NUREG-0797
Supplement No. 10

Safety Evaluation Report
related to the operation of Comanche Peak Steam Electric Station, Units 1 and 2

Docket Nos. 50-445 and 50-446

Texas Utilities Generating Company, et al.

U.S. Nuclear Regulatory Commission

Office of Nuclear Reactor Regulation

April 1985

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ABSTRACT

Supplement 10 to the Safety Evaluation Report for the Texas Utilities Electric Company application for a license to operate Comanche Peak Steam Electric Station Units 1 and 2 (Docket Nos. 50-445, 50-446), located in Somervell County, Texas, has been jointly prepared by the Office of Nuclear Reactor Regulation and the Comanche Peak Technical Review Team of the U.S. Nuclear Regulatory Commission. This Supplement provides the results of the staff's evaluation and resolution of appr ‹imately 400 technical concerns and allegations in the mechanical and piping area regarding construction practices at the Comanche Peak facility. This report does not address the Walsh/Doyle allegations regarding deficiencies in the pipe support design process and the new allegations recently received by the staff. Issues raised by the Walsh/Doyle allegations and the new allegations, as well as issues raised during recent Atomic Safety and Licensing Board hearings, will be dealt with in future supplements to the Safety Evaluation Report as needed.

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ACRONYMS AND ABBREVIATIONS

AA	-	independent assessment program allegation
AB	-	American Bridge
AB	-	bolt allegation
ABRR	-	as-built reverification records
A-C	-	Allis-Chalmers
AC	-	concrete/rebar allegation
ACI	-	American Concrete Institute
AD	-	design of pipe/pipe support allegation
ADS	-	audit discrepancy report
AE	-	electrical allegation
AEOD	-	Office for Analysis and Evaluation of Operational Data (NRC)
AFW	-	auxiliary feedwater system
AH	-	hanger allegation
AI	-	intimidation allegation
AISC	-	American Institute of Steel Construction
ALARA	-	as low as reasonably achievable
AM	-	miscellaneous allegation
ANI	-	authorized nuclear inspector
ANS	-	American Nuclear Society
ANSI	-	American National Standards Institute
AO	-	protective coating allegation
AP	-	pipe and pipe support allegation
APC	-	AMP Product Corporation
AQ	-	quality assurance/quality control allegation
AQB	-	QA/QC bolt allegation
AQC	-	QA/QC concrete/rebar allegation
AQE	-	QA/QC electrical allegation
AQH	-	QA/QC hanger allegation
AQL	-	acceptable quality level
AQO	-	QA/QC coating allegation
AQP	-	QA/QC pipe and pipe support allegation
AQW	-	QA/QC welding allegation
ARMS	-	Automated Records Management System
ASLB	-	Atomic Safety and Licensing Board
ASME	-	American Society of Mechanical Engineers
ASTM	-	American Society for Testing and Materials
AT	-	acceptance test
AT	-	test program allegation
AV	-	vendor/generic allegation
AW	-	welding allegation
AWS	-	American Welding Society

B&PVC - Boiler & Pressure Vessel Code
B&R - Brown & Root, Inc.
BISCO - Bryand Industrial Services, Inc.
BNL - Brookhaven National Laboratory
BOC - beginning of cycle
BRHL - Brown & Root Hanger Locations
BRIR - Brown & Root Inspection Report
BRP - Brown & Root piping isometric drawing
BTP - Backfit Test Program
BWR - boiling water reactor

C&L - Corner and Lada (computer program)
C&S - civil and structural
CAR - Corrective Action Request
CASE - Citizens Association for Sound Energy
CAT - Construction Appraisal Team (NRC)
CB&I - Chicago Bridge & Iron Company
CCL - Corporate Consulting and Development Company, Limited
CCS - Component Cooling System
CCW - component cooling water
CEL - Coating Exempt Log
CFR - Code of Federal Regulations
CHN - construction hold notice
CILRT - containment integrated leak rate test
CMC - component modification cards
CMTR - certified material test report
COC - certificate of compliance
COT - construction operation traveler
CP - Comanche Peak
CP - construction permit
CPPE - Comanche Peak Project Engineering
CPSES - Comanche Peak Steam Electric Station
CPSIC - Comanche Peak Seismic Interaction Criteria
CPSIG - Comanche Peak Seismic Interaction Group
CSS - containment spray system
CSTS - Construction and Startup/Turnover Surveillance Group (TUEC)
CVCS - chemical and volume control system
CZ-11 - Carboline Carbo zinc 11

DBA - design basis accident
DCA - design change authorization
DCC - Document Control Center (TUEC)
DCTG - Design Change Tracking Group
DCVG - Design Change Verification Group
DE - Division of Engineering (NRC)
DFT - dry film thickness
DL - Division of Licensing (NRC)
D-6 - Ameron Dimetcote 6

E&I - Electrical and Instrumentation
ECCS - emergency core cooling system
EDO - Executive Director for Operations (NRC)
EMR - equipment maintenance record
EOC - end of cycle
EOP - Emergency Operating Procedures
ERG - Emergency Response Guideline
ETG - Electrical Test Group (TUEC)

FDR - field deficiency report (W)
FDSG - Field Damage Study Group (TUEC)
FJO - field job orders
FP - fire protection
FSAR - Final Safety Analysis Report
FW - field weld

G&H - Gibbs & Hill
GAP - Government Accountability Project
GDC - general design criteria
GE - General Electric Corporation
GED - General Equivalency Diploma
GHH - Gibbs & Hill hanger (isometric drawing)
GTAW - gas-tungsten arc welding

HAP - head adapter plugs
HF - hot functional (testing)
HFT - hot functional test
HFTP - hot functional test program
HIR - hanger inspection report
HP - hanger package
HP - high pressure
HVAC - heating, ventilation and air conditioning system
HX - heat exchangers

IAP - Independent Assessment Program
ICC - inadequate core cooling
IE - Office of Inspection and Enforcement (NRC)
IEB - Inspection and Enforcement Bulletin
IEEE - Institute of Electrical and Electronics Engineers
IM - interoffice memorandum (TUEC)
INPO - Institute for Nuclear Power Operations
IOM - interoffice memorandum
IQI - image quality indicator
IR - inspection report (NRC)
IRC - issue record card
IRN - item removal notice
ISO - isometric drawing
ITT-G - ITT Grinnell

JTG - Joint Test Group (TUEC)
JUMA - Joint Utility Management Assessment Group

LE - left end
LOCA - loss of coolant accident
LP - liquid penetrant

M&O - memorandum and order (ASLB)
M&P - mechanical and piping
M&TE - measuring and test equipment
MAR - maintenance action request
MCC - motor control center (GE)
MDB - master data base
MFSDG - mechanical field support design group (TUEC)
MIFI - mechanical fabrication inspector
MIL - material identification list (or log)
MIME - Mechanical Equipment Inspector
MQE - Mechanical Quality Engineering
MR - material requisition
MRR - material received record
MRS - manufacturer's record sheet
MRTW - material returned to warehouse (form)
MS - main steam (line)
MT - magnetic particle test
MWDC - multiple weld data card

N/A - not applicable
NCR - nonconformance report (TUEC)
NCWFM - nonconforming weld filler metal
NDE - nondestructive examination
NDT - nil ductility transition
NDT - nondestructive testing
NI - never incorporated
NONSAT - nonsatisfactory
NOV - Notice of Violation (NRC)
NPSH - net positive suction head
NPSI - Nuclear Power Service Incorporated
NRC - U.S. Nuclear Regulatory Commission
NRR - Office of Nuclear Reactor Regulation (NRC)
NSSS - nuclear steam supply system

O&M - Operations and Maintenance (TUEC)
OBE - operating basis earthquake
OI - Office of Investigations (NRC)
OJT - on-the-job training
OL - operating license
ORNL - Oak Ridge National Laboratory
OT - operation travelers

PC - protective coating
PCR - plant change request
PET - permanent equipment transfer
PFG - Paper Flow Group
PFS - pipe fabrication shop
PITS - piping information tracking system
PORV - power operated relief valve
PPM - parts per million
PQR - procedure qualification records
PQT - performance qualification test
PSAR - Preliminary Safety Analysis Report
PSE - Pipe Support Engineering (TUEC)
PT - preoperational test
PTS - pressurized thermal shock
PW - pipe whip
PWR - pipe whip restraints
PWR - pressurized water reactor
P-305 - Carboline Phenoline 305

QA - quality assurance
QAI - quality assurance investigation (TUEC)
QC - quality control
QCI - quality control inspectors
QE - quality engineer

RCB - Reactor Containment Building
RE - right end
RES - Office of Nuclear Regulatory Research (NRC)
RFIC - request for information or clarification (B&R)
RG - Regulatory Guide (NRC)
RHRS - residual heat removal system
RI - NRC Region I Office
RIR - receipt inspection report (TUEC)
RIV - NRC Region IV Office
RPE - radiation protection engineer
RPI - rod position indication
RPS - radiation protection supervisor
RPS - report process sheet (TUGCO)
RPV - reactor pressure vessel
RPVRI - reactor pressure vessel reflective insulation
RRI - Resident Reactor Inspector (NRC)
RV - reactor vessel
RVLMS - reactor vessel level measurement system
RWN - room work notifications

SAP - startup administration procedure
SALP - Systematic Assessment of Licensee Performance (NRC)
SAT - satisfactory
SAVC - structural assembly verification card
SER - Safety Evaluation Report (NRC)
SG - steam generator

SHF - secondary hot functional (testing)
SI - safety injection
SIS - Special Inspection Services
SMAW - shielded metal arc welding
SNM - special nuclear material
SORC - Station Operations Review Committee
SRIC - Senior Resident Inspector for Construction (NRC)
SRP - Standard Review Plan (NRC)
SRT - Special Review Team (NRC)
SSE - safe shutdown earthquake
SSER - Safety Evaluation Report Supplement
SSI - safe shutdown impoundment
SSPC - Steel Structures Painting Council
SSWP - station service water pumps
STE - system test engineer
SWA - startup work authorization
SWO - shop work order

TB - Teledyne Brown
TDCR - test deficiency change request
TDI - Transamerica Delaval, Inc.
TDR - test deficiency report
10 CFR 50 - Title 10 Code of Federal Regulations Part 50
TI - temporary instruction
TIDC - Division of Technical Information and Document Control (NRC)
TNE - TUEC Nuclear Engineering
TP - test program
TPD - test procedure deviation
Tr - transcript
TRT - Technical Review Team (NRC)
TSABC - technical services as-built coordinator
TSDR - technical services design review coordinator
TSI - thermolag
TSMD - Technical Services Mechanical Drafting
TSP - tri-sodium phosphate
TUEC - Texas Utilities Electric Company
TUGCO - Texas Utilities Generating Company
TUSI - Texas Utilities Service, Inc.

UCC - University Computing Company
USI - unresolved safety issue

UT - ultrasonic test
UTA - University of Texas at Austin

VCD - vendor-certified drawing
VIB - Vendor Inspection Branch (NRC)
VRHE - vertical residual heat exchanger
VT - visual weld (inspector)

W	-	Westinghouse Electric Corporation
WDC	-	weld data card
WE	-	welding engineering (Brown & Root)
WFML	-	weld filler metal log
WPS	-	weld process sheet
WPS	-	welding procedure specification
WQTC	-	welder qualification training center

1. INTRODUCTION

On July 14, 1981, the U. S. Nuclear Regulatory Commission (NRC) issued a Safety Evaluation Report (SER) (NUREG-0797) related to the application by the Texas Utilities Electric Company (TUEC) for a license to operate Comanche Peak Steam Electric Station (CPSES) Units 1 and 2. Subsequently, eight supplemental Safety Evaluation Reports (SSERs) were issued by the staff. Supplement No. 7, published in January 1985, dealt with technical concerns and allegations in the electrical and instrumentation and test program areas. Supplements 8 and 9, published in February and March of 1985, addressed the technical concerns and allegations related to civil and structural and miscellaneous issues, and to protective coatings, respectively. This report, Supplement No. 10, addresses approximately 400 technical concerns and allegations in the mechanical and piping area. Appendix N to this report provides details of the staff's evaluation and findings of these technical concerns and allegations.

The technical concerns and allegations about Comanche Peak were part of the regulatory issues that remained outstanding toward the completion of construction of the Comanche Peak facility. The NRC Executive Director for Operations (EDO) issued a directive on March 12, 1984, establishing a program for assuring the overall coordination and integration of these issues and their resolution prior to the staff's licensing decision. In response to the EDO's directive, a program plan was developed and approved on June 5, 1984, by the Directors of NRC's Office of Inspection and Enforcement, Office of Nuclear Reactor Regulation, and the Administrator of NRC's Region IV Office. This program plan, Comanche Peak Plan for the Completion of Outstanding Regulatory Actions, specified the critical path issues, addressed the scope of work needed, and provided a projected schedule for completion.

Management and coordination of all the outstanding regulatory actions for Comanche Peak are under the overall direction of Mr. Vincent S. Noonan, the NRC Comanche Peak Project Director. Mr. Noonan may be contacted by calling 301-492-7903 or by writing to the following address:

Mr. Vincent S. Noonan
Division of Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

Copies of this supplement are available for public inspection at the NRC's Public Document Room at 1717 H Street, NW, Washington, D.C. 20555, and the Local Public Document Room, located at the Somervell County Public Library On The Square, P. O. Box 1417, Glen Rose, Texas 76043. Availability of all material cited is described on the inside front cover of this report.

2. THE COMANCHE PEAK TECHNICAL REVIEW TEAM FOR SER SUPPLEMENT 10

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APPENDIX N

NRC STAFF EVALUATION
AND RESOLUTION OF TECHNICAL CONCERNS
AND ALLEGATIONS IN THE MECHANICAL AND PIPING
AREA REGARDING CONSTRUCTION AT
COMANCHE PEAK STEAM ELECTRIC STATION UNITS 1 AND 2

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1. INTRODUCTION

As construction of the Comanche Peak Steam Electric Station was nearing completion, issues that remained to be resolved prior to the consideration of issuance of an operating license were complex, resource intensive, and spanned more than one NRC office. To ensure the overall coordination and integration of these issues, and to ensure their resolution prior to licensing decisions, the NRC Executive Director for Operations (EDO) issued a memorandum on March 12, 1984, directing the NRC's Office of Nuclear Reactor Regulation to manage all necessary NRC actions leading to prompt licensing decisions, and assigning the Director, NRC Division of Licensing, the lead responsibility for coordinating and integrating the related efforts of various offices within the NRC.

The principal areas needing resolution before a licensing decision on Comanche Peak can be reached include: (1) the completion and documentation of the staff's review of the Final Safety Analysis Report (FSAR); (2) those issues in contention before the NRC's Atomic Safety and Licensing Board (ASLB); (3) the completion of necessary NRC regional inspection actions; and (4) the completion and documentation of the staff's review of technical concerns and allegations regarding design and construction of the plant.

Technical concerns and allegations about Comanche Peak, totalling approximately 900,* arose mainly from the quality assurance/quality control personnel working or having worked on site. Their job responsibilities involve or involved QA/QC aspects of safety-related structures, systems, and components to determine whether and to what extent such items are manufactured, purchased, stored, maintained, installed, tested, and inspected as required by project documents and procedures. Most of these allegations were made orally to NRC Region IV staff, NRC Comanche Peak Site Resident Inspectors, NRC investigators, or in letters to the NRC, as well as in testimony before the Atomic Safety and Licensing Board (ASLB). Individuals with allegations were also sponsored by the Citizens Association for Sound Energy (CASE) and the Government Accountability Project (GAP). General allegations about poor construction work at Comanche Peak also appeared in several newspaper articles in the Dallas/Fort Worth, Texas areas.

By the end of April 1984, the staff identified approximately 400 technical concerns and allegations related to the construction of the Comanche Peak facility, including findings by NRC's Special Review Team (see Section 2.1 below). During its investigation of one concern or allegation, the TRT identified additional concerns. Interviews with allegers also yielded additional concerns. By December 1984, approximately 600 concerns and allegations had been identified. In addition, approximately 300 new concerns were recently provided to the NRC by one alleger.

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*This includes approximately 300 new concerns recently provided to the NRC by one alleger.

These technical concerns and allegations were grouped by subject into the following areas:

- Electrical and Instrumentation
- Civil and Structural
- Mechanical and Piping
- Quality Assurance and Quality Control (QA/QC)
- Protective Coatings
- Test Program
- Miscellaneous

This report is the fourth of a series of reports dealing exclusively with the NRC staff's efforts to evaluate and resolve the technical concerns and allegations raised by various parties and individuals regarding construction practices at the Comanche Peak facility. Issues covered in this report are related to the mechanical and piping area. A report on the staff's evaluation of technical concerns and allegations in electrical and instrumentation and test program areas was published in January 1985. Reports on the civil and structural and miscellaneous issues, and protective coatings area were published in February and March 1985, respectively. An allegation or concern was assessed as having no safety significance if, based on technical findings, the assessment showed that a structure, component, or system would perform its intended function.

The technical concerns and allegations in the QA/QC area and those recently received by the NRC, as well as the remaining areas of outstanding regulatory actions, will be addressed in future supplements to the Comanche Peak Safety Evaluation Report (SER).

The staff's findings for the mechanical and piping concerns and allegations are summarized in Section 3 of this appendix, actions required of TUEC to resolve them are presented in Section 4. Attachment 1 to this appendix is a listing of the concerns and allegations in the mechanical and piping area. Detailed assessment and findings for each concern or allegation are provided in Attachment 2 to this appendix. Those aspects of the concerns or allegations that pertain to wrongdoing (e.g., falsification of records) were forwarded to the NRC Office of Investigations (OI) for followup because they are outside the scope of the technical staff's review.

A number of potential violations of NRC rules and regulations have been identified during the course of the TRT investigation. These potential violations have not been addressed in this SSER, but will be reviewed further by the NRC Region IV staff, which will determine appropriate followup actions.

2. COMANCHE PEAK TECHNICAL CONCERNS AND ALLEGATIONS MANAGEMENT PROGRAM

2.1 Background

Shortly after the EDO's issuance of the March 12, 1984, directive, the staff found it necessary to (1) obtain current information relative to TUEC's management control of the construction, inspection, and test program and (2) obtain necessary information to establish a management plan for resolution of all outstanding licensing actions. In order to achieve these goals in an expeditious and objective manner, a Special Review Team (SRT) was formed to conduct an unannounced review of the Comanche Peak plant. The SRT consisted of eight reviewers and one team leader, all from NRC's Region II Office, and a team manager from NRC Headquarters. The SRT spent over 800 manhours, from April 3 to April 13, 1984, performing this review. The SRT concluded that TUEC's programs were being sufficiently controlled to allow continued plant construction while the NRC completed its review and inspection of the Comanche Peak facility.

The SRT review also provided a basis for the development of a management plan for the resolution of all outstanding licensing actions. This plan was approved on June 5, 1984, by the Directors of NRC's Office of Inspection and Enforcement, Office of Nuclear Reactor Regulation, and the Administrator of the NRC Region IV Office. The purpose of the plan was to assure the overall coordination and integration of the outstanding regulatory actions regarding Comanche Peak, and their satisfactory resolution prior to a licensing decision by the NRC. In accordance with the plan's proposal, a Technical Review Team (TRT) was formed to evaluate and resolve technical issues and those allegations that had been identified. On July 9, 1984, the TRT began its 10-week (five 2-week sessions) onsite effort, including interviews of allegers and TUEC personnel, to determine the validity of the technical concerns and allegations, to evaluate their safety significance, and to assess their generic implications. The TRT consisted of about 50 technical specialists from NRC Headquarters and NRC Regional Offices, and NRC consultants, who were divided into groups according to technical discipline. Each group was also assigned a group leader.

2.2 Review Approach and Methodology

2.2.1 Concern and Allegation Tracking System

The TRT developed a system for identifying and listing Comanche Peak concerns and allegations. These concerns and allegations were grouped according to their topical areas or disciplines, and were listed numerically within each group in the order that they were received by the TRT. Information in the tracking system included descriptions of the concerns or allegations; their status or the actions taken to resolve them; the nature of the source (i.e., anonymous or confidential); a code for the individual who identified the concern or allegation (instead of the individual's name); the date when the concern or allegation was received by the TRT; the pertinent source document (e.g., letter, NRC inspection report, hearing transcript, etc.); cross references; etc. The system was updated periodically to reflect the status of individual concerns or allegations as well as any new ones that had been added.

2.2.2 Review Methodology

Technical concerns or allegations similar in subject were combined and evaluated in one category. For each concern/allegation or concern/allegation category, an approach to resolution was planned and outlined by the cognizant reviewer(s). Each approach to resolution was then reviewed and approved by the responsible group leader.

The group leaders and reviewers were instructed to:

- develop and maintain for each issue or category of issues a work package that contained or referenced pertinent documentation associated with the issue(s) and the ultimate resolution, including records of interviews and inspections for supporting the final NRC staff decisions regarding the issue(s); and to

- protect the identity of the allegers, as a matter of NRC practice. Such efforts included limited and controlled distribution of allegation-related documentation and correspondence; minimal use of names, identifying titles, or position descriptions in written material; enlarged sampling of activities to prevent direct links by non-NRC personnel between the activity under investigation and the alleger; and other indirect approaches toward investigating the allegations.

During onsite sessions, the TRT held daily meetings at the review group level to assess progress, to adjust the inspection and evaluation approach as needed, and to provide a forum for the reviewers to discuss problems and to arrive jointly at resolutions. Daily meetings were also held at the management level, where the group leaders interacted with one another and with the Project Director, his assistant, and staff.

In evaluating the technical concerns and allegations, the TRT reviewers examined areas in the plant where direct observation could provide needed information to evaluate an allegation or concern. During its onsite sessions, the TRT interviewed the allegers as needed to clarify their concerns or allegations. To the extent possible, the TRT contacted allegers after its onsite review to discuss preliminary TRT findings and to obtain any additional comments from them. (See Section 2.2.3 below) The TRT also interviewed TUEC and TUEC contractor personnel as warranted by the evaluation. In addition to these contacts, the TRT reviewed various project documents including specifications, engineering drawings and analyses, procedures, instructions, NRC Region IV inspection reports, and applicable sections of the FSAR and regulations pertinent to the allegation or sample selected by the TRT for inspection. Other documents reviewed included construction records, such as design change authorizations, construction work packages, QC inspection reports, nonconformance reports, deficiency logs, lists and reports, and QC inspector training and certification records. In addition, the TRT reviewed pertinent transcripts from recent ASLB hearings, and depositions of TUEC personnel and former employees.

Based on these reviews and interviews, the TRT determined the validity of each technical concern or allegation and assessed its safety significance, its potential generic implications, and any indications of potential management breakdown. Detailed documentation of the TRT assessment and final determinations of each technical concern or allegation appear in Attachment 2 to this Appendix.

2.2.3 Interviews with Allegers

Approximately 900 technical concerns and allegations regarding the construction of the Comanche Peak facility, including approximately 300 recently provided by one alleger, have been raised by approximately 70 allegers through various mechanisms. During its onsite work, the TRT interviewed 18 individuals in person, some of whom received followup interviews by telephone. For ten allegers, the TRT reviewers were able to obtain the needed information by telephone and determined that personal interviews would not be necessary. Three allegers contacted by the TRT declined to be interviewed. Five allegers could not be located during the TRT's onsite sessions because their current addresses and telephone numbers were not available. They have not responded to correspondence from the TRT sent to their last known addresses expressing the TRT's intention to discuss their concerns with them. Efforts to locate these individuals included inquiries through the NRC's Office of Investigations, NRC's Region IV, the telephone company and U.S. Postal Service, selected inquiries of their relatives and former co-workers, confidential examination of the personnel files of TUEC and its contractors, and in some cases, inquiries with the intervenor group, the Citizens Association for Sound Energy (CASE), and the Government Accountability Project (GAP).

To the extent possible, the TRT kept a transcript of each personal interview conducted during its onsite sessions. The names and identities of the allegers had been deleted from the transcripts, as well as from other pertinent reference or source documents, before TRT reviewers were given any portions of these documents for review and follow-up. During the TRT's onsite work, the original transcripts were kept in a locked file in the TRT Project Director's office. The distribution of these transcripts within the NRC, and even within the TRT, was limited and controlled.

Subsequent to its onsite work, and at the completion of its evaluation, the TRT attempted to contact each alleger to discuss the TRT's findings regarding their original concerns, and to obtain additional comments from them, if any. Thirty-three allegers have received such followup interviews either in person or by telephone. A total of 17 allegers could not be located. Some of these individuals had received initial TRT interviews but had since left the area. Ten allegers declined further contacts with the TRT. Interview of ten allegers require additional effort by the TRT. These efforts are expected to be completed by May of 1985. The outcome of followup interviews conducted through February 1985, is briefly discussed in the individual SSER sections in Attachment 2. Transcripts were kept for all followup interviews conducted either by telephone or in person.

2.3 <u>Communications with TUEC</u>

Whenever the TRT reviewers encountered problems during their evaluations, the TRT Project Director and/or his designee would resolve them through discussions with TUEC management onsite. There were also frequent staff-level contacts between TRT members and TUEC personnel during the TRT's onsite activities. In keeping with the NRC practice of promptly notifying applicants of outstanding information or evaluation needs that could potentially affect plant safety, the staff held several meetings with TUEC representatives toward the end of the TRT's review. These meetings were held to discuss potential safety concerns and to request additional information needed by the TRT to complete its review.

The NRC staff met with TUEC representatives for the first of these meetings on September 18, 1984, to discuss the TRT's preliminary findings for electrical and instrumentation, civil and structural, and test program allegations and concerns. A letter documenting these preliminary findings and including a request for additional information was issued to TUEC on the day of the meeting. TUEC later submitted the requested information as a proposed program plan delineating actions to address the deficiencies identified by the TRT. The TRT met with TUEC representatives to discuss this proposed progam plan on October 19 and 23, 1984. TUEC submitted a partially revised program plan to NRC on November 23, 1984. On January 24, 1985, the TRT provided TUEC with detailed comments on the program plan and issue-specific action plans. On November 29, 1984, NRC sent a letter to TUEC containing potential open issues and requesting additional information and proposed program plans for mechanical and piping and miscellaneous allegations and concerns (Attachment 3). The letter also provided TUEC with the status of NRC's evaluation of coatings allegations. On January 8, 1985, the NRC issued a letter to TUEC informing them of the TRT's preliminary findings in the construction QA/QC area and requesting a program and schedule for completing a detailed assessment of the QA issues presented in the letter. A meeting between TUEC and the TRT was held on January 17, 1985, to discuss preliminary findings in the QA/QC area. Informal telephone discussions between TRT group leaders and their TUEC counterparts regarding these letters have been ongoing. (Reports documenting these discussions are available for inspection at the NRC Public Document Room, 1717 H St. N W., Washington, D.C. 20555, and at the Comanche Peak Local Public Document Room, Somervell County Public Library On The Square, P.O. Box 1417, Glen Rose, Texas 76043.) In addition, the TRT met with TUEC on February 28, and on March 5, 6, and 7, 1985, to discuss TUEC's efforts in response to the TRT's preliminary findings in the areas of electrical and instrumentation, QA/QC, test program, civil and structural, and mechanical and piping, respectively. TUEC's proposed program plan for each of these areas and its implementation of the plan will be evaluated by the NRC staff prior to the NRC licensing decision on Comanche Peak.

3. SUMMARY OF EVALUATIONS IN THE MECHANICAL AND PIPING (M&P) AREA

3.1 Scope of Concerns and Allegations

In general, the mechanical and piping concerns and allegations received or identified by the TRT were broad in scope and included concerns regarding general problems in construction and the field design change process, the NCR process and, specifically, items such as traceability of materials, the use of unqualified welders, weld quality, anchor bolt installation, the disposition of nonconformances and discrepancies, and improper or questionable documentation practices. During the course of the TRT evaluations, new allegations were raised by an alleger involving fitup and welding of component supports, bolt torquing, equipment problems, and various other concerns. Findings related to these new allegations are also included in this report. However, this report does not address new allegations recently received from the intervenor. These will be addressed in a future SSER. Also, the allegations of deficiencies in the pipe support design process raised by Messrs. M. Walsh and J. Doyle were not investigated by the TRT Mechanical and Piping Group. The Walsh/Doyle allegations were brought up during the Atomic Safety and Licensing Board hearings and have not been ruled on to date by the Board. These issues which are related to the design process will be the subject of a future SSER.

The mechanical and piping concerns and allegations, including the new ones noted above, as well as 8 Special Review Team (SRT) issues, but excluding those of Messrs. M. Walsh and J. Doyle, have been grouped into 50 categories. The 50 categories are further divided into the following five general areas:

A. Welding
B. Piping
C. Hangers and Supports
D. Construction and Documentation
E. Other

The following table presents the Mechanical and Piping SSER Category numbers included in each area:

Grouping of Mechanical and Piping SSER Categories

Welding	Piping	Hangers & Supports	Construction & Documentation	Other
Category 1	Category 10	Category 15	Category 8	Category 12
2	11	16	20	49
3	13	17	22	
4	14	18	23	
5	35	19	24	
6	36	21	25	
7	39	31	26	
9		32	27	
42		33	28	
43		34	29	
45		37	30	
46		38	40	
50		44*	41	
		47		
		48		

*Evaluation of this category is ongoing and will be included in a future SSER.

3.1.1 Welding Area

The welding concerns and allegations relate to deficiencies in Brown & Root (B&R) construction practices regarding aspects of the welding process, procedures, and inspection. Problems related to welding procedures, weld rod control, weld repairs, fabrication techniques, and weld inspection are examples of the issues raised by the concerns and allegations in the welding area and are related to welds in piping, pipe supports, and stainless steel liners. There are approximately 45 welding-related concerns and allegations grouped by the TRT into the following 13 categories.

Category No.	Subject	Characterization of Concerns and Allegations
1	Welding Performed With Incorrect or Without Procedures	Temporary hangers fabricated without procedures by unqualified welders; pipe support weld repaired using magnetized scrap material; and diesel generator skid repaired by uncontrolled weld procedures.
2	Violation of Welding Procedures	Improper buildup of undersized welds; use of downhand welding for vertical joints; use of weave bead instead of stringer bead welding; procedural questions involving flare-bevel versus butt welds; and repair of safety-related welds using weld technician holdpoints rather than QC holdpoints.
3	Improper Piping Welds	Excessive heat applied during welding resulting in excessive radial shrinkage.
4	Uncontrolled Plug Welds	Misdrilled holes repaired by uncontrolled plug welds.
5	Incorrect Weld Design	Improper weld design used to attach Cadweld sleeves to containment penetration sleeves; sleeve material susceptible to lamellar tearing.
6	Inadequate Precautions Taken During Welding	Welding performed without proper inerting or purging; inadequate electrical grounding procedures; welding and concrete chipping performed at same time in same location.
7	Improper Weld Examination and Testing	Liquid penetrant examinations improperly performed; automatic film processor speed changed to obtain correct film density; "T" holes enlarged to provide apparent adequate film sensitivity; defective welds masked during inspection of repairs to adjacent areas; calibration of the Dimetrics automatic welding machine not performed according to procedures.

Category No.	Subject	Characterization of Concerns and Allegations
9	Improper Weld Rod Control	Welders not keeping rod cans plugged in and unauthorized weld filler material used to repair diesel generator skid.
42	Questionable Primary System Welding	Unauthorized repair to safe end made using unauthorized material and procedure; RCS welding not in accordance with procedures; RCS field welds repaired too many times; resignation of Authorized Nuclear Inspector in protest.
43	Incorrect Spent Fuel Storage Pool Liner Welding	Incorrect fitup of weld seams; poor weld conditions during installation; defective block related to leak chase channels; defective seam weld.
45	Miscellaneous Welding Deficiencies	Excessive weld surface grinding; socket welds fitted and fabricated by unqualified pipefitters; defective welds on steam generator insulation supports; incomplete penetration of fuel transfer tube circumferential butt welds; and duplicate weld identification numbers and excessive tube burn-through for anti-vibration support stages.
46	Improper Weld-Quenching Techniques	Weld between 4-inch Westinghouse valve and stainless steel piping quenched contrary to procedures.
50	Piping Weld Radiography	Piping Weld Radiography was manipulated and falsified.

3.1.2 Piping Area

Piping concerns and allegations relate to the design and analysis of small bore piping systems, and to pipe installation, repairs, and modifications. The TRT grouped the approximately 20 concerns and allegations in this area into the following 7 categories.

Category No.	Subject	Characterization of Concerns and Allegations
10	Damaged Pipe	Unauthorized weld repair to a gouge in a pipe requested; 2-inch pipe damaged by sledge hammer; general concern regarding handling of safety-related piping.
11	Improper Pipe Installation	RCS piping was cold sprung; localized heating of a Containment Spray System pipe employed to achieve proper fitup; main steam line forced into proper alignment.

Category No.	Subject	Characterization of Concerns and Allegations
13	Pipe Repair and Modification	Unauthorized enlargement of spent fuel storage pool sparger holes; drill shavings and cutting oil not removed after enlargement; and nonconforming stainless steel pipe installed in containment spray system.
14	Miscellaneous Piping Problems	Crowbar dropped into a pipe in reactor core and not retrieved; deficient flexible boots supplied for penetration seals and improper construction practices during construction of main condensers.
35	Piping Design Criteria and Analysis Methods	ADLPIPE piping analysis computer program, simplified piping analysis technique, and seismic response criteria not validated and no provisions to account for Class 3 pipe support damage or failure of Class 5 supports.
36	Piping Seismic Analysis	Component modification cards not considered in small bore piping analyses; consequence of nonseismic Category I failures on seismic Category I piping and supports not considered.
39	Small Bore Piping System Analysis	Analytical method used in past could be deficient.

3.1.3 Hanger and Support Area

The concerns and allegations in the hanger and support area relate to various problems in piping and equipment supports. These problems range in scope from design-related concerns to installation and fabrication. Issues evaluated pertain to verification of a computer program used in the analysis of baseplates, material traceability, the improper installation of anchor bolts, activities related to nonconformance reports (NCRs) for piping and supports, and defective welds in pipe whip restraints and supports. The TRT grouped the approximately 60 concerns and allegations in this area into the following 15 categories.

15	Pipe Support Design Problems	Pipe supports designed by unqualified personnel.
16	Rejection of Piping Design Changes	Pipe support designer intimidated by TUEC engineers.

Category No.	Subject	Characterization of Concerns and Allegations
17	Anchor Bolt Installation and Inspection	Anchor bolts damaged or modified; failure of bolts; and bolts improperly torqued and inspected.
18	Pipe Support Nuts and Bolts	Bolts cut shorter than designed; anchor bolts improperly aligned and bent to fit holes; and jam nut installation requirements not clear.
19	Residual Heat Exchanger Tank Support	Welds were undersized; bolts were loose.
21	Pipe and Pipe Support NCRs	Pipe piece number changed; inspection report improperly dispositioned; NCR initiated but not dispositioned.
31	Pipe Support Welding Problems	Support fit-up gaps improperly sized; unauthorized cutting or welding; shim gaps improperly sized; improper inspection of skewed weld joints.
32	Pipe Support Fabrication	Welder instructed to install unauthorized support member; unauthorized support modifications made by torch cutting; sledge hammer used to straighten a support; grinders used to obtain design clearances.
33	Pipe Support Material Traceability	Unqualified foreign steel substituted for domestic steel; scrap I-beam used for a pipe support; nonsafety-related material used in safety-related and fire protection supports; heat number not marked on material; and 15-20 pipe supports with material traceability problems identified and reported.
34	Baseplate Analysis Computer Programs	Two baseplate stress analysis computer programs were based on erroneous assumptions and not validated.
37	Pipe Strut and Snubber Inspection	QC inspectors confused about 5° strut and snubber installation requirement; spring hanger and snubber adjustments not performed prior to fuel load.
38	Anchor Bolt Material	Material from two different manufacturers interchanged.

Category No.	Subject	Characterization of Concerns and Allegations
44 & 47	Pipe Whip Restraint Defects	CB&I and NPSI supplied restraints with defective welds; excessive installation gaps exist; weave bead welding performed with unauthorized weld rods; NCR never documented or resolved; vendor welds undersized, undercut and possibly porous.
48	Pipe Snubber Functionability	Dimensional conditions existed to prevent certain mechanical shock and sway suppressors from functioning through full core of action.

3.1.4 Construction and Documentation Control Area

The concerns and allegations in this area relate mainly to welding QA/QC issues. These issues include weld inspection, design changes in pipe whip restraints, improper welding practice and documentation, and use of unqualified welders and weld inspectors. The TRT grouped the approximately 30 concerns and allegations in this area into the following 13 categories.

Category No.	Subject	Characterization of Concerns and Allegations
8	Weld Data Card	Weld data card lost, reconstructed, and accepted by QC.
20	Component Modification Card	Component modification card "lost" to prevent traceability of unauthorized work.
22	Pipe Whip Restraint Design Changes	Design changes made by TUEC to a vendor-furnished restraint without vendor approval.
23	Oxygen Analyzer Documentation	Calibration records for oxygen analyzer were destroyed.
24	Welding Quality Factors	Welders improperly trained; welding inspectors unqualified; questionable rods used; required welds in inaccessible locations were omitted; weld repair and inspection documentation disorganized; welds wrongfully made to concrete reinforcing rods; welders forced to increase work rate.
25	Welding Documentation	Unauthorized and uninspected weld repairs performed on completed pipe supports; project document package contained radiograph of nonexistent welds; and documentation errors occurred on steam generator welds.

Category No.	Subject	Characterization of Concerns and Allegations
26, 27 & 28	Personnel Qualification	Unqualified welders, welding inspectors and QA/QC welding documentation personnel used in some instances.
29 & 41	Weld Inspection	Improperly certified liquid penetrant examination materials used; and improper implementation of radiographic examination program.
30	Steam Condenser Tube Sheet Supports	Steam condenser tube sheet supports incorrectly drilled.
40	Class 5 Support and Hangers	TUEC did not implement QA program for Class 5 hangers and supports.

3.1.5 Other Areas

Many issues were considered in the two categories in this grouping. They relate to the installation of the Unit 1 reactor vessel and the new concernns recently provided to the TRT by one alleger.

Category No.	Subject	Characterization of Concerns and Allegations
12	Reactor Vessel Installation	Reactor vessel support blocks were damaged during final installation.
49	Miscellaneous Concerns of Alleger A-45	Approximately 300 alleged defective items were categorized into welding, torque, equipment, and miscellaneous areas.

3.2 The Mechanical and Piping (M&P) Group

The Mechanical and Piping Group consisted of two NRC employees and nine consultants. All group members are mechanical or civil engineers with a combined total of 300 years of experience in nuclear and nonnuclear design and construction work. These reviewers brought a wide variety of knowledge, experience, and related expertise in mechanical and piping analysis, fabrication, inspection, and testing to the Technical Review Team.

3.3 Findings for Mechanical and Piping Issues

The TRT reviewed over 400 mechanical and piping related issues including the approximately 300 concerns raised by one alleger.

The staff found the mechanical and piping allegations and concerns to be generally related to personnel qualifications, compliance with procedures, adherence to codes and standards, or the existence of complete and correct documentation. Most of the approximately 400 concerns and allegations were either not substantiated or did not contain sufficient information with which to either substantiate or refute the concerns. Although about 60 allegations

were at least partially substantiated, most did not affect plant safety because the concern, though valid, would not have prevented the equipment, component or system of concern from performing its intended function.

The staff found five issues within the 49 categories (Note: Review of Category 44 is still ongoing) reviewed by the TRT's M&P Group which have potential safety significance and generic implications. An issue of concern in the Welding Area is related to uncontrolled welding repair of misdrilled holes in piping and cable tray supports. Two issues of potential safety significance were found in each of the Piping Area and Hanger and Support Area. One of the Piping Area concerns is also related to temporary pipe supports. The specific issue is failure to assess temporary pipe and equipment supports. The other Piping Area safety significant issue is the failure to consider the potential damage to piping systems and pipe supports which are routed between seismic Category I and nonseismic Category I buildings. The two safety significant concerns found by the staff in the Hanger and Support Area are related to the shortening of bolts holding the upper steam generator lateral supports to wall plates and to the lack of a fillet weld inspection criteria for certain types of skewed welds. There were no adverse safety significant findings in the Construction and Document Control Area or the Other Area. TUEC has been requested to take certain actions and to provide the NRC staff additional information before these issues can be resolved. Any finding related to QA/QC aspects will be assimilated in the QA/QC SSER (SSER No. 11).

3.3.1 Welding Area Findings

One safety significant concern was identified in the welding area as a result of the staff's evaluations. This concern relates to uncontrolled weld repairs by plug welding. Alleged generic problems regarding uncontrolled repairs to holes in pipe and cable tray supports and in baseplates were reviewed for both Units 1 and 2. The holes, which had been misdrilled during fabrication, were repaired by plug welds. Because these supports are seismic Category I supports, the effects of the welds should have been evaluated. Although the effects of unauthorized, undocumented, and uninspected plug welds in some locations (e.g., the webs of I-beams or in structural members in compression) might be inconsequential, plug weld repairs in some critical locations (e.g., flanges of I-beams in flexure or in structural members in tension) could affect the support structural integrity or its ability to perform its intended function. The safety significance of these unauthorized repairs can be determined only if the specific repairs are identified, inspected, and evaluated in this and other areas of both Units. (See Attachment 2, Category 4.)

The staff concluded that additional actions, as noted in Section 4, are required before these issues can be completely resolved.

3.3.2 Piping Area Findings

During its evaluation, the staff identified two potential problems in the piping area: failure to assess temporary pipe and equipment supports and failure to consider the potential damage to piping systems and pipe supports when these systems are routed between seismic Category I and nonseismic Category I buildings. Both are safety significant and require further action.

An allegation that a Unit 1 main steam line had been installed incorrectly and had been forced into proper alignment after flushing operations by use of the Containment Building polar crane and come-alongs was investigated as part of M&P Category 11. It was also alleged that pipe supports had been modified to maintain the line in its forced position and that vibrations following detachment of the flushing line could have damaged the main steam line. Based on its evaluation, the staff determined that the alleged incident pertained to restoration of the Unit 1, Loop 1, main steam line to its initial, correct installation position. The line had shifted during flushing operations because of the weight of the added water and because the temporary supports sagged. The staff also determined that modifications to the permanent pipe support were necessary to properly support the main steam line in its restored position. The staff's review of a TUEC analysis concluded that the analysis was incomplete. An evaluation of the full sequence of events leading up to the incident had not been performed by TUEC. Review of Gibbs & Hill Specification No. 2323-MS-100 indicated that there were inadequate requirements and construction practices for the support of the main steam line during flushing, and for temporary supports for piping and equipment in general. In particular, evaluations were not required to assure the adequacy of temporary supports during flushing and installation. The staff concluded that the additional action noted in Section 4 is required before this issue can be resolved. (See Attachment 2, Category 11.)

The staff reviewed the SRT findings in piping design and discovered that piping systems, such as main steam, auxiliary steam and feedwater, are routed from the Electrical Control Building (seismic Category I) to the Turbine Building (nonseismic Category I) without any isolation. To be acceptable, each seismic Category I piping system should be isolated from any nonseismic Category I piping system by separation, barrier, or constraint. If isolation is not feasible, then the effect on the seismic Category I piping of the failure in the nonseismic Category I piping must be considered (CPSES FSAR 3.7B.3-13.1). For CPSES, FSAR Section 3.7B.2.8 establishes that the Turbine Building is a nonseismic Category I structure and failure is postulated during a safe shutdown earthquake. The effect of Turbine Building failure on any non-isolated piping routed through the Turbine Building from any seismic Category I building must be considered. In addition, for nonseismic Category I piping connected to seismic Category I piping, the dynamic effects of the nonseismic Category I piping must be considered in the seismic design of the seismic Category I piping and supports, unless TUEC can show that the dynamic effects of the nonseismic Category I piping are isolated by anchors or restraints. The anchors or restraints used for isolation purposes must be designed to withstand the combined loading imposed by both the seismic Category I and nonseismic Category I piping. (See Attachment 2, Category 36.)

3.3.3 Hanger and Support Area Findings

The staff identified concerns with potential safety significance in two of the mechanical and piping categories within this grouping. Both require further action, as noted in Section 4 below.

Shortening bolts holding the upper steam generator (SG) lateral supports to wall plates is one of the concerns addressed by the staff within M&P Category 18. The staff found that TUEC purchased 144 bolts which were 9 inches long for the purpose of securing the SG lateral supports to the embedment plates in accordance with design requirements. Since a 7-1/2-inch bolt is necessary to meet installation requirements, the bolts were cut to this length. The staff concern is that the as-installed bolt length cannot be verified because of TUEC's inability to produce the original QA/QC inspection and installation records. Further action is required to verify the actual length of the bolts used to install the steam generator lateral supports. (See Attachment 2, Category 18)

Brown & Root (B&R) inspection procedures were reviewed for welds in pipe supports designed to ASME III Code, Subsection NF. The staff found that no fillet weld inspection criteria existed for certain types of skewed welds. B&R weld inspection procedures addressed Type 1 skewed welds; however, procedures did not include weld inspection criteria for Type 2 skewed welds. By definition, Type 2 skewed welds are those welds joining two nonperpendicular or non-colinear structural members, or two members with curved surfaces or curved cross sections such as a pipe stanchion (a section of pipe used as a structural member) welded to another pipe stanchion or to a curved pipe pad. According to records reviewed, Type 2 skewed welds were actually categorized as "all other welds" rather than "skewed welds" on the required QC checklist. The lack of inspection criteria and lack of verification of proper inspection procedures being conducted for Type 2 skewed welds could lead to undersized welds. Therefore these conditions have both safety significance and generic implications. (See Attachment 2, Category 31.)

3.3.4 Construction and Document Control Area Findings

The staff identified no safety significant concerns as a result of its investigation of the 13 categories within this group. The allegations within this group address weld documentation, quality, inspection, and pipe support documentation. The staff reviewed each allegation within the 13 categories and found no items requiring further action.

3.3.5 Other Area Findings

The staff identified no concerns as a result of their investigation of the two categories within this group. The staff found during its investigation of M&P Category 12 that there was no attempt to conceal damage to the reactor vessel support blocks. In fact, the damage had been reported and repaired by B&R and accepted by Westinghouse (See Attachment 2, Category 12). Of the approximately 300 defective items alleged by one individual, the staff investigated 63 items which the alleger considered to be "most important." Many items that may have appeared to the alleger to be unclosed NCRs or discrepancies later resolved in the normal QA/QC program were investigated by the staff. The results show that the QA/QC system provided the necessary corrective action when required. (See Attachment 2, Category 49.)

3.4 Overall Assessment and Conclusions

The staff reviewed and evaluated concerns and allegations in the Mechanical and Piping area which were related to compliance with procedures, personnel qualifications, quality of workmanship, material traceability, adherence to codes and standards, or documentation. During its evaluation, the staff reviewed pertinent construction records, NCR's, design drawings, procedures, specifications, interviewed craft and TUEC personnel, and conducted plant inspections. The staff found that most of the approximately 400 concerns and allegations were either not substantiated or contained insufficient evidence with which to substantiate the alleged concerns. Often, there was no connection between the concern and plant safety. Also, further contact with the individuals raising the concerns often did not provide the required specificiity to better focus the allegations. The staff's detailed review of each concern or allegation completely or partially substantiated approximately 60 of them. Five issues evolved from eight substantiated allegations which were of potential safety significance. The staff has requested TUEC to submit an action plan to address these allegations. Although about 60 allegations were at least partially substantiated, the staff has concluded in the individual allegation assessment (Attachment 2) that all but 8 were not safety related, i.e., that the concern, though valid, would not have prevented the equipment, component, or system of concern from performing its intended function.

4. ACTIONS REQUIRED OF TUEC IN THE MECHANICAL AND PIPING AREA

TUEC shall submit additional information to the NRC, in writing, including a program and schedule for completing a detailed and thorough assessment of the issues identified in the following subsections. This program plan and its implementation will be evaluated by the staff before NRC considers the issuance of an operating license for Comanche Peak, Unit 1. The program plan shall address the root cause of each problem identified and its generic implications on safety-related systems, programs, or areas. The collective significance of these deficiencies shall also be addressed. The program plan shall also include the proposed TUEC action to assure that such problems will be precluded from occurring in the future.

4.1 Inspection for Certain Types of Skewed Welds in NF Supports (M&P Category 31).

4.1.1 Revise B&R weld inspection procedures CP-QAP-21.1 and QI-QAP-11.1-28 to properly address skewed welds of stanchion to stanchion and stanchion to pipe pad.

4.1.2 Provide evidence to verify that previous inspections of these types of skewed welds were performed to the appropriate procedures or reinspect these welds.

4.2 Improper Shortening of Anchor Bolts in Steam Generator Upper Lateral Supports (M&P Category 18).

4.2.1 Provide evidence, such as ultrasonic measurement results, to verify acceptable bolt length.

4.2.2 Should unauthorized bolt cutting be verified, replace shortened bolts with bolts of proper length or provide analysis to justify the adequacy of shortened bolts as installed.

4.2.3 Provide justification or propose measures to ensure that no similar concern exists for bolting.

4.3 Design Consideration for Piping Systems Between Seismic Category I and Nonseismic Category I Buildings (M&P Category 36).

4.3.1 Provide analysis and documentation showing that the piping systems routed from seismic Category I to nonseismic Category I buildings meet the stated FSAR criteria.

4.4 Plug Welds (M&P Category 4).

4.4.1 Modify TUEC's proposed plan to NRC Region IV (TXX-4183 and TXX-4259) to include a sampling inspection of all areas of the plant having plug welds to include cable tray supports, pipe supports, and base plates. Propose alternate methods of inspection where the oblique lighting method is not viable (e.g., locations covered by heavy coats of paint). Assess the effects on quality of uncontrolled plug welds found during the proposed inspection, as modified above. Submit a report documenting the results of the inspection and assessment to the NRC for review.

4.4.2 Perform bounding analyses to assess the generic effects of uncontrolled plug welds on the ability of pipe supports, cable tray supports, and baseplates to serve their intended function. Submit a report documenting the results of the assessment to the NRC for review.

4.5 Installation of Main Steam Line Pipes (M&P Category 11).

4.5.1 Modify Gibbs & Hill Specification No. 2323-MS-100 and develop and implement procedures for support of the main steam line during flushing and for temporary supports for piping and equipment in general to assure that the quality of piping and equipment is not affected.

4.5.2 Perform an assessment of stresses in the portions of the Unit 1, Loop 1 main steam and feedwater lines that were affected in the sequence of events involved during their initial installation, flushing, and final installation. Conditions requiring stress analysis are:

(a) Flushing condition when the lines were full of water and temporary supports had sagged or settled.

(b) Disconnecting condition when vibrations of the temporary line could have occurred.

(c) Lifting condition when forces were applied by the polar crane and come-alongs.

These assessments shall be based on the appropriate piping configurations involved.

4.5.3 Perform a nondestructive examination of locations in the Unit 1, Loop 1, main steam and feedwater piping where stresses were exceeded during the conditions of concern in (a) through (c) above.

4.5.4 Review the existing baseline UT examinations for those portions of the Unit 1, loop 1, main steam and feedwater piping involved in all the conditions of concern in (a) through (c) above for unacceptable indications.

4.5.5 Review records of hydrostatic testing of the Unit 1, loop 1 main steam and feedwater piping to verify the quality of piping involved in the incident.

4.5.6 Provide similar assessments for circumstances involved in a lifting incident identified during the TRT inspection of the Unit 1, Loop 4, main steam line.

4.5.7 Provide assessments of effects on quality of safety-related piping and equipment which were involved in similar incidents of sagging, settlements and failures, if any, of temporary supports.

4.5.8 Submit the results of analyses, examinations, and reviews in a documented report for NRC review.

ATTACHMENT 1

LISTING OF TECHNICAL CONCERNS AND ALLEGATIONS IN THE MECHANICAL AND PIPING AREA

Concern/ Allegation Number	Characterization	Category	Page Number
A. Bolts			
AQB-1	Inspection of Hilti-bolt documentation packages may have been deemed satisfactory, even though inspectors had recognized that the documentation packages did not conform to site procedures.	17	N-139
AQB-2	Hilti-bolt inspectors did not ensure that these bolts had been properly installed and torqued prior to documenting satisfactory installation. Use of torque seal, which was applied to Hilti bolts after torquing and inspection, was not always controlled.	17	N-139
AQB-3	Some bolts were cut because there was concrete in the bolt hole that prevented installing the bolt to its full length. This cutting removed the heat numbers from the ends of the bolts.	18	N-149
AB-4	Some Hilti bolts were broken during a torquing procedure; others were elongated or had stripped threads.	17	N-139
AB-5	Some Hilti bolts were torqued to lower values than required because of improper use of the torque wrench; other Hilti bolts were welded to the supporting device such that they would not provide support. Hilti bolts will probably work free from the concrete due to vibrations over the 40-year plant life.	17	N-139
AB-6	A quality control (QC) inspector was instructed to sign for torquing	17	N-139

Concern/ Allegation Number	Characterization	Category	Page Number
	of Hilti bolts without proper authorization.		
AB-7a	There was improper torquing of fasteners on supports.	17	N-139
AB-7b	The component cooling water surge tank anchor bolts were misaligned with the baseplate holes, and the anchor bolts were bent to fit the holes.	18	N-149
AB-8	A Brown & Root, Inc. (B&R) QC inspector was fired for initiating a nonconformance report (NCR) regarding improper Hilti bolt installation.	17	N-139
AB-9	Anchor bolts in concrete walls at unspecified locations in safety-related buildings were pulling out under load.	17	N-139
AB-10	Concrete anchor bolts were modified improperly and without authorization.	17	N-139
AB-11	There was a mix-up of bolts in the Unit 1 Containment Building; 3000 anchor bolts, some furnished by "Boston Made" and others by "Southern Made," were interchanged.	38	N-245
AB-12	Some bolts holding the upper steam generator (SG) lateral supports to the wall plates were cut; therefore, they were incapable of securing the SG lateral supports to the embedment plates in accordance with design requirements.	18	N-149
AB-13	During installation of approximately 1,000 hangers, some bolt holes were drilled too large, causing an excessive bolt-to-bolt hole gap in the baseplates. (This allegation will be addressed in the staff's summary dispositions on the Walsh/Doyle allegations concerning the design of pipe supports.)	N/A	N/A
AB-14	An individual was directed to accept Hilti bolts that had been torqued and that had Torque Seal applied by someone else.	17	N-139

Concern/ Allegation Number	Characterization	Category	Page Number
B. Piping			
AQP-1	A pipe piece number was changed to cover up unauthorized work and to avoid generation of NCRs.	20	N-155
AQP-2	A component modification card (CMC) related to pipe piece number 48 was missing. It was thought that this CMC was lost deliberately so that unauthorized work could not be traced.	20	N-155
AQP-3	Design changes were made to Westinghouse (W) SG whip restraints by a B&R representative, without approval from the original W design organization.	22	N-163
AP-4	Two or three 100-ton jacks were used to cold spring a 28-inch line in the reactor coolant system.	11	N-99
AP-5	A craftsman was directed to make an unauthorized, undocumented, and uninspected weld repair of a gouge in a pipe.	10	N-89
AP-6	A crowbar that was dropped into a pipe in the reactor core 2 years ago has not been retrieved.	14	N-127
AP-7	Unauthorized redrilling was performed on undersized holes in the spent fuel pool spargers; drill shavings and cutting oil which was not removed from the spargers could cause jamming in fuel cell racks.	13	N-119
AP-8	During straightening of a support for a 2-inch pipe, the side of the pipe was caved in 1/2 inch or more by a sledge hammer.	10	N-89
AP-9	During April or May of 1979, a stainless steel line in the containment spray system was heated during installation. The line was thought to be designated non-Q.	11	N-99
AP-10	A steam line intended for the Unit 1 turbine fell off a truck and struck a	10	N-89

Concern/ Allegation Number	Characterization	Category	Page Number
	railroad track. The line was returned to the storage area and hidden.		
AP-11	Three or four support blocks for the reactor vessel were cracked and chipped during installation, and B&R attempted to conceal the damage.	12	N-113
AP-12	An unauthorized repair was made on a safe end weld in the reactor coolant system (RCS). Grinding of the buttered weld metal overlay was repaired using filler material for the final weld.	42	N-263
AP-13	Using the polar crane and 3-ton "come alongs," a 32-inch main steam line was forced 6 inches vertically and 4 inches horizontally.	11	N-99
AP-14	Flexible boots for penetration seals supplied by BISCO were deficient.	14	N-127
AP-15	In September 1982, a pipe that was 1/2 inch out-of-round was installed in the Containment Spray System. During its installation, the pipe was buttered extensively to achieve the required minimum wall thickness.	13	N-119
AP-16	Contrary to procedures, an out-of-round pipe was repaired by uncontrolled local heating and jacking, which probably damaged the pipe.	13	N-119
AP-17	(This allegation duplicates AP-16.)	13	N-119
AP-18	An excessive gap of 1 inch or more was noted during fitup on pipe support MS-1-004-007-C72K. The gap was welded in violation of fitup limitations.	31	N-199
AP-19	The web of structural support member M-17 was cut in the wrong location. Rather than reporting the error and correcting the problem according to procedure, the cut was filled by unauthorized welding.	31	N-199
AP-20	Pipe support MS-1-003-009-C72K had an excessive gap at fitup that required	31	N-199

Concern/ Allegation Number	Characterization	Category	Page Number
	backwelding. The upper stanchion of this support was cut incorrectly and then repaired by an unqualified welder.		
AP-21	The bottom saddle of pipe support MS-1-003-010-C72K was cut into four pieces. The left-hand piece did not fit and was heated, jacked, and hammered until it fit.	31	N-199
AP-22	There was an excessive gap between the shim plates in support MS-1-002-005-C72K. The plates were enclosed without the problem being reported or corrected.	31	N-199
AQP-23	The TUEC QA program did not apply to Class 5 (non-seismic) hangers and supports.	40	N-251
AP-24	The ITT-Grinnel baseplate computer program, FUB II, Revision 2, was never validated, and analyzed only one bolt out of four for tension loads.	34	N-225
AP-25	The Corner & Lada computer program for analyzing pipe-support baseplate stress and anchor bolt tension had not been validated and made erroneous assumptions.	34	N-225
AP-26	The ADLPIPE piping analysis computer program had not been validated.	35	N-231
AP-27	The seismic response spectra generated was not representative of the Comanche Peak plant and agreed poorly with the Uniform Building Code.	35	N-231
AP-28	Failure of a Class 5 (non-seismic) piping system could cause failure of an adjacent Class 3 (seismic) piping system.	35	N-231
C. Hangers			
AQH-1	(This allegation will be addressed in CPSES SSER No. 11, QA/QC Category 2.)	N/A	N/A
AQH-2	An individual was instructed to "buy off" on hanger TWX-039-714-A35R. This individual refused to accept	21	N-159

Concern/ Allegation Number	Characterization	Category	Page Number
	the hanger, but believes it was accepted by another inspector. An NCR was written about this hanger, but was voided.		
AH-3	There were photographs of hanger structural material that had been cut up and scrapped after its heat numbers had been transferred to unqualified steel. The unqualified steel was then used in various pipe hangers and restraints.	33	N-217
AH-4	A welder was instructed to weld a leg on a hanger; however, the leg was not authorized by the drawing.	32	N-209
AH-5	Hangers were designed by engineering helpers who were not trained or qualified as engineers.	15	N-133
AH-6	There were fitup gap violations on three hangers.	31	N-199
AH-7	A piece of scrap I-beam was used in the fabrication of a hanger.	33	N-217
AH-8	A pipe support engineer was fired because he made suggestions about the redesign of a hanger.	16	N-137
AH-9	Cutting torches were used on three hangers.	32	N-209
AH-10	Bolt holes in hangers were enlarged with a torch.	32	N-209
AH-11	Cutting torches were used regularly to enlarge bolt holes in structural tubing to accommodate non-perpendicular anchor bolts.	32	N-209
AH-12	(This allegation duplicates AQE-10 and AE-14, which were addressed in CPSES SSER No. 7, E&I Category 2.)	N/A	N/A
AH-13	This allegation duplicates issues in AW-52 (Category 3), AW-14 (Category 4), AW-50 (Category 31), and in AM-18 (Miscellaneous Category 13, CPSES SSER No. 8)	N/A	N/A

Concern/ Allegation Number	Characterization	Category	Page Number
AH-14	(This allegation was addressed in CPSES SSER No. 7, E&I Category 2.)	N/A	N/A
AH-15	Non-Q material was used for Q components in fire protection hangers and in other pipe hangers.	33	N-217
AQH-16	(This allegation will be addressed in CPSES SSER No. 11, QA/QC Category 3.)	N/A	N/A
AQH-17	An NCR written against a hanger was never dispositioned. An individual was concerned that the problem would be covered up with paper rather than being properly resolved.	21	N-159
AH-18	The foreman in charge of night crew pipe hangers, prior to February 1983, was unqualified.	32	N-209
AQH-19	(This allegation duplicates AB-7a.)	17	N-139
AQH-20	Sledge hammers and grinders were used to straighten pipe hangers and to establish proper clearance between the hanger and the pipe.	32	N-209
AQH-21	(This allegation duplicates AQH-20.)	32	N-209
AQH-22	Material traceability for a hanger piece was lost because several heat numbers were listed for different pieces on a receipt inspection report.	33	N-217
D. Welding			
AQW-1	The following improper welding practices were used: (1) welders were not properly trained; (2) QC inspectors lacked sufficient welding background to conduct adequate inspections; (3) poor quality weld rods were used; (4) required piping welds were not performed in inaccessible locations; and (5) although some weld procedures required heliarc welding prior to capping with stick welds, a frequent practice was to complete the entire weld with sticks.	24	N-169
AQW-2	Welders used by B&R were unqualified.	26	N-183

Concern/ Allegation Number	Characterization	Category	Page Number
AQW-3	Unqualified helpers were used for safety-related welding.	26	N-183
AQW-4	Any individual who could weld a straight line was allowed to weld.	26	N-183
AQW-5	Visual weld inspectors were inadequately trained and certified.	27	N-187
AQW-6	People were inexperienced and "working out of procedures."	28	N-191
AQW-7	A document clerk was unqualified either by experience or by education.	28	N-191
AQW-8	An individual was directed to falsify reports to management concerning welder performance and radiography.	41	N-257
AQW-9	The random radiographic testing program, used to determine welder performance, was improperly implemented.	41	N-257
AQW-10	Procedures did not provide for proper reinforcement on flare-bevel welds.	2	N-43
AQW-11	Vendor welds on the diesel generators were inspected by unqualified personnel.	27	N-187
AQW-12	Weld repair and inspection documentation was disorganized.	24	N-169
AQW-13	(This allegeation will be addressed in CPSES SSER No. 11, QA/QC Category 2.)	N/A	N/A
AW-14	Holes that had been drilled in incorrect locations in baseplates pipe supports, and cable tray supports were plug welded in an uncontrolled manner.	4	N-57
AQW-15	Tube holes in the main condenser tube support sheets were incorrectly drilled, and an inspector rejected vendor welds on a main condenser, then changed his mind and accepted them for no apparent reason.	30	N-195
AQW-16	(This allegation duplicates AQW-11.)	27	N-187

Concern/ Allegation Number	Characterization	Category	Page Number
AQW-17	QC inspections of the fuel pool liner were inadequate.	27	N-187
AQW-18	EBASCO inspectors did not properly inspect welds.	27	N-187
AQW-19	The backfit inspection program was not completely implemented.	27	N-187
AW-20	Radiography included the following irregularities: (1) film processing speed was intentionally altered to achieve correct film density; (2) "T" holes in penetrators were enlarged to give indications of adequate film sensitivity; (3) adjacent weld defects were masked when shooting thin wall repairs.	7	N-71
AW-21	(The allegation duplicates AW-20.)	7	N-71
AQW-22	An NCR on defective welds in Chicago Bridge & Iron (CB&I) pipe whip restraints was never assigned an NCR number and was not properly processed or dispositioned.	44	N-289 (evaluation ongoing)
AQW-24	There was improper use of filler material during a weld repair to a tube steel member of an auxiliary skid for the Unit 2 diesel generator.	1	N-37
AQW-25	There were documentation problems related to welds between the steam generators and the main steam lines.	25	N-179
AQW-26	There was unauthorized welding on reinforcing steel.	24	N-169
AQW-27	Improperly certified liquid penetrant materials were used at Comanche Peak.	29	N-193
AQW-28	Welding procedures were violated by using filler material to build up undersized welds.	2	N-43
AQW-29	Undocumented weld repairs were made to a hanger that had been completed and accepted; as a result, no QC inspection was performed on these repairs.	25	N-179

Concern/ Allegation Number	Characterization	Category	Page Number
AQW-30	A safety-related weld was repaired using weld technician holdpoints rather than QC holdpoints, as required by procedure.	2	N-43
AW-31	(This allegation duplicates AQW-10.)	2	N-43
AW-32	Reactor coolant system welds were not made in accordance with procedures because of "twiddling" with weld machine controls.	42	N-263
AQW-33	An authorized nuclear inspector (ANI) quit in protest because of a lack of confidence in reactor coolant system welds and poor QC.	42	N-263
AW-34	Temporary hangers were welded without procedures or by an unqualified welder.	1	N-37
AW-35	A scrapped piece of magnetized I-beam was welded for a hanger repair.	1	N-37
AW-36	A welder used "downhand" welding when "uphand" welding was required.	2	N-43
AW-37	(This allegation will be addressed in CPSES SSER No. 11, QA/QC Category 5.)	N/A	N/A
AW-38	Weld repairs on a tubular steel structural member on the diesel generator were performed without a procedure and without proper documentation.	1	N-37
AW-39	Vendor welds were defective on a CB&I-supplied pipe whip restraint in the Unit 1 pressure relief tank room.	44	N-289 (evaluation ongoing)
AW-40	One weld seam in the spent fuel pool liner was largely rust and concrete.	43	N-271
AW-41	Reactor coolant system welds FW-19 and FW-20 were improperly performed and were repaired too many times.	42	N-263
AW-42	The welding conditions for the field installation of the spent fuel pool stainless steel liners were poor.	43	N-271
AW-43	Unqualified pipefitters performed fitup and welding on socket welds.	45	N-291

Concern/ Allegation Number	Characterization	Category	Page Number
AW-44	Improper weld design was used to attach Cadweld sleeves to the outer surface of containment penetration sleeves made of A588 steel, which were installed for the main steam lines.	5	N-65
AW-45	When shear lugs were welded to stainless steel pipe, the welding was performed without proper purging.	6	N-67
AW-46	Grounding leads were wrapped around pipe allowing the clip to rest upon the pipe, resulting in numerous arc strikes.	6	N-67
AW-47	The following improper construction practices were associated with the main condensers: (1) tubes were over-rolled and split; (2) tubesheets were split; and (3) deficient welds were accepted in the Unit 2 condensers.	14	N-127
AW-48	A QC trainee used liquid penetrant improperly	7	N-71
AW-49	(This allegation duplicates AW-14.)	4	N-57
AW-50	An excessive gap was present when some pipe hangers and whip restraints were welded in place.	31	N-199
AW-51	(This allegation duplicates AW-14.)	4	N-57
AW-52	Weld FWI-B in the 12-inch containment spray system piping was improper because: (1) it was performed with too much heat, resulting in a convex weld on the inside surface; (2) not all of the consumable insert was consumed.	3	N-53
AW-53	There were weld deficiencies in pipe hangers. (This allegation is also related to Categories 2 and 9.)	44	N-289 (evaluation ongoing)
AW-54	Pipe supports were welded using the weave bead technique rather than the stringer bead technique, as required by the welding specifications.	2	N-43

Concern/ Allegation Number	Characterization	Category	Page Number
AW-55	(This allegation duplicates AW-14.)	4	N-57
AW-56	Welders did not keep their weld rod cans plugged into electrical outlets during the work day.	9	N-79
AW-57	There were defective welds in pipe whip restraints supplied by NPS Industries.	44	N-289 (evaluation ongoing)
AW-58	(This allegation duplicates AW-50.)	31	N-199
AW-59	(This allegation duplicates AW-52.)	3	N-53
AW-60	There were defective welds on the steam generator top head insulation supports.	45	N-291
AW-61	(This allegation duplicates AW-45.)	6	N-67
AW-62	(This allegation duplicates AW-52.)	3	N-53
AQW-63	A weld data card for a field weld was lost, then reconstructed. The reconstructed card was accepted by B&R QC personnel.	8	N-75
AW-64	(This allegation duplicates AW-57.)	44	N-289 (evaluation ongoing)
AW-65	The circumferential butt welds in the Unit 1 and 2 fuel transfer tubes had incomplete penetration.	45	N-291
AW-66	Welding and concrete chipping were performed simultaneously in the same area.	6	N-67
AW-67	(This allegation duplicates AW-63.)	8	N-75
AW-68	The supports on tanks for the vertical residual heat exchangers had undersized welds.	19	N-153
AQW-69	There was widespread use of inadequately qualified mechanical and welding inspectors.	27	N-187
AQW-70	Welders were instructed to work at a pace that required using at least 200 weld rods per shift.	24	N-169

Concern/ Allegation Number	Characterization	Category	Page Number
AQW-71	Fifteen to 20 hangers lacked material traceability.	33	N-217
AQW-72	A project document package contained a radiograph for a nonexistent weld.	25	N-179
AQW-73	Inspection procedures did not include instructions for examining skewed fillet welds.	31	N-199
AW-74	A stainless steel weld between a 4-inch valve and a pipe was improperly quenched.	46	N-299
AQW-75	Some of the vendor welds on a pipe whip restraint on the 832-A elevation of the Unit 1 Reactor Building were unacceptably mismatched.	47	N-301
AQW-76	The pipe whip restraint above valve 4-G-78 in Room 202, 810-foot elevation, had vendor welds that were undersized, were excessively undercut, and were porous.	47	N-301
AQW-77	Anti-vibrational straps attached to a heat exchanger in the Auxiliary Building at the 790-foot elevation exhibited burn-through. The weld data cards for the straps had duplicate weld numbers.	45	N-291
AQW-78	The B&R calibration laboratory destroyed the issue record cards for an oxygen monitor. Therefore, several QC inspectors were unable to make late entries on weld data cards about the amount of oxygen present during a purge. These inspectors then falsified the missing data.	23	N-165
AQW-79	Radiography was not performed on weld joints at the bottom of the spent fuel pool lift gates.	41	N-257
AQW-80	Liner plate weld seams on the flooring around the Unit 1 refueling cavity did not match locations on the drawings.	43	N-271
AW-81	The stainless steel floor plates in the spent fuel pool and transfer canal did not always overlap the	43	N-271

Concern/ Allegation Number	Characterization	Category	Page Number
	angle member at the bottom edge of the wall-to-floor joint.		
AW-82	A block related to the leak chase channels under the spent fuel pool liner was defective and could affect leak detection.	43	N-271
AQW-83	(This allegation duplicates AQW-29.)	25	N-179
AW-84	There was excessive grinding on weld surfaces prior to final inspection.	45	N-291
AW-35	Compliance with weld rod control procedures was lax.	9	N-79
AW-86	Weld rods were excessively exposed to ambient conditions.	9	N-79
AW-87	Violation of minimum pipe wall thickness caused by torch during welding.	N/A	N/A*
AW-88	Nonelevated preheat control was used on welding.	N/A	N/A*
AW-89	Maximum interpass temperature controls were used for welding on notch toughness materials.	N/A	N/A*
AW-90	Downhill welding stringers should not be used in nuclear power plants.	N/A	N/A*
AW-91	CPSES is using unqualified welders obtained directly from Fort Worth Trade School.	N/A	N/A*
AW-92	Welder asked to heliarc stainless steel pipe that contained sand and gravel resulting from flushing concrete-hauling trucks through the pipe.	N/A	N/A*
AQW-93	Piping weld radiography was manipulated or falsified.	50	N-319
AM-11	Incorrect fitup and poor welding techniques resulted in thin welds joining the stainless steel liner plates for the fuel pools.	43	N-271

*Evaluation of Allegations AW-87 through AW-92 is still ongoing and will be addressed in a future SSER.

Concern/ Allegation Number	Characterization	Category	Page Number
AM-29	A method for analyzing small bore piping used about 4 years ago could have been deficient.	39	N-247
AM-31	A B&R employee alleged that he logged 990 defective items in personal log books, including defective welding, torquing, and other issues.	49	N-307
AV-5	ITT-Grinnell failed to evaluate and report a dimensional problem with shock suppressors as required by 10 CFR 21.	48	N-303
SRT-1	A CMC was not considered in a small bore piping analysis.	36	N-237
SRT-2	A CMC for piping system AF-1-SB-007 was not properly addressed.	36	N-237
SRT-3	There were concerns about design considerations for piping systems from a safety-related to a nonsafety-related building.	36	N-237
SRT-4	The allowed tolerances for strut and snubber orientation angles were not clearly stated in the applicable inspection procedures.	37	N-241
SRT-5	Training for inspectors on the measurement of strut and snubber orientation angles was weak.	37	N-241
SRT-6	Spring hangers and snubbers will not receive final adjustments until after fuel load.	37	N-241
SRT-7	Various discrepancies were identified for 14 pipe supports that had previously been inspected by TUEC's QC inspectors.	N/A	N/A (evaluation ongoing)
SRT-8	Nuts on the support bolts for the vertical residual heat exchangers were loose.	19	N-153
SRT-9	There was confusion about possible requirements for the use of jam nuts or anchor bolts for certain main steam line pipe whip restraints.	18	N-149

ATTACHMENT 2

ASSESSMENT OF INDIVIDUAL TECHNICAL CONCERNS
AND ALLEGATIONS IN THE MECHANICAL AND PIPING AREA

1. Allegation Category: Mechanical and Piping 1, Welding With Incorrect or Without Any Procedures

2. Allegation Numbers: AW-34, AW-35, AW-38 and AQW-24

3. Characterization: It is alleged that welding was done without procedures or with incorrect procedures; specifically: (1) temporary supports were welded without a weld procedure specification or by an unqualified welder (AW-34); (2) a scrapped piece of magnetized I-beam was welded for hanger repair (AW-35); and (3) welders were harassed into performing weld repairs out of procedure and without authorizing documentation on a tube steel structural member on a diesel generator (AW-38, AQW-24).

4. Assessment of Safety Significance:

AW-34

Allegation AW-34 concerns the welding of temporary supports without a weld procedure specification or by an unqualified welder. The TRT reviewed the requirements for temporary supports, and made walkthrough inspections in both Unit 1 and Unit 2. In Unit 2, the TRT observed welding in progress where temporary supports were in use. During these observations, the TRT discussed the fabrication, installation, and removal of temporary supports with Brown & Root's (B&R) Assistant Project Welding Engineer and Quality Control (QC) personnel. The TRT established that temporary supports are employed during construction to maintain the required positions and alignments of components during installation until designed supports are permanently installed. Such supports are essentially made up on the site by construction personnel from available materials which are assembled in a manner to provide the necessary support function.

The American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, 1974 Edition (including Addenda through Summer 1974) and the American Welding Society (AWS) D1.1-75 Structural Welding Code do not address the subject of temporary supports except for temporary welds attaching to, and their removal from, Code installations.

The following requirements pertaining to temporary supports are found in B&R procedure CP-CPM-6.9E, Revision 7, paragraph 3.17, and reflect the requirements of revision 6 of Gibbs and Hill (G&H) 2323-MS-100, Piping Erection Specification:

Piping should be erected in its permanent hangers. If the permanent hangers are not installed, temporary hangers may be used. Piping may be temporarily supported from other piping provided adequate precautions are taken to prevent damage to the supporting pipe. Piping shall not be supported by valves, pumps, or other equipment, and care shall be taken to ensure that pipe attaching to these items is adequately supported.

Unattended pipe attached to equipment will not be temporarily supported by items which are readily removable, such as lumber, jack stands, chain falls, etc. Such piping shall be securely supported with hard supports which are rigidly attached to the pipe, such as a structural support secured to the pipe with all-thread rod, a pipe clamp suspended by rod, clamped-lashing, etc.

To ensure proper alignment, piping should be run toward equipment instead of from equipment. Care shall be taken not to cold spring piping when connecting the equipment.

When piping is connected to equipment, a minimum of two temporary or permanent supports shall be provided; when two supports cannot be provided, written direction from Site Engineering describing the deviation shall be obtained.

B&R's assistant project welding engineer informed the TRT that B&R uses the following unwritten principles for installing temporary supports:

a. Temporary supports shall be located so as not to interfere with subsequent installation of permanent supports. The actual locations of temporary supports are not documented.

b. No attachment weld is made to the component being supported. If the temporary support is anchored to a nearby permanent plant structure by welding, that attachment weld must be made using a welder and a weld procedure, both qualified to AWS D1.1 Structural Welding Code. The attachment weld is also subject to the requirements of AWS D1.1, Paragraph 8.14, "Temporary Welds."

c. Whenever practical, welders qualified to AWS D1.1 are used to weld temporary supports. However, a welder who has been qualified for making only temporary welds as described in note (11) of B&R CPSES 35-1195, "Welder Qualification Matrix," may be used for the weld fabrication of temporary supports. Such a welder has a "T" suffixed to his welder's symbol. "Temporary" welders are not permitted to make attachment welds to components or permanent plant structure.

d. A pre-qualified welding procedure for mild steel meeting the requirements of AWS D1.1 is used for weld fabrication of temporary supports and a weld filler material log for temporary welds is maintained.

e. A QC inspection is performed in accordance with B&R QI-QAP-11.1-28, Paragraph 3.1.1.1 and to the requirements of each B&R hanger location

(BRHL) isometric drawing to verify that permanent hangers are correctly located. During this inspection temporary hangers would be identified and documented as discrepancies requiring action for clearance before final acceptance of the isometric drawing installation.

B&R QC personnel, in an interview by the TRT, and independent of B&R Weld Engineering, substantiated that the above principles (a) through (e) were followed for temporary supports. The TRT finds these principles adequate in conjunction with the quoted requirements of B&R CP-CPM-6.9E, paragraph 3.17. However, to ensure the safety of components and personnel, they should be controlled by written procedure.

During a walk-through inspection of Unit 1 on July 16, 1984, the TRT did not observe any temporary supports. On the same day, during a walk-through inspection of Unit 2 north and south pump rooms at the reactor vessel level, three temporary supports were observed and visually examined by the TRT. Each temporary support was a relatively simple welded structure to satisfy the particular needs. None of these temporary supports required welding to permanent structure or components. The temporary supports conformed to CP-CPM-6.9E, paragraph 3.17, in that they offered good, rigid support and conditions were not damaging or hazardous to permanent installations or personnel.

AW-35

Allegation AW-35 relates to the welding repair of a hanger using a scrap piece of I-beam which was magnetized. The alleger stated that he was subsequently informed by the NRC that the hanger had been removed. The TRT could not identify which NRC staff member had so informed the alleger. TRT discussions further established that the hanger had not been identified to the Region IV staff. Its removal, therefore, could not be confirmed.

This allegation could not be meaningfully addressed until the hanger was pointed out to the TRT by the alleger during a plant walk-through on January 10, 1985. The pipe line supported by this hanger was marked 4-CT-1-073-152GR. The B&R hanger log, which has the same identification number as the pipe line, was obtained; from the BRHL drawing and the location of the hanger, the TRT identified the hanger as CT-1-073-001-Y45R. From the final inspection report IR-MH5-1352 it was established that the hanger was non-nuclear, safety related, seismic category II, class 5. A B&R hanger drawing identified Mark No. CT-1-073-001-Y45R, revision 2 established that weld fabrication was to the American National Standards Institute (ANSI) B31.1, Power Piping Code. Weld filler material logs (WFMLs) identified as CT-1-073-001-Y45R established that weld procedure specification (WPS) 11032, revision 7 was used with E7018 electrodes. The WFMLs established that the alleger had welded on the hanger on April 23, April 24, and June 2, 1980; additional welding was accomplished by another welder on January 8, 1981.

From drawing Mark No. CT-1-073-001-Y45R, the TRT determined that the hanger was composed of a 1-inch-thick baseplate and four pieces of material hav-

ing I-beam cross sections. Welds joining the hanger pieces were specified as 3/16-inch and 5/16-inch fillet welds.

The TRT review of final inspection report IR-MH5-1352 established that welds had been visually examined for slag, undercut, and porosity and for conformance to the drawing as specified by QI-QP-11.11-1, Revision 5. The welds were acceptable.

The TRT visually examined hanger CT-1-073-001-Y45R. All welds appeared to be fillet welds and were of acceptable quality. A 6-inch engineering scale was laid against each of the four hanger details. None of the details exhibited magnetic attraction for the scale when it was removed.

The TRT notes that the welding of magnetized material is difficult because of arc instability and would probably result in a weld with unacceptable internal and surface defects. The I-beam materials of construction for non-nuclear safety related, seismic category II supports are identified in B&R procedure CP-CPM-9.9, revision 8, as conforming to American Society for Testing Materials (ASTM) specifications A-36 and A-515, Grade 65 or to the equivalent ASME specifications. These materials are both plain carbon steels and are commonly cut by the oxy-acetylene cutting process, a gas flame process which has no electromagnetic field and would, therefore, not cause magnetization of the steel. Since the material was alleged to be scrap, it may have been welded on previously. If this were the case, it would have been subjected to the electromagnetic field of the welding arc. However, plain carbon steel is welded every day in industry without becoming magnetized. The most likely explanation is that arc blow, if encountered, was due to a poorly placed ground clamp to a welding or ground cable draped over or wrapped around the beam, or to welding into a corner.

The TRT could neither substantiate nor refute the allegation.

<u>AW-38, AQW-24</u>

Allegations AW-38 and AQW-24 concern welders who, in August of 1982, were harassed into performing unauthorized welding repair of a base metal defect in an auxiliary support skid for a Delaval emergency diesel generator system in Unit 2.

The evaluation of these allegations by the Mechanical and Piping Group of the TRT is limited to the welding aspects of the allegations.

The TRT reviewed the nonconformance report (NCR) history related to the Unit 2 support skids:

1. NCR M-82-00581, no revision, reported on May 13, 1982 that both Unit 2 auxiliary skids, which should have been to ASME B&PV Code, Section III, NF, Component Supports, were not, in fact, NF. The NCR disposition, dated May 20, 1982, specified, in part, that accessible welds not meeting B&R CP-QP-11.11, revision 1 were reworked. The TRT found no documentation which authorized rework by welding of accessible vendor welds in the Unit 2 auxiliary skids.

2. NCR M-82-00902, no revision, reported July 8, 1982 that linear indications had been found in item G. The NCR was dispositioned on July 19, 1982 for removal and replacement of item G.

3. NCR M-82-01207, no revision, reported by the alleger on August 6, 1982 stated that during rework of the diesel generator support structure, the structural steel member (item G) referenced in NCR M-82-00902 was damaged and the damage, a base metal discontinuity, was repaired by welding using unauthorized weld filler material. The TRT identified NCR M-82-01207, no revision, with the allegation.

   It is the TRT's opinion that not only was the weld filler material not authorized for weld repair of item 6, but that the weld was not authorized. The TRT, therefore, substantiated the allegation. The TRT also noted that this weld repair of a base metal discontinuity in item 6 was reported almost 1 month after item 6 was NCR dispositioned for removal and replacement.

4. NCRs M-82-00581, revision 1, and M-82-00902, revision 2, were redispositioned on August 9, 1983, to be scrapped and replaced because of additional base metal linear indications.

5. Documentation of weld repairs continued for almost 5 weeks after the decision to scrap and replace the skids.

NRC's Region IV was advised of the scrap and replace disposition in Texas Utilities Generating Company (TUGCO) letter TXX-4095, dated January 10, 1984, which also stated that replacements would be fabricated at the job site. The TRT, escorted by B&R personnel, examined the scrapped cut-up skids. The TRT also reviewed the TUGCO replacement design and determined, with respect to section properties of the steel structural members which replaced welded channel assemblies, that the design was equal to, or better, than Delaval's ASME B&PV Code, Section III, NF design.

5. Conclusions and Staff Position: Allegation AW-34 was substantiated by the TRT in that it was determined that, except for attachment welds to components or permanent plant structures, no written requirements existed addressing weld fabrication of temporary supports. Since temporary supports are related to both component and personnel safety, the TRT concludes that the allegation has both safety significance and generic implications. This allegation is related to allegation AP-13 of Mechanical and Piping Category 11, which also addresses the safety significance and generic implications of temporary supports. The alleger refused an interview with the TRT to review its findings on allegation AW-34.

   Allegation AW-35 could be neither substantiated nor refuted. The TRT could not logically explain why a piece of plain carbon steel I-beam should be magnetized and concluded that arc blow, if encountered, was probably caused by a poorly located welding ground or poor welding technique. The hanger final inspection report established that welds were visually examined and acceptable. The TRT, based on its visual inspection of the hanger, concurs with the findings of the final inspection report relative to welds. The TRT, therefore, concludes that this allegation has no safety significance.

Allegations AW-38 and AQW-24 were substantiated in that the TRT could find no documentation authorizing the repair of a base metal defect in item G. However, the TRT notes that the allegation could have no impact on safety because the skids have been scrapped and replacements have been designed to provide equivalent or superior strength and stiffness.

The findings of the TRT for allegations AW-38 and AQW-24 were reviewed with the alleger in a meeting at the Granbury Inn at Granbury, Texas on March 5, 1985. The alleger accepted the technical evaluation and conclusions of the TRT. He expressed his primary concern relative to these allegations as harassment of crew members who were coerced into violating procedural requirements.

6. Action Required:

TUEC shall modify G&H Specification 2323-MS-100 requirements and provide procedures for the fabrication and installation of temporary supports to assure that the quality of piping and equipment so supported is not adversely affected. This action is related to that required for Mechanical & Piping Category 11, allegation AP-13, item 1.

Reference Documents:

1. NRC OI Report 84-006 dated March 7, 1984 (includes testimony numerous interviews).
2. ASME B&PV Code, 1974 Edition Including Summer 1974 Addenda, Section III, Subsection NF, "Component Supports."
3. AWS D1.1-75, "Structural Welding Code."
4. B&R Procedure CP-CPM-6.9E, "Pipe Fabrication and Installation," Revisions 0 and 7.
5. G&H 2323-MS-100, "Piping Erection Specification."
6. B&R CPSES 35-1195, "Welder Qualification Matrix."
7. B&R QI-QAP-11.1-28, "Fabrication, Installation Inspections of ASME Component Supports," Class 1, 2, and 3.
8. B&R Inspection Report IR-MH5-1352.
9. B&R drawing, Mark No. CT-1-073-001-Y45R.
10. ANSI B31.1, "Power Piping Code.:
11. Weld Filler Material Logs, CT-1-073-001-Y45R.
12. B&R CP-CPM-9.9, "NNS-Seismic Category II Supports."
13. ASTM A-36, "Specification for Structural Steel."
14. ASTM A-515, "Specification for Carbon Steel Plates for Pressure Vessels for Intermediate and Higher Temperature Service."
15. TUGCO NCR M-82-01207.
16. TUGCO NCR M-82-00902.
17. B&R CP-CPM-6.9B, "Weld Filler Material Control."
18. TUGCO NCR M-82-00581.
19. B&R CP-QP-11.11, revision 1.
20. TUGCO TXX-4095, Commanche Peak Steam Electric Station, Unit 2 Diesel Generator Auxiliary Skid, QA File: CP 82-06, SDAR-82, File No. 10110, dated January 10, 1984.
21. B&R WPS 11032, revision 7.
22. TUGCO QI-QP-11.11-1, revision 5, "Installation Inspections of NNS Seismic Category II Supports for Class V Piping."

1. Allegation Category: Mechanical and Piping 2, Adherence to Welding Procedures

2. Allegation Number: AQW-28, AW-36, AW-54, AW-31, AQW-10 and AQW-30

3. Characterization: It is alleged that welding procedures were violated with respect to the following items:

   (a) buildup of undersize welds (AQW-28)
   (b) downhand versus uphand welding (AW-36)
   (c) weave bead versus stringer bead welding (AW-54)
   (d) reinforcement of flare-bevel welds (AW-31 and AQW-10)
   (e) quality control (QC) holdpoints for inspection of welds (AQW-30)

4. Assessment of Safety Significance: To assess the safety significance of these allegations, the NRC Technical Review Team (TRT) identified and reviewed codes, specifications, procedures, and other documents applicable to each of the several allegations to determine requirements. Pertinent, NRC inspection reports (IRs) were also reviewed. The resolution of each allegation is separately addressed in the remainder of this report.

   AQW-28

   The allegation is that welds which were found by Quality Control (QC) to be undersize were repaired by building them up with additional layers of weld metal instead of removing the welds completely and rewelding the components.

   Adding additional weld filler metal layers to an undersized fillet weld or an incompletely filled groove weld is not prohibited by the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, the American National Standards Institute (ANSI) B31.1, Power Piping Code, the American Welding Society's Structural Welding Code, AWS D1.1. Furthermore, the TRT notes that since the effects of weld thermal cycles on base metal metallurgical and mechanical properties, and on component residual stress and distortion tend to be cumulative, it is an industry-accepted practice to minimize these undesirable effects relative to undersize fillet welds or incompletely filled groove welds by building them up with additional layers of weld filler metal rather than by removing the welds and replacing them.

   The TRT found this allegation to have no technical merit and, therefore, did not attempt to substantiate or refute it.

   AW-36

   Although the alleger refers to "uphand" and "downhand" welding, the correct terms are "upward" and "downward." This allegation concerns the use of the downward technique instead of the upward technique for welding vertical joints in austenitic stainless steel plate during fabrication of the liner of the fuel handling facilities' spent fuel storage pools.

   The TRT established, from Gibbs & Hill Specification 2323-SS-18, Revision 3, that weld fabrication was required to conform to the ASME B&PV Code,

1974 Edition, Section IX, and that welds were to be made by the inert gas-shielded arc welding process, technically known as the gas tungsten-arc welding (GTAW) process.

Visual examination by the TRT of those few welds in the as-welded (unground) condition in spent fuel storage pools 1 and 2 established that GTAW had been used.

For the GTAW process and when welding the austenitic stainless steels (a class of alloys for which the ASME B&PV Code does not specify impact properties), Section IX, QW-410.16, of the Code defines a change from upward welding to downward welding as a nonessential variable. The Code considers this change to have no effect on the mechanical properties of the weldment, but requires the described change to be made to the weld procedure specification (WPS) by revision or amendment without requalification. This change also does not require welders to be requalified.

The TRT reviewed 11 Brown & Root (B&R) WPSs for welding of austenitic stainless steels and established that all required the direction of vertical welding to be upward. If downward welding was performed, as alleged, a technical violation of a WPS could have occurred.

The TRT was unable to substantiate or refute the allegation but, based on its assessment, concluded that the allegation had no safety significance.

AW-54

This allegation concerns the welding of pipe supports using the weave bead technique prohibited by WPSs rather than the stringer bead technique.

ANSI/AWS A3.0-80, "Welding Terms and Definitions," defines a stringer bead as a type of weld bead made without appreciable wearing motion and a weave bead as a type of weld bead made with transverse oscillation. B&R defines a stringer bead as a weld bead in which weaving (transverse oscillation) is permitted, providing the bead width does not exceed 4D (where D is the diameter of the core wire of the electrode).

The TRT determined that Gibbs and Hill (G&H) Specification 2323-MS-46A, Revision 4, dated February 10, 1984, pertains to all nuclear safety class pipe hangers and supports. This specification implements the ASME B&PV Code, 1974 Edition, including the Summer 1975 Addenda, Section III, Subsection NF, supplemented by selected code cases and specified paragraphs, tables, and figures from later code versions. Paragraph 3.11(b) of 2323-MS-46A requires integral (welded) attachments to piping categories 1303-2 and 2003-2 to be impact or notch-toughness tested at 32°F or lower. The TRT notes that notch toughness properties are much more sensitive to metallurgical effects such as composition and microstructure, than is ductility. Subsection NF requires WPSs and welders to be qualified to ASME B&PV Code, Section IX, "Welding and Brazing Qualifications."

The TRT also determined that G&H Specification 2323-MS-46B pertains to non-nuclear pipe hangers and supports. This specification implements ANSI B31.1f-1973, Power Piping Code. ANSI B31.1f-1973 also requires WPSs and welders to be qualified to the ASME B&PV Code, Section IX.

The TRT reviewed the requirements of ASME B&PV Code, Section IX. The 1974 Summer and Winter Addenda of ASME Code Section IX stated that: "for the shielded metal-arc welding (SMAW) process used for pipe hangers and supports, a change from the stringer bead technique to the weave bead technique or vice versa is a nonessential variable for qualification of the WPS." That is, a WPS may be changed from stringer bead to weave bead without requalification. The B&PV Code, therefore, considers the difference between stringer beads and weave beads as having an inconsequential effect on weld properties. The TRT also noted that for a preceding version of Section IX (1974 Edition), for the SMAW process, a change from the stringer bead technique to the weave bead technique or vice versa was specified as a supplementary essential variable for qualification of the WPS. That is, the B&PV Code at that time considered the difference between stringer beads and weave beads as having an effect of the notch toughness properties of welds, and such a change required requalification of the WPS. The TRT further noted that for a subsequent version of Section IX (1980 Edition including Summer 1981 Addenda) and for the SMAW process, a change from the stringer bead technique was reintroduced as a supplementary essential variable (one affecting notch toughness properties). However, it was modified to state, "In uphill progression, a change from stringer bead to weave bead." The B&PV Code had, therefore, reconsidered its position and felt that notch toughness properties were deleteriously affected only by the changes from stringer bead to weave bead and not vice versa, and that the effect was significant only when welding uphill in the vertical position.

Thus, the TRT's review of changes in requirements over a period of several years has shown that the B&PV Code has vacillated in its position relative to this welding variable. It is the opinion of the TRT that a change from stringer bead to weave bead technique in excess of four core diameters does have an undesirable effect on the notch toughness properties of weld heat affected zones of plain carbon steel because of the modified weld thermal cycles imposed. The travel speed parallel to the weld direction is slower, which permits the temperatures attained in the heat affected zones to be higher and the time of exposure to these temperatures to be longer. The consequence of these effects is a weld heat affected zone having a coarser grained microstructure composed of coarser metallurgical transformation products, characteristics associated with lower notch toughness. However, the effect is minimal compared to other high energy welding processes, such as sub arc.

Each welder employed by B&R to work on hangers and pipe supports is qualified to WPS 11032. WPS 11032 specifies that the maximum bead width allowed is four times the core wire diameter of the electrode being used. WPS 11032 has been qualified for a specified group of plain carbon steels having similar welding behaviors and which are listed in Section IX as P-No. 1, Group No. 1 base metals. Qualification tests include those which qualify the WPS for welding materials for which notch toughness properties are specified. The notch toughness values required (expressed as mils of lateral expansion) are listed in Section III, Division 1, Subsection NC, table NC-2331-1. For material 5/8-inch thick and less, no test is required; for material 5/8 inch to 3/4 inch inclusive, 20 mils of lateral expansion is required; and for material over 3/4 inch to 1½ inch inclusive,

25 mils of lateral expansion is required. Test data from procedure qualification records (PQRs) used to support WPS 11032 and cover material over 3/4-inch to 1½-inch thick show that the lateral expansion of the notch toughness test coupons was in most cases at least twice as high as that required and that the test temperature was 0°F. Since 68H-2323-MS-46A specified a test temperature as high as 32°F was acceptable, it is the TRT's opinion that the notch toughness properties obtained represent conservative results and establish that weaving up to four core wire diameters does not lower notch toughness properties to a level which will not meet the required test values. The TRT notes that, although qualification of the WPS has been accomplished in a manner which meets Section IX requirements, the material selected for qualification, ASME SA-333, Grade 6, is characterized by relatively good notch toughness properties. The most common material employed at CPSES for integral (welded) attachments where notch toughness properties are specified is ASME SA-36, a material characterized by relatively poor notch toughness properties. The substitution of ASME SA-333, Grade 6 for ASME SA-A36 is permitted by Section IX since both are P-No. 1, Group No. 1 materials. However, good practice would dictate that ASME SA-36 be used for qualification in this case.

A search of the NCR log books for ASME and non-ASME fabricated hangers and supports revealed that only one NCR out of hundreds was written for welds that were made using weave beads wider than permitted by the WPS. In this case, it involved a hanger that did not require notch toughness and was accepted "as is" by the site welding engineer.

A visual inspection of pipe hangers by the TRT and the NRC resident inspector was conducted in the south yard tunnel (Unit 1) and at random locations throughout both units. It was noted that all welds inspected had the proper type weld bead. In addition, because of the TRT's concern with integral (welded) attachments for applications where impact testing was required, the TRT made a visual inspection of such attachments for 10 hangers supporting the Unit 1 main steam and feedwater lines. These lines are piping categories 1303-2 and 2003-2 identified in G&H 2323-MS-46A as requiring impact testing. Five of the ten integral (welded) attachments inspected had welds which were ground smooth and therefore provided no information. The remaining five, which included saddle attachments, axial restraint lugs, and pipe attachments, all had welds in which the final weld layer was made with stringer beads.

The TRT's evaluation of the allegation determined that it had safety significance only for welds for which notch toughness properties were specified. The TRT's inspections did not substantiate, as reported in IR 50-445/81-12, dated April 16, 1982, the alleger's statement that "literally thousands of weaved welds exist at various locations on the site."

<u>AQW-10 and AW-31</u>

The source of allegation AW-31 was NRC Office of Investigations (OI) report 4-84-006. As presented in this document, the alleger stated he believed he had been intimidated on one occasion when he disagreed with his supervisor "over a procedural question involving flare bevel welds versus butt welds." The alleger further stated that the supervisor insisted that he (the alleger) "apply the butt weld procedural criteria." Allegation AQW-10

as stated in NRC Region IV IR 50-445/82-11, dated December 3, 1982, is that "B&R quality control procedures do not provide for the maximum allowable reinforcement on flare-bevel welds used on component (pipe) supports." IR 50-445/82-11 also reported that the alleger expressed "a primary concern in regard to welds between square structural tube steel welded on a side to a plate where, because of the rounded corner of the tube, the welds become a flare-bevel type of weld." The TRT determined that both allegations had been made by the same alleger. The technical aspects of AW-31, although stated in a general manner, appear to the TRT to reflect the concerns indicated by the specific information documented in AQW-10. The TRT therefore addressed the described concerns of AQW-10.

IR 50-445/82-11 stated that the alleger had identified support SW-1-173-720-543A as containing welds exemplifying his concerns. From the identification code used for supports, the TRT determined that the applicable code for support SW-1-173-720-543A was the ASME B&PV Code, Section III, Subsection NF, Class 3. Documents reviewed by the TRT for this support include Subsection NF; Revisions 9 (March 11, 1982) through 14 (September 29, 1982) of QI-QAP-11.1-28, "Fabrication and Installation Inspection of Safety Class Components"; and component modification card (CMC) 56843.

ANSI/AWS A3.0-80, "Welding Terms and Definitions," defines a flare-bevel groove weld as "a weld in a groove formed by a member with a curved surface in contact with a planar member. The TRT found that CMC 56843 related to pipe support SW-1-173-720-543A. CMC 56843 specified single flare-bevel groove welds with and without associated fillet welds and referenced paragraph NF-5232 of Section III. The TRT also found that QI-QAP-11.1-28 revisions 9 through 14 illustrated the single flare-bevel groove weld without a fillet weld which was specified by CMC 56843. The illustration includes a note which states in part, "Where dimensions are not provided, the groove shall be filled until the weld is flush with the outer surface." The TRT's review of QI-QAP-11.1-28 established that no weld reinforcement criteria were specified for a single flare-bevel groove weld. A review of Subsection NF also established that no weld reinforcement criteria were specified for a single flare-bevel groove weld. However, Subsection NF specifies in Table NF-3292.1-1 that for partial penetration groove welds (of which a single flare-bevel groove weld is an example), stress limits are based on the effective throat of the weld. ANSI/AWS A3.0-80 defines effective throat as the minimum distance from the root of a weld to its face less any reinforcement. Hence, the amount of weld reinforcement associated with a single flare-bevel groove weld does not have any effect on the weld's load carrying ability. The TRT therefore substantiated the allegation that single flare-bevel groove welds have no specified weld reinforcement criteria but found it had no safety significance.

AQW-30

It is alleged that a weld identified as 40-C-AF1 in the auxiliary feedwater system was repaired on a repair process sheet (RPS) which was issued having only weld technician (WT) holdpoints; because it was a safety-related weld, there should have been QC inspection holdpoints.

B&R drawing BRP-AF-1-SB-007 (Auxiliary Feedwater System) shows weld No. 40C to be located in line No. 6-inch AF-036-2002-3. The TRT reviewed the weld documentation package for weld 40C, which included the weld data card (WDC) 40851, and the applicable QC NDE reports. WDC 40851 identifies the applicable code for weld No. 40C to be the ASME B&PV Code, Section III, Class 3. The WDC also provided the proper sequence of required operations including the required welding technician (WT), quality control (QC), and authorized nuclear inspector (ANI) inspection holdpoints. On January 14, 1984, and prior to completing the final steps in the WDC 40851 sequence of operations, the welding engineer requested a 100% radiographic examination be performed for information only (Ref.: Request for RT No. 62071). The results of the requested radiographic examination revealed porosity with tails which appeared in radiographic views 4-6 and 6-8. The porosity was cause for rejection of weld 40C as documented in B&R radiographic report No. RT 30964, dated January 15, 1984. Weld No. 40C was repaired using the RPS form on the back of WDC 40851. The RPS was identified as "RT reject No. 30964." The statements "in-process repair cycle" and "weld major repair" also appeared on the RPS (see the TRT's discussions on categories of weld repair in M&P Category 42, AW-41). The RPS had been prepared and approved for use, the sequence of repair operations performed,* and the repair reexamined by radiography, all on January 16, 1984. The B&R radiographic examination report No. RT 30972 dated January 16, 1984, accepted the repaired area. The final operation of the RPS was completed on January 17, 1984, when a visual examination of the repaired area was performed and accepted by a WT. At this point, the instructions directed a return to operation 5 of WDC 40851 for completion of the remaining open operations. These operations were a 100% visual and a 100% liquid penetrant examination by QC. B&R's NDE request No. 175766, dated January 17, 1984, requested these examinations, and the final operations were accepted by the QC inspector on WDC 40851 as satisfactory on January 17, 1984. The TRT could find no violation to B&R procedure or to ASME Code requirements in this weld repair process. (The TRT noted the changes in dates in two places, which were initialed by the QC inspector. However, the TRT attached no significance to these changes based on its review of the dated sequence of activities.)

During the course of investigating the concerns of the alleger, the TRT extended its evaluations to a more general review to determine how WDCs and RPSs were generated and how holdpoints were established and assigned. For this purpose, the TRT reviewed B&R construction procedure CP-CPM-6.9G.

The TRT found that the Welding Engineer is responsible for preparing the WDCs and RPSs, and making all applicable entries of requirements including the assignment of WT and QC holdpoints to each sequence of activity. The WT holdpoints are assigned at the Welding Engineer's discretion. The QC holdpoints are assigned in accordance with the tables and matrices provided in Construction Procedure CP-CPM-6.9G, which is approved by both B&R and TUEC Quality Assurance Management. In a case where both WT and QC

*The repair operations required: (1) an excavation 3/8-inch deep x 7/8-inch wide x 3-1/16-inch long to remove the defects, and (2) weld repair using the required weld filler material.

holdspoints are assigned to the same step, the WT inspection shall occur prior to the QC inspection. Prior to issuance to craft personnel, the WDCs and RPSs are routed through the ANI for a preliminary review and assignment of ANI holdpoints.

Initially, the TRT thought the blend of QA/QC and WT inspection responsibilities to be unusual. However, in its review of applicable requirements and procedures, the TRT found that the WT inspections provided information important to manufacturing and weld engineering about interim activities for which QA/QC inspections were not required by applicable codes. The WT holdpoints are preliminary inspections to the required QA/QC holdpoints to provide verification that all manufacturing activities at a particular sequence of events are complete and ready for the required QA/QC inspection(s). The TRT found that the weld inspection program was acceptable and consistent with the applicable code requirements and that the WT inspections were in addition to the inspections required by the Codes.

In a 100% review of the weld documentation for the auxiliary feedwater system, the TRT found no instance where a WT holdpoint was assigned in lieu of a QC holdpoint required by CP-CPM-6.9G. In a Unit 2 walkthrough inspection, the TRT found that the data packages checked contained all the required documents, logs, and reports, and were adequately maintained at each welder's work station. Also, a random selection of 12 data packages for completed welds for the Unit 2 auxiliary feedwater system was reviewed and was found to be in compliance with requirements.

CP-CPM-6.9G is not identified as a QA/QC document; however, it is a specific inspection plan/procedure which defines the documentation requirements of the ASME B&PV Code, Section III, for welding, fabrication, and installation activities. This inspection plan/procedure was authored by B&R's assistant welding project engineer. However, based on its review of documents*, the TRT found that the plan was developed through a series of meetings and correspondence with TUGCO, B&R Quality Assurance, and the ANI. The original CP-CPM-6.9G and each revision thereafter require the review and approval of B&R QA, TUGCO QA, the senior project welding engineer, and the construction project engineer. All of the aforementioned parties and the ANI agree that CP-CPM-6.9G is in compliance with the requirements of the ASME B&PV Code, 1974 edition (including Summer 1975 Addenda, Section III, NA-4511).

The TRT reviewed CP-CPM-6.9G and found no violation of the ASME B&PV Code requirements. In addition, the TRT determined that the procedure for generating WDCs and RPSs, as defined in CP-CPM-6.9G, does not establish WT holdpoints in lieu of QC holdpoints. The TRT also determined, both by review of the procedure and discussions with QC personnel, that QC was assigned to provide an overall surveillance of the welding activities.

*B&R minutes of ANI/QA meeting dated 1/9/80; Hartford Steam Boiler Inspection & Insurance Co. - letters dated 1/22/80 and 1/24/80; ANI note dated 2/15/80; B&R letter, "Compliance of Weld Examination Program," dated 3/4/80.

For AQW-30, the TRT could neither substantiate the allegation nor find any safety significance. After an extended review of the procedure for generating WDCs and establishment of holdpoints, the TRT found CP-CPM-6.9.G to be consistent with the applicable requirements of the ASME B&PV Code, Section III.

5. Conclusion and Staff Positions:

AQW-28

The buildup of undersized welds by the addition of one or more layers of weld metal is not prohibited by ANSI B31.1, AWS D1.1, and the ASME B&PV Code to minimize distortion and adverse effects on base metal and is preferable to grinding out the entire weld and rewelding the joint. It is the TRT's position that the allegation has no safety significance.

The TRT is preparing a copy of its evaluation and findings on allegation AQW-28 to forward to the alleger, who declined an interview.

AW-36

The TRT was unable to substantiate or refute this allegation. If downward welding was performed in accordance with a WPS requiring upward welding, a technical violation of the WPS could have occurred. It is the TRT's position, however, that if such a violation occurred, there would be no safety significance.

The alleger was contacted to arrange a meeting to review the TRT's evaluation and findings. The alleger indicated he has no concerns with CPSES and is not interested in a review meeting with the TRT.

AW-54

Visual examination of numerous hangers and supports by the TRT did not reveal that a weave bead technique in violation of the WPS was used to weld these hangers and supports. In accordance with the requirements of WPS 11032, a welder may weave the electrode as long as the weld bead width in the WPS is not violated. At Comanche Peak Steam Electric Station (CPSES) this is considered to be a stringer bead technique. Also, a review of the NCR logs revealed that only one NCR had been written for weave beads that exceeded the limitations of the WPS.

WPS 11032 is also qualified to be used for welding carbon steels that require notch toughness tests. Test data from the supporting PQR show that in most cases the lateral expansion is twice as high as required minimum values. Therefore, the TRT finds that this allegation has no safety significance.

Allegation AW-54 was reviewed in detail with the alleger at a meeting on January 9, 1985. The alleger agreed with the TRT's characterization of the allegation. Despite a discussion of the technical aspects of the issue which lasted about 1 hour, the alleger refused to accept the TRT's evaluation and findings.

AW-31, AQW-10

The TRT substantiated the allegation that B&R procedures do not provide for the maximum allowable reinforcement on flare-bevel welds. The TRT also found that B&R procedure QI-QAP-11.1-28, which is applicable to the fabrication and installation of safety class 1, 2, and 3 component supports meeting the ASME B&PV Code, 1974 Edition through Winter 1974 Addenda, Section III, Subsection NF requirements, does not specify acceptance criteria for reinforcement of flare-bevel welds. However, QI-QAP-11.1-28 reflects the requirements of Subsection NF of the ASME B&PV Code and Subsection NF has no requirements for weld reinforcement on single flare-bevel welds. The TRT therefore concludes that the allegation has no safety significance.

Attempts to contact the alleger to review with him the TRT's findings on allegations AQW-10 and AW-31 have been unsuccessful.

AQW-30

The TRT determined that the WT and QC holdpoints were properly assigned and completed. Thus, the allegation was not substantiated and has no safety significance.

At the TRT's suggestion, the alleger has agreed to review a summary report of the TRT's evaluation and findings on allegation AQW-30.

6. Actions Required: None.

Reference Documents:

1. ASME B&PV Code, 1974 Edition including Summer 1974 Addenda Section III, "Nuclear Components."
2. ANSI B31.1-73 Including Addenda through Summer 1975, "Power Piping Code."
3. AWS D1.1-75, "Structural Welding Code."
4. Gibbs & Hill Specification 2323-SS-18, Revision 3, "Stainless Steel Liners."
5. ASME B&PV Code, 1974 Edition Including Summer 1974 Addenda, Section IX, "Welding and Brazing Qualifications."
6. NRC Region IV Investigative Report 50-445/79-15 dated June 21, 1979.
7. NRC Region IV Investigative Report 50-445/81-12 dated April 16, 1982.
8. Gibbs & Hill Specification 2323-MS-46A, "Nuclear Safety Class Pipe Hangers and Supports."
9. CMC 56843, Revision 11.
10. ASME B&PV Code, 1974 Edition Including Summer 1974 Addenda, Section III, Subsection NF, "Component Supports."
11. B&R QI-QAP-11.1-28, Revision 25, "Fabrication and Installation of Safety Class Components."
12. NRC Region IV Investigative Report 50-445/82-11, dated December 13, 1982
13. ASME B&PV Code Case 1734, "Weld Design for Use for Section III, Division 1, Class 1,2,3, and MC Construction of Component Supports."
14. B&R CP-CPM-6.9G, Revision 6, "Documentation for ASME Welding Fabrication and Installation Activities."

15. NRC Region IV Inspection Report 50-445/81-07, dated May 5, 1981.
16. Conversation Record with B&R QC, dated July 17, 1984.
17. Conversation Record with B&R Assistant Project Welding Engineer, dated July 16, 1984.
18. NRC Region IV Inspection Report 50-445/81-12,dated April 16, 1982.
19. Gibbs and Hill Specification 2323-MS-100, page 4-57.
20. ASME B&PV Code, Section NA 4511, 1974 Edition through Summer 1975 Addenda.
21. NCR - M1860, 12/10/79.
22. NCR - M2690 R.6, 3/5/81.
23. NCR - M3120, 1/7/82.

1. Allegation Category: Mechanical and Piping 3, Improper or Defective Pipe Welds in Containment Spray System.

2. Allegation Number: AW-52, AW-59 and AW-62

3. Characterization: Allegation AW-52, AW-59, and AW-62 are the same allegation, each somewhat differently worded. It is alleged that field weld FW-1B in a 12-inch stainless steel pipe, which was part of spool number ITT5 on line CT-1-SB-017 at the 785-foot elevation in the Safeguards Building, was improperly made with too much heat, resulting in a convex weld on the inside surface, creating a flow problem. It is also alleged that there were "hang-me-downs" in the pipe from a "consumable insert," which was only partially melted into the joint.

4. Assessment of Safety Significance: These allegations relate to the field installation of a stainless steel pipe spool on line CT-1-SB-017 at the 785-foot elevation in the Safeguards Building. Weld FW-1B was specifically identified by the alleger as questionable.

   A consumable insert is a ring of weld material which is fitted into the root of the joint. This insert is essentially preplaced weld filler metal which is fused during the weld root pass operation. The cross-sectional configuration of a consumable insert may be one of several standard shapes; however, in this case, it was a flat washer type referred to as a "Kellogg" insert.

   The TRT obtained and reviewed documentation package CT-1-SB-017, ITT5 related to line CT-1-SB-017 and field welds FW-1B and FW-2A which installed spool ITT5. The spool is shown on the ITT Grinnell Industrial Piping, Inc., isometric drawing, and is identified as "Piece mark CT-1-SB-17-5," which identifies the spool as part of the containment spray system fabricated to ASME B&PV Code Section III, Class 2 requirements. Contrary to the allegation, the spool is 10 inches rather than 12 inches long. Design conditions are specified as 550 psi pressure and 200°F temperature. The spool consists of a 45° elbow and a straight length of pipe, both specified to be either type 304 or type 316, schedule 40, austenitic stainless steel. The spool, as shown on B&R drawing BRP-CT-1-SB-017, revision 20, was modified by the addition of a valve.

   The TRT reviewed documentation package CT-1-SB-017, ITT5 for both pipe spool installation field welds FW-1B and FW-2A and found that welding procedure specifications (WPSs) 88021, Rev. 5, and 88025, Rev. 3, were used. The documentation package established that weld FW-1B replaced weld FW-1A. Weld FW-1A was removed because of misalignment problems, as directed by component modification card (CMC) 30794. Weld FW-2A replaced weld FW-2, which was removed, as directed by weld addition/removal card 001466, because the consumable insert was not completely consumed and some tack welds retaining it had broken.

   Both welds FW-1B and FW-2A were visually and radiographically examined to ASME B&PV Code, Section III, Class 2 requirements. Brown & Root (B&R) radiographic report (RT) 12691 for weld FW-1B, which documented root concavity in four views, porosity in one view, and a tungsten inclusion in one view, accepted the weld as meeting the specified ASME B&PV Code.

Section III, Class 2 criteria. If an unconsumed insert which was hanging down had been present, it would have been detected and reported. B&R radiographic report R6113 for weld FW-2A, which documented root concavity in two views, root undercut in two views, and tungsten inclusions in two views, accepted the weld as meeting the specified ASME B&PV Code, Section III, Class 2 criteria. Again, if an unconsumed insert which was hanging down in the weld had been present, it would have been detected and reported.

Weld shrinkage requirements applicable in April of 1980 when weld FW-1B was made were stated in the applicable Gibbs & Hill (G&H) piping erection specification 2323-MS-100, Revision 5. Paragraph 4.2.7.8 of 2323-MS-100 stated "Welding parameters shall be controlled to avoid excessive heat input resulting in excessive necking down of butt welds in thin wall pipe." Based on the TRT's review of documentation package CT-1-SB-017, weld FW-1B was accepted; no excessive weld shrinkage was noted at that time. However, the above shrinkage requirements did not have measureable criteria. This lack of measureable criteria resulted in design change authorization (DCA) 13335 to G&H 2323-MS-100. DCA 13335, dated May 18, 1982, specified maximum allowable radial weld shrinkages related to pipe wall thickness. The TRT found a B&R inspection report dated January 27, 1983 (approximately 2-1/2 years after weld FW-1B was completed), reporting radial weld shrinkage of weld FW-1B as 1/4-inch, which exceeded the acceptance criteria of 0.182-inch (i.e., half of the nominal wall thickness of the 10-inch schedule 40 pipe used) specified by DCA 13335.

The TRT also found that weld FW-1B was the subject of an NRC Region IV investigation and inspection documented by an Office of Investigations (OI) report (January 24, 1983) and by inspection report (IR) 83-07 (March 9, 1983). The OI report (A4-83-001) supported the radiographic results based on an examination of the weld inside surface through a nearby valve body. The OI found that the weld felt convex and smooth and was unobstructed. The weld had one protrusion, approximately 1/2-inch long and 1/4-inch high, which was located at the 12 o'clock position. The review of radiographs reported in IR-83-07 showed a smaller protrusion or area of heavy melt-through approximately 3/32 inch in diameter and projecting about 1/16 inch.

Based on weld data package information, OI report A4-83-001, and IR 83-07, the TRT determined that: (1) weld FW-1B was characterized by 1/4-inch radial shrinkage; (2) no consumable insert which might break off projected into the pipe; and (3) based on the measured radial shrinkage, an estimated 1/16-inch weld inside surface reinforcement, and the nominal dimensions for 10-inch schedule 40 pipe, weld FW-1B reduced the pipe cross-sectional-area by 13 percent. Calculations performed by the TRT indicated that the pressure drop effect on the flow of water in the containment spray line due to the reduction in area would be equivalent to that induced by the addition of less than 2 feet of pipe to the line. The TRT performed additional scoping calculations related to the stresses imposed at weld FW-1B due to the 1/4-inch radial weld shrinkage. These calculations showed that the containment spray system piping has more than enough fatigue life cycles to withstand its intended service.

The TRT found that the allegations were substantiated in part. The unconsumed insert hanging down in a pipe weld had been identified and corrected during field installation of the pipe spool with removal of weld FW-2. The condition of a flow problem related to excessive radial shrinkage of weld FW-1B was analyzed by the TRT and was not found to be a problem for this weld. The TRT recognizes, however, that there are potential generic implications. The many pipe girth welds completed prior to May 18, 1982, were required to meet G&H Specification 2323-MS-100, revision 6, paragraph 4.2.7.8, which stated: "Welding parameters shall be controlled to avoid excessive heat input resulting in excessive necking down of butt welds in thin wall pipe." Enforcement of a requirement so stated is purely judgemental on the part of an inspector. With the imposition of DCA 13335 on May 18, 1982, measurable criteria were imposed on radial shrinkage of pipe girth welds. The TRT has concerns specifically that girth welds in thin-walled, austenitic stainless steel pipe, which potentially are more severely loaded, may have substantially greater radial shrinkage than permitted by DCA 13335.

5. Conclusion and Staff Positions: Weld documentation shows that there was no unconsumed insert hanging down in the pipe at field weld FW-1B. A condition similar to that alleged, which existed in weld FW-2, was removed and replaced by weld FW-2A.

With respect to radial shrinkage of weld FW-1B, TRT calculations established that the 13 percent reduction in the cross-sectional area of the pipe at the weld will not affect flow characteristics and will not create a stress problem. The TRT concludes that the allegations were substantiated in part, but that the alleged condition of an unconsumed insert was corrected and the condition related to weld radial shrinkage and pipe flow characteristics has no safety significance insofar as weld FW-1B is concerned. The TRT recognizes that there are potential generic implications related to radial shrinkage of other pipe welds completed prior to imposition of DCA 13335 requirements. These generic concerns are being addressed under QA/QC Category 8, allegation AQ-50.

Attempts to contact the alleger to review the TRT's findings on allegations AW-52, AW-59, and AW-62 have been unsuccessful.

6. Action Required: None.

Reference Documents:

1. B&R drawing BRP-CT-1-SB-017, "Containment Spray."
2. ASME B&PV Code, Section III, "Nuclear Components," Subsection NC.
3. Weld FW-1B documentation package.
4. Weld FW-2A documentation package.
5. WPS 88021, Revision 5.
6. WPS 88025, Revision 3.
7. Radiographic Report, RT 12691.
8. NRC Region IV, Office of Investigations, Report No. A4-83-001, dated January 24, 1983.
9. Radiographic Report, R6113.
10. NRC Region IV Investigative Report IR 50-445/83-07, dated March 9, 1983.
11. G&H Specification 2323-MS-100, "Piping Erection Specification."
12. DCA 13, 335.

1. Allegation Category: Mechanical and Piping 4, Uncontrolled Plug Welds

2. Allegation Number: AW-14 (Allegations AW-49, AW-51, AW-55 and AH-13 duplicate issues in this allegation.)

3. Characterization: It is alleged that holes drilled in incorrect locations in baseplates, pipe supports and cable tray supports were "plug welded" in an uncontrolled manner.

4. Assessment of Safety Significance:

Description of Allegation: The allegation relate to incorrectly located bolt holes which were drilled for the fabrication and installation of supports. Such holes allegedly were welded up without authorization, with undocumented weld filler metal, and without quality control (QC) inspection. In some cases, holes were only slightly mislocated, so that redrilling the hole in the correct location removed most of the repair weld. In other cases, the hole was grossly mislocated, and no part of the weld repair was removed during subsequent redrilling.

The NRC Technical Review Team (TRT) further characterized the allegation relative to the subject of "plug welding" in its review of testimony presented at hearings of the Atomic Safety Licensing Board (ASLB). The TRT review found that two allegers testified that they were directed to weld up holes drilled in the wrong locations in support members; that this was accomplished without authorization, using weld filler rods withdrawn for other, authorized welds; and that these "plug welds" were not inspected by QC (Tr 4154-55, 4220, 10286, 10670-80, 10700-09, 10990-11005, 11008-9, Case 919 pp 22-23). Most "plug welds" made by one alleger were on hanger details welded on a fabrication table in the turbine building (Tr 10286). This alleger also expressed concern about entrapment of slag. Because holes are commonly filled by welding from both sides, and slag at the root of the first weld was removed only with a chipping hammer, the weld may not have been totally effective if the root surface was irregular (Tr 4154-55, 10286). The second alleger stated that he made 20 or 30 "plug welds" in the cable spread room and an unspecified number in other safety-related areas (Tr 10990-11005). This alleger also testified that such unauthorized welds were ground down to the parent metal, buffed, and painted so they would not be detected (Case 919, p 22). This alleger further testified that he could "plug weld" a 1½-inch-diameter hole in a 2-inch-thick plate with two welding electrodes in 2 minutes (Tr 10698-99, 11157-159). In a telephone interview with the alleger on September 10, 1984, the alleger clarified this allegation. The alleger stated that the number of electrodes used was only an estimate, and that such holes were "capped" with a weld on either face and had slag and an air pocket in the middle. A "plug weld" made in this manner would obviously require fewer electrodes.

The TRT also reviewed NRC Region IV (RIV) inspection report IR 81-12, dated April 16, 1982, which reported on interviews with nine B&R employees. Of these, three welders said they had made numerous "plug welds," two welders stated they understood "plug welding" was not an authorized practice, and three inspectors stated they had observed "plug welds" on numerous occasions.

All three inspectors stated that QC inspection was required. One other individual interviewed also was of the opinion that "plug welding" was not an authorized practice. It appears to the TRT that there was some confusion on the part of welders as to whether or not plug welds were authorized.

Definition of "Plug Welds" The TRT notes that the term "plug welds," as used in these allegations, is a misnomer. A plug weld is defined by the American Welding Society (AWS) in ANSI/AWS A3.0-80, "Welding Terms and Definitions," as:

> A circular weld made through a hole in one member of a lap or T-joint, fusing that member to the other. The walls of the hole may or may not be parallel, and the hole may be partially or completely filled with weld metal.

In the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, 1974 Edition (including Summer 1974 Addenda), Section IX, QW-491, the definition of a plug weld is identical to that of ANSI/AWS A3.0-80, except that the word "joining" is substituted for the word "fusing." Repairing a mislocated hole by filling it with weld metal does not meet this definition. However, the term "plug welding" will be used for the purposes of this report.

Applicable Specifications and Procedures

The TRT review determined the following:

1. Gibbs & Hill (G&H) specification 2323-MS-46A, revision 5, dated January 14, 1984, paragraph 3.3, requires that nuclear safety-related, class 1, 2, and 3 pipe hangers and supports meet the requirements of the ASME B&PV Code, 1974 Edition (including Summer 1974 Addenda) Section III, "Nuclear Power Plant Components," Subsection NF, "Component Supports."

2. B&R CP-CPM-6.9, revision 1 (February 6, 1980) and revision 2 (November 7, 1980), "General Piping Procedure," in paragrapoh 2.4 imposes the ASME B&PV Code, Section III, Division 1, 1974 Edition including the Winter 1974 Addenda on ASME component supports.

3. G&H Specification 2323-MS-46B, revision 3 dated April 15, 1983 requires that nonnuclear, safety-related, class 5 and 6 pipe hangers and supports meet the requirements of the American National Standards Institute (ANSI) B31.1g-1976 Power Piping Code.

4. G&H specification 2323-ES-100, revision 2, dated October 15, 1980, "Electrical Erection Specification," paragraph 4.3.7, requires all welding for cable tray supports to be qualified and performed in accordance with the AWS Code. (The TRT notes that there are several AWS welding codes. The reference to "AWS Code" is, therefore, incomplete.)

5. G&H specification 2323-SS-16B, "Structural Steel (Category I)," no revision, dated May 7, 1975, is a general specification for the fabrication and erection of Category I structural steel without specific

reference to cable tray supports. However, B&R drawing FSE-00159, "Cable Tray Hanger Assembly," sheets 8057, 8058, and 8073 reference specification 2323-SS-16B. DC/DDA 1828, dated June 6, 1978, revises SS-16B to permit plug welding and redrilling of mislocated holes for structural steel fitup to concrete inserts. DC/DDA 2087, dated July 13, 1978, revises SS-16B, paragraph 6.4, to require welding to be accomplished in accordance with the American Institute of Steel Construction (AISC) Specification for Design, Fabrication and Erection of Structural Steel for Buildings, which references AWS D1.1 Structural Welding Code. DC/DDA 2087 also permits the substitution of ASME B&PV Code, Section IX, for AWS D1.1 on a case-by-case basis.

<u>TRT Evaluation of "Plug Welds" in Pipe Supports</u>: As noted under "Applicable Specifications," pipe hangers of classes 1, 2, and 3 are required to conform to ASME B&PV Code, Section III, Subsection NF, and pipe hangers of classes 5 and 6 are required to conform to ANSI B31.1. Both the ASME B&PV Code and the ANSI B31.1 Code require the qualification of weld procedure specifications and welder performance qualifications in accordance with the ASME B&PV Code, Section IX, "Welding and Brazing Qualifications." The ASME B&PV Code, 1974 Edition (including Summer 1974 Addenda) Section III, Subsection NF, and ANSI B31.1g-1976 do not specifically address the subject of weld repair of misdrilled holes, which are not base metal defects but fabrication errors. The ASME B&PV Code, 1974 Edition (including the Summer 1974 and Winter 1974 Addenda) explicitly addresses the subject of repair by welding of material defects (NF-4131), but does not set forth explicit requirements authorizing, prohibiting, or governing the repair by welding of fabrication errors. The ANSI B31.1g-1976 Code does not set forth explicit requirements authorizing, prohibiting, or governing the repair by welding of either material defects or fabrication errors (misdrilled holes are fabrication errors, not material defects). Consequently, the TRT concluded that the ASME B&PV Code, 1974 Edition (including Summer 1974 and Winter 1974 Addenda), does not prohibit the repair of misdrilled holes by welding. However, the TRT notes that NF-4641 of the 1974 Edition indicates that

> Components or portions of components including materials that have been repaired by welding shall be postweld heat treated in accordance with the requirements of NF-4620 except as permitted by NF-4642.

As discussed below, Region IV found undocumented "plug welds" in the north cable spreading room. Since these plug welds are undocumented, there is no assurance that applicable portions of NF-4620 or NF-4642 were complied with.

The TRT reviewed NRC staff testimony on "plug welding" presented at ASLB hearings on April 24, 1984, in a document entitled "NRC Staff Testimony on Welding Fabrication Concerns Raised by [alleger (name withheld)]" (Tr 12146). NRC staff testified that misdrilled holes may be considered to be material defects and "plug welds" utilized to fill misdrilled holes can be considered to be "repair welds." NRC staff also testified as follows:

> The 1975 ASME [sic] Code does not specifically address whether or not "plug welds" may be utilized to repair material defects. However, Article NF-4131 of the 1974 ASME Code states that defects

in materials discovered during fabrication or installation may be repaired by welding. Moreover, Article NF-2510 of the 1974 ASME Code allows repair of unacceptable defects as permitted by the material specifications. The material specifications for A-36 and A-500 steel, as set forth in Section II, Part A of the ASME Code, permit repair of these materials by welding.

The TRT considers the NRC's reference to articles NF-4131 and NF-2510 of the ASME B&PV Code, relating to the repair of material defects by welding, to be reasonable for guidance in repairing misdrilled holes by welding in lieu of explicit code requirements. The TRT notes that there is no ASME material specification for A-500 steel in the 1974 Edition of the ASME B&PV Code (including Summer 1974 and Winter 1974 Addenda). However, ASME Code Case 1644-3 adopts the material specification for ASTM A500-74a. This ASTM material specification does not explicitly prohibit or authorize the repair of material defects by welding. The TRT is aware of material specifications for other types of steel (e.g., ASME SA-614), where repair of material defects by welding is explicitly prohibited. In light of the lack of prohibition regarding material defect repairs by welding in the ASTM material specification for A-500 steel, the TRT concludes that the ASME Code permits the repair of misdrilled holes by welding, even if misdrilled holes are considered material defects, as opposed to fabrication errors.

B&R procedure CP-CPM-9.10, "Fabrication of ASME Related Component Supports," applies to supports for ASME piping. The TRT reviewed revision 0 (September 3, 1980) to CP-CPM-9.10. Paragraph 3.3.8, Material Salvaging, states in part:

> When items cannot be used because of redesign, misfabrication, damage, the disposition to Nonconformance Reports, etc., the items may be scrapped, salvaged, or returned to bulk stock. The responsible foreman shall make this determination based on the NCR, CMC, or the item's physical condition, as appropriate. When Code stamped items or partial assemblies are modified, documentation for such modification shall be prepared as required by CPM 6.9G, and the modification accomplished accordingly.

It is the TRT's opinion that the words "as appropriate" give the responsible foreman unlimited license in the salvage of misfabricated items, and therefore that Paragraph 3.3.8 should be reworded to state clear and concise requirements.

In ASLB testimony, the NRC staff identified WPS 11032 as that used for "plug welding" hardware fabricated to ASME B&PV Code, Subsection NF. The TRT determined that WPS 11032 is an ASME B&PV Code, Section IX, WPS applicable to NF class 1, 2, and 3 supports and class 5 and 6 supports for ANSI B31.1 piping. The TRT observed that all revisions of WPS 11032 specified the shielded metal arc welding (SMAW) process and required the use of E7018 electrodes. Revision 0 through 5 of WPS 11032 also included a general statement that weld surfaces must be wire brushed to remove slag, scale, or other contamination. Revision 6, dated August 22, 1979, and

subsequent revisions, including the current revision, revision 11, had a specific statement to the effect that full penetration welds not utilizing a backing strip should be back gouged and/or ground to sound metal before welding from the second side. The TRT, therefore, determined that removal of slag from the root side of a "plug weld" using a chipping hammer would violate a requirement of WPS 11032 after August 22, 1979. Applicants have testified that it is acceptable to use a chipping hammer alone to remove slag from a "plug weld" (Testimony of W. E. Baker, Applicant's Exhibit 177, pages 35-36). If the plug welds were thoroughly cleaned of slag using the chipping hammer, the welds would likely be sound and would not present a safety concern. Nonetheless, the use of a chipping hammer in lieu of a gouging tool or a grinder to remove slag would be a technical violation of a non-essential variable for SMAW according to the ASME B&PV Code, Section IX.

TRT Evaluation of "Plug Welds" in Cable Tray Supports: The TRT identified the materials used for cable tray supports as ASTM specifications A-572, Grade 50; A-501 and A-500, Grade B. All of these materials have a maximum of 0.3 percent carbon and, for welding purposes, are considered plain, low carbon steels.

As discussed above, welding of cable tray supports at CPSES is required to be done in accordance with AWS D1.1-75 (AWS Code). The TRT did not find any sections of the AWS Code which explicitly prohibit or authorize weld repairs of fabrication errors. The AWS Code does set forth some requirements for the repair of internal discontinuities (Paragraph 3.2.3), but does not otherwise discuss weld repairs of material defects or specifically refer to repair of misdrilled holes.

The TRT concludes that the AWS Code does not prohibit the repair of misdrilled holes by welding. However, the TRT notes that the 1982 Edition of the AWS Code does include provisions regarding the repair of "unacceptable" (misdrilled) holes by welding (AWS D1.1-82 Code, paragraph 3.7.7). Therefore, the TRT concludes that the TUEC should address whether or not weld repair of misdrilled holes which do not meet the requirements of AWS Code, paragraph 3.7.7 are nonetheless acceptable.

The NRC staff previously testified that:

> Prior to January of 1983, Procedure WES-29 did require welders to contact welding engineering to repair misdrilled holes in non-ASME Code structure fabrications, and for an RPS to be generated for those repairs.

The TRT notes that procedure WES-029, "Welding Specification for Field Fabrication and Erection of Structural Steel," is a Brown & Root (B&R) procedure, and that paragraph 4.17, "Weld or Base Metal Repair," of revision 1 (January 14, 1982) states:

> 4.17.1 When a weld or base metal defect is identified during inspection, the Project Welding Engineer or his designee shall be responsible for determining the means of resolving that defect.

If weld repair is required, paragraph 4.17.2 of WES-029 requires a repair process sheet (RPS) presenting the technical resolution be generated.

The RPS sets forth the actions to be followed in making the repair, and the inspections which are necessary for final acceptance of the repair.

WES-029, revision 2, dated January 14, 1983, added paragraph 4.17.7 which set forth explicit requirements for the weld repair of misdrilled holes. An RPS was no longer required if the requirements specified in WES-029, revision 2, were followed. WES-029, revision 3, dated March 15, 1984, modified paragraph 4.17.7 by requiring an RPS only if hole preparation for welding necessitated beveling. To ensure proper inspection of a "plug weld" repair not requiring an RPS, WES-029, revisions 2 and 3, required notification of QC prior to the start of welding. The TRT considers revisions 2 and 3 of WES-029 to be improvements over revision 1, but notes that a "plug weld" is still interpreted as a base metal repair (paragraph 4.17 is entitled "Weld or Base Metal Repair). It is possible that the reason why the welders who were interviewed by Region IV (IR 81-12) were confused as to whether "plug welds" are authorized is because of the fact that none of the revisions of WES-029 specifically referred to "plug welds," misdrilled holes, or fabrication errors.

In ASLB testimony (Tr 12146), the NRC staff identified WPS 10046 as used for "plug welding" to AWS D1.1-75. The TRT reviewed WPS 10046, revisions 0 through 9. The TRT found that WPS 10046 is an acceptable WPS for weld fabrication of cable tray supports. It is both a prequalified and a qualified AWS D1.1 procedure for fillet and full penetration groove welds. Revisions 0 through 4, dated January 2, 1979, were identified as meeting AWS D1.1-74. All subsequent revisions were identified as meeting AWS D1.1-77. The TRT observed that WPS 10046 specified use of the SMAW process using E6010 or E7018 electrodes in revision 0, dated April 15, 1977, and revision 1, dated April 26, 1977. Revision 2, dated July 26, 1977, and all subsequent revisions through the current revision, revision 9, dated March 27, 1984, permitted only E7018 electrodes to be used. All revisions required groove welds made without the use of backing to be root gouged before welding of the backside. Since "plug welds" are made without backing, the TRT concluded that under WPS 10046, "plug welds" equivalent to groove welds made without backing, and therefore that "plug welds" should be root gouged. Consequently, the removal of slag from the root side of a "plug weld" using a chipping hammer would violate the requirement of WPS 10046 for root gouging. A failure to follow the WPS with respect to this requirement would also be a technical violation of mandatory requirements of AWS D1.1-75 specified in Section 4, paragraph 4.10.8 for prequalified weld procedures and in Section 5, paragraph 5.5.2.1 (11) for qualified weld procedures.

Unuathorized "Plug Welds" Identified by NRC Staff

In the "NRC Staff Testimony on Welding Fabrication Concerns Raised by [alleger (name withheld)]" in Tr 12146, the RIV staff stated (on page 27) that no physical inspection for unauthorized "plug welds" was made in the south yard tunnel and north cable spreading room, on the premise that such welds, ground down and painted, would be visually undetectable. In the "Addendum to page 27 of NRC Staff Testimony on Welding Fabrication Concerns Raised

by [alleger (name withheld)]" the RIV staff reported on visual inspections made on April 11, 12, and 18, 1984, in these previously uninspected locations. RIV found no indications of "plug welds" in supports in the south yard tunnel; however, three horizontal I-beams in cable tray supports in the north cable spreading room were each found to contain indications of two "plug welds". RIV found no documentation that these "plug welds" had been authorized. The TRT notes that these unauthorized weld repairs were subsequently documented on TUEC nonconformance reports (NCRs) M-84-01230R.1, M-84-01231R.1 and M-84-01232R.1. Examinations performed in accordance with the NCR dispositions verified the presence of two undocumented weld repairs in each of the three supports, which substantiates RIV's interpretation of the indications. In particular, CTH-8073 was reported as having sizable weld repairs of approximately 1-1/4 inches x 1-3/8 inches and 1-3/8 inches x 1-1/2 inches.

Although the effects of unauthorized, undocumented, and uninspected weld repairs of misdrilled holes in some locations (e.g., the webs of I-beams or in structural members in compression) will be inconsequential, their effects in critical locations (e.g., flanges of I-beams in flexure or in structural members in tension) and in critically loaded (highly stressed) support members or base plates could affect structural integrity and intended functions.

NRC RIV letter, dated April 30, 1984, to Michael D. Spence, requested TUEC to propose a plan to resolve the issues regarding undocumented "plug welds." TUEC responded in TXX-4183, dated May 29, 1984, and TXX-4259, dated August 13, 1984.

Other Aspects of "Plug Welding" Raised in ASLB Testimony: One of CASE's witnesses alleged that he could "plug weld" a 1-1/2-inch diameter hole in a 2-inch thick plate with two welding electrodes in 2 minutes (Tr 10698-99, 11157-59). The NRC staff noted that this would be impossible, even without cleaning the weld passes. The NRC estimated that 20 to 25, 1/8-inch-diameter electrodes, each taking about 1 minute to consume, would be required (Tr 12146). The TRT computed that with 100 percent utilization, a minimum of seven 3/16-inch-diameter electrodes (the largest permitted by either WPS 10046 or WPS 11032) would be required. The TRT concurred with the NRC staff that it would not be possible to weld up the specified hole in 2 minutes. The allegation further stated that only two electrodes were required to weld up such a hole.

The TRT, in a telephone interview on September 10, 1984, TRT clarified the alleger's earlier testimony. The alleger stated that the number of electrodes used was only an estimate, and that such holes were "capped" with a weld on either face and had slag and an air pocket in the middle. A "plug weld" made in this manner would obviously have less volume of deposited metal and therefore require fewer electrodes. (Since only visual inspection is normally specified for "plug welds," such a practice would not be detected by QC.)

The staff notes that such voids are likely to be created only in steel which is greater than ½ inch in thickness. Misdrilled holes in steel which is less than ½ inch in thickness would be completely filled by two layers of deposited weld metal.

5. Conclusions and Staff Positions: An NRC RIV inspection identified indications of unauthorized "plug welds." TUEC concurred with the RIV findings and issued NCRs, whose disposition action confirmed the presence of unauthorized "plug welds." The TRT concludes that the existence of these welds and the difficulty in detecting them raises a generic concern regarding the potential existence of an unknown number of such unauthorized "plug weld" repairs of questionable quality in the hundreds of base plates, pipe supports, and cable tray supports throughout Units 1 and 2. Potentially defective welds located in highly stressed areas could have safety significance. This concern of the TRT shall be addressed by TUEC.

The TRT also concludes that the measures proposed by TUEC in TXX-4183 and TXX-4259 to assess the extent of unauthorized repairs are inadequate. While such repairs have been found only in the Unit 2 north cable spread room, all base plates, pipe supports and cable tray supports in Units 1 and 2 must be considered suspect. Accordingly, this allegation has safety significance.

The TRT notes that while G&H 2323-MS-46A, revision 5 references the Summer 1974 ASME Code Addenda, as applicable, B&R Procedure CP-CPM-6.9, Revisions 1 and 2 reference the Winter 1974 ASME Code Addenda as applicable. The TRT finds that additional information is necessary to assess the significance of this discrepancy.

The TRT further concludes that CP-CPM 9.10, paragraph 3.3.11 is worded in a manner which permits misinterpretation as to the actions which the responsible foreman is permitted in the salvage of misfabricated items.

The TRT's evaluation of allegations AW-49 and AW-55, and the findings, were reviewed with the allegers. The allegations were stated to be substantiated. Final resolution was stated as dependent on TUEC's responses. The allegers accepted these findings. Attempts to contact the alleger to review the TRT's findings on his allegation AW-51 with him have been unsuccessful.

6. Action Required:

TUEC shall accomplish either of the following:

a. Modify its proposed inspection plan to Region IV (TXX-4183 and TXX-4259) to include: (1) a sampling plan to conduct inspection of cable tray supports, pipe supports and baseplates in all areas of the plant; and (2) alternate methods of inspection where the oblique lighting method is not viable (e.g., locations covered by heavy coats of paints). TUEC shall also perform assessments of the effects on quality due to uncontrolled plug welds found during the proposed inspections as modified above. A report documenting the results of inspections and assessments shall be submitted to the TRT for review.

b. Perform bounding analyses to assess the generic effects of uncontrolled plug welds on the ability of pipe supports, cable tray supports and baseplates to serve their intended functions. A report documenting the results of assessments shall be submitted to the TRT for review.

Reference Documents:

1. ANSI/AWS A3.0-80, "Welding Terms and Definitions."
2. ASME B 8c PV Code, 1974 Edition Including Summer 1974 Addenda, Section III, Subsection NF, "Component Supports" and Section IX, "Welding and Brazing Qualifications."
3. G&H Specification 2323-MS-46A, "Nuclear Safety Class Pipe Hangers and Supports."
4. G&H Specification 2323-MS-46B, "Nonnuclear Pipe Hangers and Supports."
5. ANSI B31.1 Power Piping Code.
6. G&H Specification 2323-ES-100, "Electrical Erection Specification."
7. G&H Specification 2323-SS-16B, "Structural Steel (Category I)."
8. B&R Drawing FSE-00159, "C.RM and Aux. B Cable Tray Hanger Assembly," Sheets 8057, 8058, and 8073.
9. DC/DDA 2087, dated July 13, 1978.
10. AWS D1.1-75, "Structural Welding Code."
11. NRC Region IV investigative report IR81-12, April 16, 1982.
12. NRC Staff Testimony on Welding Fabrication Concerns Raised by alleger [name withheld].
13. ASME Specification SA-36-70a, "Specification for Structural Steel."
14. ASTM A-500-74a, "Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes."
15. B&R CP-CPM-9.10, "Fabrication of ASME Related Component Supports."
16. B&R Procedure WES-029, "Welding Specification for Field Fabrication and Erection of Structural Steel."
17. Addendum to Page 27 of NRC Staff Testimony on Welding Fabrication Concerns Raised by [alleger (name withheld)].
18. TUGCO NCR M-84-01230, Revision 1.
19. TUGCO NCR M-84-01231, Revision 1.
20. TUGCO NCR M-84-01232, Revision 1.
21. NRC Region IV letter, R. L. Bangart to M. D. Spence, dated April 30, 1984.
22. TXX-4183, TUEC letter dated May 29, 1984 from B. R. Clements to Richard L. Bangart.
23. TXX-4259, TUEC letter, B. R. Clements to R. L. Bangart, dated August 13, 1984.
24. B&R WPSs 10046, 11032.
25. AISC Manual for Steel Construction.
26. ASLB, Testimony of CASE Witnesses dated February 7, 1984.

1. Allegation Category: Mechanical and Piping 5, Improper Weld Designs for Attaching Cadweld Sleeves

2. Allegation Number: AW-44

3. Characterization: It is alleged that an improper weld design was used to attach Cadweld sleeves to 2-inch-thick, A588 steel plate details on steam line penetration assemblies in the reactor Containment Building.

4. Assessment of Safety Significance: Cadweld sleeves are a proprietary product commonly used to connect the ends of concrete reinforcing bar (rebar) or to connect rebar to anchor plates. The alleger's concern was that the A588 steel plate details used for the steam line penetration assemblies were susceptible to lamellar tearing when tensile loaded in the thickness direction, a condition which would result if Cadweld sleeves were welded to the A588.

   The NRC Technical Review Team (TRT) determined from Gibbs & Hill (G&H) drawing 2323-SI-0513, Revision 9, "R. B. Containment Liner Details," sheet 3, that penetration sleeve materials were specified as ASME SA-537, Class 2, or SA-516 grade 70 for sleeves larger than a 20-inch diameter and SA-533 grade 6 for sleeves up to and including 20 inches in diameter. Reinforcing plate for gussets and stiffeners was specified as ASME SA-537 Class 2. Contrary to the allegation, no penetration sleeve details were specified as A588 material.

   The TRT also determined that the steam line penetration assembly design was not as described by the alleger. The TRT review of G&H drawing 2323-SI-0506, revision 5, shows the typical design details used for anchoring the ends of rebar near a penetration assembly. American Society for Testing Materials (ASTM) A588 steel, the material identified in the allegation, is used in the form of 2-inch-thick plate sections of various sizes as anchors. The anchor plate has a hole in it for the rebar to pass through. The anchor plate is tack welded to a Cadweld sleeve and the assembly is slipped on the end of a rebar, plate first. The Cadweld is then made, locking the anchor plate assembly in position. The only purpose of the tack weld is to keep the anchor plate from slipping along the rebar when concrete is poured. The design places both the tack weld and the anchor plate in compression when the cement cures.

   The TRT also searched receiving inspection records (Chicago Bridge and Iron Company nonconformance control list, repair checklist, and shop release for shipment checklist) to determine if cracks were found in the penetration sleeve details as the alleger stated. The TRT could find no reports showing that cracks were found in any of the gussets or stiffeners.

   The TRT interviewed the Chicago Bridge & Iron Company (CB&I) welding and QC superintendent who was involved with the installation of the rebar at the time the rebar was being put up for Units 1 and 2, and a Brown & Root (B&R) employee from the civil and mechanical engineering group who was assigned to follow the installation of the rebar to determine if the Cadweld sleeves were welded to the main steam line penetration sleeves. Both employees stated that, based on their experience and direct involvement,

the rebars were not attached to the penetration sleeves, and the rebars were cut so that they did not touch the surface of the penetration sleeve material.

5. Conclusion and Staff Positions: The TRT concludes that the allegation cannot be substantiated in that discussions with cognizant B&R and CB&I personnel and examination of relevant documents could not verify the improper weld joint design alleged. Instead of being attached to any of the containment penetration sleeves, the rebar is attached to anchor plates using a design which places the tack weld and anchor plate in compression. Materials in compression are not susceptible to lamellar tears. It is the TRT's position that the allegation has no safety significance.

   The findings of the TRT on allegation AW-44 could not be reviewed with the alleger since he was unidentified.

6. Actions Required: None.

   Reference Documents:

1. G&H Drawings 2323-SI-5013, "R. B. Containment Liner Details," Sheet 3.
2. ASME SA-537.
3. ASME SA-516.
4. ASME SA-533.
5. ASME SA-588
6. CB&I Nonconformance Control List, Sheet 6, dated November 30, 1976.
7. CB&I Repair Check List, page 28.
8. CB&I Shop Check List No. 313, sheet 2 of 2.
9. CB&I Shop Check List No. 314, sheet 1 of 2.
10. CB&I Shop Release for Shipment Check List, sheet 1 of 1, dated August 2, 1976.
11. CB&I Drawing 381, Revision 2, Penetration Assemblies for MI-2 and MI-4.
12. EPG Drawing 802252, Revision 1, "Penetration MI-1, 2, 3, and 4," TUSI - Commanche Peak/Gibbs & Hill.
13. B&R Drawing BRP-PN-1-503-04, "Reactor Containment Penetration & Details."
14. G&H Drawing 2323-SI-0506, Reactor Building Containment Wall Outline & Reinf.

1. Allegation Category: Mechanical and Piping 6, Improper Weld Preparation

2. Allegation Number: AW-45, AW-46, AW-61 and AW-66

3. Characterization: It is alleged that:

AW-45,AW-61

When shear lugs were welded to stainless steel pipe, welding was performed without proper inerting/purging.

AW-46

The grounding for welding was accomplished by wrapping the grounding lead around the pipe and allowing the clip to rest upon the pipe, and that this resulted in numerous arc strikes.

AW-66

Welding and concrete chipping were done in the same area simultaneously.

4. Assessment of Safety Significance:

AW-45,AW-61

The NRC Technical Review Team (TRT) reviewed the governing specifications and procedures related to purging of stainless steel piping systems (Reference 1). These specifications state that purging shall be maintained for the welding of attachments to stainless steel piping having a wall thickness of 1/4 inch or less. Therefore, purging is not required for piping with a wall thickness of greater than 1/4 inch.

The TRT reviewed NRC Region IV (RIV) inspection report (IR) 83-27, which discussed the stainless steel pipe purging allegations of AW-45 and AW-61. This report stated that two Brown & Root (B&R) employees were interviewed about their alleged knowledge of lugs that were improperly welded onto stainless steel pipe without purging the line. Both B&R employees executed signed, sworn statements indicating that they knew of no instance in which a stainless steel pipe which required purging was welded without purging unless a "purge deletion" was received from the engineer. All of the employees mentioned by the alleger in the alleger's statement who were still employed or available for interview also denied the allegations concerning purging that were made by the alleger. No evidence was uncovered during these inquiries by Region IV, which indicated deception on the part of the witnesses. The backgrounds of the witnesses ranged from pipe fitter helpers to a B&R superintendent, and included a Piping Design Services, Inc., engineer and an employee of Dravo Constructors, Inc., who also gave testimony that contradicted the testimony of the alleger.

The TRT learned (References 1 and 2 and RIV IR 83-27) that when an attachment weld requires a welding purge, the requirement should be noted on the weld data card (WDC) and a holdpoint should be established for a QC inspector to verify the purge. The purge could be waived on a case-by-case basis by Pipe Welding Engineering, as provided for by procedure. If

this was done, the waiver was to be documented on the applicable WDC, and an interoffice memorandum was to be attached to the WDC. The procedures required these memoranda to be numbered chronologically and filed in the permanent record files.

Allegation A-45 made reference to the lugs on piping at the 832-foot elevation in the reactor Containment Building; however, the allegation did not make specific reference to a particular weldment, pipe support, or piping system. In discussions with B&R welding engineers and in a review of piping drawings, the TRT determined that the majority of stainless steel piping at the 832-foot elevation has a pipe-wall thickness in excess of 1/4 inch. (Pipes with a wall thickness of greater than 1/4 inch do not require purging to make the line inert when the welding of attachments is performed.) Since the alleger stated he could show the TRT the welds, the TRT accompanied the alleger on a site visit. The alleger stated that the area had changed a great deal since he was on site; therefore, he was not sure as to the exact location of the alleged improper welding. He indicated three different riser pipe supports that could have been the item of concern. The TRT reviewed the records for the three supports and determined that all those lines were carbon steel and did not require purging. The alleger declined to provide the TRT with any further interviews or information; therefore, the NRC sent the alleger a letter describing the findings of the TRT. The TRT has not received a response to this letter.

AW-46

The TRT discussed this allegation with the B&R Welding Engineering Supervisor and the B&R Weld Documentation Supervisor. Both of the supervisors stated that proper grounding of the items to be welded was required for welding (i.e., the electrical circuit cannot be completed, therefore, there could be no arc). The TRT learned from the B&R Welding Engineering Supervisor that a Welder Orientation Program regarding grounding refers welders to B&R procedure CPM-141. Nothing was mentioned in the program about the alleged method of grounding. The B&R Welding Supervisor feels this method of grounding is absurd and therefore requires no mention.

Item No. 2 on the B&R QC N-5 checklist states that: "All items in the pressure test boundary are free from arc strikes and base metal defects." In a review of the N-5 process, the TRT found a number of instances when arc strikes were discovered and then repaired as required using the applicable procedures. Therefore, there were checks in place to identify and repair as required any arc strikes that may have resulted if this allegation were true. During its 8 weeks at the Comanche Peak job site, the TRT observed the grounding used for welding and did not observe the alleged grounding technique.

The B&R Welding Engineering Supervisor and the B&R Weld Documentation Supervisor also stated that if a grounding system of the type alleged was being used, they were unaware of it. The TRT also had discussions with six B&R welders concerning proper grounding. They all stated that they used proper grounds and that they had never used nor seen any other welder use the alleged method of grounding. In addition, various weld inspections are required for the the ASME Section III piping system to identify nonconforming welds. The TRT determined from inspection records contained in

the weld data package that the weld quality met the weld requirements established by the ASME Code for the given Code Class (i.e., 1, 2, 3, etc.). Therefore, the TRT could not establish that if the alleged grounding were used, it had resulted in unacceptable welds.

AW-66

The TRT had discussions with B&R QC personnel who stated that they could not remember any instance in December 1981, or any other time, that welding and concrete chipping were being performed in the same area. QC personnel also stated that if the chipping had been done nearby, the airborne contamination could adversely affect the welds. The TRT notes that the alleger indicated that the concrete chipping was, in fact, stopped by QC.

The TRT also interviewed approximately 15 welders concerning welding and chipping in the same room. None could remember a case when the two operations were being performed in the same area. All of the welders indicated that the two activities were not allowed in the same area.

During a phone conversation with the alleger, the TRT was unable to learn the exact location of the weld to determine if the weld had been affected.

5. Conclusion and Staff Positions:

AW-45, AW-61

The TRT concludes that the allegation that welding was performed without proper inerting/purging cannot be substantiated because: (1) the allegation lacks specificity (i.e., pipe line numbers, location, size, wall thickness, etc.); (2) the majority of the stainless steel piping at the 832-foot elevation is thicker than 1/4 inches; (3) the people named by the alleger have made signed, sworn statements that deny the allegations; (4) the procedures and implementation activities have been inspected and documented by NRC Region IV inspections on numerous occasions and no concerns were previously identified; and (5) the three supports identified by the alleger were carbon steel lines which do not require inerting. Accordingly, this allegation has no safety significance.

AW-46

The TRT concludes that the allegation that grounding for welding was accomplished by wrapping the grounding lead around the pipe can be neither substantiated nor refuted. No areas reviewed (inspection records, field observation and welder interviews) by the TRT showed any evidence of poor grounding. If the allegation were, in fact, true an N-5 inspection has the capability of detecting the arc strikes and assuring that appropriate action can be taken. Accordingly this allegation has no safety significance.

The TRT called the alleger on October 29, 1984 and August 30, 1984; however, he declined any further discussion.

AW-66

The TRT concludes that the allegation that welding and concrete chipping were done in the same area simultaneously can be neither substantiated nor refuted. The alleger also stated that the concrete chipping was, in fact, stopped by QC and therefore, the welding was not affected. The resulting actions by B&R QC in stopping this kind of occurrence show that in this specific case the QC system was working. Since this alleged activity was apparently stopped in a timely manner and since QC was aware of the incident and no NCR was written concerning this allegation, the TRT concludes that the welds that were made were not affected. No other occurrence of this type was identified during the TRT's review. Accordingly, this allegation has no safety significance.

6. Actions Required: None.

Reference Documents

1. Brown and Root CPSES Weld Procedure CP-CPM 6.9 Appendix D, "Welding and Related Processes."
2. Brown and Root Inspection Procedure QI-QAP-11.1-26, "ASME Pipe Fabrication and Installation Inspection."
3. Brown and Root Procedure, "Welder Orientation Program," CP-CPM-14.1.
4. Brown and Root Procedure, "ASME Section III Installation Verification and N-5 Certification," CP-QAP-12.1.
5. Brown and Root Procedure CP-QAP-16.1, "Control of Nonconforming Items."

1. Allegation Category: Mechanical and Piping 7, Improper Weld Examination and Testing by QC Trainees

2. Allegation Number: AW-48, AQW-20, AQW-21 and AQW-23

3. Characterization: It is alleged that:

   a. A QC trainee was improperly using liquid penetrant (AW-48).

   b. During radiographic examination (AQW-20 and -21):

      1. The automatic film processor speed was changed to get the correct film "density."

      2. "T" holes in penetrameters were reamed to a larger size to give the appearance of adequate film sensitivity.

      3. Defective welds were masked out when "shooting" adjacent thin wall repairs.

   c. The calibration of the Dimetrics automatic welding machines was not done according to applicable procedures (AQW-23).

4. Assessment of Safety Significance:

AW-48

In assessing this allegation, the NRC Technical Review Team (TRT) reviewed Texas Utilities Electric Company (TUEC) QA procedure CP-QP-2.4, with special emphasis on trainee duties and responsibilities. The QA procedure states, in part, that, "A trainee works along with a certified individual and does not conduct independently any test, interpret any results of a test, or write a report of test results." It is only reasonable to assume that some work done by a trainee during the learning process would be done improperly; however, the final interpretation and sign off of the welds done by trainees would be the responsibility of a qualified nondestructive examination (NDE) Level II or Level III inspector. The fact that a trainee may have performed a liquid penetrant examination improperly is not unexpected. Such work is considered a normal part of the training program and would not raise a concern, since a Level II or Level III inspector should have shown the trainee what had been done incorrectly. The TRT interviewed the alleger via telephone to determine if there were Level II or III inspectors present or if the alleger could identify the welds being inspected. The alleger could not recall whether a Level II or Level III inspector was present.

During a second, more detailed interview, the alleger stated that this allegation referred to the fuel pool liner. The alleger stated that the person performing the weld inspections was not a trainee, rather he was a boilermaker. The alleger also stated that the person signing off for the weld interpretation was a Level II inspector. (The weld quality of the fuel pool liner is the subject of hearing issues, and is also assessed in

Mechanical and Piping Category 43. Since the quality of these welds has been covered or will be covered by the above, it will not be addressed here.)

AQW-20 and AQW-21

These allegations were made anonymously; therefore, the TRT could not interview the alleger to obtain clarification or additional information. The TRT discussed the allegations concerning piping radiographs with a B&R QC lead nuclear inspector A (Level III) and a B&R lead nuclear inspector B (Level II) who were responsible for radiographic film interpretations during the time the allegations were made. Both inspectors stated that they each have more than 15 years experience in the area of NDE.

The results of the TRT review of these allegations is as follows:

1. The changing of the automatic film speed to obtain the correct film exposure was substantiated as a method used to obtain the desired light exposure when the film was developed. This process is considered to be acceptable as long as the rinse time is long enough to ensure that the film can be maintained for the 40-year life of the plant. Exposure calculations for processing film speed are based upon the thickness of the pipe being X-rayed, because pipe thickness could affect the exposure and different processor speeds are required to get the correct film exposure.

   TRT reviewed the records that show the results of tests required by B&R Procedure QI-QAP-10.2-3C, which is a check to assure that the final film is adequate for archival use. The TRT found that the records are complete and show that the film is of a quality that can be stored without adverse effects for 40 years.

2. The allegation that the "T" holes in penetrameters were reamed to a larger size was discussed with the B&R QA personnel listed above. Both stated that they knew of no instance where tampering with the penetrameters was ever done. In addition, after the allegation became known to the B&R QC superintendent, he had the penetrameters checked for any tampering, and found none. There is no record of this check; however, both B&R inspectors remembered the incident. Based on these interviews, and lacking further clarification from the alleger, the TRT considers this allegation to be unsubstantiated.

3. The allegation that defective welds were masked out (i.e., taped over) when radiographs of adjacent thin wall repairs were taken is vague, in that no specific weld location, pipe size, system, etc. was identified. In discussions with the B&R inspectors, both said that welds may have been masked in order to photograph only the area that was under consideration. If an adjacent weld had already been inspected, masking may have been used when a repair was made, although the preferred method would be to take the "shot" and then mark the film to make note of any adjacent defective welds.

The allegation was difficult to assess because the alleger specified no particular joints and because the masking may have been done for reasons other than to hide defective welds (i.e., arc stike weld repair near a weld joint or series of arc strikes when only one has been repaired). If a defective weld were on a system that required inspection, that inspection would be completed under the required QA/QC procedures. The Resident Reactor Inspector and inspectors from NRC Region IV (RIV) have, on a continuing basis, reviewed the weld inspection process and have made no observations or findings that would substantiate this allegation.

AQW-23

The TRT reviewed IR-79-18 which covers, in detail, the RIV review of the allegation concerning the calibration of the Dimetrics automatic welding machines. Since the Dimetrics machines have been sold, it was not possible for the TRT to talk to machine operators or to observe operation of the machines. In addition, this allegation was from an unidentified alleger; therefore, it was not possible to obtain additional information or discuss the review with the alleger. The TRT did, however, talk to the B&R senior project welding engineer who provided the TRT with a considerable amount of information concerning operation of these welding machines.

The TRT randomly reviewed the records for the performance verification of automatic welding equipment. These records contain data showing that the required factory-recommended calibration was performed by a Dimetrics factory-trained technician employed by B&R. Report IR-79-18 stated that a select group of pipe fitters was charged with the responsibility for maintaining, adjusting, and calibrating the machines. These personnel were, in reality, electronic technicians, administratively assigned to the pipe department. Their sole responsibility was the maintenance of the Dimetrics machines.

The TRT reviewed Comanche Peak Steam Electric Station Construction Procedure 35-1195-WCP-6, Revision 0 and Revision 1. The procedure requires that performance verification (calibration) be accomplished by the QA/QC department and requires that weld parameter monitoring be accomplished in accordance with Appendix 3 of the procedure. Through interviews with QA/QC supervisory personnel, a review of pertinent records, and interviews with the B&R Senior Project welding engineer (in addition to a review of IR-79-18), the TRT verified that QA/QC was not verifying the performance of the machines, as required by procedure, nor was the weld parameter monitoring done in accordance with Appendix 3 of the procedure. These infractions were a violation of the procedure and were reported in RIV IR-79-18.

As a result of the RIV findings, the following corrective actions were incorporated into Procedure WCP-6, Rev. 0, including Interim Change Notice 2: (1) Paragraph 4.2.3 was changed to state that performance verification was to be performed by Welding Engineering with the assistance of the Welding Operator or Maintenance Technician, rather than by the QA/QC department: (2) welding operators and maintenance technicians were defined as Brown & Root employees specially trained in the operation and maintenance of the

Dimetrics Welding System; (3) the frequency of performance verification was revised from a calendar time to an accumulated machine time basis; and (4) periodically, the QA staff personnel were to verify compliance to the procedure using the normal Comanche Peak audit and/or surveillance procedures.

The TRT reviewed various audits by B&R QA personnel on the Dimetrics welding equipment and found the performance verification of automatic welding equipment to be in compliance with welding procedure WCP-6, as revised.

5. Conclusion and Staff Positions:

AW-48

The TRT could not substantiate this allegation. However, allegation AW-48 refers to a training position, and since ultimate responsibility for the weld inspection would be with a Level II or Level III inspector, it is unlikely that this incident has any safety significance.

AQW-20 and AQW-21

Although these allegations were vague and from an unknown source, the TRT reviewed a considerable amount of data concerning them. The automatic film processor speed may have been changed; however, this process is considered acceptable since the resulting film can still be maintained for the 40-year storage requirement as substantiated by records. The enlarging of penetrameter "T" holes was not substantiated. The masking of adjacent welds, if done, would not affect the weld being examined. The TRT concludes that these allegations are unsubstantiated.

AQW-23

Allegation AQW-23 is true; however, the problem was identified by RIV and TUEC instituted corrective actions. The infraction was procedural in nature and had no bearing on the quality of the completed installation. The Dimetrics welding machines were maintained in good working condition, although maintenance was accomplished by personnel other than those formally delegated by procedure to maintain them. The TRT concludes that this allegation has no safety significance.

6. Actions Required: None.

Reference Documents:

1. Brown & Root CPSES Construction Procedure 3301195-WCP-6 Rev 0, and Rev 1 "Electronic Alignment, Performance Verification and Maintenance of Dimetrics Gold Track II Automatic Welding System."

1. Allegation Category: Mechanical and Piping 8, Lost and Reconstructed Weld Data Cards

2. Allegation Number: AW-63 and AW-67

3. Characterization: It is alleged that:

AW-63

A weld data card (WDC) for a field weld was lost, the data card was reconstructed, and the reconstructed version was accepted by Brown & Root (B&R) quality control personnel (AW-63).

AW-67

1400 WDC packages were lost, and at least 1 WDC was never found (AW-67).

4. Assessment of Safety Significance:

AW-63

The alleger did not identify the field weld or system associated with the alleged lost card. The NRC Technical Review Team's (TRT's) review of testimony (A-21, pp. 15-17), recorded in Office of Investigation (OI) report 84-006, dated March 7, 1984, shows the alleger's apparent concerns to be that: (1) at least two repairs had been made on the weld of concern, and it would be impossible to accurately reconstruct the WDC to reflect the required repair information; (2) the procedures did not permit a reconstruction of lost data; and (3) QC does not have the capacity to verify the information.

Since the TRT was unable to contact the alleger during the time of its review, the TRT was unable to obtain additional information on this allegation. The TRT reviewed NRC Region IV (RIV) report 83-07, which discussed RIV's assessment of allegation AW-63. This report identified a case where a WDC for Field Weld (FW) No. FW-1 on drawing No. BRP-MS-2-RB-19, "Main Steam System," had been lost and reconstructed. Brown & Root's (B&R's) NCR M-3425-R2 documents this lost WDC . The RIV review concludes that they found the reconstructed WDC to be correct and accepted by QC and the ANI.

Based upon its review of NCR M-3425-R2 and the reconstructed WDC for FW-1, the TRT believes that this reconstructed WDC is the subject of allegation AW-63. This conclusion is based on the fact that the WDC for FW-1 reflects two repairs made to weld FW-1. These reports correspond with the alleger's statement that at least two repairs had been performed on the weld of his concern.

The TRT reviewed NCR M-3425-R2 and found that it reported that the WDC for FW-1 had been lost. The NCR had 29 pages of attachments, which included the welding engineer's disposition of the NCR, copies of the reconstructed

data card, and copies of all data that were required for the reconstruction. The welding engineer's disposition defined the activities required to be accomplished for the reconstruction of the WDC and identified the records where the data necessary for the reconstruction could be retrieved.

The TRT found that these records included:

(a) The welders certification update (rod house) and weld material issue records, which provided:

   (1) The welder's symbol number.
   (2) The rod container number in which the weld material was issued, and the time and date of issuance.
   (3) The type, quantity, and heat number of the weld material, and the unused quantity of material returned.
   (4) The drawing and field weld number for which the weld material was issued.
   (5) The welding process (i.e., SMA, GTA, etc.) and the weld procedure specification number used.

(b) QA records, which included the examination reports and techniques for all nondestructive examination (NDE) methods performed (i.e., visual, liquid penetrant, magnetic particle, ultrasonic, and radiography) and copies of the required examinations performed for a given weld number. For any NDE report showing rejectable indications, the indications were identified, sized, and located, providing evidence to determine the type and quantity of repairs that were required. The NDE and final acceptance reports for repairs were also included in these files. For any NCR initiating a repair, the NCR number was referenced on the resulting NDE report. NCR records were also maintained and retrievable. Ultimately the final reports of acceptance of completed welds were also maintained in the QA records.

The TRT examined the records at their storage locations and found that the data (an original or a pressure-sensitive copy of the original form) had been properly stored, showed no evidence of alteration, and that the NCR attachment copies were a true representation of the stored records. The TRT reviewed the contents of all retrieved data and found that they did contain sufficient data and information to reconstruct the WDC (including the repair process sheet [RPS] on the back of the WDC, which showed two repairs). The TRT noted that although the original final acceptance NDE reports for dye penetrant and radiography were maintained in the quality assurance records, the NCR's disposition requested these final NDEs to be performed again and documented; these were also reviewed by the TRT. The TRT determined that B&R QA had the capability to verify the required information recorded in the reconstructed WDC. Both B&R QA and the ANI had reviewed and accepted the reconstructed WDC, as was shown by signatures.

Finally, as a further check on the feasibility of reconstructing a WDC, the TRT selected and reviewed a random sample of 12 WDC documentation packages which were not reconstructions. The TRT was satisfied that the specifics of these documents could be reconstructed if they were lost.

AW-67

The alleger was concerned that 1400 WDC packages had been lost and recovered, and that 1 WDC could not be found. During a recorded interview (A-1, dated August 1, 1984, pages 4 through 9), the alleger identified the lost WDC to be for a weld attachment for hanger CC-1-087-004-A33A. The TRT found that NCR M14560 reported this WDC to be lost. The TRT also found that this WDC had been reconstructed, verified and accepted by QA, and was currently being reviewed by the ANI. The reconstruction of this WDC had been performed using the same technique as that described for allegation AW-63. The TRT reviewed this reconstruction and found that the retrievable data records did supply the necessary information to satisfy the requirements applicable to the WDC.

The TRT was told that while several files of completed WDC packages were being moved to a new storage location some were delivered to the wrong area; one WDC was lost during the time these document files were temporarily mislocated.

5. Conclusions and Staff Position: The TRT is satisfied that there is sufficient available information to reconstruct a lost WDC and that QA has the capability to verify the reconstruction to be consistent with the requirements applicable to the original WDC.

AW-63

The TRT believes that the WDC for FW-1 is the alleged lost WDC. The TRT substantiated the allegation that a WDC was lost, reconstructed, and later accepted by QC. However, the TRT concludes that sufficient information was available to reconstruct the WDC and to provide capability for QA to verify and accept the reconstruction. Accordingly, this allegation has no safety significance.

AW-67

The TRT's review substantiated the allegation that the WDC for the attachment weld to hanger CC-1-087-004-A33A was lost. On the basis that there was sufficient information to reconstruct the WDC, and for QA to verify and accept the reconstruction, the TRT determines that this allegation has no safety significance. The TRT also substantiated the allegation that several WDC packages were temporarily mislocated. However, these WDCs were recovered, and the TRT concludes the allegation has no safety significance.

6. Actions Required: None.

Reference Documents:

1. NRC Region IV Report IR 50-445/83-07, dated March 9, 1983.
2. NCR M-3425-R2.
   NCR M-14560.
3. OI Report 84-006 Testimony, 3/7/84, A-21, pp. 15-17 and A-1, 8/1/84 interview.

1. Allegation Category: Mechanical and Piping 9, Weld Rod Control

2. Allegation Numbers: AW-56, AW-85 and AW-86

3. Characterization: It is alleged that welders were not keeping their "rod cans" plugged in during the work day (AW-56), that lax enforcement of weld rod control procedures could result in a supply of uncontrolled coated electrodes (AW-85) and that use of uncontrolled coated electrodes could violate requirements limiting atmospheric exposure of electrodes to ambient conditions (AW-86).

4. Assessment of Safety Significance: The NRC Technical Review Team's (TRT's) assessment of the safety significance of each of the allegations is as follows.

AW-56

This allegation relates to the procedural requirements for portable, electrically heated containers which are used by welders in the field to keep coated electrodes dry. The allegation was one subject of NRC Inspection Report (IR) 81-12. According to IR 81-12, the alleger withdrew the allegation, stating the problem had been corrected. However, the TRT ascertained from Atomic Safety Licensing Board (ASLB) testimony (Tr 4230) that the alleger denied having withdrawn the allegation.

The TRT assessment of this allegation included a review of both Revision 0 and Revision 1 of Brown & Root (B&R) procedure CP-CPM 6.9B, "Weld Filler Material Control," which is related to the storage and use of coated welding electrodes, and a survey of field welding activities in Unit 2. The review determined that CP-CPM-6.9B requirements for storage temperatures (250°F-350°F) and maximum allowable exposure time to ambient conditions (4 hours for E7018, the most commonly used coated electrode) were in conformance with the requirements of both the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code (1974 Edition including Summer 1974 addenda), Section IIC, and Section III, Subsection NB, and the American Welding Society (AWS) D1.1-75, Structural Welding Code. The TRT observed field weld activities on July 10, 1984, and July 16, 1984, and saw no violations in the handling and use of coated electrodes during these surveys. Specifically, the TRT inspected all welder heat-controlled "rod cans" observed during the survey of July 16 and found them to be plugged in and hot.

The TRT also observed activities in Weld Rod Shack No. 2 from 3:00 pm to 3:30 pm on September 18, 1984. Twenty welders turned in rod cans and stub cans. The TRT checked each rod can and found that the electrodes in 17 cans were too hot to handle, and in the 3 remaining cans, the electrodes were warm to the touch. While not positive evidence, these findings are considered by the TRT as reasonable assurance that all rod cans were plugged in.

The TRT reviewed a randomly selected welder surveillance checklist for the period November 28, 1977 to July 23, 1984. The surveillance is performed by B&R's Welding Engineering Department to document if the welder

is adhering to B&R procedure requirements. An item designated "Rod Oven Operational (Sat/Unsat)" is among those surveyed. This item was identified as "Sat" over the time period reviewed.

NRC IR 78-13, 78-20, 80-11, 80-18, 81-05, and 82-3, which extended over a 5-year period included results of field welding oversight activities in which inspections were made for the proper usage and recording of weld filler metals. These IRs stated that no violations or deviations were identified.

The TRT was unable to substantiate this allegation.

AW-85
This allegation relates to the creation of a supply of uncontrolled electrodes as a consequence of lax enforcement of weld rod control procedures. The supply could be used if a shortage of electrodes was encountered for welding an assigned hanger. According to the alleger, welders create such supplies to avoid time-consuming trips to the rod shack, and to make unauthorized welds or weld repairs; thereby avoiding additional paperwork and delays for required QC inspections and approvals. This allegation is based on the following concerns expressed in ASLB testimony:

(a) Rod shack employees did not count used weld rod stubs, but mathematically determined the number of used or damaged rods (Tr 10,636-40).

(b) A weld filler metal log (WFML) for pipe support SI-1035-032-S35R indicated that approximately 75 weld rods were used to fabricate this support, which is an excessive number (Tr 4164-65, Case 667, pp. 40-41).

(c) Two bundles of weld rods were found which appeared to be abandoned. No corrective action was taken (Tr 4165, Case 667, p. 41).

(d) Welders loaned rods to one another, in part because of production pressures (Case 919, p. 19).

Weld rod shack No. 2 activities were monitored on September 18, 1984, from 3:00 p.m. to 3:30 p.m. During this time, approximately 30 welders checked in. Of these, 20 turned in unused coated electrodes stored in hot rod cans and damaged electrodes and electrode stubs in stub cans. The rod shack attendant who received these items at the counter completed the WFML by entering the number of unused rods stated by the welder under "Amt. Rt'd." The difference between the number of electrodes signed out and the number returned was computed and written on the stub can along with the welder's identification. The stub can was temporarily put aside to expedite processing of welders. Unused electrodes in rod cans were removed uncounted by a second attendant and stored temporarily on a table before being returned to holding ovens. Attendants counted the damaged electrodes and electrode stubs in each stub can and checked them against the number written by the rod shack attendant on the stub can when it was returned. Three welders were each short one electrode. This information was entered in a log book. The TRT observed that these actions could be construed as not violating CP-CPM 6.9B, "Weld Filler Material Control" because paragraph 3.3.3, "Weld Filler Material Return," is not explicitly worded. However,

the TRT noted that on page 22 of Applicant's Exhibit 177, which was made a part of ASLB testimony, and following Tr-9976, W. E. Baker, Chief Project Welding Engineer for B&R, testified that unused rods, rod stubs, and damaged electrodes are counted. This testimony is accepted by the TRT as the explicit interpretation of CP-CPM-6.9B, paragraph 3.3.3. Rod shack attendants at rod shack no. 2 were, therefore, not conforming to procedure.

Part (a) of allegation AW-85 was substantiated by the TRT. However, based on discussions presented in the assessment of allegation AW-86 elsewhere in this report, the TRT concluded that allegation AW-85 has no safety significance.

In part (b) of allegation AW-85, the TRT determined that, pipe support SI-1025-033-S35R is, from its identification number, a class 5 (nonnuclear, safety-related) support for line 35 of the safety injection system of Unit 1. It is located in the safeguards building and is of the rigid restraint type. During the plant tour of Unit 1 with the allegers on January 10, 1985, the location of pipe support SI-1035-032-S35R, for which the number of welding electrodes for fabrication was stated as excessive, was visited. This location was identified by the alleger during the tour at the 832-foot level of the Auxiliary Building. The alleger stated that the support had been removed. Since the support was removed, the TRT did not further evaluate part (b) of allegation AW-85.

Part (c) of the allegation was the subject of ASLB hearings. The Texas Utilities Electric Company (TUEC) response, contained in Applicant's Exhibit 177, substantiated the allegation. NCR M-82-0034 was written by the alleger against the welder for using unauthorized welding electrodes. It is not clear whether some welding electrodes for the assigned task were held overnight by the welder or whether welding electrodes issued the next day for another task were employed. The NCR disposition directed removal and replacement of the subject weld and immediate termination of the welder. The TRT considers that the incident was properly documented and appropriate actions were taken. Since the weld was removed and replaced, the allegation has no safety significance.

Part (d) of allegation AW-85 is concerned with the welders' alleged practice of "lending" welding electrodes to each other to save trips to the rod shacks to obtain more electrodes when the supply provided for an assigned task was used up and the task was incomplete. The NRC staff, in ASLB testimony (Tr 12,146), stated that the weld rod control program does not provide complete protection against field exchange of weld rods if the borrowers return used stubs to the welder who had originally checked out the rods. The TRT agrees with NRC Region IV testimony that the integrity of the individual welders is the primary means of assuring that this improper practice does not occur. In Applicant's Exhibit 177 (Tr 9976), the applicant described the Commanche Peak Steam Electric Station (CPSES) weld rod control program as covered in CP-CPM-6.9B, "Weld Filler Material Control." The TRT concurs that the program described reflects the requirements of CP-CPM-6.9B. The TRT also concurs that there are additional overchecks of welders' activities by Welding Engineering and QA/QC, as described by the

Applicant in Exhibit 177. Finally, the TRT concurs with the Applicant's statement that all welding on the low carbon and mild steels (which are the alleger's subject of concern) uses E7018 electrodes, so that the use of an electrode other than E7018 by borrowing is virtually non-existent. This aspect of the allegation is covered in detail under the TRT's assessment of allegation AW-86.

AW-86

This allegation relates to the use of uncontrolled coated electrodes which could violate requirements of B&R Procedure CP-CPM-6.9B, "Weld Filler Material Control," with respect to exposure time to ambient atmospheric conditions. This allegation is based on the following concerns expressed in ASLB testimony:

(a) A nonconformance report (NCR) was written for a violation of the requirement that welders turn in all unused weld rods (Tr 4166, Case 667, p. 42).

(b) Two welders used welding electrodes that had been exposed for 2-3 days for welding in the "chiller room" and at the north and south yard tunnels (Tr 11,128).

(c) Welders kept rods overnight to save time and because of production welding pressures. Many welders kept rods for 2-3 days (Case 919, pp. 18-19).

(d) Porosity in root or intermediate passes (resulting from the use of contaminated weld rods) can be obscured by a cover ("cap") pass (Case 919, p. 21).

The TRT established the following:

(1) Cable tray supports are specified by Gibbs & Hill (G&H) specification 2323-SS-16B as being made from American Society for Testing Materials (ASTM) material specifications A500 Grade B, A501, and A572 Grade 50.

(2) Pipe hangers are most commonly made from A-36, A-500, A-515 Grade 65, and A-588. None of these materials exceeds 70,000 psi ultimate tensile strength.

(3) Cable tray supports are welded using welding procedure specification (WPS) 10046 and pipe hangers are welded using WPS 11032. Both of these specify the shielded metal-arc welding (SMAW) process using E7018 coated electrodes. The ultimate tensile strength of E7018 deposited weld metal, regardless of lot number, is guaranteed to be 70,000 psi minimum, which is equal to or exceeds the ultimate tensile strengths of the base metals identified in items (1) and (2).

(4) Coated electrodes are identified by an imprint of the AWS classification (i.e., 7018) on the flux coating near the bare end of the electrode.

(5) All B&R rod shacks stock the same single lot of E7018 coated electrodes. The only other coated electrodes stocked are a small supply of E8018, a low-alloy steel, which has a guaranteed minimum of 80,000 psi deposited weld metal ultimate tensile strength, and E308, which is an austenitic stainless steel electrode.

The TRT considered that if E8018 electrodes were deliberately or inadvertently (because of the similarity of identification) substituted for E7018 electrodes, the only effect would be a weld of somewhat increased strength. If an E7018 electrode was deliberately or inadvertently substituted for an E8018 electrode, the only effect would be a weld of somewhat reduced strength; however, so long as the strength of the base metal being welded does not exceed 70,000 psi ultimate tensile strength, the only consequence is that the weld strength matches, rather than exceeds, the base metal strength. As already noted, neither the cable tray hanger support materials nor the materials identified for pipe hangers exceeded 70,000 psi ultimate tensile strength.

The TRT considered the substitution of E308 austenitic stainless coated electrodes for either E7018 or E8018 to be highly improbable. E308 electrodes have a different color flux, a thinner flux coating, and are usually shorter than the E7018 or E8018 electrodes. A welder would recognize such a substitution the moment he struck an arc because the arc characteristics are so different from E7018 or E8018.

As already noted, the common coated electrode used for SMAW at Comanche Peak is E7018, a low hydrogen electrode. Low hydrogen electrodes were developed to combat hydrogen-induced brittle fracture, which is a low temperature phenomenon. Fracture usually occurs in weld heat-affected zones, although weld metal fracture can also occur. Cracking caused by hydrogen may occur hours or days after welding; hence, it may be referred to as delayed cracking.

Three factors are simultaneously involved in generating hydrogen-induced cracks: dissolved hydrogen, tensile stresses, and a low ductility microstructure. The non-hardenable steels are not susceptible to hydrogen induced brittle fracture because they do not form a low ductility microstructure. The TRT notes that with the exception of an occasionally used alloy steel having nominally 2-1/4 percent chromium and 1 percent molybdenum, the steels of construction at Comanche Peak are not among the grades characterized as hardenable and are not susceptible to hydrogen-induced brittle fracture.

The conditions for storage, drying, and bake-out of low hydrogen electrodes are taken from AWS D1.1-75, the code of record, and are fully specified in Procedure CP-CPM-6.9B. Procedure CP-CPM-6.9B, paragraph 3.6, item 4(b) requires that electrodes exposed to ambient conditions for times exceeding the specified maximums be dispositioned as nonconforming weld filler metal (NCWFM) and sent to the welder qualification training center (WQTC). Maximum exposure time to ambient conditions for E7018 is specified as 4 hours. The TRT notes that AWS D1.1-83 has added paragraph 4.5.2.2 permitting atmospheric exposure of E7018 electrodes to be extended to a maximum of 10 hours, if the user conducts specified testing.

The TRT obtained and reviewed an informal B&R report evaluating the mechanical properties and the radiographic quality of test welds in 1/2- and 1-inch-thick ASTM-A36 plate. The welds were made in accordance with WPS 11032, Revision 11, using E7018 electrodes which had been stored for 7 months in an open container in the WQTC building. The WQTC was neither heated nor cooled. The 1/2-inch-plate test weld violated the WPS in that approximately half of the weld passes exceeded the 1/2-inch maximum bead width specified for the 1/8-inch diameter electrodes used. The 1-inch-plate test weld was radiographically examined in accordance with nondestructive examination (NDE) procedure CP-QI-QAP-10.2-3 and was found to be acceptable. Some porosity was noticed in the start and stop areas. Tensile and bend tests were conducted in accordance with ASME B&PV Code, Section IX requirements. These tests were also acceptable. An all-weld-metal tensile test also met ASME SFA-5.5 requirements.

The TRT also reviewed a second report evaluating the effects of humidity on E7018 electrodes. This report, entitled "Qualification of an Alternative Electrode Control Program for AWS D1.1 for the Arizona Nuclear Power Project, Palo Verde Nuclear Generating Station, Units 1, 2, and 3," was a Bechtel study. Tests were conducted by Bechtel Corporation in which E7018 electrodes from each of four manufacturers were evaluated. One lot of electrodes from each manufacturer was exposed for 20 hours at 86 percent humidity and a second lot of electrodes was exposed for 20 hours at 100 percent humidity. All electrodes tested produced welds in mild steels that had acceptable porosity levels, as determined by radiographic examination in accordance with the ASME B&PV Code, Section III, and that were free from underbead cracking, as determined by circle patch (high weld restraint) tests and mechanical property tests.

The TRT was also concerned with welding to ASME piping for which impact properties were specified. Hangers supporting such piping are occassionally of a design having an integral (welded) attachment to the piping. The TRT identified piping categories 1303 and 2003 as the only ones in G&H 2323-MS-43A, Revision 5, Nuclear Fabricated Piping, having specified impact properties. None of the piping base metals specified by 2323-MS-43A for the two piping categories exceeded the 70,000 psi minimum guaranteed ultimate tensile strength. A check of hanger document packages for several ASME pipe hangers having integral (welded) attachments showed that neither the piping materials nor the attachment materials specified exceeded the 70,000 psi minimum guaranteed ultimate tensile strength. Furthermore, the hanger document packages reviewed established that E7018 electrodes were used to make all integral attachment welds as specified by WPS 11032.

While not involving uncontrolled coated electrodes, requirements limiting atmospheric exposure of coated electrodes to ambient conditions were the subject of an incident in a plant tour with the alleger on January 10, 1985. Several welders' rod cans found in a group were checked at 10:57 a.m., and rod can P228 was empty. A telephone call to Rod Shack No. 4 established the identity of the welder and that the welding electrodes had been signed out at 7:40 a.m. The welder, who was located nearby, had less than a dozen unused E7018 welding electrodes left of 70 that had been issued to him. The unused electrodes were in his stub bucket and were at ambient temperature. Assuming that the welder had removed all electrodes immediately

after arriving at his work assignment, the ambient exposure time of the electrodes could not have exceeded 3½ hours, which is within the 4-hour limit for E7018 electrodes specified by CP-CPM-6.9B, "Weld Filler Material Control."

In interviews at the welding location, the NRC Resident Inspector established that a B&R supervisor did not know the maximum length of time that E7018 welding electrodes could be exposed to the ambient atmosphere. The supervisor's inability to answer the question is a potential violation of Criterion II of Appendix B to 10 CFR 50. A foreman was also interviewed and stated that a recent procedure meeting had recommended a practice of removing only enough electrodes the rod can for 1 hour's use at one time. The TRT notes that this practice was not, however, a requirement of CP-CPM-6.9B. The TRT found that the foreman's statement did not violate CP-CPM-6.9B.

5. Conclusions and Staff Position:

AW-56

NRC Region IV field inspections conducted over a 5 year period did not identify any instances where welders were not keeping their rod cans plugged in during the day. Recent TRT inspections of rod cans in the field, at Rod Shack No. 2, and an inspection made during a plant tour with the alleger on January 10, 1985, did not substantiate the allegation. Furthermore, both a B&R report and a Bechtel report establish that E7018 electrodes exposed to ambient or high humidity conditions well in excess of the 4-hour limit specified by CP-CPM-6.9B will still produce welds radiographically acceptable to the ASME B&PV Code, Section III requirements related to porosity and cracks and with acceptable ductility. Accordingly, the TRT concludes that this allegation has no safety significance.

In an interview with the alleger on January 9, 1985, the TRT's evaluation and findings for allegation AW-56 relative to welders not keeping their "rod cans" plugged in during the work day were reviewed with the alleger. Although the alleger agreed with the TRT's characterization of the allegation, the alleger disagreed with TRT's evaluation and findings. In general, the alleger's concern was stated to be broader than the occasional violation of a procedure requiring that electrodes not be left out of heated containers for any extended period of time. The concern relates to the effect of a faulty QA/QC program regarding weld rod control procedures, which the TRT believes it has adequately addressed in the assessments of allegation numbers AW-85 and AW-86.

AW-85

The TRT evaluation of the allegation that lax enforcement of weld rod control procedures could result in a supply of uncontrolled coated electrodes was partially substantiated in that requirements of CP-CPM-6.9B for weld filler material return are not being followed. The TRT notes also that these requirements are not clearly stated.

Further, the TRT notes a weakness in CP-CPM-6.9B in that the integrity of rod shack attendants is critical to successful weld filler material control, yet these attendants are a part of Construction and subject to coercion. Despite the above, the TRT concludes that the allegation has no safety significance for the following reasons:

1. Exposure limits specified by B&R CP-CPM-6.9B are very conservative.

2. A high percentage of SMAW being accomplished at Comanche Peak uses a single type of low-hydrogen electrode (E7018).

3. At any given time, all rod shacks stock the same lot of E7018.

4. With the exception of a single, low alloy steel, the steels of construction are plain carbon steels which are all SMA welded with E7018 electrodes.

In an interview with the alleger on January 9, 1985, the TRT's characterization, technical evaluation, and findings of allegation AW-85 relative to lax enforcement of weld rod control procedures were reviewed with the alleger. There was a lengthly discussion about the various issues of the allegation. In general, the alleger could not accept the TRT's findings that certain violations of weld rod control procedures, which were a QA/QC problem, did not have technical safety significance.

AW-86

The TRT's evaluation could neither substantiate nor refute the allegation that the use of uncontrolled coated electrodes for welding could violate requirements limiting atmospheric exposure of the electrodes to ambient conditions. However, the TRT notes that atmospheric exposure limits for coated electrodes specified by AWS D1.1-75 and reflected in B&R CP-CPM-6.9B represent conservative requirements in view of the studies reported herein and the 1983 modification of AWS D1.1 requirements. The TRT was unable to identify a violation of welding electrode exposure limits in a check made of welders' rod cans during the January 10, 1985, plant inspection with the allegers. (However, in conjunction with this check of welding electrodes, the TRT interviewed a B&R supervisor at the welding location. The supervisor did not know the maximum length of time that E7018 welding electrodes could be exposed to the ambient atmosphere without violating requirements of B&R CP-CPM 6.9B.) The TRT also notes that the steels used for construction are not susceptible to hydrogen-induced cracking. Accordingly, the TRT concludes that this allegation has no safety significance.

In an interview with the alleger on January 10, 1985, the TRT's evaluation of, and findings for, allegation AW-86 related to possible use of electrodes violating atmosphere exposure limits were reviewed with the alleger. The alleger accepted TRT's findings.

6. Action Required: None.

Reference Documents:

1. NRC IR Reports 78-13, 78-20, 80-11, 80-18, 81-05, 81-12, and 82-13.

2. CP-CPM-6.9B, Revision 0, "Weld Filler Material Control."

3. ASME B&PV Code, 1974 Edition Including Summer 1974 Addenda
   a. Section IIC, "Welding Rods, Electrodes, and Filler Metals."
   b. Section III, "Nuclear Components."
   c. Section IX, "Welding and Brazing Qualifications."

4. AWS D1.1-75, "Structural Welding Code."

5. TXX-4095, Comanche Peak Steam Electric Station, Unit 2 Diesel Generator Auxiliary Skid, QA File: CP 82-06, SDAR-82, File No. 10110, dated January 10, 1984.

6. TUGCO NCR M-82-01207.

7. B&R, "Report on Over Exposed E7018 Electrode."

8. B&R Procedure CP-QI-QAP-10.2-3, "Radiographic Examination."

9. ASME SFA-5.5, "Specification for Low-Alloy Steel Covered Arc-Welding Electrodes."

10. Hackney, B.D., "Qualification of an Alternative Electrode Control Program for AWS D1.1 for the Arizona Nuclear Power Project, Palo Verde Nuclear Generating Station, Units 1, 2, and 3," dated March 15, 1978.

11. G&H Specification 2323-SS-16B, "Structural Steel (Category I)."

12. ASTM Material Specifications A-36, A-500, A-501, A-515, A-572, and A-588.

13. B&R WPSs 10046 and 11032.

14. G&H Specification 2323-MS-43A, "Nuclear Fabricated Piping."

15. "Rebuttal Testimony of W. E. Baker, C. T. Brandt, M. D. Muscente, F. E. Coleman, C. R. Brown, J. D. Green, J. E. Hallford, I. Pickett, A. M. Braumiller, and S. Fernandez Regarding Allegations of [A-50] and [A-51] Concerning Weave Welding, Welding of Misdrilled Holes, Downhill Welding, and Weld Rod Control," Applicant's Exhibit 177, ASLB Hearings, Tr 9976.

1. Allegation Category: Mechanical and Piping 10, Damaged Pipe

2. Allegation Number: AP-5, AP-8 and AP-10.

3. Characterization: It is alleged that:

AP-5

While fabricating a pipe support, the alleger was instructed by his foreman to make an improper (i.e., unauthorized, undocumented, and uninspected) weld repair of a gouge in a pipe. The alleger did not comply with his foreman's instruction, but was caught by his foreman while reporting the gouge to a pipe inspector and subsequently "fired."

AP-8

The "side" of a 2-inch pipe was "caved in" 1/2 inch or more by a sledge hammer during "straightening" of a pipe support.

AP-10

A steam pipe intended for the Unit 1 turbine fell off a truck and struck a railroad track. It was unknown if the pipe was damaged, but the pipe was taken back to the storage area and "hidden."

4. Assessment of Safety Significance:

AP-5

The assessment of allegation AP-5 by the Mechanical & Piping (M&P) Group of the NRC Technical Review Team was limited to the adequacy of the repair of the gouged pipe.

The allegation was investigated by NRC Region IV (RIV) and discussed during the September 1982 and March 1984, licensing hearing before the Comanche Peak Steam Electric Station (CPSES) Atomic Safety and Licensing Board (ASLB) The RIV investigation determined that the gouge was identified in a Brown & Root (B&R) Quality Assurance Department nondestructive examination (NDE) report (NDER-A 2899, July 10, 1981) as a mishandling mark on a 2-inch diameter pipe (Tr. pp. 11013-11018). The mark was described as 1-1/4-inch long x 1/4-inch wide x 1/8-inch deep at elevation 780 feet and as having been made by a grinder. The RIV investigation also determined that the mark was located on Line 2"-CC-1-062-152-3 adjacent to pipe support H-CC-1-SB-038-010-3. Line 2"-CC-1-062-152-3 was an ASME B&PVC (Code), Section III, Class 3, 2-inch SC 40 line requiring a minimum wall thickness of 0.135 inch. This minimum wall thickness was violated at the gouge since the nominal average wall thickness was 0.154 inch and the gouge was 0.125-inch deep.

The TRT determined that the gouge was repaired by welding and was inspected in accordance with the requirements of Gibbs & Hill (G&H) specification 2323-MS-100, "Piping Erection Specification," Rev. 5, February 26, 1979; G&H Memorandum CPP-4614, "Base & Weld Metal Defect Repair," February 26,

1981; 1974 ASME Code through Summer 1974 Addenda; B&R Procedure CP-CPM-6.9D, "Welding and Related Processes," Rev. 2, June 12, 1981 and B&R Procedure CP-CPM-6.9G, "Documentation for ASME Welding, Fabrication, and Installation Activities," Rev. 2, January 19, 1981. The TRT also found that the QC inspections of the repair and documentation of the repair were in accordance with the requirements of B&R Instruction QI-QAP-11.1-26, "ASME Piping and Weld Inspections," Rev. 5, April 29, 1981, and B&R Instruction QI-QAP-16.1.2, "Documenting Base Metal Repairs, Minimum Wall Violations and Arc Strike Repairs," Rev. 2, June 26, 1981.

Paragraphs 4.11.2 and 4.11.3 of G&H Specification 2323-MS-100 permitted the repair of pipe defects by welding, but required the Owner's written approval prior to repair of a defect which violated minimum wall thickness requirements. The requirement for Owner (/Engineer) approval prior to such repairs was waived by G&H Memorandum CPP-4614 in cases where the minimum wall thickness and maximum permissible variation in outside diameter requirements of the piping material specifications could be met by the repair. (The outside diameter requirement would not apply to the repair of a gouge.)

Subarticle ND-4130 of the Code also permitted the repair of defects by welding during fabrication and installation of Code Class 3 piping. Such repairs were to be in accordance with the requirements of Article ND-2500 of the Code except for the limitation on the depth of repair. Paragraph ND-2539 of the ASME Code required that the weld repair be examined by the magnetic particle or liquid penetrant method and, in addition, that a radiographic inspection be conducted when the depth of the repair cavity exceeded the lesser of 3/8 inch or 10 percent of the section thickness.

Paragraphs 3.19.4, "Base Metal Repairs," and 3.19.5, "Documentation and Evaluation of Minimum Wall Violations," of B&R Procedure CP-CPM-6.9D required that: (1) repair of defects by welding be authorized by B&R Welding Engineering (WE) approval of a nonconformance report (NCR) and/or a repair process sheet (RPS), and (2) an NDE report be submitted to WE for the repair of minimum wall violations permitted by G&H Specification 2323-MS-100, respectively. Paragraph 3.19.4 of B&R Procedure CP-CPM-6.9D also required that repairs of base metal defects be in accordance with B&R Procedure CP-CPM-6.9G.

Paragraph 3.3, "Repair Process Sheet," of B&R Procedure CP-CPM-6.9G referenced Table 6.9G.2 of the procedure, which specified that for repairs "exceeding minimum wall thickness," liquid penetrant, visual, and radiographic examinations and WE, ANI (Authorized Nuclear Inspector), and Owner/Engineer approval, as necessary, were required. Paragraph 3.3 of B&R Procedure CP-CPM-6.9G also defined requirements for the specification of the repair operations on the RPS.

Paragraph 3.4.7, "Repairs," of B&R Instruction QI-QAP-11.1-26 specified that base metal repairs were to be inspected and documented in accordance with Section 3.19 of B&R Procedure CP-CPM-6.9D and Section 3.3 of B&R Procedure CP-CPM-6.9G, respectively. Paragraph 3.1, "Reporting," of B&R Instruction QI-QAP-16.1-2 reiterated the reporting requirement of B&R Procedure CP-CPM-6.9G for repairs to minimum wall violation conditions.

TRT reviews of the B&R RPS for weld data card (WDC) Serial No. NDER-A 2899, August 24, 1981, and NDE Radiographic Report (RT) 22248, September 3, 1981, indicated that the mishandling mark described in NDE Report NDER-A 2899 was satisfactorily repaired, inspected, and documented in accordance with the above mentioned ASME Code, G&H specification, and B&R procedure and instruction requirements for the repair by welding of base metal defects which violated minimum wall thickness requirements.

Since the gouge was repaired and inspected satisfactorily, the allegation was found to have no safety significance.

During a walkdown inspection with the TRT on January 10, 1985, the alleger identified a pipe support as the support mentioned in his allegation. The support was subsequently confirmed by the TRT to be support H-CC-1-SB-028-010-3. Visual inspections by the TRT of piping adjacent to the support to examine the repair to the gouge were unsuccessful because the pipe was painted.

AP-8

During its assessment of allegation AP-8, the TRT noted that this allegation is related to allegation AH-21 in Mechanical and Piping Category 32 regarding straightening of a pipe support by means of a sledge hammer. Both allegations lacked specificity and could neither be substantiated or refuted.

The alleger associated with allegation AP-8 was contacted by the TRT during the course of its inspections but was not able to provide specific information regarding allegations AP-8 and AH-21. The alleger stated he would attempt to obtain more specific information from someone he knew who was more familiar with the subject of these allegations and would provide such information to the TRT. However, the alleger has not provided such information to the TRT to date.

AP-10

During its assessment of allegation AP-10, the TRT found that the allegation had been investigated by NRC RIV in April 1979, and documented in IR 50-445/79-11, 50-446/79-11 May 10, 1979. The RIV inspection included an interview with the alleger during which it was determined that: (1) the pipe in question was "non-Q" (i.e., nonsafety-related) pipe, and (2) the alleger had a more general concern regarding similar incidents involving "Q," (i.e., safety-related) equipment, particularly piping. RIV inspections conducted in response to the allegation concluded that: (1) no followup on the specifics of the allegation was required since the piping involved was not safety-related, and (2) the alleger's more general concern could not be confirmed or completely refuted.

The M&P Group of the TRT limited its assessment of allegation AP-10 to the adequacy and implementation of requirements for the protection of safety-related mechanical equipment (in particular, piping materials) during storage and maintenance and installation. (Related TRT assessments of the requirements during storage and fabrication were performed by the TRT QA/QC Group during investigations related to QA/QC Category 4B.)

With respect to the alleged incident, due to lack of identification of the steam pipe involved in the incident and the complexity of the nonsafety-related steam piping system, TRT investigations could not substantiate the allegation.

With respect to the adequacy and implementation of requirements for the protection of equipment, the TRT found that deficiencies were identified during previous Institute for Nuclear Power Operations (INPO) CPSES Self-Initiated Evaluation, NRC Construction Appraisal Team (CAT) and RIV inspections, and by the TRT QA/QC Group during inspections related to QA/QC Category 5B (none of the deficiencies was related to piping materials). These findings are discussed below.

First, Finding CC.2-1 of the INPO "CPSES - Design and Construction Self-Initiated Evaluation Report" (October 13, 1982), identified a deficiency in the storage and maintenance of pipe support details in outside laydown areas.

Second, IR 50-446/83-12, April 8, 1983, documented that NRC CAT inspections had identified violations of Criterion XIII and Criterion XVI of Appendix B to 10 CFR 50. The violations were associated with the improper control of storage of safety-related equipment in outside laydown areas and installed in the plant and the lack of timely resolution of TUEC audit findings related to maintenance instructions identified in 1979, 1981, and 1982.

Third, IR 50-445/79-04, 50-446/79-04, February 27, 1979, and associated notice of violation (NOV) 445-7904, 446/7904 identified a violation of Criterion V of Appendix B to 10 CFR 50. The violation was related to a noncompliance with maintenance requirements during storage of safety-related equipment. Furthermore, IR 50-445/83-24, 50-446/83-15, August 24, 1983, and associated NOV 445/8324-02, 446/8315-02 identified a related violation of Criterion XIII of Appendix B to 10 CFR 50. The violation was related to a failure to prevent deterioration of stored safety-related equipment.

Fourth, the TRT QA/QC group identified the following five violations during inspections of iron fabrication shop: (1) fabrication and installation procedures did not provide fabrication requirements to assure that B&R-fabricated threads conformed to the design specification and/or applicable standard; (2) material requisition (MR) forms were improperly prepared; (3) materials returned to the warehouse were not documented on Material Return to Warehouse (MRTW) forms and were mingled with controlled material in the laydown yard; (4) random QC surveillance over storage and control of materials in the structural/miscellaneous steel shop area was not performed as required; and (5) hangers were fabricated on the basis of sketches and memos rather than on the basis of controlled hanger packages. The TRT M&P Group observed that the failure to perform QC surveillance over storage and control of materials in the iron fabrication shop was contrary to the results to be achieved by TUEC corrective actions in response to NOV 445/8324-02, 446/8315-02.

The TRT M&P Group determined that the deficiencies identified above were indicative of a failure to establish measures to assure that the cause of conditions adverse to the quality of safety-related equipment be determined and corrective action taken to preclude its repetition. The alleger's general concern regarding safety-related equipment was, therefore, substantiated.

In view of these deficiencies in the adequacy and implementation of requirements for the protection of safety-related mechanical equipment, and the TRT observation during its inspections that no visibly damaged piping was installed, the TRT performed an assessment of: (1) the protection requirements current during its inspections, (2) the extent to which installed piping could be damaged, and (3) the safety significance of such installed piping.

In assessing the adequacy of the requirements for the protection of safety-related mechanical equipment current during TRT inspections, the TRT reviewed the following B&R procedures and instructions:

- MCP-10, "Storage and Storage Maintenance of Mechanical and Electrical Equipment," Rev. 7, September 16, 1982.
- CP-CPM-8.1, "Receipt, Storage, and Issuance of Items," Rev. 2, September 25, 1984.
- CP-QAP-14.1, "Inspection of Storage and Maintenance of Mechanical Equipment," Rev. 4, June 11, 1984.
- CP-CPM-6.3, "Preparation, Approval and Control of Operation Travelers," Rev. 11, August 8, 1984.
- CP-CPM-11.1, "Fabrication and Installation Inspections of Components, Component Support and Piping," Rev. 5, June 11, 1984.
- QI-QAP-11.1-26, "ASME Pipe Fabrication and Installation Inspections," Rev. 16, June 11, 1984.
- QI-QAP-11.1-28, "Fabrication and Installation Inspection of Safety Class Component Support," Rev. 25, June 11, 1984.
- CP-CPM-6.9D, "Welding and Related Processes," Rev. 6, January 12, 1984.
- CP-QAP-12.1, "ASME Section III Installation Verification, and N-5 Certification," Rev. 11, June 11, 1984.

The TRT first determined that MCP-10 and CP-CPM-8.1 defined requirements for the receipt, storage and maintenance, and issuance of equipment which B&R was responsible to store and maintain from the time of onsite receipt until turnover to TUEC. The requirements were intended to prevent damage, deterioration, or contamination of the equipment and were defined in Section 3.0 and Appendix B to MCP-10. Section 4.0 of MCP-10 specified that equipment maintenance records (EMRs) were required for items in need of periodic maintenance. Sections 3.2, 3.3, 3.4, and 3.5 of CP-CPM-8.1

specified procedures for the receipt, storage and handling, issuance, and return to warehouse, respectively, of equipment. The procedures required that the receipt and issuance of equipment were to be documented in material received records (MRRs) and material requisition (MR) forms, respectively. The return of previously withdrawn items to the warehouse was to be documented in Material Return to Warehouse (MRTW) forms. The procedures required QA/QC personnel inspections for all warehouse activities pertaining to safety-related equpment and warehouse personnel inspections for all warehouse activities pertaining to nonsafety-related equipment.

Second, CP-QAP-14.1 defined methods to be utilized by QC to ensure that equipment was stored and maintained as required. Section 3.1 required that a surveillance of each storage location be conducted at least once a month by QC and violations be identified in nonconformance reports (NCRs). Section 3.4 also required that "lack of maintenance," including resultant damage to equipment, be reported in NCRs.

Third, other storage and maintenance requirements were specified in other documents. Section 2.2.1 of CP-CPM-6.3 required that instructions for cleanliness, for storage, and for removing items be specified in Operation Travelers (OTs). Section 3.2.5 of CP-CPM-11.1 required that storage and maintenance inspections during the fabrication and installation of components, component-supports and piping be in accordance with CP-QAP-14.1. Section 2.4 of both QI-QAP-11.1-26, and QI-QAP-11.1-28 required that deficiencies in storage and maintenance, material segregation, and cleanliness of exposed machine surfaces during fabrication and installation of ASME piping and safety class component support also be in accordance with QI-QAP-14.1.

Fourth, Section 3.19.7 of CP-CPM-6.9D permitted the repair by welding of defects in bulk piping materials in storage.

Fifth, Section 3.3.3.2 of CP-QAP-12.1 required that inspections for final acceptance of the installation of ASME components verify that the components show no visible signs of damage.

Based on the above determinations, the TRT concluded that the requirements which were current during the TRT investigation for the storage and maintenance of safety-related mechanical equipment were adequate to prevent and/or detect and repair damage or deterioration of safety-related piping.

In assessing the current implementation of the requirements for safety-related equipment, the TRT M&P Group conducted an inspection of in-process activities in Warehouse A and the adjacent outside storage areas. (Other inspections by the TRT QA/QC Group had identified procedural noncompliances in the iron fabrication shop. However, none of the procedural noncompliance was related to piping materials.) No procedural noncompliance was found. The inspection found that the requirements of Sections 3.1.1, 3.1.6, 3.1.8, and 3.1.9 of MCP-10 related to cleanliness and good housekeeping, marking of materials for identification, outside storage conditions, and the segregation of stainless steel material, respectively, were properly implemented. The TRT also found that the requirements of Section 3.3 of CP-CPM-8.1 related to: (1) the segregation of safety-related items

and (2) the storage of nonconforming items in segregated areas were properly implemented. The TRT also examined MR 330366, March 7, 1985, and MRTW-W19816, March 6, 1985 and found that their documentation was in accordance with the requirements of Sections 3.4 and 3.5 of CP-CPM-8.1, respectively.

During its inspections the TRT also reviewed the documentation of the return in July 1983, of 87 damaged snubbers to Pacific Scientific for repair. (The TRT observed a group of damaged snubbers located in a segregated area inside the warehouse during its inspection.) The snubbers were identified in NCR M-5901, April 13, 1983, as either having failed to operate properly or as having been damaged since receipt.

With respect to the extent to which installed piping could be damaged, the TRT determined that inspections required during fabrication and installation, final piping system acceptance inspections, and hydrostatic pressures and hot-functional testing would be adequate to detect visible damage and limit the short-term effects of such damage. Additionally, plant design safety features, such as pipe whip restraints and provisions to guard against interactions between safety-related and nonsafety-related systems, would limit the long term effects of damage not detected during the above-mentioned inspections.

5. Conclusion and Staff Positions:

AP-5

The TRT concluded that the gouge in the pipe mentioned in the allegation was repaired, inspected, and documented in accordance with applicable ASME Code and G&H specification requirements and B&R procedures. The allegation has no safety significance to the extent investigated by the M&P Group of the TRT.

AP-8

The TRT investigation of allegation AP-8 could not substantiate the allegation. The safety significance and generic information of the allegation could not be assessed due to the lack of specificity of the allegation.

AP-10

TRT investigations of the alleged incident regarding the nonsafety-related steam pipe could not substantiate the allegation.

However, other investigations by the TRT M&P Group substantiated the alleger's general concern regarding safety-related equipment. The TRT found that deficiencies were identified during previous INPO, NRC CAT and RIV inspections, and current TRT inspections. However, none of the deficiencies was related to piping.

The TRT assessment of the current requirements for the protection of mechanical equipment during storage and maintenance and installation found

that the requirements were adequate and appear to be implemented adequately for piping.

Additionally, the TRT determined that installation inspections and testing were sufficient to detect visible damage in installed piping systems and that plant design safety features would limit the detrimental effects of damage not detected during installation and testing. The alleger's general concern was determined to have no safety significance with respect to piping.

The TRT contacted the alleger by telephone on August 1, 1984. The alleger declined to have any further contact with the TRT.

6. Actions Required: None.

Reference Documents:

AP-5

1. G&H Specification 2323-MS-100, Rev. 5.
2. G&H Memorandum CPP-4614.
3. B&R CP-CPM-6.9D, Rev. 2.
4. B&R CP-CPM-6.9G, Rev. 2.
5. B&R QI-QAP-11.1-26, Rev. 5.
6. B&R QI-QAP-16.1-2, Rev. 2.
7. B&R NDC Report NDER-A 2899.
8. B&R RPS NDER-A 2899.
9. B&R WFML WDC NDER-A 2899.
10. B&R NDE Radiographic Report 22248.
11. Document Package H-CC-i-SB-038-010-3.
12. ASLB Transcript - 4231-42, 10606-23, 11013-18, 11718-26.
13. NRC OI Report 84-006.
14. ASME B&PVC Section III.

AP-8

1. NRC OI Report 50-445/84-006.

AP-10

1. NRC IE Report 50-445/78-13, 50-446/78-13.
2. NRC IE Report 50-445/79-04, 50-446/79-04.
3. NRC IE Report 50-445/79-18, 50-446/79-18.
4. NRC RIV letter, July 11, 1983.
5. NRC IE Report 50-445/83-18, 50-446/83-12
6. NRC IE Report 50-445/83-24, 50-446/83-15.
7. NRC IE Report 50-445/84-12, 50-446/84-06.
8. B&R MCP-10, Rev. 7.
9. B&R CP-CPM-8.1, Rev. 2.
10. B&R CP-QAP-14.1, Rev. 4.
11. B&R CP-CPM-6.3, Rev. 11.
12. B&R CP-CPM-11.1, Rev. 5.
13. B&R QI-QAP-11.1-26, Rev. 16.

14. B&R QI-QAP-11.1-28, Rev. 25.
15. B&R CP-CPM-6.9D, Rev. 6.
16. B&R CP-QAP-12.1, Rev. 11.
17. B&R MR330366
18. B&R MRTW-W19816.
19. B&R NCR M-5901.
20. INPO CPSES Self-Initiated Evaluation Report.

1. Allegation Category: Mechanical and Piping 11, Pipe Installation

2. Allegation Number: AP-4, AP-9 and AP-13

3. Characterization: It is alleged that:

AP-4

Two or three 100-ton jacks were used to "cold spring" the reactor coolant system lines.

AP-9

A stainless steel piping spool was heated during installation to achieve proper fitup. The alleger indicated that the spool piece was probably nonsafety-related and probably located in the Containment Spray System.

AP-13

A 32-inch Main Steam line was forced into position by the polar crane and 3-ton come-alongs.

4. Assessment of Safety Significance:

AP-4

In assessing allegation AP-4, the NRC Technical Review Team (TRT) reviewed the configuration of and the installation requirements for the Reactor Coolant System (RCS) piping to assess whether "cold springing"* was likely to be used during installation of the RCS piping. The TRT concluded that the configuration and installation procedures for the RCS piping were such as to preclude the need for springing of the piping. Brown & Root (B&R) Drawing BRP-RC-1-520-001, "Reactor Coolant Loops, Layout and Details," Rev. 10, July 1984, showed that each loop of the RCS piping consists essentially of two straight pieces of pipe, the hot and cold legs, which connect the steam generator and reactor coolant pump, respectively, to the reactor pressure vessel and a U-shaped crossover leg which connects the steam generator to the reactor coolant pump. Additionally Westinghouse Specification PSPAS-01, "Assembly, Fitting and Welding Sequence for Primary Loop Piping," Rev. 0, May 26, 1977, indicated that both the hot and cold legs were supplied as single lengths of pipe while the crossover leg was supplied in two sections and that each leg was installed by fabricating

*The term cold springing, as used in Section 4.13 of G&H Specification 2323-MS-100, Rev. 0, March 1, 1976 through Rev. 8, July 5, 1984, refers to a controlled process to reduce the effects of stresses due to thermal expansion in piping systems and is consistent with the use of the term in subparagraph NB-3672.8 of the ASME B&PVC and paragraph 119.9 of the ANSI B31.1 Power Piping standard. The term springing as used in Section 4.7.6 of G&H Specification 2323-MS-100, Rev. 0 through Rev. 8 refers to the uncontrolled practice of mechanically deflecting piping at closure joints in piping systems to correct construction misalignments.

all welds in the leg simultaneously. Consequently, there was no opportunity for misalignment and no need for springing of the piping.

Additionally, Figures 5.4-13 and 5.4-14 of the CPSES Final Safety Analysis Report (FSAR) showed that the steam generator and pump in each loop were supported vertically by pin-ended columns but that lateral support of the steam generator and pump were provided by the attached RCS piping and and auxiliary structures. Due to their method of support and the anticipated shortening of the attached piping due to weld shrinkage, measures were taken to monitor and maintain the vertical positioning of the steam generator and pump casing during hot and cold leg installation, respectively (the pump internals and motor were not installed during RCS piping installation). TRT reviews of data packages for the welds in the Unit 1 RCS piping indicated that vertical positioning of the steam generator was maintained by the use of jacks. Jacks were not employed to maintain vertical positioning of the less massive and more compact pump casing.

Based on the results of the above described reviews, the TRT believed that the alleger mistakenly identified jacking operations for maintaining vertical positioning of the steam generators during installation of the RCS hot leg piping as springing.

The TRT also reviewed applicable specifications and construction procedures and inspection instructions to evaluate the requirements for and the construction practices related to springing and cold springing. The review determined that the requirements of all revisions of G&H Specification 2323-MS-100 "Piping Erection Specifications," were adequate to assure that springing and cold springing were controlled such that the related design requirements of the ASME B&PV Code and ANSI B31.1 Standard would be satisfied.

The TRT review of B&R Procedure CP-CPM-6.9E, "Pipe Fabrication and Installation," determined that: (1) cold springing was not addressed in all issues of the procedure and (2) springing requirements were addressed adequately only in Rev. 1, May 23, 1980 through Rev. 7, May 14, 1984. A similar TRT review of B&R Instruction QI-QAP-11.1-26, "ASME Pipe Fabrication and Installation Inspections and Requirements Prior to System/Subsystem N-5 Certification," determined that: (1) cold springing was not addressed in all issues of the instruction and (2) springing requirements were addressed adequately only in Rev. 10, February 2, 1983 through Rev. 15, April 18, 1984. The TRT reviews also determined that: (1) both B&R Procedure CP-CPM-6.9D and B&R Instruction QI-QAP-11.1.26 used the term "cold springing" to describe springing-related activities and hence, (2) that the use of the term "cold springing" in both B&R documents was inconsistent with the use of the term in the G&H Specification 2323-MS-100, the ASME Code, Section III and the ANSI B31.1 standard.

With respect to the failure of both B&R Procedure CP-CPM-6.9D and B&R Instruction QI-QAP-11.1-26 to address cold springing requirements the TRT was informed by TUEC and/or B&R Engineering, construction, and QA/QC personnel that no piping systems had been cold sprung. Subsequent TRT discussions with G&H piping design engineering personnel confirmed that there was no G&H requirement for cold springing of piping systems.

However, the TRT found that the failure of B&R Procedure CP-CPM-6.9D and B&R Instruction QI-QAP-11.1-26 to adequately address springing requirements of G&H Specification 2323-MS-200 prior to May 1980 and February 1983, respectively, and the use of the term "cold springing" in a manner which was inconsistent with the use of the term in G&H Specification 2323-MS-100 were in noncompliance with the requirements of B&R Procedure CP-CPM-6.1, "Preparation & Control of Construction Procedures & Instructions," and B&R Instruction CP-QAP-6.1, "Preparation of QA Procedures and Instructions," respectively. B&R Procedure CP-CPM-6.1 required that the construction procedures be reviewed for adequacy. Paragraph 3.4 of B&R Instruction CP-QAP-6.1 required that QA Procedures and Instructions shall be reviewed for technical content, Code and Regulatory requirements, grammatical correctness, clarity and for any conflict or redundancy with other documents.

In view of inadequate treatment of springing by B&R Procedure CP-CPM-6.9D and B&R Instruction QI-QAP-11.1-26, the TRT interviewed TUEC mechanical engineering and QA/QC and B&R construction and QA/QC personnel to determine the actual practice for springing at CPSES. Although the B&R construction and QA/QC personnel said that springing was prohibited, a TUEC mechanical engineering (ME) supervisor said that authorization for springing was permitted in all piping systems on a case-by-case basis. Criteria for authorization were based on guidelines in an Appendix D to an unidentified Bechtel Corporation Specification 10466-M-204. (The TUEC ME supervisor had a copy of the Appendix only.) The TRT observed that Appendix D to the Bechtel specification stated that the springing guidelines provided were intended to limit springing stresses at nozzles to 1000 psi in nuclear and non-nuclear carbon steel and stainless steel piping in the range of Sch. 10S to Sch. 160. Although the use of guidelines may be acceptable for the installation of Comanche Peak Steam Electric Station (CPSES) piping systems, the TRT found that use of the Bechtel specification for installation of piping systems at CPSES was unauthorized and undocumented. This was contrary to the requirements of Paragraph 33 of TUEC procedure CP-EP-4.0, "Design Control," Rev. 3, July 11, 1982, which required that design inputs on which final design were based were to be identified, documented and approved on a timely basis. The inputs were also required to be detailed enough to provide a consistent basis for making design decisions, accomplishing design verification and evaluating design changes.

During subsequent interviews with the B&R QA personnel the TRT was informed that springing in piping systems at closure joints was limited to cases where gaps at the joint could be closed by hand. (The TRT notes the discrepancy in the B&R QA/QC personnel's response.) During similar subsequent interviews with B&R construction personnel, a general superintendent claimed to have no knowledge of uncontrolled springing in piping systems. The TRT found that it was unreasonable to expect piping systems to be installed without some springing.

<u>AP-9</u>

During its assessment of allegation AP-9, the TRT attempted to contact the alleger on August 1, 1984, to obtain clarification and specific information regarding the allegation. The alleger declined to meet with the TRT.

The TRT also found that the allegation had been investigated by the NRC Office of Investigations (OI). The results of the NRC OI investigation, which included an interview with the alleger, were documented in OI Report 50-445/84-006, March 7, 1984.

The TRT review of the OI interview with the alleger found that the alleger had implied that: (1) the alleged heating process was permitted to achieve proper fitup in "normal" piping but was not permitted in stainless steel piping and (2) during the alleged heating process heat was applied locally by a "rosebud" (gas torch) at welds in the piping.

The TRT found that the Containment Spray System was a safety-related, stainless steel piping system. Table 6.2.2.1 and Table 6.2.2.4 of the CPSES Final Safety Analysis Report (FSAR) indicated that the Containment Spray System is a nuclear-safety-related system and that Containment Spray System piping material was to be ASME B&PVC SA-312 or SA-358 stainless steel piping. Consequently, due to the lack of identification of the stainless steel piping spool involved in the alleged incident, the complexity of the safety-related, stainless steel Containment Spray System Piping, and the large number and complexity of other safety-related and nonsafety-related stainless steel piping systems, TRT investigations could not substantiate the allegation.

Other TRT investigations found that localized heating in some carbon steel piping was permitted but not permitted in stainless steel piping. Paragraph 3.12 of B&R Procedure CP-CPM 6.9E, "Pipe Fabrication and Installation," Rev. 1, July 23, 1980 through Rev. 7, May 14, 1984 required engineering approval for localized heating to obtain proper alignment during piping installation. Paragraph 3.21.10 of B&R Procedure CP-CPM-6.9D, "Welding and Related Processes" Rev. 1, September 23, 1980 through Rev. 6, January 12, 1984 specified that localized heating for minor adjustments in alignment were permitted on a case-by-case basis as approved by the Owner but prohibited the use of such heating in stainless steel material or carbon steel piping requiring Charpy impact values.

AP-13

During its investigation of allegation AP-13, the TRT found that the alleged incident was discussed in affidavits by the alleger submitted by intervenor CASE to the CPSES Atomic Safety and Licensing Board (ASLB) on February 3, 1983 and November 28, 1983. The extent to which the alleger's allegations were open in the CPSES operating license (OL) proceeding was clarified by the ASLB Memorandum and Order (Clarification of Open Issues), March 15, 1983.

The TRT also found that the allegation had been investigated by NRC Office of Investigations (OI) and RIV. The OI investigation was documented in OI Report A4-83-005, May 20, 1983; OI Memorandum, "Assistance to Inspection Report No. A4-83-005," June 2, 1983; OI Supplemental Report Q4-84-007, February 9, 1984. The OI investigation included an interview with the alleger on April 14, 1983 and interviews with 27 other persons relating to the allegations. The NRC RIV investigation was documented in IR 50-445/83-27, September 29, 1983 and had concluded that:

Although B&R personnel named by [the alleger] contradicted his allegation, the NRC inspector conducted an independent review of the onsite documented records regarding this matter.

It was observed by the NRC inspector that the specific 32-inch steam line mentioned by [the alleger] is, Loop 1, Line number MS-1-RB-001-1302-2, and the reactor building polar crane was utilized in a vertical lift to assist repositioning a section of this permanent piping. The licensee has maintained a documented engineering record of the specific line movement. The NRC inspector noted that the movement of the line was necessary in order that a large section of temporary piping (attached to the steam generator feedwater nozzle and previously used for water flushing) be removed and to relocate the permanent section of the main steam line that had "sagged" due to the weight of the temporarily installed flushing pipe. The record folder contains meeting notes (memorandum) which reflect discussions with Westinghouse (NSS Supplier) and the cognizant A/E representatives prior to the work activity, in addition to establishing engineering limitations and acceptability. The line was moved on January 16, 1982 under the supervision of the field mechanical engineering group, and was witnessed by an engineering representative who observed the installation and use of the dynamometer (to register crane lifting loads) throughout the operation. The lift connections and applied forces were recorded and retained in the file. The lifting points were consistent with the hanger locations to simulate the permanent support system. The as-built configuration was analyzed for stress and the acceptability of the line confirmed. In addition, the recent completion of the "Reactor Hot Functional Test" did not reveal any undue stress conditions. This allegation cannot be substantiated.

No violations or deviations were identified in this area of the inspection.

The TRT investigation of the allegation was based on the numerous claims by the alleger made during the OI interview on April 14. 1983, additional information obtained by the TRT during its September 19, 1984 interview with the alleger, and other information contained in the alleger's February 3, 1983 and November 28, 1983 affidavits. Based on its reviews of these interviews and affidavits, the TRT found that the alleger made the following claims regarding the forced movement of the main steam (MS) line:

1. The incident occurred in 1982, prior to the summer.

2. The piping involved in the incident consisted of a portion of the MS line and an attached temporary flushing line (installation of the MS line was incomplete). During the incident, the installed portion of the MS line was attached at one end at the containment penetration for the line and attached at the other end to the temporary flushing line, which in turn was disconnected from a nozzle at the lower end of the steam generator.

3. During disconnection of the temporary flushing line from the steam generator, the line vibrated about 14 inches with a loud echoing noise audible throughout containment.

4. After disconnection of the temporary flushing line from the steam generator, it was discovered that the installed portion of the MS line had been placed incorrectly 6 inches vertically and 4 inches horizontally from its design location.

5. During the incident, the MS line was forced into its proper design location by the polar crane and 3- to 5-ton come-alongs.

6. The force exerted by the polar crane was applied at "the expansion chamber." The force was monitored by "a big round guage [that] look[ed] like [a] big clock."

7. The magnitude of the applied force was estimated to be between 40 tons and 85 tons (The alleger stated: "I cannot remember the exact tonage").

8. Four to six permanent pipe supports which had been installed prior to the alleged incident were redesigned to maintain the MS line in its forced position.

9. The incident was not supervised by engineering personnel.

The alleger was concerned that "tension" induced in the MS line as a result of movement during the alleged incident was still present in the line.

Based on TRT reviews of statements of the five persons interviewed by OI between May 1982 and January 1984 who claimed to have knowledge of the alleged incident, TRT interviews with B&R construction and QA/QC and TUEC engineering and QA/QC personnel, and TRT reviews of the construction records for the MS and Feedwater piping system, the TRT found the following with respect to the alleger's claims:

1. The alleged incident was related to the Unit 1, Loop 1 MS line, Line MS-1-RB-001-1303-2, and occurred in January 1982. The date of entry for the Unit 1, Loop 1 reading of 31,250 (lbs) on M&TE Issue Record for MTE Serial No. MTE-357 was January 16, 1982. The January 1982 date was also confirmed by two persons interviewed by OI. Additionally, component modification card (CMC) 61306 Rev. 4, March 23, 1982, which documented modifications to pipe support MS-1-001-007-C72K for the Unit 1, Loop 1 MS line contained the note: "Pipe was moved." RIV also found that the alleged incident had occurred in January 1982 and was related to the Unit 1, Loop 1 MS line.

2. The configuration of the piping involved was as described by the alleger, except that the temporary flushing line had not been disconnected from a steam generator nozzle but was disconnected from a field weld (FW) in a feedwater line to which it had been attached.

TRT reviews determined that the Loop 1 temporary flushing line as shown on B&R Drawing FSM-00165, Rev. 1 (undated) was intended to be attached at field weld (FW) locations FW-5 and FW-4 in Loop 1 MS Line 32"-MS-1-01-1303-2 and Loop 1 Feedwater Line 18"-FW-1-19-1302-2, respectively. Additional TRT reviews of documentation packages for the field welds verified that the temporary flushing line was installed as intended by temporary field welds FW-T5 and FW-T4 to the Loop 1 MS and Feedwater lines, respectively, on February 5, 1980 and June 19, 1980, respectively.

The TRT was informed by a TUEC mechanical field engineer that, prior to the incident, the temporary flushing line was cut at approximately 30 ft. below the 899-ft, 9½-inch elevation and that the piping involved in the alleged incident consisted of the portion of the MS line between the containment penetration and FW-5 and the attached portion of the temporary flushing line above the cut.

Because of the expanded scope of its assessment, the TRT finds it unlikely that the temporary flushing line was attached to the steam generator, since the line was intended to be a steam generator bypass line. If the temporary flushing line were attached to the steam generator, it could not function as a bypass line.

3. The alleger's claim that the temporary flushing line vibrated about 14 inches when the line was disconnected could not be substantiated. Two persons interviewed by OI and/or the TRT refuted the claim.

4. Prior to the incident, B&R discovered that the installed portion of the MS line had deviated from its initial installation position probably due to settlements at temporary supports (for the installed piping) during construction and/or flushing. B&R could not provide surveying documentation to substantiate the deviation in location; however, four persons interviewed by OI and/or the TRT supported this TRT determination. Furthermore, since B&R and TUEC personnel had informed the TRT that temporary support of the installed piping had been provided by wooden cribbing and "lashing" (metal cables) the TRT did not consider settlements at the supports unreasonable. This TRT finding was in agreement with the related RIV finding but was contrary to the alleger's claim that the MS line had been incorrectly installed and that operations during the alleged incident were necessary to force the MS line into its correct location.

   The TRT could not determine exactly how much settlement had occurred at the temporary supports. Vertical movements of the MS line (at unspecified locations) during the alleged incident were reported by persons interviewed by OI and/or the TRT to be between 1-1/2 inches to 6 inches and between 4 inches and 5 inches for horizontal movements.

5. The alleger's claim that the polar crane and 3- to 5-ton come-along were used to move the MS line was confirmed in whole or in part by all but one of the persons interviewed by OI and/or the TRT who claimed to have knowledge of the incident.

A TUEC mechanical field engineer, who claimed to have been involved in the incident, stated that initial attempts to use the main polar crane were unsuccessful and the 20-ton auxiliary crane was used during the incident "because it could be controlled more accurately" (TUEC Office Memorandum, "Comanche Peak Steam Electric Station," February 4, 1983). However during an interview with a rigger who was involved in the alleged incident, the TRT was informed that initial attempts to use the "small" (auxiliary) crane were unsuccessful due to uncontrolled slippage and that subsequently the "large" (main polar) crane was used to move the MS line.

All but one person interviewed by OI and/or the TRT confirmed the alleged use of both the polar crane and come-alongs during the alleged incident. The one person discussed the use of the polar crane only.

6. The alleger's claim that the force exerted by the polar crane was applied at "the expansion chamber" was partially confirmed by two persons (including a TUEC field mechanical engineer) interviewed by OI and/or the TRT who stated that the force was exerted at a thermal expansion loop in the MS line). The alleger's claim that the force was monitored by "clock"-like instrument (actually a dynamometer) was substantiated. M&TE Issue Record for MTE Serial No. MTE-357 documented a dynamometer reading related to the alleged incident. RIV inspections also substantiated the claim regarding the use of a dynamometer during the alleged incident.

   During an interview with a TUEC field mechanical engineer, the TRT was informed that during the alleged incident a chain was installed between the legs of the expansion loop to which the polar crane force was applied. The chain was intended to distribute the polar crane force in the section of the installed MS line consistent with the manner in which the section of line was to be supported in its design configuration. The use of the chain during the alleged incident was refuted by the alleger and a rigger involved in the incident.

7. The magnitude of the force exerted by the polar crane could not be determined exactly. As noted previously, M&TE Issue Record for MTE Serial No. MTE-357 recorded a value of 31,250 (lbs.). However, a rigger involved in the incident stated that the force applied was 47,500 lbs. Additionally, the magnitude and points of application of the forces applied by the alleged 3-to-5-ton come-alongs could not be determined.

8. The alleger's claim regarding the redesign of previously installed pipe supports was substantiated. A TRT waldown inspection of the MS line and review of pipe support designs determined that modification of permanent pipe supports had been made to accommodate a movement of the MS line in an eastern direction. Visual inspections of spring hanger supports MS-1-001-002-C72S and MS-1-001-001-C72S and vertical seismic (snubber) support MS-1-001-007-C72K indicated that support details had been modified to accommodate a lateral movement of the MS line in the eastern direction. CMC 61306 Rev. 4, March 23, 1982 (which stated that the reason for the change was "Pipe was Moved") indicated

that modifications were made to support MS-1-001-007-C72K to accommodate lateral movements of the MS line in the eastern and northern directions. Modifications to acocmmodate eastern and northern movements of the MS line were also noted at seismic supports MS-1-001-005-C72K and MS-1-001-006-C72K.

9. The alleged incident was performed under the cognizance of the TUEC field mechanical engineering group. Seven persons interviewed by OI and/or the TRT disagreed with the alleger's claim that the alleged incident was not supervised by engineering personnel. A TUEC field mechanical engineer stated that he was present during movement of the MS line "to insure that the activity was within proper engineering limitations for the equipment" involved. This TRI finding was in agreement with the related RIV finding.

The TRT reviewed a TUEC analysis performed in February 1983, 1 year after the incident, to assess stresses induced in the MS line during the incident. The TRT review concluded that the analysis was inadequate since only operations during restoration of the MS line to its initial position were addressed. The conditions during flushing, including the piping affected, the weight of added water, and settlement of temporary supports, were not addressed.

During its investigation of allegation AP-13 the TRT also found that the Unit 1, Loop 4 Main Steam Line 32"-MS-1-004-1303-2 was involved in a similar indident which has not been evaluated by TUEC. M&TE Issue Record for MTE Serial No. MTE-357 also documented a dynamometer reading of 17,750 lbs. on January 16, 1982 related to the Loop 4 MS line. The TRT noted that the dates recorded on the M&TE Issue Form for both the Loop 1 and Loop 4 dynamometer readings were identical (the recorded dates were January 16, 1982). The TRT noted, however, that it was unreasonable that both the Loop 1 and Loop 4 lines could have been moved on the same day. Furthermore, during an interview with a rigger who claimed to have been involved with both incidents, the TRT was informed that the incidents had not occurred on the same day.

Further TRT reviews determined that the use of temporary supports during the alleged incident was in noncompliance with the requirements of Section 7.4, "Adjustments of Hangers," and 7.5, "Temporary Hangers," of G&H Specification 2323-MS-100, Piping Erection Specification," Rev. 5, February 26, 1979 (Rev. 5 was in effect during the alleged incident). Section 7.5 stated that all piping was to be erected in its permanent hangers, but where not possible, the Owner's approval was to be obtained for the use of temporary hangers. Section 7.4.2, "Adjustment Prior to Testing and Flushing," only addressed requirements prior to hydrostatic testing of erected piping systems. During an interview with the TRT a TUEC chief engineer for piping informed the TRT that Owner(/Engineer) approval for the use of temporary supports during piping erection was granted to B&R by TUEC approval of B&R Procedure PCP-1, "Process Pipe Installation," Rev. 0, June 7, 1977 (TUEC approval in note TUF-3388, July 28, 1977 on B&R BRF-6565, July 11, 1977). Paragraph 4.6.1 of Procedure PCP-1 stated that pipe spools were to be rigged into permanent or temporary supports during erection. The TRT questioned whether Note TUF-3388 satisfies the intent

of the approval requirement in Section 7.5 of G&H Specification 2323-MS-100.

In view of the above identified noncompliance with the requirements of G&H Specification 2323-MS-100 and the TRT observation that the requirements of Sections 7.5 and 7.4.2 of this G&H Specification were unchanged in Rev. 0, March 1, 1976 through Rev. 5, February 26, 1979, the TRT interviewed TUEC engineering and B&R construction personnel to determine the practice regarding temporary supports. The TRT determined that there was no formal procedure to evaluate the adequacy and temporary supports during piping installation. A B&R general superintendent stated that the previous undocumented practice of the unrestricted use of lashing was discontinued due to problems with uncontrolled movements of the piping. The TRT was informed by the general superintendent that the previous practice was modified to require that the piping was to be fixed against movement at every fourth support during erection. The TRT found that the above practice was not in compliance with the requirements of G&H Specification 2323-MS-100 for temporary supports, Rev. 0, March 1, 1976 through 5, February 26, 1979 that all piping be erected in its permanent supports and that Owner approval be obtained for the use of temporary hangers.

The TRT also noted that Sections 7.4.2 and 7.4 of G&H Specification 2323-MS-100, Rev. 6 and 7, March 15, 1982 and December 2, 1983, permitted the use of temporary hangers without Owner's approval but required that during flushing and hydrotesting of steam lines with demineralized water the deadweight supports were required to be in place with all spring hangers in the locked position.

5. Conclusion and Staff Positions:

AP-4

Based on its investigation the TRT determined that the allegation regarding springing in RCS piping could not be substantiated. The TRT believes that the alleger had mistakenly identified jacking activities during installation of the hot-leg piping between the reactor vessel and the steam generator as cold springing activities. Jacking was used to maintain vertical positioning of the steam generator during axial motions of the hot leg piping due to weld shrinkage during welding.

Other TRT investigations of cold springing and springing determined that no piping systems were intended to be or had been cold sprung but that, contrary to the requirements of TUEC Procedure CP-EP-4.0, unauthorized and undocumented springing of piping systems had occurred. The TRT, however, assessed that the safety significance of the unauthorized and undocumented springing practice may be negligible; guidelines for the unauthorized and undocumented springing stresses to only 1000 psi at nozzles.

The TRT found that the failure of all issues of B&R Procedure CP-CPM-6.9E and B&R Instruction QI-QAP-11.1.26 to adequately reflect the springing and cold springing requirements of all issues of G&H Specification 2323-MS-100 were in noncompliance with the requirements of B&R Procedure CP-CPM-6.1 and B&R Instruction CP-QAP-6.1, respectively.

Additionally two matters relating to an inconsistency in responses of B&R QA personnel and possible misleading statements by B&R construction personnel were noted.

The TRT contacted the alleger on August 20, 1984 and October 29, 1984 to arrange a meeting to discuss his allegation and the results of its investigations. The alleger declined to have a meeting with the TRT.

AP-9

The TRT investigation of alleged localized heating of a stainless steel line to obtain proper alignment of the line could not substantiate the allegation.

Because the alleger declined to meet with the TRT, the TRT could not conduct a followup interview to discuss its findings with the alleger.

AP-13

The TRT investigation of allegation AP-13 concluded that the allegation was substantiated in part. The TRT found that the alleger had mistakenly identified the repositioning of a Unit 1, Loop 1 Main Steam line due to settlements of temporary supports as the correction of alignment errors during initial installation. The TRT determined that the partially installed main steam line had been used in flushing operations and sagged due to settlement of temporary supports during flushing and/or construction. TUEC's analysis to assess stresses in the main steam line due to the repositioning operations was inadequate because stresses due to the full sequence of events involved in the incident were not evaluated.

The TRT also determined that similar repositioning operations had been performed on the Unit 1, Loop 4 main steam line. No assessment of this second incident has been performed by TUEC. An apparent anomaly in the recorded dates of the Loop 1 and Loop 4 MS line was noted.

TRT reviews also found that the B&R construction practice of using temporary supports during piping erection was not in compliance with the G&H Specification 2323-MS-100 requirements.

Based on the deficiencies identified in its assessment of allegation AP-13, the TRT concluded that it has safety significance and generic implications. Additional information required to resolve concerns related to the allegation was requested in an NRC letter to TUEC dated November 29, 1984.

During a telephone call with the alleger on October 31, 1984, the TRT presented the results of the assessment of allegation AP-13 and the TRT conclusions to date. The TRT accompanied the alleger on a walkdown inspection on November 7, 1984. During the walkdown the alleger identified the location on the expansion loop where the force exerted by the polar crane was applied. Subsequently, the alleger declined to have any further contact with the TRT.

6. Actions Required: Based on its evaluation of AP-13, the TRT will require the following TUEC actions:

(1) Modify Gibbs & Hill Specification 2323-MS-100, and institute procedures to support the main steam line during flushing and provide temporary supports for piping and equipment in general to assure that the quality of affected piping and equipment is not affected.

(2) Assess stresses in the portions of the Unit 1, Loop 1 main steam and feedwater lines that were affected in the sequence of events involved during their initial installation, flushing and final installation. Conditions of concern are:

   a. the condition when the lines were full of water and temporary supports had sagged or settled.

   b. the condition when vibrations of the temporary line could have occurred.

   c. the condition when forces were applied by the polar crane and come-alongs.

   These assessments shall be based on appropriate piping configurations involved.

(3) Perform a nondestructive examination of locations in the Unit 1, Loop 1 main steam and feedwater piping involved where stresses greater than relevant stress allowables were exceeded during the conditions of concern in a. through c. above.

(4) Review the existing baseline UT examinations for those portions of the Unit 1, loop 1 main steam and feedwater piping involved in all the conditions of concern in a. through c. above for unacceptable indications.

(5) Review records of hydrostatic testing of the Unit 1, Loop 1 main steam and feedwater piping to verify the quality of piping involved in the incident.

(6) Provide similar assessments for circumstances involved in the lifting incident identified during the TRT inspections of the Unit 1, loop 4 main steam line.

(7) Provide assessments of effects on quality of safety-related piping and equipment which were involved in similar incidents of sagging, settlements and failures, if any, of temporary supports.

(8) Document the results of analysis, examinations and reviews and submit them in a report for TRT review.

<u>Reference Documents</u>:

<u>AP-4</u>

1. NRC OI Report 50-445/84-006.
2. G&H Specification 2323-MS-100 Rev. 0 through Rev. 8.

3. Westinghouse Process Specification PSPAS-01, Rev. 0.
4. Traveler ME-78-014-5505.
5. Traveler ME-78-026-5505.
6. Traveler ME-79-035-5505.
7. Traveler ME-79-036-5505.
8. Traveler ME-79-037-5505.
9. B&R BRF-9181.
10. B&R BRF-9211.
11. Southwest Fabricating & Welding Drawing Q-6214-TBX.
12. B&R BRF-9348.
13. NCR M-2305.
14. B&R QI-QAP-11.1-31, Rev. 3.
15. TUSI CP-EP-4.0, Rev. 3.
16. B&R QI-QAP-11.1-26, Rev. 0 through Rev. 15
17. ASME B&PVC Section III.
18. ANSI B31.1
19. B&R CP-CPM-6.1, Rev. 6.
20. B&R CP-QAP-6.1, Rev. 4
21. Data Package WE-78-006-5505.
22. Data Package WE-78-028-5505.
23. Data Package WE-78-025-5505.
24. Data Package WE-78-016-5505.
25. Data Package WE-78-024-5505.
26. Data Package WE-78-029-5505.
27. Data Package WE-78-030-5505.
28. Data Package WE-78-019-5505.
29. Data Package ME-78-009-5505.
30. Data Package ME-78-019-5505.
31. Data Package ME-78-010-5505.
32. Data Package ME-78-013-5505.
33. Data Package ME-78-021-5505.
34. Data Package ME-78-008-5505.
35. Data Package ME-78-020-5505.
36. Data Package ME-78-007-5505.
37. Data Package ME-78-015-5505.
38. Data Package ME-78-022-5505.
39. B&R Drawing BRP-RC-1-520-001.
40. Bechtel Specification 10466-M-204, Appendix D.
41. FSAR Figure. 5.4-12.
42. FSAR Figure. 5.4-12A.
43. FSAR Figure. 5.4-12B.
44. FSAR Figure. 5.4-13.
45. FSAR Figure. 5.4-14.
46. FSAR Figure. 5.4-15.
47. FSAR Figure. 5.4-16.
48. FSAR Figure. 5.4-17.
49. FSAR Figure. 5.4-18.
50. FSAR Figure. 5.4-19.
51. ASME B&PVC Section III.
52. ANSI B31.1

AP-9

1. NRC Reg. Guide 1.44.
2. G&H Specification 2323-MS-100, Rev. 0, 8.
3. NRC IE Report 50-445/79-06; 50-446/79-06.
4. B&R CP-CPM-6.9E, Rev. 1 through Rev. 7.
5. B&R CP-CPM 6.9D, Rev. 1 through Rev. 6.
6. FSAR Fig. 6.2.2-1.
7. B&R Heating Alignment Record Folder.
8. FSAR Table 6.2.2-4.
9. NRC OI Report 50-445/84-006.
10. Deposition of alleger A-21, July 12, 1984, pp. 1-35.
11. Deposition of alleger A-21, July 12, 1984, pp. 49500-49514.
12. Conversation Record, alleger A-21, 9/1/84

AP-13

1. G&H Specification 2323-MS-100, Rev. 0 through Rev. 8.
2. B&R letter BRF-6565.
3. B&R PCP-1, Rev. 0.
4. NRC IE Report-50-445/83-27.
5. CASE letter 2/3/83 with alleger's affidavit.
6. CASE Letter 11/28/83 with allegers affidavit.
7. NRC TRT Technical interview with alleger 9/19/85.
8. CPSES ASLB Memorandum and Order (Clarification of Open Issues).
9. NRC OI Report A4-83-005.
10. NRC OI Memorandum "Assistance to Inspection Report No. 14-83-005.
11. NRC OI Supplemental Report Q4-84-007.
12. B&R M&TE Issue Record for MTE Serial MTE-357.
13. B&R CMC 61306 Rev. 4.
14. B&R Drawing FSM-00165, Rev. 1.
15. TUEC Memorandum "Comanche Peak Steam Electric Station," Feb. 4, 1983.
16. B&R Mk. No. MS-s1-01-007-C12K Data Package.
17. B&R Mk. No. MS-1-01-001-C72S Data Package.
18. B&R Mk. No. MS-1-01-002-C72S Data Package.
19. B&R Mk. No. MS-1-01-005-C72K Data Package.
20. B&R M. No. MS-1-01-006-C72K Data Package.
21. B&R Drawing BRP-MS-1-RB-002, Rev. 13.
22. B&R Drawing BRP-FW-1-RB-002, Rev. 18.
23. B&R MS-1-RB-001 FW-TS Data Package.
24. B&R FW-1-RB-001 FW-T4 Data Package.
25. ADLPIPE Output, 2/24/83.
26. ADLPIPE Output, DAMS 2, 8/24/84.
27. ADLPIPE Output, DAMS 5 8/24/84.

1. Allegation Category: Mechanical and Piping 12, Reactor Vessel Installation

2. Allegation Number: AP-11

3. Characterization: It is alleged that Brown & Root (B&R) management and quality control personnel were incompetent. As an example, the alleger claimed that an attempt was made to conceal damage incurred to three or four blocks which support the reactor vessel during final installation. The support blocks were alleged to have been cracked and chipped. The alleger claimed, however, that he had reported the damage to the Westinghouse field representative who "went berserk, just totally berserk" after inspection of the damaged support blocks, but that, subsequently, the damage was repaired by B&R and accepted by Westinghouse.

4. Assessment of Safety Significance: The Mechanical and Piping (M&P) Group of the NRC Technical Review Team (TRT) limited its assessment of this allegation to the technical adequacy of B&R repairs of the damage to the reactor vessel support blocks.

   During its assessment of the allegation, the TRT determined that the NRC Office of Investigations (OI) had investigated the allegation previously. Results of the OI investigations are found in NRC OI report 50-445/84-006, dated March 7, 1984, which included the transcript of an interview with the alleger. The TRT assessment of allegation AP-11 was based on the allegation as characterized in the OI interview with the alleger.

   Data Package Review. In assessing allegation AP-11, the TRT reviewed data package TBX-RCPCRV-01 and Westinghouse records for the Unit 1 reactor vessel for documentation related to the damage to the support blocks. The TRT determined that three of the four reactor vessel support blocks were damaged during the completion of operations for reactor vessel installation which were required by B&R Construction Operation Traveler (COT) ME-78-003-5505, dated April 6, 1978. The damage was reported in B&R nonconformance report (NCR) M-1004, June 27, 1978 which indicated that three of the four support blocks located at azimuths 67°, 158°, and 247° were damaged ("nicked and chipped") during installation of the vessel. Damage was limited to two edges and four corners of the three blocks. Areas of edge damage were 4-1/2 inches x 1/4 inch and 1 inch x 1/8 (approximately) inch, with the maximum depth of damage being 0.065 inch and 0.100 inch, respectively. Regions of corner damage were limited to within 5/32 inch x 5/32 inch x 1/4 inch, 5/8 inch x 5/32 inch x 1/16 inch, 1/4 inch x 1/4 inch x 1/8 inch, 5/32 inch x 1/16 inch x 15/33 inch, and 3/8 inch x 1/4 inch x 1/2 inch of the corners. Westinghouse Drawings 10773-121-002, -003, -004 and -005, "Upper Vessel Machining," showed that the support blocks had flat underside bearing surfaces of 28.50 inches x 10.25 inches and average heights of approximately 3.5 inches. The damage could, therefore, be characterized as surface defects.

   Westinghouse memorandum, TBX-M-152, dated June 27, 1978, to Texas Utilities Electric Company (TUEC) referenced NCR M-1004 and required that the damage be repaired by blending (removal of all sharp edges) and a magnetic particle (MT) examination be performed to detect possible flaws resulting from the damage. These methods of repair and inspection were specified in the disposition of NCR M-1004. Westinghouse memorandum TBX-M-152 further required

that a copy of the MT examination be submitted to the Westinghouse site office for disposition and specified an acceptance criterion for the MT examination which required that no indications were to be found. Westinghouse received a B&R NDE magnetic particle report, dated June 27, 1978, documenting that no indications were noted during MT of the Unit 1 reactor vessel, on June 28, 1978, for disposition. Gibbs & Hill (G&H) memorandum GHF-2845, June 28, 1978, to TUEC referenced the NDE magnetic particle report, NCR M-1004 and TBX-M-152 and documented G&H concurrence with the repair disposition.

Based on the review of the data package described above, the TRT determined that the damage to the three support blocks of the reactor vessel was documented in NCR M-1004, that the damage was subsequently repaired, examined and accepted by Westinghouse in accordance with Westinghouse memorandum TBX-M-152, and that it was also accepted by G&H in GHF-2845.

Paragraph 4.1.13 of Westinghouse Specification 676413, Rev. 4, May 10, 1972, for the reactor vessel specified that the support blocks for the vessel were to be fabricated from ASME Code Section II, SA-516, Grade 70, quenched and tempered plate material, or SA-533 Grade A, B or C, Classes 1 or 2 plate material, or by weld buildup equivalent to the strength levels of the preceding materials. Also, paragraph 6.3 of Specification 676413 specified that, in addition to the MT examination of the vessel required by ASME Code Section III, all vessel external surfaces and weld metal buildup for the supports were to be MT examined in accordance with Code Section III requirements. MT examination of weld metal buildup was required after deposition of the first layer and at each 1/2 inch of deposit.

Accordingly, the repair and examination requirements of sub-subarticle NB-2530 or NB-4130 and NB-5340 of the 1971 Code through Summer 1973 Addenda were applicable, depending on whether the support blocks were fabricated from plate material or by weld buildup. (Paragraph 1.0 of Westinghouse Specification 676413 specified that the reactor vessel was to be designed, fabricated, examined, and tested in accordance with the Code in effect on the date of the purchase order. The contract for the vessel was signed on July 25, 1973.)

With respect to the method of repair, the TRT review indicated that the requirements of NB-2530 and NB-4130 for the repair of defects would permit the repair of the damaged support blocks by blending of sharp edges in the damaged area. NB-2538 explicitly permits the elimination of surface defects by blending; however, NB-4131 states only that defects during installation may be eliminated or repaired by welding in accordance with the requirements of NB-2500. (Since the Code is a permissive code, NB-4130 would not prohibit repair by blending of sharp edges.)

The TRT noted that NB-2538 permitted the elimination of surface defects if the remaining thickness of the material was not reduced below that required by design. However, the TRT found that this provision was not applicable to the repair of the damage to the support blocks. (The provision is applicable to pressure retaining material; the blocks were intended for support of the vessel only.) With respect to the requirements for examination subsequent to repair, the TRT review of of sub-subarticles NB-2530 and NB-5340 determined that based on the configuration

of the support blocks, the requirements of NB-5340 were more stringent than those of NB-2530. (The acceptance standard for NB-5340 stated that any linear indication was unacceptable; however, only linear indications greater than 1/8 inch or 3/16 inch long were unacceptable in plate material with thickness of 5/8 inch to under 2 inches or of 2 inches or greater, respectively, according to NB-2530.)

The TRT noted that the MT examination report specified that the examination of the damaged area of the support blocks was to be in accordance with B&R Procedure CP-NDEP-400, "Magnetic Particle Examination." The TRT review of CP-NDEP-400 determined that the acceptance standards (for ASME Code items) applicable at the time of examination of the vessel support blocks were based on the 1974 Code through Summer 1974 Addenda. However, these acceptance standards were identical to those of sub-subarticle NB-5340 of the Code applicable to the vessel. Accordingly, the TRT concluded that the requirements for the MT examination specified for the inspection of the damaged support blocks were, at minimum, in accordance with the applicable Code.

Based on its review of the reactor vessel specification and applicable Code requirements, the TRT determined that the repair and examination of the damaged reactor vessel support blocks were performed in accordance with the specification and Code requirements. Further, since the MT examination report documented that no indications were found, and NCR M-1004 indicated that the repair and MT examination were verified to be satisfactory, the TRT determined that the repair was performed satisfactorily.

Documentation Deficiencies. During its review, the TRT identified the following deficiency related to the accuracy of the documentation of NCR M-1004. A review of NCR M-1004 determined that the basis given for the nonconforming condition was inaccurate. The NCR stated that:

> Westinghouse drawings E-10773-121-002, 3, 4 and 5 require the surface of the support pad to be parallel with respect to center line of the nozzle within 0.005 inch.

The TRT found that the NCR should have referenced the flatness and parallelism requirements for various surfaces of the support blocks which are specified in Wesinghouse drawing E-10773-121-004. Flatness of the bearing surface of the block was required to be within 0.005 inch and parallelism was required to be within 0.010 inch or 0.005 inch/foot depending on the surface. The inaccurate basis for the nonconforming condition provided in NCR M-1004 was contrary to the requirement of paragraph 3.1.1.3 of B&R Procedure CP-QAP-16.1, "Control of Nonconforming Items," Rev. 21, June 11, 1984 which required that "a reported nonconformance shall be evaluated for accuracy."

TRT Assessment of Brittle Fracture of Reactor Vessel Nozzles. The TRT assessed the alleger's concern that brittle fracture of the reactor vessel nozzles could occur during thermal transients if cracks in the vessel had not been repaired. The alleger was concerned that brittle fracture could occur following radiation exposure of the vessel material during which the nil ductility transition (NDT) temperature of the material would be increased.

(The NDT temperature for a given material is the maximum temperature at which the material fractures in a totally brittle manner and above which a transition to a ductile mode of fracture is initiated.)

The TRT review of the extent and location of the damaged areas determined that the damage was limited to areas which were expected to experience very low compressive stresses and that cracks in these areas were unlikely to propagate. (Tensile or in plane shearing stresses or antiplane shearing stresses are required for crack propagation.) Furthermore, the TRT observed that since the damaged areas were located on the edges and corners of the support blocks where free thermal growth or shrinkage of the material will occur, stresses in these areas would be negligible during thermal transients. (Thermal stresses will be induced during thermal transients in regions of material bodies where free thermal growth or shrinkage of the material is prevented due to the constraint of adjoining material.)

Further TRT reviews determined that B&R construction operation traveler (COT) ME-78-003-5505 required 75 percent surface contact between the bottom of the support blocks and the top of shim plates on which the blocks were to be placed. Westinghouse memorandum TBX-M-156 to TUEC which was attached to COT ME-78-003-5505 and dated June 29, 1978 and which was subsequent to repair and inspection of the damage, documented that the actual surface contact was greater than the required 75 percent.

Based on its assessment of the type and magnitude of the stresses expected in the support blocks and the actual percentage of surface contact achieved, the TRT determined that there was no concern regarding brittle fracture of the vessel nozzles or the ability of the support blocks to perform their intended function during service.

5. Conclusion and Staff Positions: The TRT concludes that the damage to the Unit 1 reactor vessel support blocks was repaired and examined in accordance with applicable ASME Code and Westinghouse specification requirements and was accepted by both Westinghouse and Gibbs & Hill. The TRT also concludes that the alleger's concern regarding brittle fracture of the reactor vessel nozzles was resolved and the repaired support blocks will function satisfactorily as designed. Accordingly, the damage and subsequent repair of the support blocks has no safety significance.

   The TRT contacted the alleger on August 30, 1984, and on October 29, 1984, to arrange a meeting to discuss his allegation and the results of the TRT investigation. The alleger declined to meet with the TRT.

6. Actions Required: None.

   Reference Documents:

   1. Westinghouse Specification 676413, Rev. 4, May 10, 1972.
   2. Westinghouse Drawing 10773-121-002, Rev. 2, April 23, 1975.
   3. Westinghouse Drawing 10773-121-003, Rev. 0, April 23, 1975.
   4. Westinghouse Drawing 10773-121-004, Rev. 2, April 23, 1975.
   5. Westinghouse Drawing 10773-121-005, Rev. 3, April 23, 1975.

6. B&R Procedure CP-NDEP-400, dated July 7, 1975.
7. B&R Construction Operation Traveler ME-78-003-5505, April 6, 1978.
8. B&R NCR M-1004, June 27, 1978.
9. Westinghouse Memorandum TBX-M-152, June 27, 1978.
10. B&R NDE Magnetic Particle Report, Reactor Vessel, June 27, 1978.
11. G&H Memorandum GHF-2845, June 28, 1978.
12. NRC OI Report 50-445/84-006, A-7 Testimony, pp. 6-9, March 7, 1984.
13. B&R CPQAP-16.1, Rev. 21

1. Allegation Category: Mechanical and Piping 13, Repairs and Modifications to Pipe

2. Allegation Number: AP-7, AP-15, AP-16 and AP-17

3. Characterization: It is alleged that:

AP-7

Unauthorized redrilling was performed on undersized holes in the spent fuel pool stainless steel spargers and that drill shavings and cutting oil were not removed from the spargers after redrilling.

AP-16

In September 1982, a nonconforming (1/2 inch "out-of-round") piece of pipe was installed in the Containment Spray (CT) System. During installation, the nonconforming pipe was "buttered" extensively to achieve the required minimum wall thickness (AP-15), and probably made round by uncontrolled heating and jacking operations, contrary to procedures. (Allegation AP-17 is a duplication of AP-16)

4. Assessment of Safety Significance:

AP-7

During its investigations of allegation AP-7, the NRC Technical Revisew Team (TRT) found that this allegation was similar to a previous allegation (by the same alleger) regarding the presence of drill shavings in electrical underwater lighting poles in the Unit 1 refueling pool. The TRT found that the lighting pole allegation had been investigated by NRC Region IV and that the presence of drill shavings in the lighting poles was confirmed during QC inspections.

The NRC Region IV (RIV) evaluation of the lighting pole allegation (IR 50-445/83-03, March 28, 1983) determined that the poles had been fabricated in a manner such that drilling chips could have been left inside the poles and not removed. Brown & Root (B&R) nonconformance reports (NCRs) M-83-00154S Rev. 1, January 13, 1983 and M-83-01301S, January 5, 1983, reported that metal chips were found in two installed pole assemblies during B&R inspections sampling cleanliness of the lighting poles. Disposition of the NCRs required that the lighting poles be cleaned to remove the shavings and other foreign matter inside the pole assemblies. The RIV assessment of the alleger's claim regarding the ability of the drill shavings to jam the fuel cells and fuse to the control rods if washed into the reactor had concluded that the safety significance of the drill shavings "was very small," and the TRT concurs with the RIV assessment.

The TRT investigation of allegation AP-7 determined that the spargers in the Spent Fuel Pool were fabricated by ITT Grinnel Industrial Piping, Inc. (ITT), as shown on ITT Order No. 7124 piping spool drawings. The drawings showed that each sparger was initially designed with twenty-five 1-1/2-inch diameter holes in the bottom of the spargers at approximately 19-1/8 inches on centers. The spools were installed in February and March 1980,

as documented by weld data cards (WDC) 57608, 57607, 60918 and 57300. The TRT reviewed component modification card (CMC) 46408, Rev. 1, March 18, 1981, which modified the spargers to increase the number of 1-1/2-inch diameter holes from 25 to 46. The TRT also reviewed fabrication documentation manufacturing record sheets (MRSs) 2323-MI-0801, 2323-MI-0801 R-2, 2323-MI-0803 and 2323-MI-0803 R-2, which indicated that drilling of the additional 1-1/2-inch holes in the spargers was performed on the installed spargers in April 1982. The documentation showed that dimensional inspections were acceptable.

The TRT review of B&R System Cleanliness Plan FP 47-05, September 16, 1982, indicated that: (1) cleaning of the Spent Fuel Pool Cooling Water Supply and Return piping associated with both Unit 1 and 2 spent fuel pools was satisfactorily completed on September 24, 1982, and (2) cleanliness requirements were reported to have been satisfactorily met on October 28, 1982. The cleanliness requirements limited the size of particles to no larger than 1/32-inch in any dimension, except that fine hairline slivers less than 1/32-inch thick were permissible in lengths of up to 1/16 inch.

In view of the previously discussed confirmation of the presence of drill shavings in the lighting poles, the TRT conducted visual inspections of the spargers with the aid of a boroscope on August 24, 1984 to determine if drill shavings or debris were currently present in the spargers. The inspection found that the spargers, including the capped ends, were free of drill shavings and debris.

During inspection of the holes in the spargers, the TRT found that the drilled holes were not in compliance with B&R Procedure CP-CPM-6.9E, "Pipe Fabrication and Installation," Rev. 0, February 6, 1980. The TRT found that the holes were not radiused on their inside diameter and deburred. (Burrs of up to 1/16 inch wide were found.) This condition was in noncompliance with paragraph 3.1 of B&R Procedure CP-CPM-6.9E, which required that after drilling, all holes were to be deburred and the inside diameter of the hole radiused to 1/4 of nominal wall thickness of the penetrating part or 3/4-inch, whichever was less.

<u>AP-15 and AP-16</u>

The allegations regarding "buttering" (allegation AP-15) (actually weld metal surfacing) and probable heating and jacking (allegation AP-16) of nonconforming piping installed in the System are related to allegations AQP-1 and AQP-2 in Mechanical and Piping Category 20. All these allegations pertain to a piece of 10-inch Sch. 40 stainless steel pipe in the CT System identified on B&R Drawing BRP-CT-I-SB-014, Rev. 20, as Item No. 48 (Note 18 on the drawing stated that piece number 48 was originally documented as piece number 38).

During its assessment of allegations AQP-1 and AQP-2, the TRT substantiated the claim that the 10-inch pipe reported as nonconforming prior to installation (NCR 4013S, Rev. 0, September 2, 1982 reported that the pipe was 1/2 inch out-of-round) was installed in September 1982, contrary to the disposition specified in Revision 1 of the NCR as set forth in Mechanical and Piping Category 20.

Initial TRT reviews of documentation for the two welds fabricated during installation of the alleged nonconforming pipe had substantiated the claim that the pipe was buttered extensively to achieve the minimum wall thickness (allegation AP-15). TRT reviews of weld data cards (WDC) 688147 and 688148 for field welds FW 13-4A and FW 11-4A, respectively, indicated that weld metal surfacing was performed in the vicinity of weld FW 13-4A to repair an extensive area of minimum wall thickness violation. However, during a telephone conversation with the TRT on November 27, 1984, the alleger denied any concern regarding the weld surfacing but alluded to an earlier implication that uneven surfacing to achieve apparent acceptable fitup during installation of the alleged nonconforming pipe could have been performed. The TRT agreed with the alleger that there was no concern regarding the weld surfacing. The TRT had determined that the weld surfacing in the vicinity of weld FW 13-4A was fabricated and inspected in accordance with Sections 3.19.4 and 3.19.5 and B&R Procedure CP-CPM-6.9D, "Welding and Related Processes," Rev. 4, January 18, 1982 and sub-subarticle NC-4130 of the ASME B&PVC. Since the TRT review of the data package for weld FW-13A had previously determined that joint fitup and visual and radiographic inspections indicated that the weld was fabricated acceptably, the TRT concluded that the alleger's implication was not substantiated; if the joint was fabricated as implied, proper fitup and acceptable visual and radiographic inspection results would not have been obtained.

The TRT could not substantiate the allegation concerning heating and jacking operations to make the pipe round (allegations AP-16 and AP-17). TRT reviews of WDCs 688147 and 688148 could determine only that fitup prior to welding of welds FW 13-4A and FW 11-4A was acceptable.

During its assessment of allegations AP-15 and AP-16, the TRT evaluated installation of the nonconforming piece of pipe by mechanical means (jacks and clamps) for possible detrimental effects. NCR 4015S, Rev. 5, suggested that fitup was achieved by mechanical means (see below).

First, the TRT found that the 1/2-inch "out-of-round" (actually, variation in outside diameter) was in excess of the 1/8 inch permitted by Criteria VII and XIII of Appendix B to 10 CFR 50 and the ASME B&PVC Code for the 10-inch pipe. Although sub-subarticles NB/NC/ND-4231 of the ASME Code do not limit the extent to which mechanical means may be used to achieve fitup, limits can be established on the basis of Criteria VII and XIII of Appendix B to 10 CFR 50. Criterion VII required in part that measures be established to assure that purchased material conform to the procurement documents; Criterion XIII required in part that measures be established to control the handling, storage and shipping of material and equipment to prevent damage or deterioration. The material for the alleged nonconforming pipe was specified as SA-312 on B&R Drawing BRP-CT-I-SB-014. The ASME Code Section II SA-530 on material specification, which is referenced by the SA-312 material specification, limited the maximum variation in outside diameter in a 10-inch nominal diameter pipe to 3/32 inch over and 1/32 inch under the nominal pipe outside diameter, respectively, for a maximum out-of-roundness of 1/8 inch. Accordingly, the TRT found that the use of jacks and clamps to achieve fitup for the 10-inch nominal diameter pipe was limited to cases where variations in pipe outside diameter was less than 1/8 inch.

Second, conservative calculations performed by the TRT indicated that significant elastically calculated stresses could have occurred during installation of the 1/2-inch out-of-round pipe by mechanical means which were not included in the G&H piping stress analysis. Based on the magnitude of the stresses obtained in the TRT calculations, the TRT finds that TUEC should perform more detailed analyses to demonstrate the structural integrity of the installed nonconforming pipe, especially in the vicinity of weld FW 13-4A. The TRT notes however that stresses in the installed nonconforming pipe are secondary stresses which will be applied only once during the life of the plant and that plastic deformations associated with these stresses are less than those permitted in other processes acceptable to the ASME Code, e.g., during pipe bending (Paragraphs NB/NC/ND-4223 of the ASME Code). Furthermore, since hydrostatic and preoperational testing of the CTS system were completed successfully, the TRT found that the installed alleged nonconforming pipe may be acceptable.

During the investigations of allegations AP-15 and AP-16 the TRT found the disposition stated in Revision 5 of NCR 4015S, February 8, 1983, was without basis. The disposition stated:

> (This is not a nonconforming condition.)
>
> Per Construction Procedure CP-CPM-6.9E, fitup can be made by mechanical means; i.e., by the use of clamps and jacks. This pipe can be used for fabrication provided fitup requirements are maintained.

The TRT found that this disposition was founded on an error in logic. Given that "If the pipe was conforming, then the pipe can be installed by mechanical means (i.e., clamps and jacks)," it does not follow that "If the pipe can be installed by mechanical means, then the pipe is conforming." Rather, it follows that "If the pipe cannot be installed by mechanical means then the pipe is nonconforming."

The TRT also found the same error in logic in the disposition of NCR 4942S, January 2, 1983. NCR 4942S, which reported the installation of the nonconforming piece of pipe and the change in pipe piece number, stated:

> (This is not a nonconforming condition.)
>
> See NCR M4015S (Rev. 5).

The TRT also found that the bases for the dispositions in NCRs 4015S, Rev. 5, and 4942S were invalid. The TRT review of B&R procedure CP-CPM-6.9E, "Pipe Fabrication and Installation," determined that the only reference to the use of clamps and jacks for fitup during welding was contained in Section 3.3 of the procedure. However, Section 3.3 of Procedure CP-CPM-6.9E was entitled "Control of Piping Materials in the Fabrication Shop." The references to Procedure CP-CPM-6.9E was therefore invalid for field welds. The use of clamps and jacks to achieve acceptable fitup of field welds would have constituted a technical procedural noncompliance. The TRT found that the failure to permit the use of jacks and clamps to achieve fitup in field welds in B&R Procedure CP-CPM-6.9E as a

weakness in the procedure. Paragraph NB/NC/ND-4231 of the ASME Code does not limit the use of bars, jacks, and clamps for fitup to shop welds only.

Furthermore, the TRT noted that measurements in inspection reports (IRs) attached to NCR 4015S, Rev. 5 were used to provide verification that the nonconformance identified in Revision 5 of the NCR did not exist. The TRT found that the use of these measurements was invalid. The IRs dated July 4, 1984, document measurements taken on July 4, 1984 (22 months after installation of the pipe) on the installed pipe and on two related pieces of bulk pipe, all of which had been cut from a common piece of bulk pipe. The IRs suggest that the nonconforming pipe was only 1/4 inch out-of-round rather than 1/2 inch, as alleged. The TRT notes, however, that (1) measurements of the installed pipe were invalid since proper fitup during installation may have been achieved by mechanical means and (2) measurements from the two pieces of bulk pipe may not be valid since their relationship to the nonconforming piece of pipe, before they were cut from their common parent-bulk pipe, was unknown. Use of the measurements for the purpose intended was in noncompliance with the intent of paragraph 3.2.6 of TUEC CP-QP-16.0, "Nonconformances", Rev. 14, July 2, 1984, which required that the disposition of nonconforming conditions be evaluated for adequacy.

5. Conclusion and Staff Positions:

AP-7

The TRT concludes that the alleged enlargement of holes in the spent fuel pool spargers (allegation AP-7) was not substantiated; rather, 21 additional holes were drilled in the spargers. The TRT's visual inspections, performed after flushing and cleaning of the piping system containing the spargers, showed drill shavings were not currently present in the spargers. The TRT concludes that allegation AP-7 has no safety significance.

The alleger was informed of the results of assessment during a meeting with the TRT on March 5, 1984. The alleger stated that his concern was resolved.

AP-15 and AP-16 (and AP-17)

The TRT investigation substantiated the allegation that the 1/2-inch nonconforming pipe was buttered extensively (allegation AP-15). The TRT found that extensive weld metal surfacing was performed in the vicinity of weld FW 13-4A to repair an extensive area of minimum wall thickness violation. The TRT could not substantiate the allegation that uneven buttering was performed to achieve fitup. The weld data package indicated that proper fitup and acceptable visual and radiographic inspection results were obtained.

The TRT could not substantiate the allegation regarding heating and jacking of the nonconforming pipe (allegations AP-16 and AP-17).

TRT evaluations of the installation of the nonconforming pipe by jacks and clamps, as suggested by NCR 4015S, Rev. 5, indicate that significant stresses could have occurred during installation which were not included in the pipe stress analysis. However, since these stresses are secondary stresses and are associated with a one-time loading and by hydrostatic

and preoperational testing of the CT system and were successfully completed, the TRT concludes that the installed alleged nonconforming pipe may be acceptable.

During its assessment of Allegations AP-15 and AP-16 the TRT identified noncompliances with the requirement of B&R Procedure CP-QP-6.0, "Control of Nonconforming Items" that the disposition of NCRs be evaluated for adequacy. These nonconformances were associated with errors in logic and invalid references in the disposition of NCRs 4015S Rev. 5 and 4942S. A noncompliance with the intent of B&R Procedure CP-QP-6.0 was also identified in the use of inspection results to verify that the nonconforming pipe was not nonconforming. A weakness in B&R Procedure CP-CPM-6.9E in not permitting the use of mechanical means to achieve fitup in the fabrication of field welds was also identified by the TRT.

The TRT reported its findings to date in a telephone conversation with the alleger on November 27, 1984. As indicated earlier, the alleger denied any concern regarding the buttering of the alleged nonconforming pipe during the conversation. During the conversation the TRT reported that evaluation of the installation of the alleged nonconforming pipe was not complete; initial TRT assessments had indicated that if the alleged nonconforming pipe was 1/4 inch out-of-round, the installation would have been acceptable. Final evaluation of the 1/2 inch out-of-round condition was to be transmitted to the alleger.

6. Actions Required: None.

Reference Documents:

1. IE Report No. 50-445/83-03.
2. B&R Drawing No. BRP-SF-X-FB-027.
3. B&R Drawing No. BRP-SF-X-FB-030.
4. B&R Drawing No. BRP-SF-X-FB-041.
5. B&R Drawing No. BRP-SF-X-FB-044.
6. ITT Grinnel Drawing PC.MK.SF-X-FB-30-3.
7. ITT Grinnel Drawing PC.MK.SF-X-FB-27-2.
8. ITT Grinnel Drawing PC.MK.SF-X-FB-44-4.
9. ITT Grinnel Drawing PC.MK.SF-X-FB-41-5.
10. Documentation for weld FW-3A.
11. Documentation for weld FW-1A.
12. Documentation for weld FW-3B.
13. CMC 46408 Rev. 1.
14. MRS 2323-M1-0801 R-2.
15. MRS 2323-M1-0803 R-2.
16. MRS 2323-M1-0801.
17. MRS 2323-M1-0803.
18. NCR M7183S.
19. System Cleanliness Plan FP 47-05.
20. System Cleanliness Verification XCP-ME-4.
21. System Cleanliness Requirements and Control CP-SAP-24.
22. TUSI Drawing 2323-M1-0235.
23. B&R NCR M-83-00154S, Rev. 1.
24. B&R NCR M-83-01301S.

25. B&R WDC 57608.
26. B&R WDC 57607.
28. B&R WDC 57300.
29. B&R CP-CPM-6.9E Rev. 0.

AP-15 and AP-16

1. B&R Data Package CT-1-SB-014 for weld FW-11-4A.
2. B&R Data Package CT-1-SB-014 for weld FW 13-4A.
3. B&R NCR M-4015S Rev. 0 through Rev. 5.
4. B&R NCR M-4942S.
5. B&R CMC 80104 Rev. 3 through Rev. 5.
6. B&R Drawing BRP-CT-1-SB-014, Rev. 20.
7. B&R Procedure CP-CPM-6.9E.
8. B&R Procedure CP-CPM-6.9E.
9. NRC Letter "CPSES Unit 1 and 2 Allegations," 4/24/84.
10. NRC Letter "CPSES Unit 1 and 2 Allegations," 5/1/84.
11. TUGCO Letter TXX-4180.
12. TUGCO Letter TXX-4187.
13. ASME BRPVC Section II.
14. ASME B&PVC Section III.

1. <u>Allegation Category</u>: Mechanical and Piping 14, Miscellaneous Piping and Components.

2. <u>Allegation Number</u>: AP-6, AP-14 and AW-47

3. <u>Characterization</u>: It is alleged that:

   a. A crowbar that was dropped into a pipe in the "reactor core," probably in 1980 or 1981, has not been retrieved (AP-6).

   b. Flexible boots supplied by Bryant Industrial Services, Inc. (BISCO) for penetration seals are deficient, in that overlap should be 3 inches rather than 2 inches, boot fabric may be of questionable strength, and possible segregation of seal aggregate and carrier material may occur (AP-14).

   c. Deficient welds in the Unit 2 condensers were "bought-off" without inspection by an inspector who had been intimidated (AW-47).

4. <u>Assessment of Safety Significance</u>:

<u>AP-6</u>

In assessing this allegation, the NRC Technical Review Team (TRT) determined that the reactor core (which is internal to the vessel) was not in place at the time that the alleged incident occurred. Consequently, the allegation, as stated, is not completely correct. Furthermore, inspection reports prior to installation of the reactor vessel internals did not confirm that a crowbar was found in the vessel. The TRT therefore reviewed Texas Utilities Services, Inc. (TUSI) drawings 2323-SI-0545 through 2323-SI-0549, "R.B. Internal Structure, Reactor Cavity Outline, Sections and Details" (sheet 1 through sheet 5), to determine if any open pipes into which a crowbar could have dropped existed in the reactor cavity. (The reactor vessel is located within the reactor cavity.) The review showed that eight neutron detector wells were located around the reactor cavity between the 810-foot and 822-foot elevation. The TRT found that the instrumentation wells were mounted on carriage assemblies and were accessed through vertical 8-inch pipes, which were located above the instrument wells. Covers for the access pipes were located at the 834-foot elevation, which was the approximate elevation of the reactor vessel flange. The TRT judged that a crowbar could have been dropped down one of these 8-inch pipes.

The TRT determined that work to clean and inspect the carriage assemblies for freedom of movement was authorized on October 31, 1983, during start-up procedures for Unit 1, and prior to loading of the detector instrumentation. An inspection at that time revealed that two of the assemblies would not move as designed; therefore, the wells were flushed from November 28, 1983, through November 30, 1983. Debris, including a crowbar and an approximately 1 foot long 2 inch x 4 inch wooden wedge, was removed from the well and track assemblies during flushing.

Because of the close proximity of the instrumentation well to the bottom of the reactor vessel, and because a crowbar was found in the neutron

detectors instrumentation well, it is the opinion of the TRT that the alleger was referring to the access pipe and/or instrumentation well as a "pipe in the reactor core."

Relative to the removal of the crowbar some 3 to 4 years after it was dropped into the neutron detector instrumentation well, the TRT learned during discussions with Texas Utilities Electric Company (TUEC) startup personnel that, based on their experience, the accumulation of debris in the reactor cavity was not an uncommon occurrence and that the removal of debris only prior to startup was industry practice. (Access in the reactor cavity adjacent to the reactor vessel was limited.) The TRT found, however, that this practice was contrary to the housekeeping requirements of TUEC Procedure CP-QP-19.5, "Surveillance of Plant Conditions," Rev. 4, February 21, 1984. The housekeeping inspection guidelines of Attachment 1 to CP-QP-19.5 required that: (1) work areas were to be sufficiently clean and orderly; and (2) garbage, trash, scrap, litter and other excess material were to be removed or temporarily stored neatly.

AP-14

The TRT performed followup inspections to assess the results of NRC Region IV (RIV) inspections related to AP-14, as documented in IR 83-24, August 24, 1983. The RIV inspections concluded that none of the three aspects of this allegation had technical merit based on reviews of BISCO procedures and inspections of BISCO seals installed at CPSES. The TRT concurred with the RIV findings.

Nonetheless, the TRT reviewed the current BISCO production and quality procedures applicable to the work BISCO was doing on site. The alleger specifically mentioned that the NRC should review BISCO Procedure QCP-507 in regard to the flexible boot overlap problem. However, Procedure QCP-507 "Method For Inspecting BISCO Flexible Penetration Seals," does not address overlap of the seams in the boot. BISCO Procedure SP 504, "Method of Layout and Fabrication of the BISCO Flexible Boot," provides details on seam overlap. Paragraph 5.3.1 of this procedure required that all intended joining surfaces of the boot material (the overlap seam) be roughened with sandpaper a minimum of 3 inches from the edge and wiped clean with solvent. Paragraph 5.3.3 stated that a bead of BISCO 732 RTV sealant was to be applied to the inside of the overlapped seam and spread to a minimum width of 3 inches. The seam was then to be closed and all excess sealant removed.

The TRT found that the formula for laying out the boot material allowed only enough extra fabric for a 2-inch overlap of the seam. The BISCO QC superintendent could not explain the inconsistency in the procedure. He stated that it was standard practice to overlap the seam 3 inches. To verify his statement, the TRT inspected 12 BISCO flexible boots, which were installed, to determine the width of lapping on the seams. These boots were used for several pipe diameters, and in all cases the boots had a 3-1/32-inch to 3-1/4-inch overlap. The TRT found that revision 1 of procedure SP 504 was approved for use by TUEC on August 8, 1984 (TUEC memorandum, "Procedure Approval," August 8, 1984). This revision changed the amount of seam overlap required as follows:

Pipe Diameter	Overlap Required
• Less than or equal to 2 inches	1-inch
• Greater than 2 inches, but less than or equal to 20 inches	2-inch
• Greater than 20 inches	3-inch

A second concern of allegation AP-14 is that the fabric used to fabricate the flexible boots may be of questionable strength. The TRT was informed in an interview of BISCO personnel that BISCO required their vendor to conduct tensile tests of the fabric material and to supply BISCO with a copy of the results of these tests. In addition, the QA manager of BISCO in Chicago informed the TRT that BISCO conducted its own tests after the fabric was received to verify the vendor's results and that this procedure was followed until BISCO was assured that the fabric was acceptable and not prone to tearing. The TRT reviewed onsite inspection records for rejects of boots with tears in them, and found none.

Allegation AP-14 is also concerned with BISCO's use of radiation sealing material that may separate the aggregate from the carrier, thus losing its radiation shielding effect. The TRT reviewed BISCO's procedure SP-304NH, "Formulation of BISCO SF-150NH." This procedure provides detailed instructions for the mixing the shielding material. The TRT determined that the procedure provides ample inspection check points to ensure proper mixing of the material. Furthermore, no obviously deficient material was observed during the previously described TRT inspection of 12 BISCO flexible boots.

AW-47

This allegation was expressed during an interview conducted on August 24, 1983, by the NRC Office of Investigations (OI) (NRC OI report 50-445/84-006, March 7, 1984). During the interview, the alleger had raised concerns related to improper construction practices involving the Comanche Peak Steam Electric Station (CPSES) main condensers (Units 1 and 2). NRC RIV requested TUEC to provide information regarding both the quality control programs used during fabrication and installation and the impact of any expected condenser tube leakage (NRC RIV letter to TUEC, dated June 19, 1984). The requested information was provided by TUEC in their letter TXX-4219, dated July 9, 1984.

During its assessment of AW-47, the Mechanical and Piping (M&P) Group of the TRT determined that allegation AW-47 was similar to allegation AQW-15 in M&P Category 30, which is concerned with the acceptance of welds which could have been defective. Allegation AW-47 is also related to allegations evaluated by the TRT Miscellaneous Group. (Allegations AM-8, -9, and -10 in Miscellaneous Category 8 were related to improper construction practices during the installation of condenser tubes, misalignment of holes in tube sheets and welding in the turbine/condenser joint, and the use of the wrong type of condenser.)

Since the TRT assessments of concerns related to welding issues are set forth in both M&P Category 30 and Miscellaneous Category 8, no further technical assessments were made for allegation AW-47.

5. Conclusion and Staff Position:

AP-6

The TRT found that a crowbar had fallen into a neutron detector instrumentation well, external to the reactor vessel (and not into the reactor core, which is internal to the vessel), as alleged, but was subsequently retrieved during flushing. Accordingly, the TRT concludes that the allegation has no safety significance. However, the TRT found that the accumulation of the crowbar and other debris in the reactor cavity was in noncompliance with the housekeeping requirements of TUEC Procedure CP-QP-19.5.

The alleger was informed during a March 4, 1985 meeting with the TRT that the crowbar had been removed. The alleger said that he was satisfied with this resolution.

AP-14

Based on their review of allegation AP-14, the TRT concludes that, although BISCO procedure SP-504 did not specifically state that there shall be a 3-inch overlap of the material at the seam of flexible boots, their layout formula allows only for a 2-inch overlap of the seams. However, an inspection of 12 installed flexible boots indicated that a 3-inch overlap of the seams was made on all boots inspected. The TRT also concluded that both inspection reports and physical testing of the boot fabric verified that the material was not prone to tearing. Last, BISCO procedures are adequate and explicit enough to ensure that the radiation seal material will be thoroughly mixed and will not tend to separate, as alleged. Accordingly, allegation AP-14 has no safety significance.

AW-47

The conclusion and staff position for allegation AQW-15 in M&P Category 30 and allegations AM-8, -9 and -10 in Miscellaneous Category 8 for welding issues related to the main condensers are also applicable to allegation AW-47.

The alleger was informed during a March 4, 1985, meeting with the TRT of its findings related to allegation AQW-15. The alleger stated that he was satisfied with the TRT's findings.

6. Actions Required: None.

Reference Documents:

AP-6

1. TUSI Drawing, "R.B. Internal Structures, Reactor Cavity Outline, Sect. & Dets.," Sheet-1, 2323-S1-0545, Rev. 4, December 27, 1979.
2. TUSI Drawing, "R.B. Internal Structures, Reactor Cavity Outline Sect. & Dets.," Sheet-2, 2323-S1-0546, Rev. 2, 1977.

3. TUSI Drawing, "R.B. Internal Structures, Reactor Cavity Outline Sect. & Dets.," Sheet-3, 2323-S1-0547, Rev. 4, 1979.
4. TUSI Drawing, "R.B. Internal Structures, Reactor Cavity Outline Sect. & Dets.," Sheet-4, 2323-S1-0548, Rev. 4, April 1, 1983.
5. TUSI Drawing, "R.B. Internal Structures, Reactor Cavity Outline Sect. & Dets.," Sheet-5, 2323-S1-0549, Rev. 3, January 10, 1977.
6. Startup Work Authorization, Neutron Detector Positioners, October 31, 1983.
7. NRC OI Report 50-445/84-006 March 7, 1984.
8. B&R Procedure CP-QP-16.5, Surveillance of Plant Conditions, Rev. 4, February 21, 1984.

AP-14

1. NRC Region IV IR 50-445/83-24, 50-446/83-15, August 24, 1983.
2. TUGCO memorandum, Penetration Seals - Procedure Approval, August 8, 1984.
3. BISCO Procedure SP-504, Rev. 0, September 26, 1979.
4. BISCO Procedure SP-505, Rev. 3, August 2, 1982.
5. BISCO Procedure SP-505-2, Rev. 1, June 2, 1982.
6. BISCO Procedure SP-505-1, Rev. 2, June 2, 1981.
7. BISCO Procedure SP-505, Rev. 4, December 12, 1983.
8. BISCO Procedure QCP-507, Rev. 1, October 26, 1982.
9. BISCO Procedure SP-504, Rev. 1, September 14, 1983.

AW-47

1. NRC OI report 50-445/84-006, March 7, 1984 (AW-47).
2. NRC Region IV letter, June 19, 1984.
3. TUGCO letter TXX-4219, Construction of CPSES Condensers, July 9, 1984.
4. TUGCO memo SU-81134, Condenser Tube Sheet Leakage, October 2, 1981.

1. Allegation Category: Mechanical and Piping 15, Pipe Hanger Design Problems.

2. Allegation Number: AH-5

3. Characterization: It is alleged that hangers have been designed by engineering helpers who were not qualified or trained as engineers.

4. Assessment of Safety Significance: In an August 24, 1984, interview with the NRC Technical Review Team (TRT), the alleger stated that he had only second-hand information about this allegation, but that the individual who told him about the situation could give the TRT more specific information. The alleger kept the anonymity of the other person but agreed to pass on the TRT request to him. The TRT attempted to contact the alleger subsequent to this interview, but was unsuccessful. Neither the alleger nor the individual identified as the helper has contacted the TRT with more information.

   Because the TRT was unable to learn any specific details about the allegation, it discussed the issue with inspectors from NRC's Region IV (RIV). A RIV inspector then apprised the TRT of a similar allegation by another alleger concerning an unqualified individual locating hangers. That allegation is that hanger locations were put on hanger location isometric drawings (BRHLs) without the dimensions between supports being recorded. Draftsmen were allegedly told by the Technical Services Mechanical Drafting (TSMD) management to estimate the spacing between the supports, then issue the drawings to the field for construction. The alleger subsequently checked some hanger locations in the plant and found them to be in the same location as he had put on the BRHL. The alleger appears to have deduced from this process that he had participated in "designing" the hangers because he "chose their final locations."

   The TRT reviewed various procedures governing the design and design control of pipe supports at the time of the alleger's employment (January to July 1980), i.e. CP-EI-4.5-2, CP-EI-4.5-3, CP-EI-4.1-1 and CP-EI-4.0-1. The TRT interviewed the Texas Utilities Electric Company (TUEC) management personnel responsible for both small-bore and large-bore piping and hangers. TUEC said all large-bore hangers were designed by pipe support engineering personnel who received the hanger location, type, and load data from the Architectural Engineer, Gibbs & Hill (G&H). The determination of the hanger location was based upon an interactive process that began with the pipe support engineer estimating the location using thermal and seismic criteria. Subsequent to this, G&H performed the required piping analysis to arrive at the designed hanger location. The G&H isometrics were transmitted to Texas Utilities Generating Company (TUGCO) along with support locations, support types, and load combination data. The hanger locations on the piping isometric are a basic requirement of an acceptable piping analysis. The hanger engineer then designed the hanger and produced a support detail with a hanger location. This information was transmitted to TSMD, which produced a final hanger sketch with a location plan. This hanger sketch was then issued through the document control center (DCC) to construction personnel. Also at this time TSMD began developing the Brown & Root hanger location isometric (BRHL). The Brown & Root Hanger Location Drafting Guide, dated August 12, 1980, provides guidelines to

develop the BRHL. Using information received from G&H, the draftsman marked up a Brown & Root piping isometric (BRP) to show the approximate locations of the hangers and the hanger sketch number. The approximate hanger location was marked with an "X" on Revision 0 of the BRHL with no hanger spacing dimensions.

During subsequent revisions, the exact hanger locations, together with the spacing between adjacent supports, were added to the BRHL using field walk-down information. TSMD management indicated that Revision 0 of the BRHL was generated from the BRP and the accompanying hanger sketches. According to TSMD management, the BRHL, by itself, was neither used nor intended for hanger construction. The BRHL was developed as an aid to perform the hanger as-built inspection, which was supposed to begin when approximately 80 percent of the hangers were installed on any particular run of piping that defined a stress problem (pipe support flow chart in CP-EP-2.1).

The TRT reviewed approximately 25 BRHLs for which a Revision 0 was issued between the dates of the alleger's employment at TSMD. Two BRHLs were found on which the alleger had worked. All 25 BRHLs had a stamped legend in the Revision 0 area stating "Issued for Hanger Identification and Accountability Only." This statement substantiated TSMD management's contention that, by itself, the BRHL was not used for construction purposes. Both BRHLs containing the alleger's initials were Revision 0; that is, the hanger locations were marked with an "X" rather than with spacing dimensions. The TRT reviewed subsequent revisions of each BRHL and found that Revision 1 of one BRHL and Revision 2 of the other BRHL were issued to include the missing hanger spacing dimensions, thus indicating that the hangers already existed. This revision sequence substantiates TSMD management's statement that the BRHL was developed to aid in the as-built inspection. TSMD management supplied the TRT with a copy of the BRHL Drafting Guide of August 12, 1980, which outlined the process through which the BRHL was developed and maintained. This drafting guide substantiated TSMD management's description of the BRHL revision sequence.

The TRT reviewed ten hanger sketches from the two BRHLs mentioned above. All ten sketches were issued for construction with a hanger location plan on the sketch from 1 to 2 years prior to the issuance of Revision 0 of the BRHL. This indicated that the designed hanger location existed before the initial issue of the accompanying BRHL.

In an effort to review all possible avenues, the TRT also reviewed the hanger sketch and construction process for small-bore piping (piping 2 inches and under). As was true for large-bore piping, the small-bore piping analysis was performed with the hanger locations shown on the piping stress isometric. (The piping stress analysis may have been either rigorous or simplified.) Pipe Support Engineering (PSE) management indicated that a stress isometric marked with hanger locations (GHH [Gibbs & Hill hanger] for small bore-piping) was sent to PSE for hanger design and analysis. The GHH included the hanger identification number and the design spacing between hangers. All hangers on a particular isometric were to be designed as a package and kept together until all hangers were designed and drafted. A hanger location plan was not required on the small-bore hanger sketch. According to PSE management, the small-bore piping program was just beginning when the alleger was employed as a draftsman. The TRT reviewed two

specific GHH piping isometrics and eight of the hangers located on the two GHHs. The hanger spacing was included on the initial issue of both of the hanger location isometrics. The eight hanger sketches reviewed all contained a location plan as additional information. None of the sketches had the alleger's initials. The TRT was told by PSE that all hanger sketches of this vintage were redesigned and redrawn at a later date. A review by the TRT of the eight hanger sketches substantiated that these hangers had subsequently been redesigned.

The TRT sent a letter on January 15, 1985, to the individual concerned with the related allegation for the purpose of proposing a followup interview. As of this writing the TRT has received no response from the alleger requesting a followup interview or the results of the TRT findings.

5. Conclusion and Staff Position: The TRT reviewed specific examples of both small-bore and large-bore piping hanger location isometrics and numerous hanger sketches. The large-bore BRHL drawings for large-bore piping were issued as an aid to the as-built program and to establish the as-built hanger location on the piping. The small-bore GHH hanger location isometric was used both for hanger location information and for construction. All documents reviewed showed evidence that the proper procedures had been followed, that the hanger locations were being established during the piping and hanger design phase, and that they were later verified or annotated during an as-built review. Accordingly, this allegation was not substantiated and does not have safety significance.

On March 6 1985, the TRT met with the alleger for the purpose of providing feedback. The alleger was apprised of the TRT's unsuccessful attempt to gain further information. The alleger had no comment concerning the TRT assessment; however, he was accompanied by the individual who had first-hand knowledge of the allegation. The additional information required to fully assess the allegation will be provided by the new alleger during a site visit.

6. Action Required: None.

Reference Documents:

1. TUSI letters dated August 1, 1980; August 6, 1980; May 5, 1980; November 20, 1979.
2. TUSI procedures: CP-EI-4.0-1, CP-EI-4.1-1, CP-EI-4.5-1, CP-EI-4.5-2, CP-EI-4.5-3, BRHL Drafting Guide dated August 12, 1980.
3. TUGCO procedures: CP-EP-2.1, CP-EP-4.0, CP-EP-16.3, CP-EP-4.5.
4. BRHL-CC-1-FB-002, BRHL-CC-1-SB-015.
5. GHH-CC-1-SB-028, GHH-CC-1-SB-045.
6. Hanger sketches: CC-X-039-001-F43S, CC-X-039-005-F43R, CC-X-039-009-F43R, CC-X-126-015-F43R, CC-1-126-011-F33R, CC-1-146-005-S43S, CC-1-146-014-S43R, CC-1-167-004-S43R, CC-1-145-001-S43S, CC-1-145-005-S43K, H-CC-1-SB-028-001-3, H-CC-1-SB-045-010-3, H-CC-1-SB-045-008-3, H-CC-1-SB-045-007-3, H-CC-1-SB-045-003-3.

7. Affidavit of alleger A-4 dated March 31, 1983, page 4.
8. OI interview with alleger A-4 dated March 7, 1984, page 73.
9. TRT interview with alleger A-4 on August 24, 1984.
10. Comments of alleger A-52 to CASE on December 13 and 20, 1982, CASE Attachment 11, pages 1-3.
11. Region IV interview with alleger A-52 on November 8, 1982, CASE Attachment 10, pages 6-34.
12. ASLB limited appearance of alleger A-52 on September 16, 1982, pages 5551-5559.
13. Deposition of alleger A-52 on July 25, 1984, entire transcript.

1. Allegation Category: Mechanical and Piping 16, Intimidation Due to Hanger Redesign Suggestions

2. Allegation Number: AH-8

3. Characterization: It is alleged that a pipe support engineer was fired because he made suggestions about how to redesign a pipe hanger. The redesign was for large-bore pipe supports to be used on piping in a tunnel.

4. Assessment of Safety Significance: The NRC Technical Review Team (TRT) reviewed that part of the allegation that pertained to technical concerns.

   During an August 28, 1983, telephone interview between the alleger and the NRC Office of Investigations (OI), the alleger stated that the events that he believed resulted in his termination began when he suggested a redesign of a hanger that would not fit in the tunnel for which it was originally designed. During the interview, the alleger did not refer to a specific hanger or to a specific tunnel location; therefore, the TRT could not identify the hanger which was the source of the allegation. The TRT reviewed Texas Utilities Electric Company (TUEC) procedures, CP-EP-2.1, CP-EP-4.0, and CP-EP-4.6, pertaining to support fabrication and design control and similar Brown & Root (B&R) procedures (CP-QAP-4.1 and QI-QAP-11.1-28). The TRT also discussed design of large-bore supports and the revision cycle of support design and construction with TUEC pipe support engineering (PSE) and QC inspectors. Large-bore pipe supports are commonly redesigned because of interferences and pipe rerouting during the design and construction cycle, according to those interviewed. The TRT extensively reviewed of similar hanger supports for the assessment of the allegations in Mechanical and Piping Category 31; the documentation in the hanger packages (HP) verifies these statements.

5. Conclusion and Staff Positions: A TRT review of the design procedures indicated that redesign of hangers is common and is controlled by approved procedures. The alleger indicated that he did not know of a specific design problem. Accordingly, the TRT was unable to identify any technical aspect of the redesign of large-bore pipe supports which had safety significance.

   On November 14, 1984, the TRT met with the alleger to brief him on the results of its review. During this interview, the alleger said that his concern was not based on improper design techniques, but rather centered on intimidation with respect to the technical design issue. The alleger indicated that the TRT did more review than he expected and he was satisfied with the results.

6. Actions Required: None.

Reference Documents:

1. TUEC Procedures CP-EP-2.1, CP-EP-4.0, CP-EP-4.6
2. Brown & Root Procedures CP-QAP-4.1, QI-QAP-11.1-28.
3. Telephone interview of Alleger A-41 with OI on August 28, 1983, page 30.
4. ASLB limited appearance statement of Alleger A-41 on September 15, 1982, pages 4861-4865.
5. Meeting with Alleger A-41 on November 14, 1984.

1. Allegation Category: Mechanical and Piping 17, Anchor Bolt Installation Problems

2. Allegation Number: AB-4, AB-5, AB-6, AB-7a, AB-8, AB-9, AB-10, AB-14, AQB-1, AQB-2 and AQH-19.

3. Characterization: It is alleged that Hilti anchor bolts for pipe support baseplates were modified or improperly installed and, therefore, are not capable of withstanding their design loading. The specific allegations are listed below.

AB-4

A Hilti bolt was broken during a hydro-torquing procedure. It is also alleged that other bolts (Hilti) were elongated and had stripped threads.

AB-5

a. Hilti bolts were torqued to lower values than required because craft personnel modified the torque setting before the bolt was torqued and after the QC inspector verified the setting.

b. Hilti bolts were welded to the devices that they were supposed to support rather than being properly installed and, thus, failed to provide the intended support to the device.

c. Hilti bolts would probably "walk-out" of the concrete when subjected to vibrations over the 40-year life of the plant.

AB-6

A QC inspector was improperly instructed to sign off on torquing of Hilti bolts without the proper authorization.

AB-7a (allegation AQH-19 duplicates this allegation)

Two craft workers combined to mislead a QC inspector that anchor bolts on a 20-foot ceiling were properly torqued. The first craft person sent down a wrench to the QC inspector who verified the wrench number and torque setting; the other craft person set another wrench to a low torque value and used it to torque a nut welded to the scaffold. The QC inspector observed the first craft person turning the nut on the anchor bolt while hearing the clicks from the second wrench that the other craft person was using to torque the nut welded to the scaffold. Therefore, the anchor bolt was never torqued properly.

AB-8

The employment of a Brown & Root (B&R) quality control inspector was terminated because he attempted to submit an a nonconformance report (NCR) regarding improper Hilti bolt installation. This allegation involved a support baseplate that had been signed off by QC and was later removed without QC knowledge.

AB-9

Anchor bolts used in the concrete walls of safety-related buildings were pulling out under load.

AB-10

Concrete anchor bolts (Hilti) were modified without authorization and were done improperly.

AB-14

During final inspection of a pipe support, the alleger was told to "buy off" Hilti bolts which had already been torqued and had the torque seal applied to them.

AQB-1

Inspection of Hilti bolt documentation packages may have been approved in spite of inspectors recognizing that they did not conform to procedures.

AQB-2

a. There is a lack of control of the "Torque Seal," which is used on Hilti bolts after they have been inspected and torqued. This lack of control could lead to questionable integrity of those bolts marked with this substance.

b. Some Hilti bolt QC inspectors did not properly ensure that bolts were correctly installed and torqued prior to documentation of satisfactory installation.

4. Assessment of Safety Significance:

General Anchor Bolt Review

The NRC Technical Review Team (TRT) reviewed the site construction and QA/QC procedures that were used for the inspection and installation of Hilti and super-Hilti concrete expansion anchor bolts. The TRT determined that the installation instructions and procedures, as developed and recommended by Hilti Fastening Systems, were incorporated into these QA/QC and construction procedures (References 1 through 7). Attachments 1 and 2 of B&R procedure CEI-20 detail the minimum spacing between Hilti bolts and other Hilti bolts and between Hilti bolts and Richmond inserts. The TRT determined that the expansion bolts were set by tightening the nut to the torque value required to obtain a minimum static tensile load of 115 percent of the allowable tensile working load without slippage (Reference 1). This working load is based upon a safety factor of 5.

During the review of these allegations, the TRT discussed the installation and inspection of Hilti bolts with the B&R QC supervisor responsible for the anchor bolt inspections. The discussion covered inspector training,

anchor bolts installed under previous installation procedures, torquing, use of torque seal, and bolt sign-off procedures.

The TRT determined that procedures required an IR to be completed before an anchor bolt was considered properly torqued. The TRT also found that the IRs had unique identification numbers for each support or fixture. The procedures applicable to Hilti bolt installation and inspection require that the following be written on the IR: (1) verification that the torque wrench is calibrated and the calibration is current; (2) verification that the torque wrench setting is in accordance with the applicable requirements for the bolt being torqued; (3) verification that the correct size socket for the bolt being torqued is used; and, (4) the torque wrench number and calibration due date.

The TRT also performed a random review of the documentation (i.e., installation travelers and Hilti bolt inspection reports, etc.) for the installation of Hilti anchor bolts for ten pipe supports. These supports required about 100 bolts of various sizes, were located in different buildings, and supported various systems. The TRT reviewed the documentation for its adherence to the inspection specification and found that it was complete and that all bolts had inspection reports (IRs) covering torquing and the application of torque seal. Separate inspection reports covered the final review of each pipe support and included a review of the anchor bolt documentation (i.e., torque seal intact and an IR for the torquing signed off by a QC inspector).

The TRT is aware of the Hilti bolt test data generated as a result of NRC Bulletin 79-02, "Pipe Support Base Plate Designs Using Concrete Expansion Anchor Bolts." A great deal of Hilti-bolt test data has been generated (e.g., References 8, 9 and 10). This data provides insight into the performance characteristics of Hilti bolt sizes used at Comanche Peak Steam Electric Station (CPSES).

<u>AB-4</u>

During an interview with the alleger it was established that these bolts were not Hilti bolts, but rather were A490 structural bolts used in pipe restraints. For a discussion of A490 structural bolts, see Mechanical and Piping Category 49, Torque Group, item A, Bolt Torquing.

<u>AB-5</u>

These allegations were vague and nonspecific. The TRT tried to contact the alleger to obtain more specific information. A letter was sent to the alleger's last known address asking him to contact the NRC; however, no response was received.

The results of the TRT review of allegation AB-5 are as follows.

a. The TRT discussed the procedure for QC verification of Hilti bolt torquing with QA/QC training personnel who stated that inspectors are told in training classes that wrenches must be checked and that craft personnel must be watched very carefully when they actually

torque the bolts. The TRT also received an audio cassette of a QC training class on Hilti bolt inspection which mentions this careful surveillance of craft personnel. If the inspectors, in fact, watched the craft personnel, they could have detected a change in the wrench torque setting. However, in cases like the one alleged, it would be very difficult for the inspector to stop such a fraudulent act.

b. The TRT discussed the welding of anchor bolts to the structures these bolts supported with QA/QC and craft personnel, who stated that they had no knowledge of this type of work being performed. During the TRT's review of this and other allegations, no NCRs were discovered concerning this subject, and the TRT found that no violations of this nature were discovered during the normal RIV inspection of this plant.

   The most likely reasons for welding bolts to the structures they support, rather than properly installing them, would be that (1) the bolt would not take torque or (2) the anchor bolt struck rebar. The solution for the first problem is simply to use the next larger diameter bolt, which would be easier to do than welding the bolt to the plate. In the second case, which is the more likely occurrence, it would be necessary either to obtain approval to cut the rebar or to use a shorter anchor bolt or cut the bolt and weld it to the plate to make it appear to be properly installed. If the anchor bolts had been cut short, they would have been discovered during ultrasonic testing of anchor bolts (described in allegation AB-10), and no modifications of this nature were discovered during the ultrasonic test.

c. The TRT reviewed published technical literature prepared by anchor bolt manufacturers, utilities, testing laboratories and the NRC (References 8 through 10) concerning the topic of dynamic loading of anchor bolts. These publications have reported on the testing of Hilti anchor bolts at loadings equal to the maximum allowable at CPSES for 1,000,000 to 2,000,000 cycles with no reduction in the ultimate strength. The loading due to system vibration would be only a very small percentage of the allowable design loadings.

AB-6

This allegation did not refer to a particular support or weld traveler. The alleger stated that the supervisor told him to sign off on the Hilti bolt torquing without the proper authorization and later denied having told him to do so. A sign-off of the general hanger inspection report under the line item for Hilti bolt inspection is only a sign-off for the separation of bolts, and verifies that torque seal is intact. The TRT found that the only sign-off that was acceptable for Hilti torquing was the one shown on the IR, which was usually completed prior to hanger inspection; therefore, the hanger inspection required only verification of bolt separation and torque seal.

The TRT contacted the alleger, who stated that the document that was signed was the weld filler metal log. The weld filler metal log is not a required sign-off for Hilti bolts. However, it does contain a cross reference to the Hilti bolt IR. The TRT randomly reviewed 20 hanger packages and noted

that the IR number for the Hilti bolt installation was referenced on the weld filler metal log. These IRs were then checked and found to be complete. This allegation could not be substantiated.

AB-7a (allegation AQH-19 duplicates this allegation)

This allegation is very vague, and the alleger was unable to provide any specific information as to location, system, or support number in meetings with the TRT. In addition, if the QC inspectors had watched the craft personnel, as instructed, they should have noticed the second craft person using the torque wrench on the scaffold bolt.

AB-8

The TRT attempted to obtain more specific information regarding this allegation; however, the alleger was unable to recall any additional details. This allegation deals with the removal of the baseplate rather than its reinstallation. The baseplate could have been removed because the support was no longer required or was totally redesigned. If the baseplate was replaced and the anchor bolts retorqued, the torque seal would have been disturbed. The disturbed torque seal could have been spotted during the final inspection of the support.

The TRT's review of the general anchor bolt installation program at CPSES showed that there were methods in place that could have detected the disturbed torque seal.

AB-9

This allegation, from an unknown alleger, states that anchor bolts pulled out when loaded. No particular traveler, support, or area was indicated by the alleger. One of the reasons that the Hilti anchor bolts are torqued (loaded) is to ensure that anchor bolts are capable of sustaining design loadings while maintaining their mechanical properties. When bolts pull out while being torqued, it is generally because the anchor bolt hole is oversized, which causes the bolt to pull out at a load less than design load. Inspection report 80-16 indicates that the Resident Reactor Inspector (RRI) found no evidence that anchor bolts pulled out after they achieved full load. The TRT determined from the referenced procedures (References 4 through 8) that when a bolt failed to reach its required torque value it should have been shown as unsatisfactory on the inspection report and modified until it met the acceptance criteria. This modification process is covered by both B&R and Texas Utilities Generating Company (TUGCO) installation procedures (References 2 and 5).

AB-10

This allegation from an unknown alleger resulted in the Texas Utilities Electric Company (TUEC) filing a 10 CFR 50.55(e) report. This item was first reported verbally to the NRC on October 1, 1980. TUEC submitted interim reports on October 21, 1980, January 12, 1981, and April 15, 1981 and a final report on December 4, 1981. The allegation also led to ultrasonic testing (UT) of Hilti bolts to establish their actual, installed

length. Of the approximately 50 anchor bolts examined, 2 were identified by UT as being shorter than the required anchor bolt. The TRT learned from the 10 CFR 50.55(e) reports that one of the anchor bolts (identified as being too short and removed by jacking) had been modified without authorization. The modifications consisted of cutting off the old mandrel and grinding a new mandrel on the anchor bolt. A second shortened bolt was torqued prior to removal by jacking and the required torque value could not be obtained. This second anchor was also shortened by cutting off the old mandrel and grinding a new mandrel. B&R removed the identified Hilti bolts and reworked the support to meet design criteria.

To ascertain whether additional problems existed with these bolts, B&R instituted a detailed UT program which was performed by the B&R Quality Engineering Group. The initial phase of this program consisted of a statistically sound sampling program for those Hilti bolts installed according to functional craft disciplines, i.e., mechanical, electrical, instrumentation, fire protection, and heating ventilation and air conditioning (HVAC). Results from this initial phase, as shown below, provided adequate confidence that the mechanical, instrumentation, and fire protection Hilti bolt installations had not been modified in a unauthorized manner. The second phase of the program included further examination of HVAC and electrical installations. Finally, B&R construction management, as part of their 10 CFR 50.55(e) corrective action, emphasized to the craft personnel that any unauthorized modification or alteration to permanent plant components would result in disciplinary action.

A TRT review of the UT program revealed the following results:

a. Fire Protection -- 161 bolts tested; all passed.
b. Instrumentation -- 783 bolts tested; all passed.
c. HVAC -- 818 bolts tested; 3 were unacceptable.
d. Electrical -- 796 bolts tested; all passed.
e. Mechanical -- 816 bolts tested; all passed.

Additional testing was required for the HVAC and in those areas of the plant where the crew involved in the original allegation had worked. B&R examined 8,511 additional Hilti bolts which represented all bolts installed by the installation crew in question and those for HVAC supports, with the exception of those that were inaccessible and the 1/4-inch bolts. These 1/4-inch bolts were not used in HVAC installations and normally are not long enough to hit rebar; therefore, they were not considered. B&R examined 4,870 additional Hilti bolts in the HVAC group; only one bolt was found to be nonconforming because of mandrel modifications. In the electrical group, B&R examined 3,641 additional Hilti bolts and identified 7 bolts as nonconforming due to mandrel modifications.

AB-14

The TRT was unable to contact the alleger for additional information regarding this allegation; therefore, a letter was sent to his last known address. The TRT has not received any response to this letter. The TRT determined that since the final pipe support inspection of the completed pipe support is performed following inspection of the anchor bolts, (i.e.,

the baseplate and anchor bolts are installed and inspected before the remaining support structure) the allegation that a QC inspector would sign off on Hilti bolts which had already been torqued and had torque seal applied would be a common occurrence. Since the sign off on the final pipe support inspection for the line item concerning Hilti bolts is only for verification that the bolt separation meets requirements and that the torque seal has been applied and is undisturbed, the TRT determined that this sign off was not inappropriate and is not a safety concern.

AQB-1

The TRT was unable to contact the alleger for additional information regarding this allegation. Therefore, a letter was sent to his last known address asking him to contact the NRC. The NRC received no response to this letter. Because the allegation was vague and nonspecific, it was reviewed during the TRT's review of the general QA system for the installation of Hilti bolts.

AQB-2

The results of the TRT review of allegation AQB-2, from an unknown alleger, are as follows.

a. The TRT reviewed IR-81-12 which detailed the results of Region IV's investigation of this allegation. The alleger stated that there was concern over the control of the product "torque seal" which was placed on Hilti bolts after torquing and verification by a QC inspector. The alleger stated that he was personally aware that anchor bolts were moved and that craft personnel had replaced the torque seal. The RRI interviewed four B&R QC Inspectors, none of whom had any first-hand knowledge of craft personnel using torque seal. The RRI also interviewed five B&R welders who installed Hilti anchor bolts. All five stated that the QC inspectors did a good job of inspecting Hilti bolt installations. These welders also stated that they knew of no instance of craft personnel using torque seal without the proper authorization. In addition, the TRT interviewed craft and QC inspectors concerning the use of torque seal. All of those interviewed knew that torque seal was to be applied only when authorized by the QC inspector after the bolt was been correctly torqued. None had any knowledge of the improper use of torque seal.

   Application of the torque seal, which occurs after the torquing operation, did not constitute verification that the Hilti bolt had been torqued. As discussed in the General Anchor Bolt Review, the completed IR provided this verification. The purpose of torque seal was as a visual check to help determine if a bolt has been torqued.

   The TRT observed that "torque seal" could be bought at various supply houses that sell Hilti bolts to contractors. If craft personnel could get torque seal off site, they could have used it without authorization; however, no evidence of the improper use of torque seal was found by the TRT.

b. The TRT reviewed the Region IV report (IR-81-12) regarding the allegation that QC inspectors failed to properly ensure that Hilti bolts were correctly installed and torqued prior to documentation of satisfactory installation. In addition, the TRT interviewed construction personnel involved in the anchor bolt installation process. Based on both TRT interviews and Region IV interviews, it appeared that the QC inspectors adequately inspected and documented the installation of Hilti anchor bolts. The TRT reviewed the installation documentation for anchor bolts as described in the general review of anchor bolt installations. The documentation was found to be complete and easy to retrieve.

5. Conclusion and Staff Positions: Based on the review of the site procedures and their implementation, the TRT concludes that there were correct and adequate procedures to assure proper installation and inspection of Hilti anchor bolts.

AB-4

Refer to Mechanical and Piping Category 49.

AB-5a and AB-5b, AB-6, AB-7a, AQH-19, AB-8, AB-14, AQB-1, AB-9

These allegations were vague and cannot be substantiated; however, based on a review of the anchor bolt installation procedures, the TRT concludes that these procedures were adequate to ensure that proper installation of Hilti anchor bolts was achieved. Accordingly, these allegations have no safety significance.

AB-5c

This allegation has no technical merit and, therefore, has no safety significance.

AB-10

The allegation that Hilti bolts were modified improperly and without authorization was substantiated. The problem was previously identified by TUEC and resulted in the issuance of a 10 CFR 50.55(e). After reviewing the applicable documentation, the TRT concludes that appropriate corrective actions were taken.

AQB-2a and b

The TRT concludes that this allegation cannot be substantiated or refuted. The TRT concludes from the general review of anchor bolt installation that QC inspections of anchor bolt torquing were performed correctly and resulted in safe installation. Accordingly, this allegation has no safety significance.

6. Actions Required: None.

<u>Reference Documents</u>:

1. Gibbs & Hill Specification 2323-SS-30 "Structural Embedments."
2. Brown & Root Procedure CEI-20 "Installation of 'Hilti' Drilled-In Bolts."
3. B&R Instruction 35-1195-IEI-13, "Calibration of Micrometer Torque Wrenches."
4. TUGCO Procedure CP-QP-11.2, "Surveillance and Inspection of Concrete Anchor Bolt Installations."
5. TUGCO Instructions "Concrete Anchor Bolt Installation."
6. TUGCO Instructions "Torquing of Concrete Anchor Bolts."
7. TUGCO Instructions "Inspections of 'Hilti' Super Kwik Bolts."
8. FFTF Report "Drilled-In Expansion Bolts Under Static and Alternating Load," Bechtel Power Corporation Report BR-5853-C-4, January 1975.
9. "Static and Dynamic Loading of 5/8-inch Concrete Anchors," (unpublished) report No. 7745.10-72, August 10, 1972, Pacific Gas and Electric Company, Department of Engineering Research.
10. NUREG/CR-2999, "Final Report USNRC Anchor Bolt Study Data Survey and Dynamic Testing" prepared by M. R. Lindquist of Hanford Engineering Development Laboratory.

1. Allegation Category: Mechanical and Piping 18, Equipment and Pipe Whip Restraint Bolt and Nut Problems.

2. Allegation Number: AB-12, AQB-3, AB-7b and SRT-9

3. Characterization: It is alleged that:

AB-12

Some bolts holding the upper steam generator (SG) lateral supports to the wall plates were cut off and were incapable of securing the SG lateral supports to the embedment plates in accordance with design requirements.

AQB-3

Bolts were cut because there was concrete in the hole and the bolts would not fit, and the heat numbers were cut off these bolts.

AB-76

The component cooling water (CCW) surge tank anchor bolts were out of alignment with the holes in the baseplate, and the anchor bolts were bent to fit the holes.

SRT-9

There was confusion as to where to use jam nuts during installation of pipe whip restraints. (The NRC Region II Special Review Team [SRT] raised this concern.)

4. Assessment of Safety Significance: The NRC Technical Review Team (TRT) assessment of these allegations is discussed below.

AB-12 and AQB-3

Texas Utilities Electric Company (TUEC) purchased 144 bolts which were 9 inches long ($1\frac{1}{2}$ inches longer than the required $7\frac{1}{2}$ inches necessary to meet the installation requirements for the SG supports). Work package MRB-550-013-RB, Rev. 0, shows that these bolts were then cut to $7\frac{1}{2}$ inches. While sawing off the end of the bolt, some stencilled identification may have been removed, as alleged. The TRT verified through field inspections that the permanent markings were on the bolt head and that traceability was maintained.

TUEC was unable to provide an inspection record or traveler package documenting the installation of the bolts for TRT review. This package would normally contain evidence of bolt length and bolt heat numbers. The absence of the inspection record raises a potential safety and QA/QC concern, since the four support beams require a total of 144 bolts, and these beams are designed to restrain the SG during a seismic or pipe rupture event. After the TRT raised this concern, NCR M84-100384 was promptly written to determine the actual, installed length of these anchor bolts.

The TRT reviewed Region IV (RIV) inspection report (IR) 84-12 (p. 12, item 5), which addresses the bolt cutting allegations. The IR noted that the anchor bolt cutting was authorized by work package MRB-550-013-RB, Rev. 0; therefore, the allegation was substantiated, but had no technical merit. The RIV investigation was in response to allegation AB-12 which states only that the bolts were cut. The report did not address (nor was it intended to address) allegation AQB-3, which states the bolts were cut because there was concrete in the hole. AQB-3 was the allegation which led to the TRT to review the installation records for bolt length and heat numbers.

AB-76

The TRT met with the alleger on March 5, 1985 and the information received from the alleger is still under review at this time. The results of this review will be reported in a future SSER.

SRT-9

To determine if the jam nuts were properly placed during installation of the pipe whip restraints, the TRT reviewed five Gibbs & Hill (G&H) drawings for pipe whip restraints (2323-S1-0581, 0581-01, 0584, 0585, 0585-01) and the unincorporated design changes against these drawings. These whip restraints are located in SG compartments No. 4 and No. 1 at the top of the steam generators, and are intended to restrain the main steam (MS) line in the unlikely event of a complete rupture of the MS line at the SG outlet. The TRT also reviewed the documentation packages for pipe whip restraints M-22 and M-25, including the weld travelers, QC inspection of structural steel bolting, QC inspection of welding, and as-built drawings. In addition, the TRT reviewed, in detail, the requirements of design change authorization (DCA) 14813, R2, which states that nuts shall be hand tight and that bolt threads shall be spoiled or a jam nut shall be installed to prevent the nuts from inadvertently loosening and falling off. In interviews with QC inspectors, the SRT learned that the QC inspectors considered this DCA to be very confusing, and there was no agreement as to its actual intent.

During a field review, the TRT observed similar pipe whip restraints and saw no jam nuts. The TRT also closely observed the bolts for M-22, M-25, and M-41 and determined there was no evidence of upset threads. However, these whip restraints receive a epoxy topcoat which could very well cover up any evidence of threads being upset. The TRT interviewed the iron worker who had signed off the construction portion on the weld traveler (CD80-031-3401) for these bolts. He stated that the threads were upset by using a center punch to strike the threads near the nut. He said that he recalled upsetting these threads and pointed out the bolts that were in question. The iron worker also stated that since the upset threads were close to the nut bevel, he could understand why the TRT could not see the upsetting; however, he was certain that he had upset the threads. The traveler also contained the proper QA/QC sign off for thread upsetting.

The B&R QC inspectors produced a generic DCA (18853) from G&H which stated that epoxy coatings could be considered to provide protection against the

nut vibrating loose (i.e. the same function as double nutting or thread upsetting). The TRT reviewed this DCA and agreed that epoxy coatings have the potential to provide the required protection to prevent accidental loosening of the connection. The requirements for paint used as a locking device are discussed in QA/QC Category 8.

5. Conclusion and Staff Positions: The TRT's conclusions regarding allegations AB-12, AQB-3, AB-7b and SR7-9 are discussed below.

AB-12 and AQB-3

The TRT concludes that the portion of the allegation dealing with loss of traceability was not substantiated. This portion, therefore, has no safety significance.

The TRT concludes that the absence of installation inspection records creates a potential safety and QA/QC concern, since these beams are required for restraint of the SG during a seismic and pipe rupture event. TUEC is performing a study to determine the actual installed bolt thread engagement. Until this study is complete, this will remain an open item.

SRT-9

The TRT review confirms the SRT observation that there was confusion concerning the double nutting/thread upsetting requirements for pipe whip restraints. However, documentation shows that upsetting was performed and inspected. The TRT could not see any upset threads during field inspection; however, from the documentation and from talking to the actual installer, the TRT concludes that the threads were upset. The installed bolts also received an epoxy topcoat which has the potential to ensure that these nuts do not vibrate loose. (See QA/QC Category 8, Allegation AQ-503 for paint requirements.)

The TRT concludes that this allegation has no safety significance.

6. Actions Required:

AB-12 and AQB-3

TUEC shall, if possible, find the original QA/QC inspection and installation records for the restraint in question. If the records are not retrieved, TUEC shall prov de evidence such as ultrasonic measurement results, to verify acceptable bolt length. Should unauthorized bolt cutting be verified, TUEC shall:

(1) replace shortened bolts with bolts of proper length, or provide analysis to justify the adequacy of shortened bolts as installed, and
(2) provide justification or propose measures to ensure that no similar concern exists for bolting.

Reference Documents:

1. G&H Drawings 2323-51-0550, Rev. 4; -0551, Rev. 5; and -0519 Rev. 4.
2. AFCO Steel Drawing 77-667-303, Rev. 2.
3. MRB-0550-013-RB, Rev. 0.
4. G&H Drawing 2323-S-0762, Rev. 2.
5. TUGCO Drawing N-2640-359, Rev. 1.
6. DCA 1967, Rev. 1; 3220, Rev. 0; 5290, Rev. 1; 8656, Rev. 1; 9909, Rev. 1; and 11648, Rev. 10.
7. TUGCO letter CP-0065, dated March 2, 1979.
8. APCO letter 2640-422, dated March 28, 1979.
   APCO letter 2640-435, dated May 30, 1979.
9. TUEC QI-OP-11.14-1 "Inspection of Site Fabrication and Installation of Structural and Miscellaneous Steel."
10. Gibbs & Hill Specification 2323-SS-16B "Structural Steel (Category 1)."
11. Installation travelers CD-80-031-3401 and CD-80-048-3401.

1. Allegation Cagetory: Mechanical and Piping 19, Undersized Welds and Loose Nuts

2. Allegation Number: AW-68 and SRT-8

3. Characterization: It is alleged that the supports on tanks for the vertical residual heat exchangers (VRHE) have undersized welds (AW-68) and that the support bolts for the VRHE nuts were loose (SRT-8).

4. Assessment of Safety Significance:

AW-68

The NRC Technical Review Team (TRT) discussed this allegation with the Texas Utilities Electric Company (TUEC) Supervisor of Mechanical Engineering to see if he was aware of this problem. The TUEC supervisor said that the allegation must have come from repair work done on the VRHE.

During Brown & Root's (B&R's) ASME-Code-required preservice surface examination of the residual heat exchanger, various weld indications were discovered. Nonconformance report (NCR) M-9918, R-1, describes these weld defects in detail. The examination documented by this NCR identified welds containing defects, but no welds were reported to be undersized. The disposition of this NCR required repair work to be performed and provided the methods to be used for the repair process and the requirements for final examination of the repairs. The TRT found that the documentation for this repair work was complete. The TRT measured all of the accessible welds and found that they met the size requirements shown on the design drawing.

SRT-8

The TRT reviewed the NRC Region II report "Comanche Peak Special Review Team Report" for references to VRHE bolting. The report stated that a few nuts were very loose and that there were many exposed threads between the nuts and the surfaces against which they would be tightened. The report also noted that the threads between the loose nuts and tighting surfaces had been painted. The Region II report pointed out that the support bolting and welding records were not readily retrievable.

The TRT reviewed the records for these supports and found that the records for the support bolts lacked proper documentation (i.e., traceability). The TRT also learned that the lack of proper documentation for these support bolts was discovered during the N-5 preparation and was reported on NCRs M-14243 and M-14244. These NCRs have not yet been closed out, since they required B&R to order new bolts to ensure proper documentation of the installation. The NCRs will be closed out upon the installation and proper documentation of the new bolts. The TRT reviewed the documentation and installation for the containment spray heat exchanger (a similar installation in the same area), found the bolt material records, and observed that the bolts were not loose.

5. Conclusion and Staff Positions:

AW-68

Based on its review of supporting records and on inspections of the installed welds, the TRT concludes that the allegation that the welds were undersized cannot be substantiated. The TRT did confirm that weld indications were identified; however, the TRT also found that they were corrected as part of the normal plant inspection process. Based upon the size of the defects, the location of defects, the number of defects, and the type of loading (primarily shear), the TRT concludes that the weld defects that were found would not have had an impact on the safety or functioning of the VRHE had they gone undetected. Accordingly, this allegation does not have safety significance.

This allegation was made anonymously; therefore, it was not possible for the TRT to provide the alleger with the results of its assessments.

SRT-8

Based on a review of applicable NCRs, the TRT concurs with the Region II assessment that the material traceability records for the bolts were not contained in the installation file; however, the QA System did, in fact, pick up this deficiency. Since this NCR is still open, it must be closed-out before the plant goes into operation. The TRT concludes that TUEC has correctly addressed this problem and that, upon closing this NCR, there will be no safety significance . The TRT found that the alleged loose bolts were tightened. The TRT also found that the installation and material records for a similar heat exchanger were readily retrievable and were complete.

6. Actions Required: None.

Reference Documents:

1. NCR No. M-9918, R1.
2. Westinghouse Drawing No. 5774 Rev. 5.
3. Westinghouse Drawing No. 5773 Rev. 3.
4. Gibbs & Hill Drawing No. 2323-SI-0654.
5. NCRs M-14243 and M-14244.

1. Allegation Group: Mechanical and Piping 20, Revised NCR and Lost Component Modification Card

2. Allegation Number: AQP-2 and AQP-1

3. Characterization: It is alleged that (1) the component modification card (CMC) related to a piece of pipe was deliberately lost so that unauthorized work could not be traced (AQP-2); and (2) a pipe piece number (38/48) was changed and a nonconformance report (NCR) was revised to allow the use of nonconforming material (AQP-1).

   The pipe and the NCR referred to in these allegations were also assessed in Mechanical and Piping Category 13, where it was alleged that a 1/2-inch out-of-round pipe was buttered (weld build-up) extensively to achieve proper wall thickness (AP-15), and that the 1/2 inch out of round pipe was made round by localized heating and jacking operations contrary to procedures (AP-16).

4. Assessment of Safety Significance: The NRC Technical Review Team (TRT) found that these allegations pertained to a spool piece (a length of pipe) identified on Brown & Root (B&R) isometric drawing (ISO) BRP-CT-1-SB-014 as one required for installation in the 10-inch CT-1-012-301R2 line in containment spray pump room 51 at the 778-foot elevation. The TRT also found that B&R nonconformance reports (NCR) M-4015S, Rev. 0 through Rev. 5 and M-4942S contained additional details of the allegation. The TRT reviewed BRP-CT-1-SB-014, Rev. 0 through Rev. 20 (the current revision), to determine if applicable CMCs were identified on and incorporated into the revised ISO. The TRT then tracked the ISO revisions to establish that CMC 80104 was the alleged "lost CMC."

   AQP-2

   The TRT was unable to obtain a copy of CMC 80104 Revisions 1, 2, and 4 from B&R Document Control Center (DCC); however, the TRT obtained copies of the missing revisions from the B&R welding engineering file. The complete CMC consists of Rev. 1 through Rev. 5. The TRT found that CMC 80104R5 was incorporated into the ISO by Rev. 8 on November 29, 1982. Rev. 20 of the ISO, dated July 20, 1984, contained a note which stated: "Piece (PC) #48 was originally documented as PC #38, Ref. CMC 80104R4." The TRT accompanied an NRC RIV representative in an interview with Texas Utilities Generating Company (TUGCO) mechanical engineering to obtain an explanation for TUGCO's reason for changing the piece number from 38 to 48. The TUGCO representative was not able to explain the reason for the change.

   Because the allegation (AQP-2) pertains to a lost CMC, the TRT's inability to obtain the complete CMC (80104, Rev. 0 through Rev. 5) from DCC prompted further discussion between the TRT and a DCC area supervisor. When asked by the TRT if there were any CMCs that were not available in the DCC record file, the supervisor replied that some CMCs were missing from the file, but that Section 3.2.2 of Procedure DCP-3, "CPSES Document Control Program," requires the DCC to account for controlled documents (including CMCs) by periodic monitoring and initiation of actions to retrieve missing documents.

The TRT saw evidence of the monitoring activity in the form of a B&R Message and Reply form longhand memorandum (dated July 19, 1984) which tracked the retrieval of 17 CMC revisions which were missing from the DCC file.

The TRT found that although copies of revisions 1, 2, and 4 of the CMC were not available in the DCC files, copies of those revisions were available and retrievable from other locations on site (e g., weld engineering). N-5 walkdown inspections performed by B&R verify the as-built acceptance of a piping subsystem or system prior to turnover to TUGCO nuclear engineering (TNE). Further, the piping drawing (ISO BRP-CT-1-5B-014) included the details of CMC 80104 prior to the N-5 walkdown inspection. For these reasons, the TRT found that the CMC was not lost as alleged, and that the allegation is not substantiated.

AQP-1

The TRT reviewed B&R NCR M-4015S, Rev. 0, dated September 3, 1982, and found that the reported nonconformance identified four spool pieces (pipe cut to prescribed length) and two remaining pieces of bulk pipe of indeterminate length, as being 1/2-inch out of round. The NCR also noted that hold tags (to prevent use prior to approved disposition) were applied to the pipe. The piece number 38/48 referred to in the allegation is one of the four spool pieces described above and is also the same piece identified in the TRT assessment of allegation AQP-2.

NCR M-4015S, Rev. 1, dated October 15, 1982, provided an approved disposition: "Transfer pipe of the above heat number (F11744) to the steel fab shop for use in the fabrication of linear component supports." NCR Revision 2, dated December 19, 1982, reported that the four spool pieces were not installed in the piping system. Contrary to the NCR Rev. 2, the TRT found that B&R weld data cards (WDC) 688147 and 688148 documented the installation of piece number 38 (in the CT piping system) and that final visual inspection of the installation welds (FW11-4A and FW13-4A) was performed on September 14, 1982. B&R nondestructive examination (NDE) radiographic reports RT 28394 and RT 28403 indicate the acceptance of FW11-4A, and RT 28393 reports the acceptance of FW13-4A. Both of these welds were accepted on September 14, 1982. The WDCs record the QC inspection for acceptable fit-up and a margin notation on WDC 688148 stated "no cold spring-fit OK." The acceptability of "fit up" is assessed in Mechanical and Piping Category 13.

The TRT also found that the subsequent NCR, Rev. 3, dated January 3, 1983; Rev. 4, dated January 20, 1983; and Rev. 5, dated February 2, 1983, provided: (1) changes and clarifications of the reported nonconformance, and (2) clarification and revision of the disposition. These NCR revisions continued to state that hold tags (to prevent use) were applied and that the pipe was not installed, not withstanding the evidence (WDC and RT) that one of the four nonconforming pieces was installed and there was potential that the other three pieces could also be installed. The TRT considers that the failure to control the use of nonconforming material (piece 38) is a violation of B&R procedure CP QAP 16.1, "Control of Nonconforming Items."

NCR M4942S, January 2, 1983, reported the installation of nonconforming piece 38 and the change in piece number from 38 to 48 per CMC 80104. The disposition stated: "use 'as is' based on acceptable fit up inspection results." (This disposition was further clarified by a statement added on February 2, 1983, stating, "This is not a nonforming condition. See NCR M4015S R5.") The TRT noted that this NCR M4942S disposition was improper because the reported piece (38) was still on hold per NRC M40155, Rev 3.

Manufacturing record sheet (MRS) 688143 recorded the inspection of the transfer of the heat number marking for piece 38 on September 3, 1982. A correction markup in April 1983 changed the piece number from 38 to 48. An entry in the margin references NCR 4942S. The TRT was unable to obtain an explanation of the reason for the change of the piece number. (See the assessment of AQP-2, above.)

Based on a review of the documents previously identified, and a walkdown inspection of the piping system, the TRT verified that piece 38 was installed. It was evident that at the time of installation a nonconforming item (material) was used. By visual inspection of the installed piece, the TRT determined that the piece is still marked "38," although the MRS, ISO, and CMC identify the piece as "48." B&R Procedure CP-CPM-6.9E, Section 3.15, requires that the piece number on the pipe be marked. Since piece number 48 is not marked on the pipe, and since both final inspection and acceptance are documented, a violation of procedure has occurred.

5. <u>Conclusion and Staff Positions</u>: The TRT review determined that the alleged "lost CMC" was incorporated in the as built drawing. Therefore, the TRT concludes that allegation AQP-2 is not substantiated.

Based on its review and assessment of the NCRs, the TRT substantiated allegation AQP-1. The fit up inspection of piece 38 was recorded as acceptable, and the weld acceptance and material traceability were documented in the QA records. The technical aspects of the use of the nonconforming pipe are assessed in Mechanical and Piping Category 13, allegations AQP-15 and AQP-16. The potential safety significance is reported in that assessment.

The TRT also concludes that there is a generic implication (AQP-2) because a nonconforming item (piece No 38/48) was installed and no information is available covering the disposition of three other nonconforming spool pieces: CT-1-SB-017 ITT2 piece number 23, CT-1-SB-013 ITT1, piece number 33, and CT-1-SB-004 ITT1, piece number 41, which were identified on NCR M-4015S. These nonconforming pieces also may have been installed while in the NCR hold status.

In a meeting with the alleger on December 10, 1984, the TRT presented the results of the assessment of the allegations and the TRT's conclusions. The alleger had no major items of disagreement and identified no new concerns or allegations.

6. <u>Actions Required</u>: None.

Reference Documents:

1. Brown & Root procedure CP-CPM 6.9D, Appendix D, "Welding and Related Processes."
2. Brown & Root procedure WEI-4.6, "Instruction for Control of Welding Engineering CMCs."
3. Brown & Root procedure CP-CPM 6.9E, "Pipe Fabrication and Installation."
4. Brown & Root DCP-3, "CPSES Document Control Program."
5. Gibbs & Hill drawing 2323-51-0550, "Reactor Building Structure Equipment and Foundations."
6. Gibbs & Hill drawing 2323-51-0544, "Reactor Building Internal Structure S.G. Component Details and Reinforcement."
7. AFCO Steel drawing 35-1195-303, Rev 2.
8. Brown & Root Rework drawing MRB-0550-013.
9. Isometric drawing BRT-CT-1-513-014 Rev 20.
10. Nonconformance report M4015S, Rev. 0 through Rev. 5 and NCR 4942S.
11. TUEC letter TXX-4187, dated June 1, 1984.
12. Component modification card 80104, Revisions 1 through 5.
13. B&R manufacturing record sheet 688143.
14. B&R weld data cards 688147 and 688148.
15. B&R NDE radiographic reports RT Nos. 28393, 28394 and 28403.
16. TUEC Procedure CP-EP-4.6, "Field Design Change Control."
17. Mechanical and Piping Category 13, AQP-15 and AQP-16.

1. Allegation Category: Mechanical and Piping 21, NCR Activities on Pipe and Hangers

2. Allegation Number: AQH-2 and AQH-17

3. Characterization: It is alleged that:

AQH-2

An alleger was instructed to "buy off" on a hanger (TWX-039-714-A35R) or the supervisor would find someone who would. The alleger refused and believed the hanger was accepted by another inspector. An NCR was written against the hanger, but was voided.

AQH-17

An NCR was initiated but never dispositioned.

4. Assessment of Safety Significance:

AQH-2

The NRC Technical Review Team (TRT) reviewed inspection report (IR-MH5-2408) pertaining to hanger TWX-039-714-A35R to determine who had signed-off on the package, and found evidence that the alleger signed-off on the package on April 8, 1981, and not "someone else" as the alleger stated.

The TRT reviewed the NCR logbook from February 1, 1981, to June 30, 1981, and did not find the alleger's name entered as having an NCR number assigned for the hanger in question. The TRT noticed that an NCR number was assigned to the alleger for a different hanger and for a different deficiency on May 16, 1981.

AQH-17

The TRT reviewed NCR M-4989S, which was alleged to have been initiated but not dispositioned, and found that the nonconforming condition had been reported on January 14, 1983. The NCR indicated that "during assembly of the valve flange, one stud was cross-threaded into the valve threads; while attempting to remove stud, the stud was broken off." The disposition of the NCR was to rework as follows: "Stud to be removed by drilling and threads to be chased. QC to attach inspection report." A B&R inspection report dated March 25, 1983, to close out NCR M-4989S, indicated that the last six threads of the stud hole were damaged and the hole was elongated. NCR 4989S R-1 was then written on May 19, 1983, and required the following corrective actions:

(1) remove stud and chase the threads.
(2) QC to inspect the threads.
(3) Mechanical Engineer to measure and evaluate elongation of bolt hole.

The TRT conducted a review to determine if the corrective action as described had been addressed. Traveler MEV 83-0232-4600 indicated that on July 18, 1983, the stud was removed and the threads were chased, and that QC inspected the threads and discovered that the last three threads were stripped. Also, on that date, Mechanical Engineering inspected the threads for damage and elongation and accepted that the last three threads had been stripped away, since no note to the contrary appeared in the traveler, as stipulated in the traveler. The traveler was signed by the appropriate personnel on July 27, 1983, and the NCR was closed out on August 11, 1983.

5. Conclusion and Staff Positions:

AQH-2

The TRT review of the hanger IR showed that the alleger signed-off on the package as being acceptable. Also, a search of the non-ASME NCR log showed that the alleger was not assigned an NCR number for the hanger in question. The TRT determined during a field inspection that the hanger had not been modified since the inspection by the alleger. Also, the documents reviewed indicate that the alleger had declared the hanger as satisfactory both in the inspection report and the alleger's log book. Accordingly, the TRT cannot substantiate the allegation and concludes the allegation does not have safety significance.

The TRT interviewed the alleger on January 9-10, 1985, who indicated that to the best of her recollection she had noted in her log book that hanger TWX-039-714-A35R had been entered as unsatisfactory. She said that during the site visit on January 10, 1985, she would point out the hanger to the TRT. During the visit the TRT escorted the alleger to the vicinity of the hanger in question. After inspecting the area, the alleger indicated that since she could not recognize the hanger, it must have been replaced with an entirely new design. The TRT reviewed the hanger package (HP) and found that CMC 32798, Revision 2, dated March 2, 1981, described a design change "per field conditions." This change required the hanger to be removed and completely rebuilt. However, a review of the inspection report signed by the alleger indicates that the hanger was inspected to Revision 4 of CMC 32798 dated April 4, 1981, which is the latest revision to the CMC. This indicates that the hanger inspected by the alleger was the latest design, and had not been revised as the alleger thought. The TRT inspected the hanger in the field and verified that the current hanger design agreed with the latest revision of the CMC.

AQH-17

The TRT found that the NCR which allegedly was initiated, but was not dispositioned had, in fact, been dispositioned. The TRT also found that the rework of the part was completed and the NCR was closed.

Accordingly, the TRT concludes that these allegations do not have safety significance.

The TRT interviewed the alleger on November 27, 1984, and reported that NCR M-4989-S had been properly dispositioned. The alleger, after reviewing the NCR, requested more information concerning a potential conflict in the NCR. The alleger was referring to a second inspection report dated May 19, 1983, which makes reference to a conflict with the March 25, 1983, inspection report. The TRT determined that the conflict existed because the stripped threads and elongated hole had not been addressed by Engineering. The TRT review of traveler MEV-83-0232-4600 indicated that the engineering evaluation was accomplished on July 18, 1983.

6. Actions Required: None.

Reference Documents:

1. IR-MH5-2408.
2. Hanger Sketch TWX-039-714-A35R
3. NCR M-4989, Revision 0 and Revision 1.
4. Traveler MEV-83-0232-4600
5. Alleger interview dated November 27, 1984.

1. Allegation Catetory: Mechanical and Piping 22, Design Change Control of Whip Restraint

2. Allegation Number: AQP-3

3. Characterization: It is alleged that modifications were made during 1982 and 1983 on "Westinghouse whip restraints for the main steam generator" by a Texas Utilities Generating Company (TUGCO) representative without Westinghouse design and engineering approval since "there was no blueprint documenting Westinghouse approval of the modifications."

4. Assessment of Safety Significance: The NRC Technical Review Team (TRT) reviewed the modification work which had been performed on the whip restraints near the main steam generator during the period that the events relating to the allegation allegedly occurred.

   The TRT determined that two large safety injection pipe whip restraints (shown on drawings 1457F30 and 1554E32), which had been furnished by Westinghouse (W) were being installed during 1981-1982. Modification work was later done on the restraints to provide clearance for other equipment. The TRT found that Texas Utilities Electric Company (TUEC) engineering personnel had received approval for the proposed changes to the restraints by W letters WPT-4406 and WPT-4408 dated October 8, 1981. Traveler ME-81-2153-5500 was issued on November 24, 1981, to cover the safety injection line vertical restraints. This traveler documentation was controlled by B&R procedure CP-CPM-6.3. The procedure states in paragraph 3.1.1 that the discipline engineers or construction personnel initiating the traveler shall obtain W approval if the traveler involves NSSS equipment. Traveler ME-81-2153-5500 was submitted to the W representative on November 24, 1981, and was approved by him on July 20, 1982, as indicated by his initials at the bottom of the last page of the traveler.

   Attached to the traveler are sketch #1, sheet 1 and 2 (undated) and sketch 2 (undated), which show the modification work that was performed on the restraints. Sketch #2 shows an initialed W approval dated July 20, 1982.

   On the basis of the W letters and the W representative's initialing of the traveler for the modifications, the TRT determined that W approval had been given for the modifications.

5. Conclusion and Staff Position: Based on a review of the applicable documents, the TRT concludes that a system was in effect that provided for Westinghouse approval of site modifications of W-furnished equipment and that the modifications to the SI whip restraints were properly approved by W. Accordingly, this allegation has no safety significance.

   In a meeting with the alleger on December 18, 1984, the TRT presented the results of its assessment and its conclusions. The alleger accepted the TRT conclusions. No new concerns or allegations were identified.

6. Action Required: None.

Reference Documents:

1. Drawing 1554E32, Revision 2.
2. B&R Procedure, CP-CPM-6.3.
3. TUEC Letter CPPA-12,720 dated September 24, 1984.
4. TUEC Letter CPPA-12,719 dated September 24, 1981.
5. Westinghouse Letter WPT-4408 dated October 8, 1981.
6. Westinghouse Letter WPT-4406 dated October 8, 1981.
7. NRC OI Report 4-84-006 dated March 7, 1984.
8. Drawing 1457F30.

1. <u>Allegation Category</u>: Mechanical and Piping 23, Missing Documentation on Oxygen Analyzer.

2. <u>Allegation Number</u>: AQW-78

3. <u>Characterization</u>: It is alleged that the Brown & Root (B&R) calibration laboratory destroyed oxygen analyzer issue record cards. The alleger also stated that, as a result, several B&R quality control inspectors (QCI), who were unable to make late entries of analyzer numbers to weld data cards (WDC), completed the documents by entering false analyzer numbers.

4. <u>Assessment of Safety Significance</u>: Prior to welding a stainless steel pipe seam, the volume of the pipe is purged with argon gas to lower the oxygen content. An amount of oxygen over 2 percent could affect the integrity of the weld; therefore, an oxygen analyzer is used to measure the amount of oxygen present during the purge. The analyzer is considered to be a piece of measuring and test equipment (M&TE) and its use and calibration control are covered by several procedures.

   A history of all calibration for each M&TE is kept on a calibration report. The TRT learned that when the analyzer was placed in service it was assigned a unique number. This number was used to track use and calibration of the monitor. An issue record card (IRC) is also prepared by the calibration laboratory at the time of issuance of each M&TE item. This card includes the following information, as required by B&R procedure CPM-13.1, paragraph 3.4.5:

      1. M&TE identification number.
      2. Date of issue.
      3. Item on which the M&TE was used.

   Upon completion of the work, the item is returned to the laboratory and the IRC information is completed.

   The alleger claims that the IRCs for oxygen analyzers used prior to January 1984 were improperly destroyed. The TRT reviewed the method used by B&R to maintain analyzer calibration documentation. The B&R calibration laboratory supervisor told the TRT that the oxygen analyzers were calibrated every 6 months. During the 6-month period, all IRCs were maintained on file. The cards provided a source of information to determine where a particular analyzer had been used since the previous calibration. Such data were needed in case the analyzer failed calibration and a recheck of the weld seams was required. When the analyzer passed recertification, the IRCs were no longer needed and could be destroyed. B&R procedure CPM-13.1, paragraph 3.4.6, which states: "Completed tool data issue/record cards will be maintained until the next calibration date" is consistent with the record retention requirement of ANSI N45.2.11 which is referenced in the TUEC Final Safety Analysis Report (FSAR) Table 17.2-2.

   The B&R calibration laboratory supervisor made a personal decision, however, to retain all analyzer IRCs after the recalibration dates. However, storage space was becoming a problem and when, on June 22, 1983, the TUEC site QA supervisor verified in TUEC memorandum TUG-1713 that the IRCs need

not be kept past recalibration, the laboratory disposed of all IRCs related to analyzers which had been successfully recalibrated to date. The laboratory began destroying IRCs for analyzers as each was successfully recalibrated after June 22, 1983.

The TRT found that the TUEC site QA supervisor reversed himself in office memorandum TUG-1916, dated January 17, 1984, and requested that the IRC for the analyzers be maintained after recalibration.

While the sequence of events described above is consistent with the statements made by the alleger regarding the IRC records, the TRT determined that the destruction of the IRC was in accordance with the requirements of B&R Procedure CPM-13.1 and ANSI N45.2.11. Moreover, there is no problem in TUEC deciding to maintain records beyond the requirements of its own procedures or of applicable regulatory documents.

The alleger stated that, because the IRC records were destroyed, quality control inspectors (QCI) may have falsified weld data cards (WDCS). The alleger believes there may have been times when the QCI failed to enter the required analyzer information on the WDC. Prior to the destruction of the issue record cards, the QCI could have obtained the missing information from the IRC file. After June 22, 1983, if the analyzer had been recalibrated, the IRC was no longer available. The TRT did not attempt to determine if falsification of records had occurred, but reviewed the analyzer calibration problem to determine if the falsification of weld data cards would have resulted in a potential safety concern.

B&R procedure QI-QAP-11-1-26, paragraph 3.6.7, states that the QCI shall enter the analyzer M&TE number and due date of calibration on the weld data card for the weld involved. The TRT found that the recalibration dates for the analyzers were spread over a 6-month period. The recalibration occurred immediately upon the analyzers arrival in the calibration laboratory on the anniversary date.

If the QCI had failed to note the analyzer data on the WDC originally, then had returned to the calibration log for information to complete the WDC and found the IRC had been destroyed, it would have indicated that the analyzer was found to be in calibration on the anniversary date. Thus, the QCI would have assumed that the analyzer was accurate. If the analyzer had been out of calibration on the anniversary date, all IRCs issued following the last successful calibration would have been assembled and attached to a deficient MT&B evaluation report, and a copy of the report would have been forwarded to quality engineering (QE) for evaluation. If the results of the evaluation showed that previous activities on which the analyzer had been used were unacceptable, QE would have prepared a nonconformance report in accordance with QA procedures. Since the IRCs for each analyzer list all the welds that were fabricated over the previous 6 months for a particular analyzer, there would be no loss of weld traceability.

5. Conclusions and Staff Position: The TRT concludes that the allegation stating that the IRCs were destroyed was correct. The destruction of the cards, however, was in accordance with the requirements of B&R procedure CPM-13.1.

The TRT also concludes that lack of oxygen analyzer information on the weld data card would not have resulted in loss of traceability of the weld if the oxygen analyzer was found to be out of calibration on the anniversary date. Accordingly this allegation has no safety significance.

In a meeting with the alleger on November 14, 1984, the TRT presented the results of the assessment of the allegation and the TRT conclusions. The alleger maintained that, since the TUEC site QA supervisor decided in 1984 to retain the IRC past the recalibration date, B&R Procedure CPM-13.1, Paragraph 3.1.3 should be revised to reflect the new IRC retention requirements. TRT concurs that, since the longer retention requirements were a directive from management, it is appropriate for the applicant to revise the procedure.

6. <u>Action Required</u>: None.

<u>Reference Documents</u>:

1. B&R interoffice memo, IM-19923, dated December 9, 1980.
2. B&R memorandum, 35-1195, dated April 26, 1983.
3. TUGCO office memorandum, TUQ-1713, dated June 22, 1983.
4. TUGCO office memorandum, TUQ 1916, dated January 17, 1984.
5. B&R Procedure CP-CPM-13.1.
6. ECOLYZER Advertising Literature, Model 600 Monitor.
7. B&R issue record card (typical).
8. ANSI N45.2.11 (11th printing).

1. Allegation Category: Mechanical and Piping 24, Improper Welding Practices

2. Allegation Numbers: AQW-1, AQW-12, AQW-26 and AW-70

3. Characterization: It is alleged that the following improper welding practices occurred:

AQW-1

a. "Welders were not properly trained."

b. "Quality Control inspectors did not have sufficient welding background to allow them to do weld inspections."

c. "The poorest quality of weld rods was used."

d. "Required welds were not accomplished on piping when they were at inaccessible locations."

e. "Some weld procedures require that a heliarc weld be made prior to capping with stick welds. It was frequently the practice to accomplish the entire weld using stick welds."

AQW-12

"Weld repair and inspection documentation was disorganized."

AQW-26

"Welds were wrongfully made to reinforcing rod."

AQW-70

"Welders were forced to work at a pace which required using a minimum number of weld rods per day."

4. Assessment of Safety Significance:

AQW-1a

The alleger stated that "welders were not properly trained."

Welder training occurs at the Brown & Root (B&R) Welder Qualification and Training Center. The NRC Technical Review Team (TRT) learned from the B&R Training Center supervisor that the purpose of the work done at the center was to assist welders in preparing to take the performance qualification tests (PQT). The results of the TRT evaluation of welder performance testing are addressed in Mechanical and Piping (M&P) Category 26.

AQW-1b

It is alleged that "quality inspectors did not have sufficient welding background to allow them to do weld inspections."

The subject of inspector qualifications is addressed in QA/QC Category 4.

AQW-1c

The alleger stated that he believes "the poorest quality of weld rods was used."

The TRT reviewed the documentation used by B&R to purchase and receive welding materials, and found that B&R procedure CP-CPM-6.9B "Weld Filler Material Control," Table 6.9B-1, lists the procurement standards index for weld filler materials. Each standard is prepared by a welding engineer and contains the specifications for a special type of welding material. The standard, along with a B&R Document, "Supplement QA Requirements," is attached to the B&R weld material purchase order and becomes a part of it. B&R procedures ACP-3 "Material Receiving, Storage, and Maintenance" and CP-QAP-8.1 "Receiving Inspection" provide instructions for the receipt, storage and handling of welding materials. B&R procedure CP-CM-6.9B "Weld Filler Material Control" covers the storage and issuance of weld filler material.

The TRT determined that a control program was in place which provided for the purchasing and receipt of welding material, thus assuring that the quality of the materials was as required.

The TRT also found that in a letter (R. G. Taylor to G. L. Madson, dated August 13, 1982) Region IV stated that "all rods examined during our inspections met the code requirements."

AQW-1d

It is alleged that "required welds were not accomplished on piping when they were at inaccessible locations."

The TRT reviewed B&R procedure QI-QAP-11.1-26 to determine if instructions were available to provide guidance in the identification and resolution of problems associated with welds in locations with limited access. Paragraph 3.6.9 of the procedure states that welds with less than 12 inches of clearance from the weld joint or physical restriction shall be evaluated at the time of fitup inspection by the QC inspector. If the welding engineer evaluates a weld as needing a special access performance test, the welder shall be qualified for limited access conditions or alternatively may be given a test simulating existing field conditions. Therefore, the TRT determined that adequate instructions to provide guidance in the welding of limited access welds existed.

AQW-1e*

The implication in this allegation leads the TRT to characterize the allegation to mean:

> For the welding of components for which a weld procedure specification (WPS) qualified using a GTAW root pass and SMAW fill passes is specified, the weld must not be made using only the SMAW process.

GTAW is not one of the welding processes specifically identified for use by the American Welding Society's AWS-D1.1 Structural Welding Code. It is the TRT's opinion that the allegation would have to be related to welding accomplished in accordance with the American Society for Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, 1974 Edition, including Summer 1974 Addenda, or to the American National Standards Institute (ANSI) B31.1 Power Piping Code. Both of these codes require application of Section IX, Welding and Brazing Qualifications, of the ASME B&PV Code for WPS qualification and welder performance qualifications.

The TRT reviewed the requirements of Section IX for WPS qualification. Section IX, QW-201.3, states that more than one welding process may be used in a single production joint and that each welding process shall be qualified either separately or in combination with other processes. It also states that a welding process may be deleted from a production joint qualified by a combination of two processes, providing the remaining welding process is qualified for the deposited weld metal thickness range required to make the production joint. QW-201.3 does not state the WPS, qualified by a combination of two processes, must be amended to reflect deletion of one welding process when welding a production joint.

The TRT does not, therefore, consider the deletion of a GTAW root pass in a WPS which specifies a GTAW root pass and SMAW fill passes as a WPS violation provided the weld data card (WDC) so directs. The TRT also notes that for such a WPS, the GTAW root pass acts as a backing (or support) for the first SMAW fill pass. Section IX stipulates for the SMAW process that the deletion of backing in single-welded butt joints is a nonessential variable for procedure qualification (one which does not affect the properties of a sound weld) and permits revision of the WPS to make such a change without requalification. The TRT notes that the omission of the GTAW root pass is of no technical consequence for weld joints which include backing; for fillet welds, which by their design have backing; for double welded joints in which the root pass is ground to sound metal before welding from the second side; or for partial penetration welds, which by design have an inherent crevice at the weld roots.

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*Heliarc" is a trade name and the technically correct term for the welding process is gas tungsten-arc welding (GTAW). "Stick Welds" is technical jargon and refers to the use of shielded metal-arc welding (SMAW).

This discussion has a two-fold purpose

> (1) how the definition of ASME BPV Code, Section IX requirements are relative to the allegation, and (2) how the scope of the allegation is relative to the making of full penetration, single-welded joints without backing using qualified WPSs.

The TRT reviewed 28 Brown & Root (B&R) WPSs which were current at Comanche Peak Steam Electric Station (CPSES) during September 1984. Five WPSs (11012, 33010, 55010, 88011, and 88012) were identified which specified a GTAW root pass and SMAW fill passes. The base metals qualified included plain carbon steels, some alloy steels, and austenitic stainless steels. The TRT's review therefore determined that WPSs qualified with the combination of welding processes identified by the allegation existed which covered a variety of base metals. Based on Section IX WPS qualification requirements, the gas tungsten-arc root pass for each of these WPSs could be replaced by an SMAW root pass without violating the WPS qualification, providing all other essential variables of the WPS were met. Three WPSs (11032, 11065, 55011) were identified which specified SMAW welding only and were qualified with a combination of GTAW root passes and SMAW fill passes. The TRT's review determined that these WPSs also were properly qualified.

Two WPSs (11034 and 88032) were identified which specified and were qualified with only SMAW. WPS 11034 was qualified for welding of Section IX, P-No. 1, plain carbon steels using a full penetration single-welded joint without backing. WPS 88032 was qualified for welding of Section IX, P-No. 8, austenitic stainless steels with backing for full penetration single-welded joints. The TRT's review determined that these WPSs also were properly qualified for SMAW welding of root passes in full penetration single-welded joints.

The allegation as quoted did not identify specific welds, or hardware components. The TRT, by analyzing the technical aspects of the allegation, reduced its scope with respect to safety significance to full penetration, single-welded joints welded using SMAW without backing.

Because of a lack of specific information, the TRT could neither substantiate nor refute the allegation. It did establish that several WPSs were current, at least in July 1984, covering several base metals, which permitted SMAW root passes without violating WPS qualification. The TRT also learned that from 1975 to the present, 30 welders passed the C13 (C3) standard qualification test which allows them to weld to the WPSs. In view of this fact, the TRT considers it unlikely that WPSs not properly qualified for the application would have been used.

AQW-12

It is alleged that weld repair documentation was disorganized. The alleger also stated that so many pipe weld repairs were being made on the same seam that the repair process sheets reflecting previous repair attempts were not being properly closed out. Since the alleger provided no information about where or when the incident occurred, the TRT reviewed the B&R procedures associated with weld repair documentation.

B&R procedure CP-CPM-6.9G "Documentation for ASME Welding, Fabrication and Installation Activities" provides instructions for the documentation of weld repairs. The procedure requires that "welds requiring recording which were projected after final inspection, all major repairs and all base metal repairs shall be documented on the weld process sheet (WPS)." The repairs are numbered sequentially on the WPS, thereby requiring that one repair be completed before another can be started.

The TRT reviewed a number of completed repair process sheets (RPSs) during the course of reviewing other allegations. The TRT found that the RPS program followed procedural requirements.

AQW-26

It is alleged that while a piece of equipment was being placed in position on a concrete floor, a tack weld was made between the equipment and a reinforcing rod to level the equipment rather than using shims to level it. The TRT found that Gibbs & Hill (G&H) Specification 2323-SS-10, revision 4 (March 2, 1979), Reinforcing Steel, covers reinforcing bar. G&H 2323-SS-10 permits arc welded joints at the base of the containment structure. The joints connect diagonal rectangular steel bars to reinforcing bars. The rectangular steel bars are specified as ASME SA-537 Class 2 or ASTM A572, Grade 60. The reinforcing bars are specified as ASTM A-615, Grade 60, which is a plain carbon steel having a specified maximum carbon content of 0.32% and a guaranteed minimum ultimate tensile strength of 60,000 psi. Weld joints are required to have a minimum tensile strength of 75,000 psi. Welding electrodes are specified as ASME SFA-5.1 or 5.5. To achieve the 75,000 psi minimum weld joint tensile strength, which the TRT notes is substantially higher than the base metal strength, low-alloy steel electrodes, such as E8018, would be required. Specification 2323-SS-10 relates preheat temperature required for welding to the reinforcing rod's carbon equivalent. This is a measure of material weldability arrived at by a formula which takes into account several elements in the material and is based on the material's actual chemical analysis. Arc welding is prohibited for reinforcing bar whose carbon equivalent is greater than 0.55. Specification 2323-SS-100 also states "No tack welding to reinforcing bar shall be permitted at any location except by written permission of the engineer." The TRT, therefore, established that welding of reinforcing bar was permitted but in a single specified area and with restrictions imposed by the chemical composition of the reinforcing rod. Tack welding required special permission.

The TRT also found B&R WPS 10031, revision 3, for shielded metal-arc welding (SMAW) of reinforcing bar made from ASTM A615 Grade 60 to steel bar made from ASTM A572 Grade 60.

During a meeting with the TRT on August 24, 1984, the alleger provided the name of a B&R millwright welder who was in the area at the time of the incident; the welder was part of a millwright crew installing equipment. The TRT discussed the incident with the welder and learned that he was unaware of any welding which had occurred on rebar. He also indicated that he had known of the prohibition of doing so for a long time. He said he felt confident that other welders in millwright and boilermaker crews

also knew not to weld to rebar. The welder stated that if his crew had to attach a temporary bar or angle to rebar, they would use an electrician's C-clamp available from a tool crib. The C clamp creates a mechanical bond between the temporary support and the rebar. As a result no welding would be needed for adequate support.

Because the alleger did not specifically identify the equipment or its location, and the welder identified by the alleger disavowed any knowledge of the incident, the TRT addressed the allegation by assuming the tack weld was made to the reinforcing bar and also assumed that the metallurgical effects of the tack weld on the reinforcing bar were equivalent to cutting through the bar, which is a grossly exaggerated assumption. The TRT has considered the effects of cutting rebar in Civil and Structural Category 15, Allegation AC-15. In its assessment of allegation AC-15, the TRT postulated that approximately 5000 unauthorized cuts through reinforcing bars could have been made. The TRT's evaluation of allegation AC-13 continued as follows:

> The TRT estimated that, depending upon the average length of rebar assumed, there are approximately 800,000 to 1,200,000 bars installed in all of the concrete structures. Thus, if 5000 bars were cut without authorization, they would represent approximately 0.6% of the total rebar in the plant. Even if all 5000 drill bits were used in an unauthorized manner, it still would only represent 3% of the total rebar in the plant. Thus the percentage of rebar that could have been cut without proper authorization is low. Since no information was supplied to the contrary, the TRT assumed that these unauthorized cuts, if they did occur, were scattered throughout the plant and not concentrated in one localized area. In addition, as noted earlier, a large number of rebar cuts are not necessarily synonymous with an identical number of rebar actually being cut. It is also noted that nuclear structures are very conservatively designed. In addition to the conservative loads, load combinations, and safety factors utilized in the design, it is the common practice of the design engineer to specify 5 to 10 percent more rebar than is actually required by his calculations. This occurs because it is difficult to obtain the exact area of reinforcement required using standard bar sizes and standard bar spacing. The area of reinforcement is selected from charts which show the area provided for each bar size at a given spacing. Rather than underdesigning, the designer selects an area of reinforcement from the charts which is higher than that which is actually required. In addition, because critical structures contain a large number of bars, they are not generally vulnerable to the random cutting of a small number of bars.

The TRT under allegation AC-13, considered the number of unauthorized reinforcing bar cuts alleged would have an inconsequential effect on the safety of the structure.

AQW-70

An alleger indicated that, while working as a rigger, he was present at a department safety meeting held in late 1981 along with approximately 35 other welders. The welders were told by B&R personnel to increase their welding speed by "burning" at least 200 weld rods per shift. The welders were also told that failure to meet this minimum criterion, which apparently was established by the performance of two of the lead welders in their group, would result in dismissal.

The alleger, who was a fitter at this time, observed other welders attempting to increase their welding speed, which resulted in greater heat being generated and, consequently, warping of the parts being joined. As a result, the welds were subsequently rejected by quality control (QC) inspectors. B&R personnel then told the welders to slow down the welding speed, which resulted in a reduction in the number of weld rejections.

Because the alleger recalled that the incident occurred during the period of mid-winter 1981, records of one of the two lead welders mentioned by the alleger were reviewed for the 2-week period from December 9 through December 17, 1981. The TRT learned that during that time work was done on a moment limiting component support (DWG MSB-0688-009). The structure was a Class 2 NF support, and the weld procedure used was WPS 12010.

The following summary of weld rod withdrawals by the welder shows the date, the time of withdrawal, and the number of rods used, as recorded on the weld filler material log for two weld data cards. The welder certification update for the days involved identified this support as the item being welded.

Date	Time	Number of Rods Used
12/5	2:15	37
12/7	7:19	48
12/9	7:18 & 4:12	95
12/10	7:16	66
12/11	7:41 & 10:15	124
12/16	9:06	2
12/17	7:14 & 1:52	49

WPS 12010 covers single and double V-groove welds and fillet welds for a thickness range of 5/8 inch to 4.0 inches. No travel speed of welding is listed.

The summary showed that the maximum amount of weld rod used on any one shift was 124. It is not possible to state that the timeframe chosen was approximately the period when the alleger claims the safety meeting occurred; however, the results could be considered typical of the work being performed at the time. The TRT determined that the rod consumption rate of the welder identified as the one whose performance set the production goal was well below the figure that the B&R personnel purportedly used as the goal to be reached.

Due to the vagueness of this allegation, the TRT is unable to substantiate or refute it. In an interview, the alleger indicated that inadequate welds were rejected by QC inspectors. When asked if he had knowledge of any incorrect welds which were not reported and corrected, he said "no."

5. Conclusions and Staff Position:

AQW-1a

The TRT's evaluation of this allegation is discussed in Mechanical and Piping Category 26.

AQW-1b

This allegation will be discussed in QA/QC Category 4

AQW-1c

The TRT concludes that a control program was in place to provide for the purchasing and receipt of welding material, thus assuring that the quality of the material was as required. Accordingly, the allegation has neither safety significance nor generic complications.

AQW-1d

The TRT concluded that there were adequate instructions to provide guidance in the welding of limited access welds. There was no safety significance to the allegation.

AQW-1e

The TRT could neither substantiate nor refute allegation AQW-1e because of the lack of information identifying a weld or a component. It did determine that several qualified WPSs were current, at least in July 1984, which permitted SMAW root passes without violating WPS qualification requirements. The TRT considers it unlikely that WPSs inappropriate to the application would have been used. On this basis, the TRT concludes the allegation has no safety significance.

A letter was sent by the TRT to the last known address of the AQW-1 alleger. No response has been received.

AQW-12

Based on the fact that procedures in place appear to be adequate to assure that the purchase and storage of weld rods meet Code requirements and that the Region IV inspections found the weld rod met code requirements, the TRT concludes that quality weld rods were being used at Comanche Peak. Accordingly, the allegation does not have safety significance.

The originator of Allegation AQW-12 has declined to have further meetings with the TRT.

AQW-26

The TRT could neither substantiate nor refute the allegation. However, based on the TRT's evaluation of allegation AC-13, the TRT considers the allegation to have no safety significance.

The TRT also found that no B&R procedure existed which reflected the requirement of G&H 2323-SS-10 prohibiting tack welds to reinforcing bar without engineering approval.

The TRT will transmit the results of the TRT study to the originator of allegation AQW-26 by mail.

AQW-70

The TRT can neither substantiate nor refute the allegation. Accordingly, this allegation has no safety significance.

A telephone interview with the alleger was held on November 8, 1984, at which time the TRT presented its findings regarding the production of one of the lead welders during a two-week period in December 1981. The alleger did not indicate any disagreement with the findings and provided no additional information in support of his allegation.

6. Actions Required: None.

Reference Documents:

1. NRC OI Report 84-006, dated March 9, 1984.
2. NRC OI Report IR Q4-82-005, dated August 2, 1982.
3. NRC Memorandum, G. C. Madsen from R. G. Taylor, dated June 13, 1982.
4. WE-030 and WE-031.
5. ANSI N45.2.
6. 10 CFR 50 Appendix B.
7. ASME Code Section III.
8. ANSI B31.1, "Power Piping Code."
9. B&R Repair Process Sheet.
10. B&R Procedure CP-CPM-6.96.
11. B&R Weld Data Card.
12. B&R Procedure 35-1195-CCP-18.
13. B&R Specification 223-SS-10.
14. B&R Procedure WPS 1212 BB103.
15. ISO DWG MSB-0688-009.
16. B&R Procedure WPS 12010.
17. Welder Certification, dated December 5, 1981 to December 17, 1981.
18. ASME B&PV Code, Section IX, Welding and Brazing Qualifications.
19. ANSI B31.1 Power Piping.
20. AWS-D1.1 Structural Welding Code.
21. B&R WRPs 11012 (Revision b), 33010 (Revision 2), 55010 (Revision 0), 88011 (Revision 5), and 88012 (Revision 5).

1. Allegation Category: Mechanical and Piping 25, Incorrect Welding Documentation

2. Allegation Number: AQW-25, AQW-72, AQW-29, and AQW-83

3. Characterization: It is alleged that:

   a. Undocumented weld repairs were made on a hanger that had been completed and accepted (AQW-29, AQW-83).

   b. An individual stated he had a radiograph film package for a weld which was not shown on the isometric drawing (AQW-72).

   c. A weld data card was lost (AQW-25).

4. Assessment of Safety Significance: The alleger stated that she saw repair welding being performed on a hanger that had previously been accepted by a QC inspector. Nonconformance report (NCR) 7912 was prepared on June 14, 1983, to report the nonconformance; however, the alleger does not feel that the NCR was dispositioned properly.

   The TRT found that NCR-7912 was one of a series of NCRs which resulted from repair welding on sway strut assembly CC-1-028-003-A33R. These NCRs and their dispositions are discussed below.

   NCR-M7122

   The final QC inspection of the strut assembly revealed that a weld between a vertical and a horizontal tubing assembly was 1/4-inch rather than 5/16-inch as specified on the drawing. NCR M7122 was issued on May 16, 1983, to cover the nonconformance, and a hold tag was placed on the assembly. After a review, the hanger engineering group found that the smaller-sized weld was acceptable and issued a disposition to the NCR that the weld could be used in the "as is" condition. The disposition also stated that the drawing was to be revised and reissued. This was done on June 25, 1983, which closed the NCR.

   NCR-M7912

   On June 9, 1983 (before the drawing was revised and the previous NCR had been closed), a Brown & Root (B&R) welding inspector checked the hanger and found the same undersized welds. The hold tag from NCR-M7122 was still applicable and, as a result, no repair work should have been done. However, repair process sheet (RPS) 705612 was prepared on June 10, 1983, and welding was performed to increase the undersized weld. This nonconforming action was recognized and NCR-M7912 was prepared on June 14, 1983. A second hold tag was placed on the assembly. NCR-M7912 was closed by the issuance of NCR-M7949 on June 20, 1983.

   NCR-M7949

   On June 20, 1983, a third NCR was prepared to cover the continuing nonconforming repair welding which had been done while a hold tag was in

place. The disposition of NCR-M7949 required a QC reinspection of the assembly. This was done on August 12, 1983, and the results showed that the repair welding performed under RPS 705612 was inadequate. This nonconformance was reported on NCR 10216 issued on August 12, 1983, which closed NCR-M7949.

NCR-M10216

The disposition of this NCR required that the 1/4-inch weld be moved from the top of the horizontal tubing to the bottom. The work was completed and the NCR was closed on September 23, 1983. All hold tags had been removed prior to the start of the repair work. Revision 7 of the assembly drawing was issued on August 29, 1983 and reflected the final changes.

Both a hanger inspection report and a component support checklist were issued on September 20, 1983, reflecting the completion and acceptance of the strut assembly.

The records show that NCR-M7912 was properly dispositioned by a reinspection performed under NCR-M7949. The TRT also found that, at the time of the nonconformances, the B&R support inspection program provided for welding inspection prior to the final QC inspection. The TRT substantiated the allegation that welding had been done while a hold tag was in place, which is a violation of B&R Procedure CP-QAP-16.1, "Control of Nonconforming Items." The TRT also found that the welding inspection occurred incorrectly while the final QC inspection was in progress.

AQW-72

The alleger stated that he overheard a conversation during which an individual said that he had a radiograph film package for a weld identified as 9-1 that was not shown on isometric drawing (ISO) BRP-CC-2-AB-003. The TRT determined that the referenced ISO covered a portion of the 24-inch component cooling water piping (CCSW). The two field welds identified on the drawing were marked "FW2" and "FW6." A shop weld marked "9" is shown on the drawing as connecting a 1-inch schedule 40 pipe to a 1-inch valve. A multiple weld data card attached to manufacturing record sheet BRP-CC-2-AB-003, dated September 26, 1979, does not show that a radiographic inspection was required or performed on weld 9.

AQW-25

The alleger stated that he believed that a weld data card was lost and, as a result, weld repair information would be missing from the welding documentation package. The subject of recreating lost weld data cards is covered in Mechanical and Piping Category 8.

5. Conclusions and Staff Position

AQW-29, AQW-83

The TRT concludes that NCR-M7912 was properly dispositioned. The TRT also found that welding inspection incorrectly occurred while the final QC inspection was in progress, and that welding had been done while a hold tag was in place. The sway strut assembly was completed and accepted in accordance with the drawing. Although there is a procedure deficiency in performing welding repair while there is a hold-tag on the strut assembly since the weld was ultimately fixed and found acceptable in accordance with the drawing, the TRT found no safety significance with regard to this assembly.

AQW-72

The TRT found no evidence that a radiograph had been taken on a weld marked "9" on ISO BRP-CC-2-AB-003.

AQW-25

The subject of recreating lost weld data cards is evaluated in Mechanical and Piping Category 8.

The TRT concludes that these allegations have no safety significance.

In a meeting with the alleger on November 27, 1984, the TRT presented the results of the assessment of allegations AQW-29 and AQW-83. During the discussion that followed, the alleger emphasized her concern that welding had occurred on the strut assembly which had previously been inspected during the time an outstanding NCR was in effect.

Allegation AQW-72 was received anonymously; therefore, the TRT was unable to contact the alleger to provide the results of its review. The originator of allegation AQW-25 declined, during a telephone call on August 1, 1984, to have further meetings with the TRT.

6. Action Required: None.

Reference Documents:

1. ISO BRP-CC-2-AB-003.
2. Drawing CC-1-028-003-A33R, Revision C-7.
3. NCR M-7122, Revision 0.
4. RPS 705612.
5. NCR M-7912, Revision 0.
6. UMRC 705612.
7. NCR M-79495, Revision 0.
8. NCR M-10216, Revision 0, 1.
9. B&R NDE A-0706.
10. MWFL A-0973.
11. MWDC A-0973.

1. Allegation Category: Mechanical and Piping 26, Use of Unqualified Welders

2. Allegation Number: AQW-2, AQW-3 and AQW-4

3. Characterization: It is alleged that unqualified welders and helpers were being used.

4. Assessment of Safety Significance: These allegations were primarily concerned with unqualified welders. Therefore, the NRC Technical Review Team (TRT) reviewed the welder qualification program to determine if unqualified welders could have been used for production welding.

   The TRT found that welder training occurs at the Brown & Root (B&R) Welder Qualification and Training Center. The TRT learned from the B&R Training Center supervisor that the purpose of the work done at the center was to assist welders in preparing to take the performance qualification tests (PQTs), which are performed to an approved B&R procedure specification and which must produce an acceptable test weldment.

   The TRT reviewed the documentation used to control the use of qualified welders during production welding and found that a welding procedure specification (WPS) is prepared in accordance with B&R procedure WES-30. The WPS establishes the welding parameters to be used and methods included in the production of a weld joint.

   The welder qualification matrix, as defined in paragraph 2.1.3 of B&R procedure WES-016, establishes a cross-reference between the WPS and the schedule of standard tests. The welder performance qualification record lists the standard tests a welder has successfully completed. To assure that welders perform only welding they are qualified to do, both the welder qualification matrix and the welder performance qualification record are distributed on a weekly basis. These documents identify all currently qualified welders by name and describe the extent of each welder's qualifications.

   Weld filler material log 630321 listed the symbols of the four welders who worked on an original weld and on the two repairs that followed. The weld filler material log also identified the two welding procedures that were used (88021, 88023). The TRT reviewed the welder performance qualification record for the week each weld was made and found that each of the welds was made during the relevant period. The TRT also found that the procedure used for each weld qualified the weld which was made and that the welders were correctly selected based on qualifications shown in the appropriate welders qualification matrix. The TRT then reviewed the performance qualification test results for each of the welders, and found that the weld procedures followed in the qualifying tests corresponded to those on the performance qualification test results.

   The TRT determined that a program is in place which can control the use of qualified welders during production welding. NRC Region IV also concluded in IR-79-15, dated July 2, 1979, and IR-79-22 dated November 27, 1979 that the site welder qualification program was in full compliance with ASME Section IX Welding Code.

A meeting was held with the alleger (AQW-2) on March 6, 1984, to present the TRT findings. The alleger provided the name of a welder he considered to be unqualified and who may have been improperly requalified.

The alleger stated that, as a boilermaker foreman, he had been dissatisfied with the work being done by a welder in his crew and had asked that the welder be reevaluated. He understood that the welding qualification training center (WQTC) determined that the welder was unqualified. The alleger stated that the general superintendent told the WQTC supervisor that if the welder was not requalified by the end of the week the supervisor's employment would be terminated. The alleger did not know the results of the action.

The TRT determined that the individual named by the alleger was employed by B&R from 1978 to 1982. A record of the performance qualification tests passed by the individual is as follows:

10-16-78	S6	SS Pipe Weld
4-20-79	C6 & A5	CS Pipe Weld
1-18-80	C11	CS Butt Weld
6-17-81	S12	SS Pipe Weld

On November 10, 1981, an interoffice memorandum indicated that the welder had two consecutive rejects in one lot of welds and was told to report to the welder qualification training center for training and recertification. The memorandum suspending the welder was sent to all involved parties, in addition to the weld shacks, thus prohibiting him from welding at the site.

After several days of reevaluation, a memorandum was issued on November 19, 1981, stating that the welder had failed the requalification test. A comment on the memorandum stated that the welder had been given a 20-hour evaluation and was found to be incapable of performing acceptable welding. The welding qualification and training center supervisor and the pipe general foreman recommended that the individual be returned to work, but not be allowed to perform welding. On January 16, 1982, the welder passed PQT 6 for stainless steel pipe welds, which the TRT was told also allowed him to perform socket fillet welds. The TRT was also told that an agreement was made between the WQTC supervisor and the welding foreman that the welder be allowed only to weld socket fillet welds. On January 15, 1982, the welder passed PQT A8, which allowed him to do flat plate welds. The TRT was told that this test was often used to certify welders doing work on temporary supports. On January 25, 1982, he passed the C11 butt weld test. The welder left B&R employment on July 19, 1982.

The WTQC supervisor told the TRT that he does not recall any directive from the general superintendent to have the welder recertified within a week or have his employment terminated.

5. <u>Conclusion and Staff Positions</u>: The TRT determined that a program is in place which assures the use of qualified welders during production welding. In the case of the specific welder mentioned by the alleger, the TRT found the welder failed a recertification test and was prohibited from doing

further welding. The TRT review indicates that the retraining and recertification of the welder proceeded in accordance with site procedures.

Because the originators or allegations AQW-3 and AQW-4 are unknown, the TRT was unable to present its findings.

6. Actions Required: None.

Reference Documents:

1. IRs 79-22, 79-15, 79-11, 79-20 and WDC 630321.
2. NDT Radiographic Report, RT 12378.
3. VT Thickness Report No. 0439.
4. Weld Filler Material Log No. 630321.
5. Weld Data Card No. 493.
6. Weld Filler Material Log No. 493.
7. Performance Qualification Tests BHI-88021-RF, APL-88021-RF, BJI-88021-RF, and AZC-88021-RF.
8. Welders Qualification Matrix for July 22, 1984, through July 31, 1984.
9. Welders Performance Qualification Records for the weeks of July 18, 1980, August 27, 1979, and March 17, 1980.
10. Performance documents as follows:

    (a) ASME Section IX Code.
    (b) B&R Procedure WES-031.
    (c) 150 BRP-CT-1RB-016-3.

1. Allegation Category: Mechanical and Piping 27, Unqualified Weld Inspector

2. Allegation Number: AQW-5, AQW-11, AQW-16, AQW-17, AQW18, AQW-19 and AQW-69.

3. Characterization: It is alleged that:

   a. Weld inspectors were not qualified (AQW-5 and AQW-19).
   b. Vendor welds on a diesel generator were inspected by an unqualified individual (AQW-11 and AQW-16).
   c. A cleanliness holdpoint was improperly released by a QC inspector (AQW-17).
   d. EBASCO inspectors did not properly inspect welds (AQW-18).
   e. Inspectors did not have proper educational backgrounds (AQW-69).

4. Assessment of Safety Significance:

AQW-5, AQW-19

Two allegers stated that they had witnessed inadequate inspection. One allegation concerned welding inspection; the other related to undesignated inspection which was done during one of the backfit programs. (The subject of inspector qualifications will be addressed in QA/QC Category 4.)

AQW-11 - AQW-16

In 1982, the alleger was told to inspect certain vendor welds on a diesel generator skid. She told her supervisor she did not feel "confident or qualified" to inspect the welds. She stated that she was told to "do the work or go home."

The NRC Technical Review Team (TRT) learned that the inspection was part of a program to evaluate the welding on a vendor-furnished diesel generator skid. Nonconformance report (NCR) M-80-0009 had been prepared on July 17, 1980, to cover the vendor's apparent failure to fabricate the skids to the ASME NF requirements. The disposition of this NCR stated, in part: "The fabrication records have been examined and there is insufficient documentation to claim NF equivalency. A program had been developed, however, to qualify the support and skid fabrication to AWS D1.1-1975 and the AISC Manual of Steel Construction, Seventh Edition." Texas Utilities Service, Inc. (TUSI) Procedure CP-QP11.11 was prepared to cover the reinspection program. Paragraph 3.5 of the procedure provided instructions for conducting a visual inspection of the welds.

The alleger was qualified as an AWS D1.1 visual weld inspector and was being asked to inspect welds to the same code. The TRT can find no evidence that the alleger was unqualified to perform the inspection. Texas Utilities Generating Company (TUGCO) letter TXX-4095, dated January 10, 1984, adivsed the NRC that the skids would be scrapped and replacements fabricated at the job site.

AQW-17

It is alleged that a QC inspector released a cleaniness hold point on a fuel pool liner weld without performing the necessary inspection. The alleger also claimed that the weld was poor because "water was coming through while the weld was being made." An NRC Region IV inspector had investigated the allegation and reported his findings in IR 79-15, dated July 2, 1979. According to the IR a QC inspector would examine cleanliness of the weld, and after acceptance of the weld would mark the stainless steel liner inspection traveler (per Brown & Root procedure CCP-38, "Stainless Steel Liner Erection") accordingly and cover the seams with tape for protection. Subsequently that seam would be released for further work.

In the case mentioned by the alleger, the QC inspector who had made the original inspection had given a second QC inspector authorization over the telephone to release the seam. The Region IV inspector, who is no longer at the site, discussed the incident with the original QC inspector who admitted he had released the work over the telephone, but who claimed that the weld was still clean because the tape was intact. The Region IV inspector concluded that the QC inspector may have made an error in judgement by not re-examining the seam, although the seam had previously been inspected and found to be acceptable. The TRT concurred with this conclusion. Allegation AW-42 in Mechanical and Piping Category 43 describes the TRT evaluation of allegations that poor welding conditions existed during the installation of the liners.

AQW-18

The alleger stated that EBASCO inspectors often signed off on inspections of welding made from the floor level when the welders were working 15 feet or more above them. The Texas Utilities Electric Company (TUEC) training supervisor told the TRT that EBASCO inspection personnel were employed by TUEC primarily to do balance of plant (BOP), non-ASME inspection work. TUEC procedure QI-QP-11.21-1 "Requirements for Visual Inspections" is, therefore, applicable and provides instructions for performing visual inspections of BOP work, describing in detail the acceptable conditions of the weld surface, weld size and configuration and other characteristics of the weld which must be viewed up close. The TUEC training supervisor told the TRT that EBASCO inspection personnel were trained and certified in the same manner as new TUEC employees.

The results of the TRT QA/QC group review of the TUEC training program will be reported in QA/QC Category 4.

AQW-69

It is alleged that "eight B&R QC personnel may not have either high school diplomas or General Education Development (GED) certificates and, therefore, are not qualified to be inspectors."

The subject of QC inspector training and qualification will be addressed in QA/QC Category 4.

5. Conclusions and Staff Position:

AQW-5, AQW-19

The subject of inspector qualifications will be addressed in QA/QC Category 4

AQW-11, AQW-16

The TRT found no evidence that the alleger was not trained to perform inspection work on the diesel generator skid. Accordingly, this allegation has no safety significance.

AQW-17

The TRT determined that the QC inspector should have been present to verify that the weld seam he had inspected was the one being released and that it had remained clean. The QC inspector may have made an error in judgment; however, the weld had previously been accepted. Accordingly, this allegation has no safety significance.

AWQ-18

The TRT found that EBASCO inspection personnel were trained and certified in the same manner as TUEC employees. The subject of TUEC inspector training and qualification is addressed in QA/QC Category 4.

During telephone conversations of August 30, 1984, and October 29, 1984, the alleger of AQW-5 declined to have further discussions with the TRT. A letter sent to the alleger of AQW-19 on August 30, 1984, received no response. Efforts are being made to arrange a meeting with the alleger for AQW-17 to discuss the TRT's findings. A letter sent to the originator of allegation AQW-18 on August 30, 1984 received no response. A letter was also sent to alleger of AQW-69 on August 30, 1984; however, the TRT has received no response.

A meeting was held with the originator of allegations AQW-11 and AQW-16 on January 9, 1985. The alleger continues to maintain she was unqualified to perform the work, even though she was a qualified AWS weld inspector. Since the skids were scrapped and replaced, the allegation has no safety significance.

6. Actions Required: None.

Reference Documents:

1. ANSI N45.2.6-1978.
2. TUGCO Procedure QI-QP-11.21-1.
3. NUREG 1.2.6.
4. TUGCO Procedure CP-QP-11.21.
5. B&R Procedure TCP-1.
6. TUGCO Procedure QI-QP-2.1-19.

7. B&R Procedure QI-QAP-2.1-5.
8. TUGCO Procedure CP-QP2.1.
9. B&R Procedure CP-QAP-2.1.
10. B&R ISO BRP-CT-1-SB-019, Rev. 6.
11. NRC IR 79-15.
12. NRC IR-82-10 and IR-82-11.

1. Allegation Category: Mechanical and Piping 28, Unqualified Welding Documentation Clerk and People Working "Out of Procedures"

2. Allegation Number: AQW-7 and AQW-6

3. Characterization:

AQW-7

It is alleged that a supervising welding engineering documentation clerk in the radiographic (RT) welder surveillance program was not qualified for this position on the basis of experience or education (AQW-7). The random RT welder surveillance program is the subject of related allegations which are assessed in Mechanical and Piping Category 41, allegations AQW-8 and allegations AQW-9.

AQW-6

It is alleged that people were inexperienced and working out of procedures and the alleger felt that personnel involved in nuclear construction should be familiar with construction practices and comply with procedures.

4. Assessment of Safety Significance:

AQW-7

NRC Region IV (RIV) investigated the allegation related to the unqualified welding engineering documentation clerk (AQW-7). The results of the RIV investigation and an interview with the alleger and the alleger's attorney are stated in the Region IV inspection report (IR) 79-12 and summarized below for this assessment.

From the description of the alleger's background by her attorney, it appears that the alleger may have been overqualified for the position rather than unqualified. In addition, what the alleger believed to be her responsibility and authority were actually those of the chief welding engineer and the mechanical department general superintendent.

The TRT noted that the alleger's position as documentation clerk was the same as the position identified in AQW-8, which stated that the alleger was directed to falsify reports. These reports pertained to the RT program which was allegedly improperly implemented (AQW-9).

The TRT found no additional information during its assessment, and therefore cannot substantiate or refute the allegation.

AQW-6

The TRT found that this allegation, as stated, was a generalization of alleged conditions. Specific concerns of the alleger are assessed in various Mechanical and Piping and Civil and Structural Categories (24 allegations in 15 M&P categories; 7 allegations in 5 Civil and Structural categories).

5. Conclusion and Staff Position: Based on a review of IR 79-12, and on interviews with B&R welding engineering personnel and a review of the applicable procedure, the TRT concurs with the conclusion stated in the RIV IR, that allegation AQW-7 could not be substantiated or refuted. Since the RT program did not pertain to the acceptance of safety-related piping systems, the TRT concludes that this allegation has no safety significance.

The TRT also concludes that allegation AQW-6, was a generalization of alleged conditions. The specific concerns of the alleger are assessed in other Mechanical/Piping and Civil/Structural SSER categories.

The results of the TRT assessment of allegation AQW-6 were discussed with the alleger in an interview conducted on March 5, 1985. There was no disagreement, and no new concerns were identified. The originator of allegation AQW-7 is unknown.

6. Actions Required: None.

Reference Documents:

1. Mechanical and Piping SSER Category 41, AQW-8 and AQW-9.
2. Region IV Inspection Report 79-12.
3. Brown & Root Procedure WEI-1.
4. Transcript of A4 statement 84-006, page 10, dated March 7, 1984.
5. Transcript of exit interview with alleger (A4) dated March 5, 1985 (AQW-6) pages 4 through 11.

1. Allegation Category: Mechanical and Piping 29, Improperly Certified Liquid Penetrant Material

2. Allegation Number: AQW-27

3. Characterization: NRC Region IV (RIV) inspection report (IR) 82-18 82-09, dated October 1, 1982, reported that pen and ink changes were made to the date and batch number on the certified test report for (liquid dye penetrant) developer batch 82-C-068. RIV IR 82-11, dated November 24, 1982, also reported altered certified test reports for other batches of liquid penetrant examination material.

   An RIV IR, 83-24, 83-15, dated August 24, 1983, reported that the Citizens Association for Sound Energy (CASE) also informed the ASLB on May 18, 1983, that they had learned that certain uncertified (sic) liquid penetrant (LP) materials were used. This RIV review of the CASE allegation showed it was related to the same nonconforming condition reported in the two prior RIV inspection reports.

4. Assessment of Safety Significance: The NRC Technical Review Team (TRT) reviewed the RIV IRs (noted above) and found that IR 82-11 issued a notice of violation dated November 24, 1982, to the Texas Utilities Generating Company (TUEC) which requested that TUEC submit a written statement or explanation of these altered reports to Region IV including: (1) the corrective steps which have been taken and the results achieved; (2) the corrective steps which will be taken to avoid such violations in the future; and, (3) a date when full compliance will be achieved.

   The TRT found that TUEC responded to the Region IV notice of violation in a letter TXX 3603, dated December 12, 1982. This letter detailed the TUEC action that was initiated and implemented to correct the condition cited and to prevent a recurrence of the violation. The letter also stated that TUEC's investigation to determine the cause of the reported violation found that the certified test reports were altered by the jobber/supplier from whom the material was purchased. In its implementation of the response to the request for corrective actions, as detailed in the RIV notice of violation, TUEC issued stopwork order No. 28 to prevent use of the improperly certified materials until proper identification and certification were obtained. Further TUEC corrective action was accomplished by the issuance of five TUEC nonconformance reports (NCRs). This action corrected the receiving inspection reports (RIRs) to show the correct identification of the materials and provided the material manufacturer's (Magnaflux) original (unaltered) certified material test reports. The TRT verified that the acceptable manufacturer's certifications (test reports) provided documentation for the integrity and acceptability of the liquid penetrant examination material used. The TRT found that the test reports were included in the QA record package.

   TUEC took additional corrective action on the cited violation by revising the receiving inspection procedure (CP-QAP-8.1). Revision 5 of this procedure implemented a detailed receiving inspection checklist to assure that the liquid penetrant material containers were properly identified (marked)

and that material certifications were originals and were not altered by mark-up.

The TRT reviewed the Brown & Root (B&R) approved vendor list and found that to prevent a recurrence of the problem with altered certifications, TUEC discontinued the practice of procuring liquid penetrant examination materials from jobbers and instituted a policy of purchasing directly from the material manufacturers. TUEC also removed the jobber who had altered the certified test reports from the approved vendor list.

Following implementation of corrective action, TUEC issued purchase orders (POs) 10470, 10565, 10707, 11444, and 11685 to the material manufacturer (Magnuflux). The TRT reviewed receiving inspection reports (RIRs) 21313, 21627, 22414, 23579, and 24271 for material on the above listed POs, and verified that the penetrant examination material was procured directly from the manufacturer and the receiving inspection conformed to the Procedure CP-QAP 8.1, Rev. 5, requirement for use of the detail checklist. During this review, the TRT found that the checklist included in RIRs 21313 and 24271 did not conform to the procedure because an incorrect checklist was used. TUEC corrected the RIRs on July 20, 1984, and the TUEC receiving inspection supervisor conducted a documented training session for the receiving inspector who had used the incorrect checklist. The TRT verified both the corrected reports and training documentation on July 30, 1984.

IR 83-10/83-05, dated March 10, 1983, Appendix 3, para. 2, and IR 83-24/83-15, dated August 24, 1983, pages 13 and 14, document that the RIV inspector verified that TUEC completed corrective action for the stopwork order and the NCRs, that the receiving inspection procedure was revised and implemented, and that the receiving inspectors were trained. The item (cited in the RIV notice of violation) is considered closed.

5. Conclusion and Staff Position: Based on the documents reviewed, the TRT concurs with the allegation that improperly certified liquid penetrant examination materials were used at CPSES. However, after this problem was detected, TUEC initiated, implemented, and maintained effective corrective action to provide documented evidence for traceability and acceptability of the alleged improperly certified dye penetrant material that was used at CPSES. Since the TRT verified that TUEC implemented effective corrective action, the TRT concludes that there is proper certification of the dye penetrant examination materials which were used at CPSES. Accordingly, this allegation has no safety significance.

6. Actions Required: None.

Reference Documents:

1. Receiving Inspection Procedure, CP-QAP-8.1.
2. Liquid Penetrant Examination Procedure, QI-QAP-10.2.1
3. NCRs M4438, M4339, M4340, M4484 (Rev. 1), and M4050.
4. NRC RIV IRs: 82-18/82-09,82-11, 83-10/83-05, 83-24/83-15.

1. Allegation Category: Mechanical and Piping 30, Improper Receiving Inspection and Deficient Vendor Fabrication.

2. Allegation Number: AQW-15

3. Characterization: It is alleged that:

   a. Some tube holes in the main condenser tube support sheets were drilled incorrectly.

   b. An inspector rejected vendor welds on a main condenser, then changed his mind and, for no apparent reason, accepted them.

4. Assessment of Safety Significance: The main steam condenser is not a safety-related item; however, the NRC Technical Review Team (TRT) chose to investigate the allegation to determine if a generic problem, which could affect the handling of safety-related item, existed.

   The TRT learned that Texas Utilities Service, Inc. (TUSI) purchased the two main steam condensers from Westinghouse Electric Corporation (W). The condensers arrived from the vendor's shop in a partially fabricated condition. Brown & Root (B&R) completed the final assembly and welding at Comanche Peak Steam Electric Station (CPSES).

   Each condenser has four groups of tube bundles. The tubes are field-assembled and rolled into end sheets and are supported within the condenser by 15 tube support plates. The holes in the support plates are located in the same pattern as in the end sheets, but have a drilling tolerance which could result in holes being larger in diameter than those in the tube sheets. The tube sheet holes are slightly larger than the tube outside diameter. Gibbs & Hill (G&H) Technical Specification 2323-MS-23 requires the tube sheet and support plate holes to be drilled, mechanically disc-sanded, and brush deburred. The alleger stated that, after several of the support plates arrived at the site, his work team stacked them together so that the holes were aligned. After placing dowel pins in several holes, the alleger discovered that the holes were out of alignment by as much as 0.375 inch (3/8 inch). The alleger claimed that this misalignment would cause binding between the tubes and the support plate holes, resulting in damage.

   The TRT reviewed five G&H quality control vendor surveillance reports concerning visits by a G&H QC engineer to the vendor's plant from May 1 to May 22, 1979. During these visits, the engineer observed the physical condition of the final 30 plates. In addition, a "go, no-go" gauge was used to randomly inspect hole size. The proper hole pattern was also checked, although no inspection reports were found which showed the exact results of the examination.

   The G&H quality control vendor surveillance reports show that the final 30 plates were inspected, then loaded on trucks for shipping in units of ten. The plates were wrapped in plastic sheeting and banded with 2-inch metal bands. The TRT found no indication that any effort was made to secure the plates tightly enough to maintain exact hole alignment.

The TRT interviewed the B&R millwright foreman who was present during part of time the material was being unloaded. He stated that, since the support plate holes were to be aligned after the plates were placed within the condenser, there was no reason to check the location of the holes during the unloading process, and that the weight of each plate precluded the ease of movement needed to check hole alignment.

The TRT learned that after both tube sheets and the 15 support plates were approximately in place, tight wires were run through several key holes for final alignment and to ensure correct drainage. The wires were stretched from one end of the condenser to the other at several locations. In addition, several large rods with the same diameter as the outside diameter of the tubes were inserted into the support plate holes. These rods were rotated in place to ensure ease of tube insertion. One end tube sheet was left off until the tubes were pushed through the 15 support sheets. The remaining end tube sheet was then placed in position, and the tubes were moved into the final rolling position.

The millwright foreman stated that an offset of 3/8 inch would have prevented the tube from going through all the support plates. If the tube had been forced out of alignment between two support plates, it would have been difficult, if not impossible, to force the tube back into alignment for the next plate, which was 3 feet away.

The inspector named by the alleger as having rejected and then accepted welding performed by the condenser vendor is no longer at the site. The TRT found the condensers were purchased to G&H Specification 2323-SS17. The inspection documentation retention requirements were in accordance with B&R procedure CP-CMP 6.90, paragraph 2.7.2, which states in part that, "Welds to misc steel considered temporary nonplant items and welds performed in accordance with Gibbs & Hill specification AS-5, 6, 7, 17, 18, 20, SS-16A and SS-17 do not require inspection documentation." As a result, no documentation was available, and the TRT was unable to prove or disprove the allegation.

The TRT also reviewed an allegation of improper practices that may have occurred during the construction of the condensers. (See Mechanical and Piping Category 14, AW-47.) During the investigation of this allegation, Texas Utilities Electric Company (TUEC) informed the TRT that it was their intention to retube the Unit 1 and Unit 2 condensers in the near future due to corrosion considerations.

5. Conclusion and Staff Position: Based on a review of the methods used by B&R to install the tube support plates and to verify hole location, the TRT concludes that there was no reason to include a hole alignment check in the receiving inspection. B&R's use of alignment rods to check the size of the holes and their location in the support plates prior to tube insertion was sufficient to verify that the holes were drilled correctly.

The TRT also concludes that the allegation related to condenser inspection cannot be proved or disproved. Accordingly, these allegations have no safety significance.

The TRT met with the alleger on March 5, 1985. The alleger maintained his position that the tubes were difficult to insert. He also indicated that he found the holes he claimed were out of line while checking the tube support plates to see if any holes were missing. The alleger was informed that TUEC intends to retube the condensers.

6. Actions Required: None.

Reference Documents:

1. Final Inspection Report No. 000565, dated December 13, 1976.
2. Final Inspection Report No. 05028, dated January 15, 1977.
3. G&H Specification 2323-MS-23.
4. B&R Procedure CP-CPM-6.9D.
5. CPSES Material Reviewed Report No. 4646.
6. G&H Letter to TUGCO, dated January 11, 1979.
7. Waiver of Final Surveillance, January 10, 1979.
8. G&H Quality Control Vendor Surveillance Report.

1. Allegation Category: Mechanical and Piping 31, Hanger Welding Problems

2. Allegation Number: AH-6, AH-13, AW-50, AW-58, AP-18, AP-19, AP-20, AP-21, AP-22 and AQW-73

3. Characterization: It is alleged that there were improper fit-up gaps on hangers (AH-6, AH-13, AW-50, AW-58, AP-18, AP-20, AP-22); that improper QC inspections were performed; that QA procedures were not followed (AQW-73); that improper welding was performed (AP-19, AP-21); and, that improper skewed fillet weld joint inspections were made (AQW-73). (Allegation AH-13 is a duplication of AW-50.)

4. Assessment of Safety Significance: The NRC Technical Review Team (TRT) independently reviewed Region IV (RIV) inspection reports 50-445/-83-07, 50-445/84-05, 50-445/82-14, and 50-445/84-08 concerning various allegations of hanger fit-up gap and other welding fabrication and QC inspection problems. These allegations are delineated in the following list.

Allegation	Description	RIV Report No.
AH-6, AW-50, AW-58	Fit-up gaps in three supports: SW-1-102-106-Y33K, SW-1-012-010-A33R, CC-1-087-004-A33A	50-445/83-07
AP-18	Fit-up gaps in one support MS-1-004-007-C72K	50-445/84-05
AP-19	Unauthorized Welding in one support M-17	50-445/84-05
AP-20	Excessive gap in one support: MS-1-003-009-C72K	50-445/84-05
AP-21	Improper cutting/welding in one support: MS-1-003-010-C72K	50-445/84-05
AP-22	Excessive gap in one support: MS-1-002-005-C72K	50-445/84-05
AQW-73	Improper skewed weld joint inspections	50-445/84-08 50-445/82-14

In order to properly assess these allegations, the TRT visually examined supports and reviewed procedures pertaining to the following: (1) support fabrication; (2) control of design change authorizations (DCAs) and component modification cards (CMCs); (3) QC inspection; (4) welding of supports; (5) corrective action; and, (6) design control.

AH-6, AW-50, and AW-58

These allegations concern fit-up gap violations on three specific hangers and initially were addressed by a RIV inspection report (IR 50-445/83-07).

The TRT reviewed this report and found that three supports had been inspected by RIV inspection personnel in detail. The RIV inspectors removed the paint and part of the weld necessary to determine if an excessive fit-up gap existed at the joint. Two of the supports (SW-1-012-010-A33R and CC-1-087-004-A33A) had no violations or deviations. The TRT also visually inspected support SW-1-012-010-A33R and saw no apparent physical evidence to suggest a fit-up gap problem between support items 18 and 19, as alleged. The TRT reviewed the hanger package (HP) for this hanger and found that it contained the proper multiple weld data cards (MWDCs), QC hanger inspection reports (HIRs), and other related documents.

The third support (SW-1-102-106-Y33K) was the subject of a RIV Notice of Violation in RIV Inspection Report (IR) 83-07. This support contained a 6-inch x 6-inch x 1/2-inch structural tube brace welded to a floor-mounted baseplate and was located at the 800-foot elevation in the south yard tunnel. During the RIV inspection in January 1983, the inspectors found a fit-up gap violation of this connection which resulted in RIV Notice of Violation No. 445/8307-01. Texas Utilities Electric Company (TUEC) responded to the violation on April 15, 1983, by (1) initiating a nonconformance report (NCR) to correct the hanger; (2) performing an engineering evaluation of the existing weld condition; and, (3) reinstructing construction personnel regarding the necessity for rigid compliance with design and procedural requirements.

The TRT reviewed NCR M-5123S, dated February 8, 1983, which initiated the rework. Brown & Root Inspection Report (B&RIR) N5-SW-1-YD-012 contained evidence of a fit-up gap inspection of the reworked piece that exceeded the 5/32-inch limit. To compensate for this, the leg size was increased by the amount of the gap in excess of 1/16 inch. The TRT visually inspected support SW-1-102-106-Y33K and found that it was painted, and that the weld along the obtuse edge of the tube/plate connection was built up. The TRT also reviewed the HP for this support and found that it contained both the MWDC and weld filler metal log (WFML) for the rework operation identified in the TUEC response letter. The TRT verified the increase in leg size by visual examination. The TRT reviewed the additional documentation supporting the NCR and found it to be in order.

The TRT reviewed the hanger calculation package to verify the TUEC Pipe Support Engineering (PSE) response stating that the weld between items #4 and #7 on SW-1-102-106-Y33K would carry the design loads. The TRT determined that PSE evaluated the weld design by reducing the weld line model by an appropriate amount along the sides of the tube to account for the excessive gap and corner radius of the tube. The calculations were conservative in that they did not take the obtuse weld into account. The resultant weld line model, therefore, had an additional safety factor of 3.94 above the required ASME III Subsection NF code allowable stress for operating loads. The TRT reviewed the stress calculations for the skewed joint and found them to meet the appropriate codes and standards. The TRT also determined that the joint was initially a very low stress joint.

In response to the RIV Notice of Violation, B&R management issued an interoffice memo (IM 25,408 dated April 13, 1983) which re-emphasized mandatory compliance with design and procedural requirements and reporting of nonconforming conditions. The TRT reviewed the IM and found it to be

responsive to conditions that led to the violation. However, the TRT was concerned that other highly skewed support structures previously constructed might have similar fit-up problems. The TRT interviewed B&R Level III inspection personnel, PSE management, and the B&R Project Manager and his staff. Everyone interviewed stated that current procedures, which do not require a QC holdpoint for fit-up gap inspection before welding, are adequate for skewed welds. The TRT noted that the obtuse angle of the weld cited in the RIV violation was approximately 160°. The TRT asked each of those interviewed if fit-up of highly skewed joints on component supports was a problem that warranted revising the procedure; all replies were negative. The B&R Level III examiner also stated that QC is required to perform a random sampling of fit-up gaps and that they perform it routinely; however, no documented evidence was available. The B&R Project Manager and his staff stated that the individual who made the weld on hanger SW-1-102-106-Y33K was also the alleger. The TRT verified this statement in a telephone conversation with the Region IV inspector who prepared IR 83-07. However, in reference to the B&R memo IM 25,408 as being responsive to the violation, the TRT has two concerns. First, no documented attempt was made to determine whether the fit-up gap is a general problem for skewed joints with an obtuse angle above 135°. AWS D1.1 provides criteria for evaluating obtuse angle welds to 135°, but does not provide any guidelines for skewed weld joints above 135°. Second, the TRT believes a sampling of the alleger's previous work should have been inspected by QC.

Additionally, the TRT reviewed the HPs for two of the supports identified in the IR and two similar HPs for supports located in the same general area. The documentation reviewed was complete, and provided a fabrication tracking history of the support which could also be verified on the support drawing. The TRT found no further evidence of excessive fit-up gap.

A letter summarizing the TRT's assessment of this allegation was sent to the alleger by the TRT on August 30, 1984. The TRT has not received a reply. The TRT attempted to telephone the alleger on November 7, 1984, but was unable to locate him.

<u>AP-18 through AP-22</u>

RIV IR 50-445/84-05 originally addressed these allegations, some of which are similar to AH-6 (fit-up gaps). The TRT discussed this IR with one of the RIV inspectors, who reiterated the results of the inspection (i.e., no problems were found and the allegations could not be substantiated). The TRT reviewed the IR and determined that it contained evidence of a detailed review of each of the records in the hanger packages (HPs) for each of the supports inspected. The welds in question on support MS-1-004-007-C72K were ground and etched for the RIV inspector who found no fit-up gap in excess of code/procedure limits. QC documents and other related documentation supported these findings. The IRs documenting similar inspections for the remaining supports with alleged improper fit-up gaps (MS-1-003-009-C72K and MS-1-002-005-C72K) contained similar conclusions. The RIV inspector examined support MS-1-001-903-C77W attached

to M-17 for faulty welding and additionally found that the required documentation for the alleged cutting and welding was available. The RIV inspector also reviewed the HPs and inspected hangers MS-1-003-010-C72K, MS-1-003-007-C72K and pipe whip restraint M-17. The RIV inspection revealed that all welding and rework performed on these items were properly documented in the HP. The on-site inspection by RIV could not substantiate the allegation.

The TRT reviewed the HP for all five hangers to verify that the documents reviewed by the RIV inspector were included in the HP. The TRT also reviewed all remaining documents in the HPs for the supports inspected by RIV. The TRT visually inspected three of the supports on the main steam line system; however, inaccessibility of these supports made a close-up examination of the alleged fit-up gaps impossible. In addition, a review of the HP for MS-1-003-007-C72K verified that the pipe saddle had been cut into four pieces as authorized by CMC 65236.

The TRT contacted the alleger on November 7, 1984 and he said he was satisfied with the results of the RIV reports and the TRT review.

AQW-73

The TRT reviewed two RIV IRs (50-445/82-14 and 84-08) related to AQW-73, which substantiated the allegation that procedures for both ASME and non-ASME supports failed to contain proper inspection instructions for measuring skewed welds, which are the fillet or partial penetration groove welds that join two structural members that are not in the same plane and/or not perpendicular to each other or whose weld legs are not perpendicular. As a result of the open item identified in IR 82-14, B&R QA agreed to perform a sampling of skewed fillet weld sizes based upon revised procedure QI-QAP-11.1-28. A follow-up RIV inspection report (84-08) identified a 100 percent reinspection by B&R of skewed fillet welds for existing non-ASME supports. The RIV inspector performed a visual inspection of ten Unit 1 non-ASME supports and found no undersized skewed fillet welds, violations, or deviations.

The TRT independently reviewed this allegation of skewed fillet weld inspection in reference to size. The TRT talked to PSE management concerning the skewed weld inspection effort. Since there is a distinct QA difference in the Code requirements for ASME and non-ASME supports, PSE established two different reinspection programs for skewed welds (one for ASME and the other for non-ASME supports). The TRT interviewed the personnel from Mechanical Quality Engineering (MQE) who were responsible for inspecting all 640 Class 5 and 6 supports (non-ASME). Since the procedure for inspection of non-ASME supports (QI-QP-11.16-1 Rev. 6, dated July 11, 1982) contained no specific instructions for inspecting non-ASME skewed welds joints, applicants issued Rev. 7 of QI-QP-11.16-1, dated September 8, 1982. This revision referred to procedure QI-QP-11.14-09, "Verification of weld size for skewed weld joints," which clearly defined the correct method of inspecting skewed welds (this procedure was later deleted and replaced by procedure QI-QP-11.21-1, Rev. 7). MQE personnel produced a Texas Utilities Electric Company (TUEC) memorandum (dated August 15, 1983), which identified all 640 Class 5 and 6 supports that were included in the

reinspection effort. The supports were identified by support mark numbers. The results of the B&R reinspection effort are recorded on inspection reports located in each hanger's documentation package. The TRT performed a random sampling of 15 of these supports and found that MQE also included skewed fillet welds to the pressure boundary in the reinspection. The TRT found that all of the welds on the 15 supports met the criteria of the appropriate inspection procedures.

The TRT also reviewed the hanger fabrication packages for the ten supports referenced in RIV IR 50-445/84-08. Each of the ten supports had a separate QC inspection checklist that provided evidence of a skewed weld inspection. The TRT found that two of these support inspections identified in unsatisfactory/undersized skewed fillet welds which were subsequently increased in size to comply with the inspection criteria. The TRT reviewed seven additional HPs and found that all seven contained evidence of satisfactory weld inspections.

The TRT reviewed the training records of five separate training classes which were held to instruct inspectors in the revised weld inspection techniques, and found the records acceptable.

In a related concern, AQP-23 in Mechanical and Piping Category 40, the TRT reviewed the effectiveness of the QA program for non-ASME Class 5 and 6 pipe supports. The TRT concluded that the QA program put into effect for Class 5 and 6 supports is now working. Since the reinspection of the Class 5 and 6 supports took place in 1982 and 1983, after the implementation of the QA program, the findings in AQW-73 area are consistent with the conclusions in AQP-23.

The TRT interviewed B&R QA personnel to determine how ASME supports were addressed with respect to the revised skewed weld inspection criteria. The revised insepction criteria recognized that the size of a skewed weld could not be measured accurately with a standard fillet weld gage; therefore, a revised inspection method using a scale and a straight edge to measure skewed weld size was presented. Since all ASME supports must undergo a final vendor-certified drawing (VCD) inspection, B&R and TUEC personnel decided to perform the skewed weld inspection during the VCD inspection. The TRT reviewed TUGCO procedure QI-QAP-11.1-28 Rev. 24 "Fabrication, Installation and Inspection of ASME Class 1, 2 & 3 Component Supports" and B&R procedure CP-QAP-12.1 Rev. 10, "Inspection Criteria and Documentation Requirements prior to N-5 System Certification" and "Quality Control Component Support Checklist," Attachment 5, which contained a specific line item (No. 5b) used to record reinspections of skewed welds when applicable.

In order to determine the effectiveness of the revisions to procedures QI-QAP-11.1-28 and CP-QAP-12.1, the TRT reviewed 12 HPs that contained skewed weld joints between structural members (i.e., square or rectangular tubing to a plate, or tubing to tubing connections) that were correctly reinspected and documented on inspection reports. However, the TRT determined that the procedures for skewed weld inspection may be inadequate whenever a pipe stanchion, used as a structural member, was welded to a

another pipe stanchion or to an intermediate pipe pad. (Whenever a pipe stanchion type connection is made by a fillet weld and the diameter ratio between the pieces is less than or equal to approximately 2, a noticeable skewed weld condition exists.) Since neither of these connections was made directly to the pressure boundary, they fell under the jurisdiction of ASME III Subsection NF and, therefore, were governed by CP-QAP-12.1 and QI-QAP-11.1-28. The TRT determined that integral attachments (welded directly to the pressure boundary) were considered by B&R inspection personnel correctly to be part of the piping and were not covered by procedure CP-QAP-12.1.

In order to clarify the two types of skewed welds inspected, the TRT for the purpose of this review, has identified type 1 skewed welds as those resulting from the angular connection of structural members that produce skewed weld profiles of a constant size. An example of a type 1 skewed weld would be the skewed connection of a piece of tube steel to a flat plate. The TRT has defined a type 2 skewed weld as one that results in a continuously varying weld size profile due to the curvature of the mating pieces. An example of a type 2 skewed weld would be the connection of two pieces of pipe perpendicular to each other. The TRT reviewed a sampling of hanger packages to determine the effectiveness of the reinspection of type 2 skewed welds. During this review the TRT found no evidence in the QC hanger checklist that type 2 skewed welds were reinspected as skewed welds. In fact, the TRT found that the line item for skewed welds on the checklist was marked "N/A" for supports with type 2 skewed welds.

The TRT identified three pipe supports, MS-1-002-005-C72K, MS-1-003-009-C72K, and MS-1-003-005-C72K that exhibited a type 2 skewed weld where the QC checklist was marked "N/A" for operation number 5B, "All skewed welds have been reinspected and are in compliance with the VCD/DRD." During an interview with the TRT, B&R QA personnel stated that since type 2 skewed welds were identical in configuration to a pressure boundary stanchion attachment weld, inspectors used a different procedure to inspect these welds, and identified the procedure as QI-QAP-11.1-26. B&R personnel further stated that QI-QAP-11.1-26 was used as a guideline to inspect type 2 skewed welds, and that the reinspection was documented on line item 5.a. of QC hanger checklist of procedure CP-QAP-12.1, which pertains to all other welds in the structure. However, B&R QA could provide no other documented evidence to show that type 2 skewed welds were inspected to procedure QI-QAP-11.1-26. The TRT determined that the revised inspection technique outlined in procedure QI-QAP-11.1-28 was identical to the technique described in QI-QAP-11.1-26. The TRT reviewed procedures QI-QAP-11.1-28 and CP-QAP-12.1 and found that no reference for type 2 skewed welds contained in either procedure would lead the inspector to procedure QI-QAP-11.1-26, except for pressure boundary attachments.

On December 18, 1984, the TRT discussed the conclusions of the review with the alleger. He was informed of the potential violation of skewed fillet welds and its safety significance. He indicated that the TRT had done more than he thought would be done in assessing this allegation.

5. Conclusion and Staff Positions:

AH-6, AW-50 and AW-58

The TRT reviewed RIV IR 50-445/83-07 and determined that TUEC submitted a response to the violation reported in IR 83-07 (AH-6). The TRT verified TUEC's rework and engineering design response to this violation and concludes that the conditions were corrected. In addition, the TRT concludes that the reduction in effective weld length due to the fit-up gap has no safety significance from a design and engineeri ¸ standpoint. The TRT also reviewed the documents submitted by PSE to address this concern and concludes that the results of the engineering response are acceptable. Accordingly, the allegations AH-6, AW-50 (and AH-13), and AW-58 do not have safety significance. The TRT concludes, however, that the response by B&R management to avoid future violations was not acceptable. The TRT concludes that IM-25,408 provided the necessary response from B&R management concerning the reporting of non-conforming items. However, no attempt was made to (1) check similar work performed by the welder, or (2) determine whether the fit-up gap on highly skewed welds should be randomly checked.

AP-18 through AP-22

The TRT's review of applicable documents, interviews with QA personnel, and examinations of supports confirmed the findings of RIV IR 50-445/84-05. The TRT found no further evidence to support the allegations specifically related to IR 84-05. The RIV inspector verified that he had talked to the alleger after the inspection and that the alleger was satisfied with the results of the inspection for allegations AP-18 through AP-22. The TRT confirmed this with the alleger. Accordingly, these allegations do not have safety significance.

AQW-73

In the review of this allegation, the TRT found evidence that procedures were revised to include appropriate criteria for skewed weld inspection, and that a 100 percent reinspection program for non-ASME skewed fillet welds was completed. A sampling of those supports identified by the TRT shows that all inspections were satisfactory. Accordingly, this allegation has no safety signficance for non-ASME supports.

Additionally, the TRT concludes that the inspection of skewed fillet welds between typical structural members for ASME supports was also satisfactory. However, for those pipe stanchion type connections that are typically inspected to a piping procedure, but by definition are a Subsection NF weld, the TRT substantiated the allegation. The TRT found no evidence which would permit the use of a piping inspection procedure as stated by B&R in the inspection of a component support skewed weld. Since these pipe stanchion type fillet welds were not inspected as skewed fillet welds, as defined on the QC checklist (line item 5B) of procedure CP-QAP-12.1, the commitment to rectify the skewed weld inspection problem by reinspection was not completed. A review of the weld data cards of a random sampling of supports indicates that the welds were inspected. However, B&R could not provide any documentation to indicate the revised procedure

for correctly inspecting skewed welds was used. This allegation may have safety significance because undersized welds may exist. This is an open issue for which TUEC action is required.

6. Actions Required: TUEC shall respond to allegation AQW-73 (pertaining to ASME supports for inspection criteria for skewed welds) by correcting procedure CP-QAP-12.1 and QI-QAP-11.1-28 to include all subsection NF welds, including stanchion-to-stanchion welds and stanchion-to-pad welds.

TUEC shall provide evidence to verify that previous VCD/DRD inspections of these types of skewed welds were performed correctly and inspected to the appropriate criteria.

Reference Documents:

1. TUEC and B&R procedures: CP-EP-2.1, CP-EP-4.0, CP-EP-6.0, CP-EP-4.6, CP-EP-16.1, CP-QAP-4.1, QI-QAP-11.1-28, CP-CPM-6.96, WPS-11032, CP-CPM-9.10, QI-QP-11.16-1, QI-QP-11.21.1, QI-QP-11.14-09, CP-QAP-12.1, CP-QP-18.0

2. NRC Region IV Inspection Reports 50-445/83-07, 50-445/84-05, 50-445/82-14, 50-445/84-08

3. Support Drawings: MS-1-004-007-C72K, MS-1-003-009-C72K, MS-1-003-010-C72K, MS-1-002-005-C72K, MS-1-003-007-C72K, SW-1-102-106-Y33K, SW-1-012-010-A33R, CC-1-087-004-A33A. CI-1-016-043-S35K, CI-1-016-038-S35K

4. Hanger Documentation Packages: MS-1-004-007-C72K, MS-1-003-010-C72K, MS-1-002-005-C72K, MS-1-003-007-C71K, SW-1-102-106-Y33K, SW-1-012-010-A33R, SW-1-012-009-A33R, SW-1-102-725-Y33K. SF-1-022-005-C46R, RC-1-099-001-C86K, CA-1-028-021-C46R, DD-1-109-035-C46R, RC-1-115-020-C66A, RC-1-101-002-C86K, RC-1-115-025-C66K, VD-1-148-001-C46R, SF-X-135-700-A35R, CH-1-005-005-C86R, DO-1-089-700-S65R, CH-1-001-033-A75R, CH-1-017-003-C86R, DD-1-003-086-S35R, CI-1-016-038-S35K, RC-1-115-009-C76S, CT-1-083-013-S25R, MS-1-003-005-C72K, CS-1-112-705-C41R, CS-1-112-712-C41R, CS-1-112-716-C41K, S1-1-027-702-C41R, S1-1-059-702-C41R, S1-1-066-713-C42R, CS-1-240-007-A42R.

5. CMCs and NCRs for the above listed packages.

6. Piping Isometrics BRHL: MS-1-RB-001,MS-1-RB-003, MS-1-RB-004, SW-1-YD-12, SW-1-AB-02.

7. Support calculational package for SW-1-102-106-Y33K.

8. Affidavit of alleger A-20 dated January 9, 1983.

9. Assistance to Inspection Report No. A4-83-001 concerning alleger A-20 January 24, 1983.

10. Testimony of Alleger A-45 before the ASLB on July 29, 1982 (pages 3199-3468), on September 13, 1982 (4378-4380), and on September 14, 1982 (4457-4460).

11. Alleger interview of December 18, 1984.

1. Allegation Category: Mechanical and Piping 32, Unauthorized Fabrication Techniques on Hangers and Incompetent Personnel

2. Allegation Numbers: AH-4, AH-9, AH-10, AH-11, AH-18, AH-20 and AH-21

3. Characterization: It is alleged that: unauthorized fabrication occurred contrary to established procedures that included cutting hangers with a torch (AH-9, AH-10, AH-11), installation of structural steel without approved drawings (AH-4), hitting hangers with a sledge hammer, use of grinders, and sitting on the pipe to maintain a gap (AH-20, AH-21). It is also alleged that an incompetent individual was in charge of construction of some hangers (AH-18).

4. Assessment of Safety Significance: Since most of these allegations are closely related to fabrication practices, the NRC Technical Review Team (TRT) reviewed the hanger and support fabrication and inspection procedures and addressed each allegation separately.

AH-4

Allegation AH-4 states that a welder was instructed to weld a leg on a hanger which was not authorized by the hanger drawing.

On August 28, 1984, the TRT called to ask if the alleger could identify specifically which hanger was involved or in what building, elevation, or area the hanger was located. The alleger could not provide any further information about the incident than already existed and indicated that no further details concerning the welding of the hanger could be provided. Additional questions concerning the date, the QC inspector involved, and whether any NCR was initiated yielded similar results. The TRT also attempted to contact the alleger's supervisor at the time of the incident, but he no longer worked at the site and his whereabouts were unknown.

The TRT further interviewed the alleger on January 9-10, 1985, to say that after reviewing the TUEC and B&R procedures, the welding operation described could have been performed within procedures. She said that she was told by her supervisor to use a piece of scrap steel to increase the length of Q-material that had been cut too short by the fabrication shop, that she choose a piece of steel from the floor without a heat number and, contrary to procedures, transferred the heat number of the short piece of Q-material to the piece of scrap steel. She could not identify the hanger by number. She continued by saying that she was caught by QC welding the piece of scrap steel and that she thought the hanger was scrapped. The QC inspector identified by the alleger confirmed her story that she was performing an undocumented weld and also that the hanger had been scrapped. The QC inspector said that no NCR was written because the hanger was "in process" fabrication, and that he observed the hanger cut up and put in an authorized scrap bin. The QC inspector told the TRT that the scrapping of the hanger was not documented. The QC inspector also told the TRT that he did not observe the alleger transferring the heat number to the scrap piece of steel, as alleged.

The TRT reviewed Brown & Root procedure CP-QAP-16.1 "Control of Nonconforming Items" paragraph 3.2.2.4, which provides requirements for reporting in-process deficiencies. This procedure requires any deficiency observed during in-process inspection to be designated "UNSAT" with a hold tag applied. An NCR should then be written and a disposition established. TUGCO procedure CP-QP-16.0 for non-ASME work also provides similar requirements in paragraph 3.1.1 "Field Identification," and paragraph 3.2.4.1(e) "Disposition of Scrap." The alleger said that the fabrication of "counterfeit hangers" (hangers where heat numbers are transferred to scrap steel) was a common practice, but she could not identify any by number. The TRT could not identify any other counterfeit hangers fabricated by the alleger. (This concern is closely related to AH-7 in Mechanical and Piping Category 33, "Counterfeit Hangers.")

AH-9, AH-11

These allegations state that the alleger saw his supervisor and others use cutting torches to fabricate various hangers (AH-9), and to cut bolt holes in tube steel (AH-11). In his sworn statement of November 22, 1983, the alleger identified three hangers on which he had knowledge of torch cutting by hanger number (AH-9). However, he is not sure whether CMCs were used to authorize these cuts. The TRT attempted to review the HPs for these hangers; however, the exact hanger numbers identified by the alleger could not be found and were thought to be incorrect. The TRT interviewed the alleger on September 11, 1984, about the incorrect hanger numbers that he identified in his November 22, 1983, sworn statement. The TRT then provided the alleger with the Brown & Root (B&R) hanger location (BRHL) isometric drawings for the four main steam loops, and a sampling of their associated support drawings. The alleger identified the supports he believed were deficient. He indicated that he was not concerned about the use of torches to cut steel, but about the fit-up of the mating pieces that were cut. He confirmed that all pieces cut were either ground smooth or machined per procedure. The alleger also stated that his concerns had been addressed previously by the NRC Resident Inspector at Comanche Peak Steam Electric Station (CPSES) and that he, the alleger, was given a copy of the final inspection report. Upon further review, the TRT learned that the second set of hanger numbers provided by the alleger (MS-1-004-007-C72K, MS-1-002-005-C72K and MS-1-003-009-C72K) were indeed addressed in RIV Inspection Report (IR) 80-445/84-05. These concerns have been reviewed by the TRT as allegations AP-18, AP-20, and AP-22 (see Mechanical and Piping Category 31.)

The same alleger (AH-11) stated in a related allegation that cutting torches were regularly used to enlarge holes in structural tubing to accommodate anchor bolts that were not exactly perpendicular and that the cuts were authorized by CMCs. During the September 11, 1984 interview, the alleger described the only hanger (unidentified, except that it was in Unit 2) he had ever seen with an unauthorized torch-cut bolt hole. He also acknowledged that his crew had torn it down and rebuilt it. The TRT discussed the use of cutting torches on hangers with PSE, B&R QC, and pipe hanger fabrication personnel. All individuals interviewed said and the TRT agreed that even though thermal cutting was allowed by paragraph 3.3.4 of CP-CPM-9.10, this would have been a very inefficient method to use.

Also, since paragraph 3.3.4 of CP-CPM-9.10 specifies a particular tolerance on hole size that would account only for a very small amount on non-perpendicularity of the mating anchor bolt, an elongated hole would not be allowed. Cutting holes with a torch would have required grinding to smooth out the rough edges and allow for proper seating of the nut. According to hanger fabrication personnel, drilling was used by the craft personnel for enlarging holes since it required very little cleanup work on the hole. Their preference for drilling to enlarge holes was confirmed by discussions with QC inspectors.

AH-10, AH-18

These allegations are very closely related to AH-11, since they refer to the same concern of bolt holes cut with a torch. In allegation AH-10, the supervisor of the alleger for AH-11 reiterates the same concern about enlarging bolt holes with a torch, even though he provided no specific information concerning the allegation. However, the alleger did stipulate that eight B&R employees had knowledge of torch cutting of bolt holes. The TRT reviewed NRC Assistance to Inspection Report A4-83-005 which addressed the statements of the eight B&R employees. Two individuals remembered an instance of enlarging bolt holes with a cutting torch in a piece of tube steel; however, the hangers were scrapped and replaced with new material. The TRT reviewed a sworn statement by the alleger of AH-11 concerning this incident. He stated that he had knowledge of tube steel that had to be cut to allow proper fit-up with the anchor bolts; however, all hangers had CMCs authorizing the work. He also expressed his knowledge about the above-mentioned incident, since it was his crew that rebuilt the hanger. The statement gives no further information that would identify the hanger. The remaining six employees interviewed by NRC's Office of Investigations (OI) had no knowledge of improper use of cutting torches on hangers.

The TRT reviewed Region IV (RIV) Inspection Report (IR) 50-445/83-27, which addressed allegation AH-11. The RIV inspector discussed the use of cutting torches on hangers with B&R welding and fabrication engineers and was told that this operation was not prohibited. The TRT confirmed this finding through similar interviews with hanger fabrication and QC personnel and by a review of paragraph 3.3.4 of CP-CPM-9.10. The RIV inspector also was told that holes are normally enlarged, if so required, by drilling offset holes and that cutting torches were permitted on other types of structural members. The TRT again confirmed these statements in similar interviews. However, no procedures could be found that addressed torch cutting of bolt holes. The RIV inspector examined approximately 60 hangers in the Containment Building between the 860 and 905-foot elevations that contained tubular sections connected with anchor bolts. Although the RIV inspector stated in his report that he was limited in visual accessibility to the bolt hole, he did not find any hole that was enlarged by a cutting torch. The RIV IR concluded that based upon the lack of specificity of the allegation, the lack of corroborative testimony of the eight B&R employees interviewed by OI, and the examination of the installed hangers, the RIV inspector could not substantiate the allegation. The TRT, as part its assessment of allegation AC-3, inspected 150 anchors connecting tubular steel between the same elevations. The inspection was conducted to review

the allegation of non-perpendicular anchor bolts; however, the TRT observed no enlarged holes by torch cutting.

The TRT interviewed the alleger on October 31, 1984 and was told that that the torch cutting operations he described were not prohibited by procedure; however, all personnel interviewed indicated that bolt holes in tube steel would normally be drilled rather than torch cut. The alleger insisted that he could provide evidence of torch cutting of bolt holes if he went to the site. On November 7, 1984, the TRT accompanied the alleger to the site. During the site tour he described a restraint that had holes "out of round" in tube steel. The alleger said the support was located on the wall in one of the steam generator bays, but he was unable to identify the specific hanger. The alleger also indentified the individual, who under orders, cut the oversize holes.

The TRT inspected the steam generator bays and was able to identify only one possible hanger (SG Bay #4) that might be the one identified by the alleger. Since this support was highly inaccessible, the TRT was unable to inspect it for torch cut holes. However, the TRT inspected 20 similar supports in the Unit 1 Containment Building identified by the alleger as the area in which he worked. The TRT found no bolt holes that were cut with a torch. The TRT did find, however, two supports with drilled holes where the holes exceeded the 1/8-inch oversize permitted by paragraph 3.3.4 of CP-CPM-9.10 for bolt holes over 1-inch in diameter. Support MS-1-151-037-C52R had a bolt hole in the tube steel oversized by approximately 1/4 inch and CC-1-233-001-C53R contained a hole oversized by approximately 1/2 inch. Four additional supports (MS-10-150-010-C52S, CT-1-036-403-C72K, CT-1-036-404-C72K, and CT-1-051-413-C72K) had bolt holes that appeared slightly oversized.

With respect to the individual identified by the alleger as the person who used a torch to cut the bolt holes, the TRT learned that he no longer worked on site.

In order to assess allegation AH-18, the TRT contacted the alleger to gain further information. Although the alleger was unable to identify any specific hangers worked on by the individual alleged to be incompetent, he did identify the individual. Since the "incompetent" individual was no longer on the job site and was unavailable for an interview, the TRT had no basis for establishing the validity of the allegation.

AH-20, AH-21

These allegations concern the use of sledge hammers to straighten pipe hangers and the use of grinders and the forced positioning of the pipe to establish the correct design clearance around the pipe as described on the design drawing. One of the allegations contends that due to binding and/or misalignment of the pipe, wood timbers were used to jack the pipe down to the bottom of the hanger frame in order to maintain the design clearances. Another describes a crewman sitting on the pipe to force the pipe to the bottom of the frame during a QC inspection. The TRT interviewed the alleger on August 24, 1984, and was told that he did not have first-hand knowledge of these allegations. He said that a former employee,

whose name he refused to reveal, related these allegations to him. The TRT asked the alleger to contact the individual to determine if he was willing to talk to the TRT concerning more detailed information on these allegations. The alleger said that since he had no details on the allegations, he would contact this individual, and either the alleger or the individual would contact the TRT. Neither individual has contacted the TRT, and further attempts by the TRT to contact the alleger have been unsuccessful.

The TRT discussed the construction and inspection of pipe hangers with B&R hanger fabrication engineers and QC personnel. Hanger fabrication engineers said that sledge hammers would not be allowed; however, a 4-pound rubber mallet used with a piece of wood to soften the blow could have been used to align the structural members during welding. The use of a 4-pound rubber mallet was not prohibited by any specific procedure, a practice confirmed by a QC inspector as something that could have occurred. The B&R personnel interviewed indicated that the type of deficiency described would require an NCR and engineering disposition. In order to ascertain whether hangers were damaged with sledge hammers or contained incorrect vertical gaps the TRT, during site inspections of other pipe supports, looked for evidence of support frames with no gap at the top and some gap on the bottom of the pipe. No evidence of this condition could be found.

5. Conclusion and Staff Positions:

AH-4

The TRT determined that the allegation originally described as "welding a leg to a hanger not authorized by the drawing" was later expanded to include the fabrication of a "counterfeit hanger" (i.e., improperly transferred heat number). Since the hanger in question was observed by QC as having an undocumented weld and was scrapped, this allegation was partially substantiated. The TRT could not substantiate that part of the allegation that the heat number of a piece of Q-steel was transferred to a piece of scrap steel. The TRT concludes that an NCR should have been written to document the unauthorized weld with a disposition to scrap the hanger. This allegation has no safety significance, since the hanger was scrapped.

AH-9 and AH-11

Because these allegations are closely related, the TRT interviewed the alleger for AH-9 and AH-11 and discovered that AH-9 duplicates the review done for AP-18, AP-20 and AP-22 in Mechanical and Piping Category 31. The TRT also learned that AH-11 pertained to a single hanger in Unit 2 that had been replaced. The alleger knew of no other instances to support this allegation. Allegations AH-9 and AH-11 could not be substantiated and has no safety significance.

The alleger was contacted on September 11, 1984 and on November 7, 1984, and said he had no further concerns.

AH-10

The TRT could find no specific details for AH-10, since it was vague. The TRT reviewed RIV IR 83-27 and agrees with the inspector's assessment for torch cut bolt holes. The TRT, as part of its assessment of allegation AC-31, inspected 150 anchors of the type described by the alleger and found no evidence of torch cutting. However, the TRT did identify two supports that had oversized holes by drilling according to CP-CPM-9.10, and four supports that appeared questionable. The related concern of oversized bolt holes by drilling was substantiated.

AH-18

The TRT was able to identify the "incompetent" individual "in harge of construction of some hangers" described by the alleger; however, he was unavailable for an interview. Accordingly, this allegation could not be substantiated.

AH-20 and AH-21

The TRT interviewed the alleger and was unable to accumulate more detailed information needed to fully assess Allegations AH-20 and AH-21. Even though the alleger agreed to contact the TRT with more clarifying information, he did not do so and the TRT was unsuccessful in attempting to reach him. The TRT reviewed construction and inspection procedures relating to the allegations and found evidence of proper practices. The TRT interviewed B&R construction and inspection personnel and found that these individuals concurred with the finding that the construction practices in general conformed with procedures. The B&R personnel interviewed indicated that the type of deficiency described would require an NCR and engineering disposition.

During site inspections of various pipe support frames the TRT found no evidence to substantiate the allegations. During a March 6, 1985 interview with the alleger, the individual previously described as having first-hand information concerning the allegation was present and agreed to point out the deficiencies during a future site visit. Accordingly, the allegation can neither be substantiated nor refuted at this time.

6. Actions Required: None.

Reference Documents:

1. Sworn Statement of alleger A-50 taken on September 15, 1983.
2. Interview between alleger A-50 and OI on September 15, 1983.
3. Assistance to Inspection Report A4-83-005 dated November 30, 1983 from OI.
4. Sworn Statement of alleger A-38 taken on November 22, 1983.
5. Assistance to Inspection Report A4-83-005 dated May 20, 1983 from OI.
6. Assistance to Inspection Report A4-83-005 dated May 20, 1983 from OI.
7. Sworn Statement of alleger A-19 dated June 18, 1983 pages 35, 36, and 49.

8. Affidavit of alleger A-19 dated November 26, 1983.
9. Affidavit of alleger A-19 before the ASLB, dated February 3, 1983 pages 6 & 7.
10. Affidavit of alleger A-4 dated March 31, 1984 pages 3&4.
11. Brown & Root procedures CP-CPM-9.10, CP-CPM-6.96, QI-QAP-11.1-28.
12. TUGCO Procedures CP-EP-2.1, CP-EP-16.3, CP-EP-4.6, CP-EP-16.1.
13. Region IV Inspection Report 50-445/83-27.
14. TUGCO procedure CP-QP-16.0.
15. B&R procedure CP-QAP-16.1.

1. <u>Allegation Category</u>: Mechanical and Piping 33, Use of Nonqualified (Non-Q) Materials on Hangers

2. <u>Allegation Number</u>: AH-3, AH-7, AH-15, AQW-71 and AQH-22

3. <u>Characterization</u>: It is alleged that there have been various instances of the use of non-Q materials in the fabrication of safety-related pipe hangers, such as the use of foreign steel (AH-3), scrap material (AH-7), and material with no heat numbers (AH-15, AQW-71 and AQH-22).

4. <u>Assessment of Safety Significance</u>: Since these allegations are closely related to material traceability, the NRC Technical Review Team (TRT) reviewed the procedures and material-handling process that control the fabrication and installation of pipe hangers.

<u>AH-3</u>

Initially, the alleger claimed that color photographs existed that contained information (undefined) that would lead to the backfitting of many hangers and supports. On August 2, 1984, the TRT met with the alleger to clarify the allegation. During this meeting, the alleger indicated that he was misquoted by the NRC Office of Investigations (OI). He said that he was referring to color photographs of qualified hanger structural material whose heat numbers had been transferred to unqualified Japanese steel and used throughout the plant in pipe hangers and restraints. The qualified steel was then scrapped and hauled offsite or dumped into the Squaw Creek Reservoir. The alleger had no other information, such as purchase order numbers, for the traceable qualified steel or the foreign steel. When asked what hangers this material was used in, the alleger told the TRT that he had no first-hand knowledge of any specific hanger numbers or of the transferring of heat numbers, but he believes this material was used throughout the plant. He indicated that he had seen the photographs but did not have them in his possession.

The TRT questioned purchasing, QC, and fabrication personnel concerning Japanese steel at the job site. No one had ever seen purchase orders or material specifications for Japanese steel. The TRT reviewed purchase order numbers CPF-500 through CPF-1585 which identified hanger material from September 1981 to May 1982 (while the alleger was on site). Ten purchase orders were reviewed in detail and no evidence of any foreign steel vendors was found.

The TRT interviewed Texas Utilities Electric Company (TUEC) purchasing personnel to determine the method by which hanger material is purchased and distributed. They indicated that all structural steel, such as structural tubing (SA-500) and wide flange materials (SA-36), is ordered fully traceable for Class 1, 2, and 3 supports with Certified Material Test Reports (CMTRs), even though ASME Section III, Subsection NF, requires only a Certificate of Compliance (COC) for Class 2 and 3 supports. The COC requires the identification of the material type and grade, but not the heat number. The TUEC purchasing method involved their receiving requests for material, typing the purchase order, and having it signed by Brown & Root (B&R)

Quality Engineering (QE) before issuing it to the vendor. Purchasing personnel were not aware of any prohibition against ordering qualified Japanese steel, although the person interviewed knew of none that had ever been ordered or received.

Upon receipt of the material, B&R QC inspectors inspected the material with the accompanying documentation to verify heat numbers. The TRT interviewed QC receipt inspectors and B&R material control personnel. QC receipt inspection personnel confirmed that all incoming steel was checked for documented heat numbers and was either approved or put on a nonconformance report (NCR). The TRT also talked to personnel at the hanger fabrication shop who said that steel was requisitioned from the warehouse by means of a material requisition (MR), which listed the heat numbers. When the material was requested for hanger fabrication by field personnel, a material identification log (MIL) was prepared which included the hanger item numbers and the corresponding heat numbers. In addition, any time a cut was made, a QC holdpoint was established to verify that the heat number had been transferred prior to the cut. The TRT interviewed QE and QC inspection personnel who indicated that a QC hold point was also established prior to welding of the hanger. The purpose of the holdpoint was to allow the QC inspector to verify that the heat number on the MIL corresponded to the heat number on the piece of steel. This review was then documented on the MIL. The TRT reviewed evidence of properly signed MILs in randomly selected hanger packages (HP). The TRT also confirmed the above described system of material controls and found that documentation was consistent with the requirements of TUEC and B&R procedures CP-EP-9.2, CP-QAP-8.5, QI-QAP-11.1-28, CP-CPM-6.9C, and ACP-3.

Additionally, the TRT reviewed corrective action request (CAR) S-41, which had been identified by the alleger in previous OI reports and during the TRT's interview with the alleger. The alleger was especially concerned about this CAR since he indicated in his testimony that it had been "pencil-whipped." He defined this as either dispositioning the associated NCRs in writing, but not following up with the corrective action or as improperly dispositioned NCRs. The CAR referenced 36 NCRs identifying various hanger material discrepancies. The TRT reviewed 12 of these NCRs in detail, and found 6 that pertained to material traceability. All documentation to verify the written disposition of 5 of the 6 NCRs was found and verified by the TRT. NCR M-2324, dated June 18, 1980, described a pipe hanger (H-CC-1-EC-007-018-3) having a piece of 4-inch x 4-inch x 3/8-inch tube steel (item 4) with an incorrect heat number. The NCR states that the tube steel had heat number 05197 written on it and a hold tag applied. Subsequently, the number was changed to 051897. The NCR was dispositioned to "use as is," since the heat number was verified on material requisition (MR) number 083021 as 051897. The TRT determined from procedure QI-QAP-11.1-28 that the MIL and not the MR is the correct document to connect material heat numbers to a specific hanger. The TRT found no MIL to identify the heat numbers of the original piece of tube steel as 051897. In addition, there was no documentation to link MR 083021 to pipe support H-CC-1-EC-007-018-3 other than the fact that it was in the HP. Moreover, the TRT found a material identification log (MIL), dated September 30, 1980, which gave the heat number for item number 4 on the

hanger sketch as 051392. Also, a subsequent material verification checklist, dated May 17, 1982, identified item 4 as having heat number 051392, thus implying that the piece had not been changed between September 30, 1980 and May 17, 1982. The conflicting heat numbers between the June 18, 1980, NCR and the September 30, 1980, MIL suggest that the original item 4, with heat number 051897, described in the NCR had been replaced with a new piece of tube steel. The TRT found no fabrication records in the hanger package to support this conclusion. The TRT then inspected the hanger with two Brown and Root representatives. No one could find a heat number on item 4 to help substantiate either of the material documents.

The TRT reviewed 20 unrelated NCRs on material traceability for supports initiated from January to June 1982. A detailed review of 10 of these NCRs by the TRT indicated that disposition of the NCRs had been completed and documented per the appropriate procedures. The TRT inspected two of the supports identified in the NCRs. Support CS-1-158-027-S42R (NCR M-3168) was inaccessible, but visible. NCR M-3168 indicated that item 3 had been installed as a channel C3x4.1, and not an S-beam, S3x5.7. The NCR disposition was to replace the channel with the correct S-beam. The TRT was not able to verify the heat number of the beam due to the inaccessibility of the hanger. However, the TRT did verify that item number 3 was an I-shaped beam, not a channel shape as described in the NCR. NCR M-3354 states that item 12 of support MS-1-076-009-S52K was a TS 1/2" x 6" x 6" fabricated without proper QC inspection or heat number transfer. The disposition of the NCR deduced that the heat number of item 12 was C11645 based upon supporting documents in the hanger package. The TRT inspected support MS-1-076-009-S52K and the heat number for items 12 and 15 was verified as C11645, as shown on the MIL. The inspection of these supports documented that the NCR dispositions had been correctly completed.

<u>AH-7</u>

The TRT reviewed allegation AH-7 that a piece of scrap I-beam was used in the fabrication of a hanger. The alleger indicated that his foreman told him to substitute the scrap piece of material and he followed instructions. On August 28, 1984, and again on September 10, 1984, the TRT talked to the alleger to gather more detailed information concerning the allegation. The alleger could not identify the hanger numbers or the time when the incident occurred. The alleger did say that he had notified the NRC of the incident and was later told by the NRC that the hanger had been taken out. The TRT discussed this incident with the Region IV OI investigator who recalled talking to the alleger, but could not confirm telling the alleger that the hanger had been removed without checking his notes. The TRT reviewed these notes (identified as Case Exhibit 666), but could find no corroborating statements. The TRT also discussed the allegation with a RIV inspector who told the TRT on October 12, 1984, that he remembered the incident, but that the alleger had never identified the hanger.

The TRT reviewed B&R and TUEC procedures governing the use of scrap material and non-Q material that can be recertified as Q material. B&R Procedure CP-QAP-8.5 allows the use of lower code class material in a higher class with the issuance of an NCR or an MTR. When such substitutions are made, QE is required to review the material and the NCR for

correctness; however, no non-Q scrap material is allowed. The TRT also reviewed various procedures previously referenced in allegation AH-3. The TRT inspected a sample of accessible hangers, and in all cases found heat numbers on the appropriate pieces of steel.

The TRT interviewed the alleger on January 9 and 10, 1985, to provide feedback. The TRT told the alleger that the allegation could not be substantiated due to lack of specific details. The TRT also stated that it had reviewed the total material handling process to see whether the system would permit the actions alleged, and concluded that there were procedures (CP-QAP-8.5) established to prevent the use of non-Q scrap material in hangers (CP-QAP-8.5).

The alleger said during the interview that not only was the I-beam a piece of scrap steel, but that he had fraudulently transferred the heat number from the original piece of material to the scrap material and proceeded to weld it to the hanger. The original piece was not being used because it had been cut too short. The alleger also said that during the site visit the next day he could point out this hanger to the TRT. During the site visit on January 10, 1985, the alleger identified the hanger at the 820-foot level in the Unit 1 South Yard tunnel as a ceiling hanger on isometric CT-1-YD-02. The TRT identified the hanger pointed out by the alleger as CT-1-073-001-Y45R. This is a Class 5 hanger, and the ANSI B31.1 code does not require material traceability for its supports.

The TRT reviewed Texas Utilities Generating Company (TUGCO) procedure QI-QP-11.16 and B&R procedure CP-CPM-7.1I which provide requirements for inspection of Class 5 hangers and the contents of a Class 5 hanger package. These procedures did not require maintenance of an MIL in the hanger package, which is consistent with the ANSI B31.1 code.

AH-15

This allegation very broadly states that non-Q material was used in Q components for both fire protection hangers and pipe hangers. The TRT's evaluation of material controls for pipe supports is presented in allegation AH-3 of Mechanical and Piping Category 33. The TRT reviewed the B&R and TUEC procedures governing the material control and traceability of safety-related fire protection (FP) hangers. FP hangers that are classified as safety-related are considered to be Class 5, nonnuclear safety-related seismic Category II supports and need not be constructed of Q-material, pursuant to ANSI B31.1. However, B&R Procedure CP-CPM-9.9, paragraph 3.11, required all FP hangers which were fabricated onsite to be made with Q material. TUEC did not require FP hangers that were shipped to the site from Grinnell Fire Protection to be constructed of Q-material. Therefore, it would be possible to have some FP hangers without heat numbers. In its review of FP hangers, the TRT found that all FP hangers inspected contained evidence of heat numbers.

AQW-71

This allegation states that 15 to 20 hangers without material traceability were identified and reported to the alleger's supervisor. The incident

occurred in the QE material verification group, which was responsible for inspecting hanger packages to verify that proper material documentation was present prior to final VCD/DRD inspection. The TRT talked to a QE inspector who had previously supervised the group and who confirmed that one of the functions of the group was to identify and correlate the material traceability documents for pipe supports manufactured by NPS Industries (NPSI), because much of the material traceability was located at NPSI. The QE inspector said that NPSI had the proper certified material test reports (CMTR) at their home office and had been requested to ship all evidence of material traceability to the site for those hangers they had fabricated. The initial evaluation of the material verification group was to sort out all of the paperwork and add the proper documents to each hanger package.

The TRT reviewed RIV Inspection Report 50-445/82-11 addressing this allegation. The RIV inspector had talked to the alleger's supervisor who did not remember the alleger discussing the hangers with him. The supervisor told the RIV inspector that the purpose of the group was to inspect and research the hanger packages for completeness. The RIV inspector could neither substantiate nor refute the allegation due to its vagueness.

Since the TRT could not locate the alleger to identify the 15 to 20 hangers, the TRT talked to his supervisor, who allegedly had received the report on the lack of hanger traceability. The supervisor, who currently works in a different department, said he remembered the alleger worked in his group from approximately January to July 1982. The supervisor did not remember ever receiving a report from the alleger concerning lack of material traceability on 15 to 20 hangers. He said the group normally had HPs which required additional CMTRs for vendor-supplied material; however, they were able to locate the correct documents, which was one of the functions of the group. In addition to NPSI supports which are shipped with CMTRs, the supervisor said that ITT-G hangers also were shipped with Certificates of Compliance (COC), rather than CMTRs. The TRT confirmed with ITT-G that they had shipped hangers requiring only COCs to the site until the early part of 1981.

The TRT reviewed 400 NCRs initiated between January and July 1982. The purpose of this review was to determine if the alleger had initiated an NCR and if NCRs were processed routinely for similar deficiencies. The TRT could find no evidence of an NCR initiated by the alleger. The TRT did find 20 NCRs relating to material traceability processed in a 5-month period. The TRT reviewed 10 of these NCRs in detail and found that all had been properly dispositioned.

AQH-22

This allegation states, that although several heat numbers were listed in receiving inspection report (RIR) 21236, the alleger could not determine which was applicable to piece No. 5 of pipe support SI-2-073-401-S32R. The QC supervisor then assigned an inspector other than the alleger to verify the transfer of the heat number to piece No. 5 and to sign off on the subsequent traveler. In an interview with the TRT, the alleger implied an impropriety on the part of the QC supervisor and General Foreman in

bypassing the alleger and assigning a different QC Inspector to verify transfer of the heat number which the QC supervisor had deduced was the correct heat number.

The TRT interviewed the QC supervisor, who stated that he concluded from his review of the material documentation that a transcription error in the heat numbers had been made on the MIL by the QC inspector who originally verified the transfer of the heat numbers onto the MIL. The QC supervisor said his conclusion was based upon the amount and type of material listed on RIR 21236. Since two No. 6 pieces were listed, one an SA-240 stainless steel piece and one an SA-36 carbon steel piece, he concluded that one was the missing piece No. 5. The QC supervisor then assigned another inspector under his supervision to verify the transfer of piece No. 5 to the MIL and to sign off the traveler.

In assessing this allegation, the TRT reviewed support traveler documents consisting of the support drawing, material requisition (MR), request hanger or parts (request to fabrication shop), material identification log (MIL), weld data card (WDC), NPSI material tracer (shipper), and B&R RIR 21236. The TRT found that material for support SI-2-073-401-S32R was supplied by NPSI, but was apparently erroneously misnumbered on the NPSI material tracer. The tracer lists the shipment of two different material items as piece No. 6. There were three pieces of stainless steel plate of a specified dimension and one piece of carbon steel plate to a different dimension. Since the different dimensions and material composition were readily apparent, the TRT agreed that the supervisor was able to deduce that one of the items identified as piece No. 6 was actually No. 5. This is also supported by the fact that piece No. 5 on the hanger sketch matched the description of the carbon steel plate on the receipt inspection report.

The TRT does not agree with the alleger's inference of impropriety and finds that the QA supervisor acted within his responsibility to identify and evaluate problems and assist in providing solutions. The TRT also finds it reasonable for a supervisor to select and assign personnel and to provide direction to personnel under his supervision.

5. Conclusion and Staff Positions:

AH-3

This allegation was reviewed in the context of material traceability in general. The TRT found the material handling system followed the prescribed procedures. The TRT found no evidence of Japanese steel being substituted for qualified steel. The TRT did find a violation with the disposition of an NCR as part of CAR S-41, and also a lack of heat number traceability on the hanger in question; thus, this allegation was partially substantiated. The allegation does not have safety significance because (1) heat traced materials are not required by ASME III subsection NF for Class 2 & 3 supports, and (2) only A-500 or A-501 tube steel was purchased on site.

The TRT discussed the conclusions of the review with the alleger on December 18, 1984, and he was informed of the violation. He was very

receptive and stated that the TRT had done more work than he thought would be done.

AH-7

This allegation was vague in content; however, the alleger subsequently identified the pipe hanger as a specific Class 5 hanger. Since the hanger package for Class 5 supports is not required to contain evidence of the material traceability, this allegation cannot be substantiated and accordingly does not have safety significance.

AH-15

This allegation was vague and non-specific and pertained to the control and identification of materials for fire protection and pipe supports. Traceability of materials for pipe supports is addressed in Allegation AH-3, Mechanical and Piping Category 33. The TRT reviewed the procedures governing material traceability and reviewed evidence of compliance with these procedures. The allegation can neither be substantiated nor refuted; accordingly, the TRT could not find any evidence to substantiate the allegation.

The alleger was not identified and his whereabouts are unknown; therefore, the TRT has been unable to contact him for a follow-up interview.

AQW-71

This allegation is specific, although the hangers in question could not be identified. The TRT could find no evidence to support the allegation and the alleger's supervisor did not remember whether the incident ever took place. Accordingly, this allegation does not have safety significance.

The TRT sent the alleger a letter on August 30, 1984, to his last known address. As of this writing the TRT has not received a response.

AQH-22

The assessment of this allegation verified documented evidence of the traceability for the correct heat number for piece No. 5. Accordingly, this allegation does not have safety significance.

The TRT interviewed the alleger on November 14, 1984 for the purpose of providing feedback. The alleger was satisfied with the results of the TRT review.

6. Actions Required: None.

Reference Documents:

1. B&R and TUGCO Procedures : QI-QAP-11.1-28, CP-EP-9.1, CP-CPM-6.9C, CI-CPM-8.2, CI-CPM-8.1, CP-CPM-9.10, ACP-3, CP-CPM-9.1, CP-QAP-8.1, CP-EP-5.0, CP-CPM-9.9.
2. Corrective Action Request CAR S-41 dated 6/23/80.

3. NCRs M-3117, 3127, 3130R-1, 3137, 3152, 3168, 3200SR-1, 3214, 3234, 3241, 3254, 3345, 3346S, 3354R, 3379, 3412, 3427, 3431, 3508, 2265R.1, 2326, 2324, 2308, 2318, 2312, 2303, 2297, 2294, 2289, 2281, 2234, 2248R.2 , 2294, 2341, 2362.
4. Purchase Orders CPF-523-S, 529-S, 551-S, 599-S, 1000-S, 1025-S, 1026-S, 1308-S, 1585-S.
5. Statement of alleger A-45 - dated March 7, 1984.
6. Statement of alleger A-51 - dated September 15, 1983.
7. Interview of alleger A-51 - dated September 15, 1983.
8. Statement of GAP witness "J" (Unknown and undated).
9. Limited appearance of alleger A-17 before ASLB - September 15, 1982, pages 4845-4852.
10. Region IV IR 50-445/82-11.
11. RIR 21236.
12. Hanger Package SI-2-073-401-532R.
13. Alleger interviews August 8 and 23, November 14, December 18, 1984, and January 9-10, 1985.
14. Case exhibit 666 and 666C 9/2/82.

1. Allegation Category: Mechanical and Piping 34, Computer Programs for Base Plates Not Properly Validated

2. Allegation Number: AP-24 and AP-25

3. Characterization: It is alleged that the ITT-Grinnell FUB II, Rev. 2, and Corner & Lada Base Plate computer programs, which are used for evaluating pipe support base plate stress and anchor bolt tension loads, made erroneous assumptions and were not validated.

4. Assessment of Safety Significance: In assessing these allegations, the NRC Technical Review Team (TRT) reviewed the documentation of the two vendor-supplied computer programs, together with the appropriate procedures.

   AP-24

   Allegation AP-24 indicated that, in general, the ITT-Grinnell (ITT-G) base plate computer program, FUB II, Revision 2, was never validated. This allegation specifically contended that the FUB II Revision 2 program only checked one bolt out of four for tension loads, and that the same bolt (Bolt No. 4) was chosen as the highest loaded bolt regardless of input data.

   The NRC Region IV (RIV) inspection team reported its assessment of these allegations in IE reports 50-445/83-12 and 50-446/83-07, dated February 22, to March 23, 1983. The RIV inspector reviewed analyses performed in January 1981 that showed the program did not chose just bolt No. 4 as the highest loaded bolt, as alleged. In the process of the evaluation the RIV inspector learned that the program author had discovered in September 1982 that the FUB II program (Revision 2) failed to choose the correct moment arm (the "moment arm" is the distance over which the moment load applied to the baseplate is transferred to the bolt as a force). The RIV inspector reviewed the results of an analysis performed by ITT-G to quantify the effect of the programming error. This analysis involved the comparison of the results of the analysis of 25 supports using FUB II Rev. 2, FUB II Rev. 3 (corrected version), and a finite element analysis, Base-Plate II. Since the FUB II Rev. 3 results were 25 percent more conservative than the finite element analysis, and FUB II Rev. 2 is more conservative than FUB II Rev. 3, the RIV inspector concluded the programming error was considered to be insignificant.

   Prior to assessing the allegation, the TRT conducted a detailed technical review of the validation of the FUB II computer program. The TRT found that the evolution of the FUB II program from Rev. 0 to Rev. 3 was well documented and that Rev. 2 was revised to account for the correct moment arm calculation as identified by the RIV inspectors. The TRT reviewed the technical development of the equations used in FUB II, and the problems used as a benchmark to compare with finite element analyses. ITT-G told the TRT that the FUB II program was the first computer program issued by ITT-G for the Comanche Peak Project. (The TRT confirmed by telephone with ITT-G engineering management that the earlier version of the program, FUB I, had not been issued to the Comanche Peak Project.)

During the assessment of the allegation, the TRT learned that based upon a request from the field, ITT-G addressed the concern that only bolt No. 4 was chosen as the highest loaded bolt. The TRT reviewed a series of analyses of various based plate configurations analyzed by ITT-G using FUB II Rev. 2 that indicated that bolts other than bolt No. 4 were correctly chosen as the bolt with the highest tension load. Contary to the allegation, the TRT could not find any evidence that FUB II Rev. 2 chose only bolt No. 4 as the highest loaded bolt and, therefore, agrees with the conclusion of the RIV inspector. During its reviews, however, the TRT determined that ITT-G discovered the computer program failed to perform the correct moment arm comparisons for choosing the shortest moment arm (i.e., the one associated with highest force).

In order to determine the technical impact of the moment arm discrepancy, the TRT reviewed the ITT-G FUB II Rev. 3 documentation which provided benchmark comparisons to correct the moment arm discrepancy that existed in FUB II Rev. 2. (Rev. 3 documentation was included because it was a concern identified by the Region IV inspection report.) The TRT reviewed 25 actual samples of previously analyzed base plates at Comanche Peak reanalyzed using Rev. 3 of FUB II, which included the change by ITT-G to account for a conservative moment arm calculation to determine maximum bolt load. ITT-G explained that the moment arm calculations now being used in Rev. 3 of FUB II were based upon previous engineering comparisons that resulted in conservative results, regardless of whether the shortest or longest moment arm was chosen by FUB II. This is explained by the fact that the classical "closed formed" engineering technique used by FUB II was so conservative when compared to the more precise finite element engineering technique that the determination of a "more correct" moment arm become irrelevant.

The TRT reviewed the 25 sample analyses of four-bolted base plates and found, as did the RIV inspector, that an average conservatism of bolt tension/shear interaction of 25 percent between the finite element analyses and FUB II Rev. 3 was substantiated. As additional documentation, ITT-G provided evidence of approximately 50 other base plate designs that were compared for conservatism between FUB II Rev. 3 and finite element engineering analysis. This grouping showed similar results.

In reviewing the documentation of previous revisions of FUB II, the TRT discovered that early onsite records by TUEC's Pipe Support Engineering (PSE) revealed that some base plates had been analyzed by FUB II Rev. 0 and Rev. 1. The TRT learned that approximately 1200 hangers with base plates were reanalyzed as part of a backfit program using the more accurate FUB II, Rev. 2 or Rev. 3. Since PSE did not identify these 1200 hangers by hanger number, the evidence of the reanalysis should be in the calculation package of each stress isometric drawing package. The TRT verified that this program had been accomplished by reviewing approximately 90 hanger calculation packages from 25 pipe stress isometric drawings. Each analysis reviewed had been performed to FUB, Rev. 2 or Rev 3 and the TRT could find no evidence that FUB II, Rev. 0 or Rev. 1 analyses still existed.

AP-25

Allegation AP-25 stated that (1) the Corner & Lada base plate program assumes rotation about the center of the attachment, (2) the program has not been validated, and (3) there is additional rigidity that is not being taken into consideration.

The Corner & Lada Co. (C&L) stated that the C&L computer program was used to analyze plate stresses and anchor bolt loads for approximately 2000 base plates at the Comanche Peak project. The TRT reviewed the documentation for this program in order to assess whether the program assumes rotation about the center of the attachment. The basic mathematical formulation for this base plate analysis takes into account the anchor bolt stiffness, base plate flexibility, and foundation stiffness. Using that information, the program calculates a new rotation point from which the plate stress and anchor bolt loads can be determined. The extensive documentation for this program includes studies on a .375-inch and a .75-inch base plate. The results of the C&L Base Plate Program were compared by C&L with the results from both C&L's finite element analysis and a published finite element analysis from Teledyne Engineering Services. The C&L Base Plate Program calculated anchor bolt loads were from 3.3 to 9.5 percent higher than the two finite element solutions. Thus, the C&L program yields conservative engineering results compared with finite element analysis, and is consistent with standard industry practice.

The alleger's concern that additional rigidity due to the attachment stiffness had not been considered is substantiated. However, this additional rigidity would only reduce the loads on the anchor bolts. Therefore, the present method of calculating anchor bolt reactions is more conservative.

In order to more fully assess the use of the C&L program at CPSES, the TRT reviewed various additional base plate analyses. The plates had non-symmetric bolt patterns, attachments not located at the plate center, and two attachments. When these analyses were compared with their finite element analysis, they showed that the C&L Base Plate Program was between 5 to 18 percent more conservative than the finite element analysis.

5. Conclusions and Staff Positions:

AP-24

After an in-depth review of the documentation and historical backup for FUB II, Rev. 0 through Rev. 3, the TRT finds that the program was adequately documented, thus substantiating the conclusions of the RIV inspection concerning the choice of the correct bolt as the bolt with the highest load. Additional verification was reviewed and found to document ITT-G's conclusions that a moment arm analysis more conservative than finite element analysis was being chosen in both Rev. 2 and Rev. 3 of FUB II. Accordingly, this allegation does not have safety significance.

AP-25

The TRT, after reviewing the Corner & Lada base plate program, determined that the allegations do not have safety significance.

The TRT interviewed the alleger on November 14, 1984, who was given the results of the TRT review; he said that his real concern was whether the design information was input correctly to the computer programs. The TRT indicated that the design process required all calculations to be checked, including computer calculations. The TRT indicated that 90 examples of computer calculations were reviewed by the TRT during its assessment of the ITT-G FUB II computer program. The results of this review showed all calculations were checked and the input data was correct. The TRT also indicated that during the assessment of other allegations, the TRT did see that calculations were being checked for correct input data. This satisfied the alleger that there was some positive mechanism for checking. The alleger also said that the TRT had done more work than he thought would be done on his concerns.

6. Actions Required: None.

Reference Documents:

1. ITT-Grinnell FUB II, Rev. 2 Base Plate Program documentation dated April 20, 1982.
2. ITT-Grinnell FUB II, Rev. 3 Base Plate Program documentation dated September 12, 1982.
3. ITT-Grinnell FUB II Engineering Procedure.
4. US NRC Region IV Inspection Report 50-445/83-12, 50-446/83-07.
5. TUEC Procedures CP-EP-2.1, CP-EP-4.0.
6. TUSI Engineering Guidelines Section II "General Engineering Criteria for Pipe Support Design," Section IV "Base Plates", Section V and VI "Hilti and Richmond Anchor Bolts," Section XV "Pipe Support Design Guidelines.
7. C&L Base Plate Program Documentation dated May 11, 1981.
8. Base Plate Output for Hanger No. DD-1-006-101-Y35R, CC-1-043-026-A33R, AF-1-048-045-A35R DD-X-059-020-F45R, SW-1-011-022-F-33R CC-1-132-008-543R.
9. C&L letter dated February 18, 1983 to John Finneran from Francis H. Lavelle concerning Base Plate documentation.
10. PSE Small Bore Hanger Stress Isometrics H-SA-X-EC-007, H-MS-1-RB-005, H-SA-X-TB-014, H-MS-1-PB-007, H-RM-1-SB-001, H-CH-1-AB-045, H-WD-1-SB-014, H-CS-1-AB-006B, HWP-X-AB-018, H-SA-X-AB-015 with their associated hanger calculation packages (70 total).
11. PSE Large Bore Hanger Calculation Packages 00-1-067-712-553R, CT-1-021-701-S22R, CS-1-063-703-A42R, CC-1-050-701-A43S, BR-1-013-701-S43R, WP-1-049-700-S-43R, CS-1-002-700-C52S, 00-X-026-701-A33R, BR-X-001-706-A53R, BR-X-001-705-A53R, BR-X-001-707-A53R, BR-X-079-700-A53R, CC-X-909-718-E23R, BR-X-044-703-A33R, CS-X-004-703-A33R, CC-X-909-702-E23R, VA-X-006-700-A73S, VA-X-004-702-A73R, CC-X-12-700-A43R, CC-X-12-701-A43R.

12. Testimony of alleger A-41 before the ASLB on September 14, 1982 (pp. 4861 and 4862).
13. Interview with alleger A-41 on November 14, 1984.

1. Allegation Category: Mechanical and Piping 35, Computer Program Verification for Piping

2. Allegation Numbers: AP-26, AP-27 and AP-28

3. Characterization: It is alleged that (1) the ADLPIPE piping analysis computer program and the seismic response spectra criteria for CPSES have not been validated (AP-26); (2) the simplified piping analysis technique has never been validated (AP-27); and (3) there are no provisions to account for damage to Class 3 (seismic) piping and supports caused by the failure of Class 5 (nonseismic) piping supports (AP-28).

4. Assessment of Safety Significance:

AP-26

This allegation contends that the ADLPIPE computer program, originally conceived and maintained by Arthur D. Little Co. and currently owned by DIS/ADLPIPE, Inc., has never been validated. The NRC Technical Review Team (TRT) reviewed the Region IV (RIV) Inspection Report 50-445/83-12 & 83-07 concerning these allegations. During their inspection of this allegation, NRC's RIV reviewed the documentation to support the benchmark verification of the ADLPIPE computer code at the Gibbs & Hill (G&H) engineering offices and found the verification of the code was performed in accordance with G&H Procedure EDP-10. Also, Region IV reviewed a letter from the NRC's Office of Nuclear Reactor Regulation to Arthur D. Little Inc. (Ref. benchmark verification of ADLPIPE Version 3C dated June 1980) and determined that the NRC staff found acceptable agreement with the G&H benchmark problems and the requirements of NRC Regulatory Guide 1.92. The TRT discussed the technical validation and the QA maintenance of DIS/ADLPIPE with G&H pipe stress and QA personnel. Gibbs & Hill has a copy of ADLPIPE at their New York office and they are on a direct mailing list for all updates, changes, and bulletins identifying any deficiencies. G&H pipe stress personnel stated that one individual is responsible for receiving all incoming correspondence from DIS/ADLPIPE, and he is also responsible for disseminating all pertinent information, such as bulletins describing technical errors, to all project managers. The project manager is then responsible for evaluating this information as it pertains to piping analysis performed on his project. He is required to return a completed form to the person in charge of ADLPIPE bulletins that states he has received the information, that he has evaluated its impact, and that he has taken the appropriate action to correct any deficiencies, if needed.

The G&H piping engineer responsible for CPSES says that he could not remember any technical bulletin that described deficiencies that required reanalysis at CPSES since he has been associated with the project (1982). He also said that the procedure describing the engineering and QA maintenance requirements described above are given in G&H procedure EDP-10. This procedure also provides criteria for benchmarking and accepting computer codes when they are initially purchased. The G&H pipe stress engineer stated that DIS/ADLPIPE was initially QA checked and benchmarked with other computer codes for comparison of results, and that these results are maintained by QA. The TRT plans to visit G&H in New York at a later date

to verify their compliance with the procedure (EDP-10) and the QA maintenance of DIS/ADLPIPE. The TRT also reviewed ADLPIPE verification documentation unrelated to CPSES, which consisted of benchmark problems with other public access computer codes, as well as simple hand (noncomputer) calculations.

The benchmark documents reviewed showed that the displacement and force responses of the piping subjected to applied multi-directional seismic input incorporated the provisions of modal superposition/response spectra techniques specified in Regulatory Guide 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis." On the basis of the documentation identified above, the TRT agrees with the NRC's RIV conclusions that the DIS/ADLPIPE program has been acceptably validated.

Allegation AP-26 also contends that the seismic response spectra generated by G&H for the Comanche Peak Station was nonrepresentative and only poorly agreed with the Uniform Building Code.

The TRT reviewed th Comanche Peak Final Safety Analysis Report (FSAR) concerning the development of the response spectra criteria (paragraphs 3.7 and 3.7B) and found the development of the various response spectra to be consistent with good engineering practice for nuclear power application. The TRT agrees with the RIV inspector's conclusion in IR 50-445/83-07 and 83-12 that the derivation of a response spectrum for a nuclear plant is more conservative, based upon the more rigorous design techniques utilized, than the Uniform Building Code. The FSAR gave a detailed consideration to SSE and operational basis earthquake (OBE) earthquake criteria, critical damping values, supporting media, various seismic analysis methods, differential seismic motion of connected structures, deformation criteria, soil-structure interaction, floor-by-floor response spectra, torsional effects, and interaction of various piping and component classes.

AP-27

This allegation stipulates that the simplified piping analysis technique had its "growing pains" over a number of years, and had not been validated.

The TRT reviewed in depth the Comanche Peak "Simplified Method for Design and Analysis of Small Size Piping, " procedure AB-5, Rev. 5, of May 1982, of G&H specification MS-200. The procedure was very detailed and specified the ASME code class, loading conditions, pipe size, temperature and pressure ratings, seismic criteria, anchors, restraints and nozzle connections. The TRT also reviewed a sample problem provided with the procedure and found the results acceptable with respect to the requirements of ASME III subsection NC & ND. Although the use of the simplified method appeared to consume much time, the TRT found that the results were conservative and consistent with proper engineering techniques. The TRT interviewed Pipe Support Engineering (PSE) management and was told that EDS, Inc. had initially developed an alternate analysis method early in the piping analysis for field run piping. However, this alternative was soon replaced with the current procedure. The TRT was told by PSE that

systems that had previously been analyzed with the EDS alternate analysis were subsequently rerun with the G&H simplified analysis. The TRT reviewed the EDS alternate analysis as part of allegation AM-29 in Mechanical/Piping Category 39.

The TRT also reviewed the G&H simplified method for small bore piping analysis for compliance with the NRC Standard Review Plan (SRP). The TRT reviewed the CPSES FSAR paragraph 3.7B.3.5, "Use of Equivalent Static Load Method of Analysis," which states:

> For a subsystem which can be adequately and realistically represented as a simple model, similar to the guidelines of NRC Regulatory Guide 1.100, Rev. 1, and produce conservative analysis results, and no determination of natural frequencies is made, the response of the subsystem is assumed to be the peak of the appropriate floor response spectra at the appropriate value of damping multiplied by a factor of 1.5. A factor less than 1.5, but not less than 1.0 may be used, provided conservative results are obtained and proper justification provided.

The SRP also recommends that in those cases where an equivalent static alternate analysis is used, a multiplication factor of 1.5 should be applied to the peak values of the floor response spectra. The G&H procedure AB-5 provides criteria for establishing seismic loads using the peak values of the appropriate floor response spectra in all loading directions, but does not apply the 1.5 factor as suggested by the SRP. The TRT was referred to work performed by Dr. John Stevenson ("Seismic Design of Small Diameter Pipe and Tubing for Nuclear Power Plants," Paper No. 314, 1973, and "Amplification Factors to be Used in Simplified Seismic Dynamic Analysis of Piping Systems," Paper No. PVRC 74-NE-9, June 1974) which indicated that the 1.5 factor was not required. TUEC, in a written statement to the TRT, indicated that the development of the G&H alternate analysis was based upon the same model of the piping system as described in Dr. Stevenson's paper. TUEC also provided the TRT with a copy of a paper authored in part by G&H which also concludes that for the type of piping analysis model used to develop the alternate analysis for CPSES (G&H procedure AB-5), a 1.5 factor for the seismic loads was not required.

The TRT reviewed the G&H procedure AB-5, both papers by Dr. Stevenson, and the G&H paper provided by TUEC (C. I. Corban and C. Veiss, "Nomagraph for Simplified Seismic Analysis Based on Allowable Stress Limit," Paper No. K12/11 presented to the 6th International Conference on Structural Mechanics, 1981). TUEC stated that these papers were provided as proper justification for the use of a dynamic amplification factor of 1.0 rather than 1.5. TUEC, however, could provide no documented evidence that the results of the G&H work to justify the reduction of the 1.5 factor had been formally evaluated and approved by G&H prior to usage at CPSES and presented to the NRC as part of the FSAR commitment.

AP-28

This allegation states that failure of a Class 5 (nonseismic) piping system could in turn cause the failure of a Class 3 (seismic) piping system and its supports. The TRT reviewed RIV Inspection Reports 50-445/83-12 and 83-07, which looked at the implementation of the G&H damage study. The RIV inspector indicated that a G&H damage study had determined the impact of all Class 5 lines larger than 2 inches for their capability to reduce the functioning of Seismic Category I piping and components as required by NRC Regulatory Guide 1.29, "Seismic Design Classification." The RIV inspector reviewed the design techniques used by G&H. Since there is an unknown contribution from the Class 5 segment on the Class 3 supports, two supports in the Class 5 segment are included in the Class 3 design. In addition, the rest of the Class 5 line is represented by utilizing the maximum dead weight span recommended in the ASME Code along with the peak acceleration of the response spectra. The analysis techniques were found to be consistent with good engineering practice by the Region IV inspector.

The TRT interviewed the TUEC management responsible for the Comanche Peak Field Damage Study Group (FDSG). According to procedure CP-EI-4.0-36, this group is responsible for ensuring that sources identified as nonseismic piping and conduit larger than 2 inches in diameter, and nonseismicially supported equipment and structures located in Category I buildings, would not cause unacceptable damage (as defined in CP Seismic Interaction Criteria) to safety-related components during and following a seismic event. This procedure identifies the sources and the targets (Nuclear Safety Class 1, 2 and 3 piping and equipment) that are subject to its criteria. The FDSG field team is required to perform walkdown inspections of each applicable compartment to identify and document potential interactions between sources and targets. All interactions require evaluation and resolution if they are found unacceptable based upon the requirements of the CP Seismic Interaction Criteria. Procedure CP-EI-4.0-36 does not identify the timing of the initiation of the walkdowns required for the damage study; however, the procedure does provide controls for areas already reviewed where changes have taken place. The TRT reviewed several samples of damage study walkdowns in the Auxiliary Building. Room 226 was reviewed in detail and found to have 43 sources and 16 targets. Many interactions were dispositioned as initially unacceptable by the FDGD field team and were resolved according to paragraphs 3.4 and 3.5 of CP-EI-4.0-36 either by (1) requiring additional supports for the source piping as deter-mined by the appropriate engineering organization, or (2) accepting the configuration after comparison with the Comanche Peak Seismic Interaction Criteria (CPSIC). The CPSIC provides a detailed step-by-step approach to addressing potentially unacceptable interactions for an acceptance disposition. The damage study records identifying targets and sources and their interaction reviewed by the TRT provided adequate evidence that potential damage that could be caused by the postulated failure of nonseismic piping adjacent to seismic piping was adequately considered.

This allegation is related to Civil/Structural Category 14, "Control Room Area" (AE-17), in that both reviewed the Damage Study Group. In that review, the TRT was concerned with nonseismic electrical conduit, 2 inches

in diameter and under, and other nonseismic items in the control room and throughout the plant that might affect safety-related piping. This category of conduit was excluded from the scope of the damage study group and TUEC is required to respond to this open issue.

This item is also related to Mechanical/Piping Category 36, "Piping Analysis Problem" (SRT-3). The TRT, in that review, was concerned about the design of the same piping going from a nonseismic Category I building to a seismic Category I building. SRT-3 differs from AP-28 in that AP-28 was concerned with the affects of the failure of adjacent nonseismic piping on the design of the seismic piping. TUEC is required to respond to the open issue described in SRT-3.

The TRT interviewed the alleger for allegations AP-26, AP-27, and AP-28 on November 14, 1984, to provide feedback. The alleger said he was satisfied with the results of the review. However, he said that even though ADLPIPE was validated and maintained by G&H, he still has a concern about whether the input data used in ADLPIPE was checked. The TRT indicates that G&H was required by procedure to perform checking as a part of their design control. The TRT also told the alleger that evidence of computer input data being properly checked by engineering personnel was reviewed by the TRT for both piping and piping supports during the review of other allegations. The TRT also informed the alleger that the RIV inspector, during his review of the allegation, had reviewed some piping analyses and concluded that they were satisfactory. The alleger was satisfied with these results.

5. Conclusions and Staff Position:

AP-26 and AP-28

The TRT reviewed both allegations AP-26 and AP-28 identified in RIV IR 50-445/83-12 and 83-07 and agrees with the RIV IR conclusions that none of the allegations could be substantiated. The TRT reviewed various documents which provided evidence contrary to the allegations. Accordingly, these allegations have no safety significance. However, related items have resulted in open issues in Civil and Structural Category 14 (AE-17), and Mechanical and Piping Category 36 (SRT-3).

AP-27

The TRT agrees with the RIV inspector's conclusions concerning his review of the equivalent piping analysis techniques. However, the TRT concludes that TUEC should have advised the NRC in the FSAR of the exclusion of the 1.5 factor as recommended by the SRP, and additionally TUEC should have provided technical evidence as the basis for this exclusion. Since the reduction of the 1.5 factor is also being evaluated by the TRT in a related concern (Civil and Structural Category 70), a statement of safety significance will not be made pending the results of that assessment.

6. Actions Required: None.

Reference Documents:

1. Comanche Peak FSAR Paragraph 3.7.N and 3.7B.
2. TUGCO procedures CP-EI-4.0-36, CP-EP-4.0, DP-EP-4.5.
3. Comanche Peak Seismic Interaction Criteria Document.
4. DIS/ADLPIPE letters to VCC dated October 27, 1983; June 10, 1983; June 22, 1983; March 29, 1983; October 26, 1982.
5. ADLPIPE users manual.
6. Testimony of alleger A-41 before the ASLB on September 15, 1982 (pages 4861-4865).
7. Transcript of interview with alleger A-41 on November 14, 1984.
8. "A Simplified Method for Design and Analysis of Small Size Piping," Rev. 5, Gibbs & Hill, Inc., 1982.
9. Stevenson, J.D., "Seismic Design of Small Diameter Pipe and Tubing for Nuclear Power Plants," Paper No. 314, presented at 5th World Conference on Earthquake Engineering, Rome, 1973.
10. Stevenson, J.D. and LaPay, W.S., "Amplification Factors to be Used in Simplified Seismic Dynamic Analysis of Piping Sytems," Paper 74-NE-9, presented at the Pressure Vessel and Piping Conference, Miami Beach, June 1974.
11. Corban, C.I. and Veiss, C., "Nomograph for Simplified Seismic Analysis Based on Allowable Stress Limit," Paper No. K12/11, presented at the 6th International Conference on Structural Mechanics in Reactor Technology, Paris, France, 1981.
12. Region IV IR 50-445/83-07 & 83-12.

1. Allegation Category: Mechanical and Piping 36, Piping Analyses Problems found in Region II Report

2. Allegation Number: SRT-1, SRT-2, and SRT-3

3. Characterization: The issues in this SSER are not the result of allegations, but were found during an NRC Region II Special Review Team (SRT) inspection at Comanche Peak Steam Electric Station (CPSES). They were listed as open items and, as such, are considered part of the NRC Technical Review Team (TRT) review.

SRT-1

The SRT found that a component modification card (CMC) apparently was not considered in the small bore piping analysis.

SRT-2

The SRT partially reviewed piping system AF-1-SB-007 and discovered that one CMC was not properly addressed.

SRT-3

The SRT raised concerns about the design considerations that should be implemented when a piping system goes from a safety- related building to a nonsafety-related building.

4. Assessment of Safety Significance:

SRT-1,SRT-2

The TRT discussed the SRT's concerns about CMCs with the SRT member who was responsible for this area of the SRT's report. His concern was that engineering judgment may have been applied to piping analyses when a calculation was required. The SRT randomly selected 50 systems and instructed Texas Utilities Electric Company (TUEC) pipe support engineering (PSE) personnel to review and report on the methods (e.g., engineering judgment, calculations) that were used to accept the CMC changes.

The TRT also reviewed system AF-1-SB-006 and CMC No. 90567, which were the subject of the SRT's concern. The TRT agreeed with the SRT assessment that PSE used engineering judgment and that this judgment was, indeed, conservative. The degree of conservatism of the engineering judgment was determined by hand calculation and by rigorous computer analysis. The TRT found that the hand calculation results showed higher stress levels than the computer solution by a factor of 2.

The TRT reviewed 10 of the 50 systems in detail to determine if the PSE engineers incorporated all open CMCs into their analyses and to determine if they were using engineering judgment too liberally. The TRT found that the analysis packages which they reviewed were complete and easy to follow. The TRT also found that "engineering judgment" was used only for minor changes in the 10 systems reviewed and that hand calculations were used

for the remaining changes. The TRT reviewed the calculations and found them to be accurate and conservative. The TRT also found that all outstanding CMCs were incorporated into the analyses.

It appears that the CMC that was not incorporated on piping system AF-1-SB-007 was an isolated case since the TRT found no similar problems during its review. The TRT also determined that this unincorporated CMC would have been picked up when the final review was performed on the "as-built" isometric drawing for this system.

SRT-3

The TRT called the New York office of Gibbs & Hill (G&H) to determine the status of their response to the SRT concerns regarding the design of piping systems which go from safety-related to nonsafety-related buildings. The TRT learned that G&H to date had done nothing to answer the SRT concerns.

The TRT agreed with the SRT that piping lines going from a seismic Category I building to a nonseismic Category I building could cause damage to supports and the piping system on the seismic Category I side. The TRT determined that these effects must be considered unless an isolation anchor was provided between the two buildings.

Piping systems at CPSES, such as those for the main steam auxiliary steam and feedwater systems, are routed between the electrical control building, which is seismic Category I, and the turbine building, which is nonseismic Category I, without any isolation. To be acceptable, each nonseismic Category I piping system should be isolated from any seismic Category I piping system by separation, barrier or constraint. If isolation is not feasible, then the effect on the seismic Category I piping of the failure in the nonseismic Category I piping must be considered (CPSES FSAR 3.7B.3-13.1).

In the case of CPSES, the FSAR, Section 3.7B.2.8, establishes that the Turbine Building is a nonseismic Category I structure and failure is postulated during the seismic (SSE) event. The effect of turbine building failure on any non-isolated piping routed between the turbine building and any seismic Category I building must be considered. In addition, for non-seismic category I piping connected to seismic category I piping, the dynamic effects of the non-seismic category I piping must be considered in the seismic design of the seismic category I piping and supports, unless TUEC can show that the dynamic effects of the non-seismic category I piping are isolated by anchors or restraints. The anchors or restraints used for isolation purposes must be designed to withstand the combined loading imposed by both the seismic category I and non-seismic category I piping.

5. Conclusion and Staff Positions:

SRT-1, SRT-2

After reviewing the TUEC treatment of CMCs for small bore piping isometrics, the TRT concludes that TUEC performed reviews according to procedures and

used methods that are widely used in piping stress analyses throughout the industry. The TRT concludes, therefore, that TUEC has addressed the SRT concerns and demonstrated that they do not have safety significance.

SRT-3

Since G&H has not addressed the original SRT concern regarding piping system design (SRT-3), the status of this item remains undetermined. The TRT concludes that this concern could have safety implications; however, until G&H completes their review, a final determination of the safety implications cannot be made.

6. Actions Required: TUEC shall provide analysis and documentation that the piping systems routed between seismic Category I and nonseismic Category I buildings meet the stated FSAR criteria.

Reference Documents:

1. PSE Piping Calculation Numbers

   (a) CC-1-EC-001.
   (b) CC-1-FB-002.
   (c) CC-1-SB-001.
   (d) FW-1-RB-005A.
   (e) FW-1-SB-018.
   (f) MS-1-SB-007.
   (g) RC-1-RB-012.
   (h) AF-1-SB-007.
   (i) RH-1-SB-006.
   (j) SI-1-RB-035.

2. G&H Procedure AB-5, Revision 5, "A Simplified Method for Design and Analysis of Small Size Piping."

1. Allegation Category: Mechanical and Piping 37, Hanger QC Inspection Deficiencies

2. Allegation Number: SRT-4, SRT-5 and SRT-6

3. Characterization: The concerns in this category were raised by the NRC Region II Special Review Team (SRT) and, as such, are not allegations. The SRT determined that (1) some QC inspectors were confused with respect to the interpretation of the 5° installation requirements for struts and snubbers, and (2) prior to fuel load, the final adjustments for spring hangers and snubber settings were not performed.

4. Assessment of Safety Significance: In April 1984, the SRT report identified several violations that were to be followed up by the NRC Technical Review Team (TRT). These violations contained the phrase "this matter will be forwarded to the Comanche Peak Project Director for follow up." The TRT reviewed the SRT report and identified items SRT-4, SRT-5, and SRT-6 as matters requiring followup.

SRT-4 and SRT-5

The SRT report states that Texas Utilities Electric Company (TUEC) had agreed to revise its inspection procedure QI-QAP-11.1-28 to clarify the strut and snubber installation tolerance and to conduct training for all QC inspectors involved with pipe support inspections. The TRT reviewed QI-QAP-11.1-28, Revision 23, which was in effect at the time of the SRT review. The procedure did not precisely define the inspection acceptance criteria for strut and snubber orientation. TUEC clarified the installation acceptance criteria in Revision 24 (April 17, 1984) such that no strut or snubber could be installed with an orientation angle between the axis of the strut and the attachments at either end of greater than 5°. TUEC also conducted QC inspector training on April 24, 1984, specifically on strut and snubber orientation angles (paragraph 3.3.1.1C of QI-QAP-11.1-28). The training aids consisted of the revised procedure and a universal protractor, which is the instrument used to measure the angular orientation of the strut or snubber. TUEC revised paragraph 3.3.1.1C of QI-QAP-11.1-28 again on June 11, 1984. This revision (Rev. 25) expanded the description of the orientation angle inspection tolerance and stated that struts and snubbers were to be installed within a tolerance of ± 1° of the angle shown on the design drawing, with the angle not to exceed 5° unless specified by Pipe Support Engineering (PSE). Also, if no angular dimension existed on the design drawing, the QC inspector was to notify PSE to provide this dimension.

As required, TUEC has revised the inspection criteria and provided the proper training specified by the SRT for strut and snubber orientation inspections. These actions clarify the acceptance criteria for struts and snubbers and provide the basis for ensuring that future inspections will be properly conducted. TUEC, however, did not address the concern about how to correct previously inspected struts and snubbers that could be outside of the specified tolerance because of confusion among the QC inspectors. The TRT discussed this situation with Brown & Root (B&R) QA and PSE, and with various QC inspectors. B&R QA indicated that pipe

supports, especially snubbers, were subject to many inspections prior to the initiation of power operation. Even though many supports containing struts or snubbers had already undergone the as-built and/or vendor-certified drawing or design-review drawing inspections, they still had to undergo the inspections associated with start-up activities.

The TRT discussed these start-up inspections with PSE personnel operating under the authority of the TUGCO start-up group. The PSE personnel stated that prior to fuel loading hot functional (HF) and secondary hot functional tests (SHF) are performed on all safety-related supports. During hot functional testing, snubbers are checked for such items as travel, piston setting, and binding of the bushings at initial ambient temperature, at 250°, 350°, 450°, 550° and at final ambient temperature, and the information is recorded. If any parameters are outside the approved acceptance criteria, a test deficiency report is generated and sent to PSE for disposition. During the hot functional test all affected piping systems are given walkdown inspections to check the piping positions. If the piping is off position, the line is walked down further to determine the cause, which could be a binding strut or snubber. The TRT also learned that a detailed check for binding of struts is not performed, since the Generic Letter to TUGCO of January 14, 1981 from the NRC Division of Licensing pertains to the pre-service inspection and testing of snubbers only. PSE did say, however, that if the piping maintains its designed position within a prescribed tolerance during the HF piping system walkdown inspection, they assume that no struts or snubbers are binding and, therefore, the struts or snubbers are within the 5° installation tolerance. During the SHF, which is done at ambient temperature, the lines are walked down and snubber parameters are checked and recorded. The TRT reviewed data sheets listing these parameters to assure that they were properly recorded for both the HF and SHF testing. Also during this walkdown, interferences are looked for and recorded, if found. PSE told the TRT that the walkdown crews do look for struts that might be bound up, but when asked they could provide no evidence to document this type of inspection.

In order to determine the effectiveness of the training given to the QC inspectors concerning measurement of the strut installation angle, the TRT inspected two supports containing struts which had a visible orientation angle greater than zero degrees. Together with B&R QC inspectors, the TRT measured the swing angles of the struts to be 3° and 4½°. Both struts complied with the criteria of the appropriate revision of QI-QAP-11.1-28 in effect at the time of their documented QC inspection.

The TRT also discussed the 5° angular limit on installation with a strut manufacturer, and confirmed that the primary purpose for providing an angular limitation is to prevent strut binding. The angular limitation is provided by the manufacturer of the spherical bushing and is normally 6°.

Further TRT review gave no direct evidence that additional inspections and/or walkdown inspections performed by QC or PSE during preoperational testing could verify that all safety-related struts met the 5° angular installation requirement. PSE indicated that if the piping is on position during an HF or SHF walkdown, it is assumed no struts are binding. Both B&R QA

and PSE concluded that enough redundancy existed in the many inspections and walkdowns to provide assurance that a problem did not exist. However, the TRT cannot conclude that this is true in all cases, since there could be instances of piping being on position within its acceptance criteria with a strut still binding. This condition could exist when a strut is binding: however, the force on the pipe resulting from the binding force at the strut connection is not high enough to move the pipe beyond the pipe movement acceptance criteria due to a high pipe stiffness or the routing of the pipe in the vicinity of the binding strut.

This item is closely related to QA/QC Category 8, "Snubber/Sway Strut Misalignment" (AQ-50). During the as-built review, the TRT discovered two hangers with struts exceeding the 5° limitation. Both of these struts had been previously inspected to revision 18 of QI-QAP-11.1-28 and found acceptable. This discovery confirms the TRT concern of a lack of a retrofit program to correct the strut angles.

SRT-6

The TRT reviewed the SRT's results of the final adjustments on snubber piston settings and spring hanger positions. The TRT interviewed PSE personnel operating under the auspices of the TUGCO start-up group and confirmed that a final inspection was planned for all safety-related supports requiring final adjustments of their mechanisms to assure proper functioning. This inspection will include snubber piston position and spring hanger adjustments to assure compliance with the design drawings and will take place after fuel loading. The TRT reviewed pre-operational testing procedure 1CP-PT-55-11 which described the requirements of this inspection. The TRT also reviewed the format of the appropriate data sheets used for recording functional parameters, e.g., snubber piston positions, and found them to be acceptable. Samples of previously completed data sheets were reviewed and found to be in order.

5. Conclusions and Staff Positions:

SRT-4, SRT-5

With reference to the confusion among QC inspectors concerning the installation tolerance on strut and snubber orientation, the TRT reviewed TUEC's response to the SRT report and finds that the committed responses have been carried out and that the allegation does not have safety significance. However, the TRT was concerned about potential generic implications on previously inspected struts and snubbers. The TRT reviewed documentation that snubbers had been inspected for potential binding during HF testing; however, no documentation could be produced by PSE that struts had been similarly reinspected. Both B&R QA and PSE attempted to provide indirect assurance that, in their opinion, based upon other inspections and documented pipe positions, no struts were binding to cause a problem; however, the TRT disagreed with their conclusions.

SRT-6

Concerning the final adjustments of snubber and spring hanger settings, the TRT reviewed evidence that a final inspection to check snubber and spring hanger settings is planned after fuel loading, and agrees that this is an appropriate method to provide proper hanger settings prior to full power operation. At this time, this concern does not have safety significance.

6. Actions Required: None.

Reference Documents:

1. Brown & Root Procedure QI-QAP-11.1-28 Revision 23, 24, and 25.
2. TUGCO Pre-Operational Testing Procedure 1CP-PT-55-11.
3. Support Drawings and Hanger Packages for CT-1-053-418-C62R and CT-1-038-413-C62R.
4. NRC Letter dated January 14, 1984 Concerning Snubber Testing.
5. TUGCO Pre-Operational Testing Thermal Movement Acceptance Criteria for Snubbers dated June 19, 1984.
6. Comanche Peak Special Review Team Report of Region II dated April 1984.

1. <u>Allegation Category</u>: Mechanical and Piping 38, Installation of Improper Anchor Bolt Material

2. <u>Allegation Number</u>: AB-11

3. <u>Characterization</u>: It is alleged that there was a mixup in bolts in the Unit 1 Containment Building and that 3000 anchor bolts, some furnished by "Boston Made" and others by "Southern Made," were interchanged.

4. <u>Assessment of Safety Significance</u>: The NRC Technical Review Team (TRT) reviewed Region IV (RIV) inspection reports (IRs) 79-25,26 and 77-09 and discussed this allegation with the Texas Utilities Electric Company (TUEC) site QA/QC supervisor.

   The site QA supervisor referred the TRT to nonconformance reports (NCRs) M704 (dated July 25, 1977), M722, Revision 1 (dated July 25, 1977), and C718 (dated July 27, 1977). These NCRs described a mixup in a group of about 2000 bolts and nuts used for embedded equipment anchorages. These bolts were supplied by both Bostrom-Bergen Metal Products (i.e., "Boston Made") and Southern Bolt Co. (i.e., "Southern Made").

   The TRT found that Bostrom-Bergen Metal Products used A540 material for their anchor bolts and nuts and A588 material for plates. Southern Bolt Company used A320 material for anchor bolts, A194 for nuts, and A588 material for plates. In the process of installing these anchor bolts, some A194 nuts were intalled on A540 bolts and some A540 nuts on A320 bolts. Also many of the A194 nuts were tack welded to A320 bolts and the A-194 nuts were tack welded to the A540 bolts without a proper welding procedure being used.

   The TRT learned that Brown & Root (B&R) reviewed the weld procedure that was used to tack weld the A194 nuts to the A320 bolts and the A194 nuts to the A540 bolts and found the procedure to be acceptable. B&R and TUEC personnel then performed a random examination of approximately 70 nut-to-bolt welds and found no evidence of cracks. The TRT determined that to prevent a recurrence of this problem B&R issued procedure CEI-15, which put a color coding system into effect to prevent the intermixing of the different anchor bolt materials and parts.

   The TRT also learned that NCRs for the intermixed anchor bolts were closed in August of 1977. This allegation was reported to RIV in October of 1979 by an anonymous alleger; therefore, the NCR history indicates that the quality assurance system at Comanche Peak Steam Electric Station discovered the nonconformance and promptly dispositioned it prior to the alleger's contacting RIV.

5. <u>Conclusion and Staff Positions</u>: Based upon a review of NCRs and applicable procedures, the TRT concludes that the actions by TUEC were technically sound and that appropriate procedures were implemented to prevent recurrence of the problem in the future. The TRT considers the anchor bolts that were mixed up during installation to be acceptable, since the weld procedure for connecting the nut to the bolt had been qualified and

no evidence of cracks was found. Accordingly, this allegation has no safety significance.

The TRT was unable to discuss its findings with the alleger, who was not identified.

6. Actions Required: None.

Reference Documents:

1. Gibbs & Hill Drawing No. 2323-51-0566.
2. NCR C718, Rev 1, dated July 27, 1977.
3. NCR M704, dated July 25, 1977.
4. NCR M722, Rev 1, dated July 25, 1977.
5. Region IV reports 79-25, 26 and 77-09.
6. B&R procedure 35-1195-CEI-15, "Installation of Containment Anchor Bolts, Nuts, and Plates."

1. Allegation Category: Mechanical and Piping 39, Adequacy of Small-Bore Piping Design Practice

2. Allegation Number: AM-29

3. Characterization: It is alleged that the "simplified" (i.e., noncomputer) method of analysis for small-bore piping systems prior to early 1980 could have been deficient.

4. Assessment of Safety Significance: While inspecting another nuclear power plant in March 1984, an NRC Region II (RII) inspector was told of this alleged deficiency at Comanche Peak. The RII inspector subsequently evaluated the allegation while he was a member of the Comanche Peak Special Review Team (SRT) in April 1984, although the evaluation was done independently of his role on the SRT. The evaluation concluded that the alleger's concern was resolved. Documentation of the RII inspection was subsequently transmitted to NRC Region IV (RIV) for their review and action. The NRC Technical Review Team (TRT) reviewed the RII correspondence with RIV related to the allegation and conducted an independent assessment of the allegation.

The TRT review of a RII memorandum dated April 2, 1984, determined that the allegation was made during RII inspections related to the application of alternate analysis criteria for small-bore piping systems. The RII memorandum stated that:

> Questions were primarily directed in the area of training received, understandability of the procedures, and how comfortable the designers were with systems designed using alternate analysis criteria.

The Region II memorandum indicated that the alleger's concern was related to his experience with the alternate analysis method used at Comanche Peak during his employment by Gibbs & Hill (G&H) at Comanche Peak 4 years earlier. The memorandum stated that the alleger said that:

> [The Comanche Peak] job had been very backward in that the procedures were not nearly as good as the [utility name deleted] alternate analysis procedure. In fact, for parts of the analysis there were no procedures at all (e.g., thermal calculations were based on an ITT Grinnell Handbook rather than a procedure; seismic spanning was not covered by a procedure; etc.)... [H]e was not comfortable with what was being done so he left. . . [H]e understands that alternate analysis is not being done at Comanche Peak now but he had reservations about what was happening 4 plus years ago.

TUEC Alternative Analysis Methods

During its assessment of the allegation, the TRT determined that two alternate (noncomputer) methods of analysis have been utilized for the design and analysis of ASME B&PVC (Code) Section III Class 2 and 3 piping systems and supports at the Comanche Peak Steam Electric Station (CPSES).

These methods were documented in Texas Utilities Services, Inc. (TUSI) Mechanical Field Support Design Group (MFSDG) Specification MFSDG-APAC-100, "Alternate Criteria for Piping Analysis and Support Design" (also known as the EDS Criteria), and G&H Procedure AB-5, "A Simplified Method for Design and Analysis of Small Size Piping." G&H "Nomograph for Simplified Seismic Analysis (Piping Size <4 inches, Operating Temperature <200°F)" was excluded from the TRT assessment since this nomograph provided guidelines for establishing the spacing between seismic supports only. The TRT found that only one issue of MFSDG-APAC-100 (Rev. 0, October 26, 1979), but six issues of AB-5 (Rev. 0, January 1980 through Rev. 5, May 1982) had been authorized for use. Based on the dates of issue of MFSDG-APAC-100 and AB-5 and the period of the alleger's concern, the TRT determined that the alleger's concern could have related to either of these alternate methods of analysis.

During its investigation of allegation AM-29, the TRT found that information contained in the Piping Information Tracking System (PITS), identified in G&H Specification 2323-MS-200, could have been incorrect since 1983 and was indicative of a breakdown in the control of the method of analysis of safety-related piping systems of 4 inches and smaller in diameter. The TRT was informed by TUEC PSE personnel that the PSE organization discontinued its use and updating of the PITS listing in 1983. The TRT found that Paragraph 5.6.2 of current G&H Specification 2323-MS-200, "ASME Section III, Code Class 2&3 Piping," Rev. 4, June 20, 1984, stated that: (1) piping systems 4 inches and smaller in diameter could be analyzed by noncomputer methods, but were to be identified in the PITS listing of Appendix B to the specification, and (2) piping systems 4 inches and smaller with operating temperatures less than 200°F could be analyzed by the noncomputer AB-5 procedure of Appendix 9 to the specification, but were also to be identified in the PITS listing.

Furthermore, the TRT observed that prior to 1984, the AB-5 alternate procedure of analyzing piping systems was incorrectly located in G&H Specification 2323-MS-46A "Nuclear Safety Class Pipe Hangers and Supports" rather than in G&H Specification 2323-MS-200 for piping systems. Texas Utilities Generating Company CPPA-36,322, dated January 14, 1984, and G&H GTN-68532, dated February 27, 1984, documented the transfer of procedure AB-5 from G&H Specification 2323-MS-46A, Rev. 4, dated December 2, 1983, to Appendix 9 of G&H Specification 2323-MS-200, Rev. 4, dated June 29, 1984.

The TRT finding of a breakdown in the control of new safety-related piping systems 4 inches and smaller in diameter was analyzed and the TRT observation that, prior to 1984, procedure AB-5 was incorrectly located were transmitted to the NRC staff for evalaution.

Review of TUEC Procedures

With respect to the alleger's specific claim that the alternate method of analysis did not provide procedures for "thermal calculations" or "seismic spanning," the TRT reviewed the scope and verified the contents of MFSDG-APAC-100 and AB-5.

The TRT review of Specification MFSDG-APAC-100 found that Sections 5.1, 5.2 and 5.3 of the specification provided procedures for the consideration of "gravity" (weight), seismic and thermal expansion, and anchor movements effects, respectively, in piping systems and procedures in Appendixes B and C for "seismic/gravity support spacing" and "support loads for uniform and concentrated weights," respectively.

A similar TRT review of procedure AB-5 found that Sections 4.1, 4.2, and 4.3 of the procedure contained procedures for deadweight, seismic and thermal expansion and anchor movement loadings, respectively. Support spacing and loads and anchor or equipment-nozzles were addressed in various subsections of Section 4 of procedure AB-5.

Based on the results of its review of the contents of MFSDG-APAC-100 and AB-5, the TRT determined that the alleger's concern about a lack of procedures for the simplified method of analysis for small bore piping utilized at CPSES some 4 years prior to 1984 was unsubstantiated.

Review of Past TUEC Practices

Relative to TUEC's past use of two different simplified methods of analysis for small bore piping systems, the TRT learned that the use of MFSDG-APAC-100 was discontinued in March 1980. Thereafter, all Code Class 2 and 3 small-bore piping systems, including those previously analysed by the MFSDG-APAC-100 method, were to be analyzed by the TUEC Pipe Support Design Group (PSDG) using procedure AB-5 or computer analysis methods. (PSDG, currently Pipe Support Engineering, was organized in early 1980 and had assumed the MFSDG responsibility for the analysis of the small-bore piping systems.). The reanalysis of piping systems previously analyzed by MFSDG-APAC-100 was undertaken purportedly for the sake of uniformity in methods of analysis and purportedly also was not a significant effort since approximately only ten piping systems had been previously analyzed by MFSDG-APAC-100. These systems could not be identified by TUEC during the TRT inspections.

The TRT therefore interviewed four PSE stress analysts who have worked in the PSDG and PSE organizations since late 1980 or early 1981, and who were involved in the final review of all small bore piping systems in Unit 1 and Common Areas. All of the analysts interviewed stated that they had never used the MFSDG-APAC-100 method and all except one stated that none of the piping systems they reviewed in the final review had been analyzed by the MFSDG-APAC-100 method. The one analyst stated that he had encountered less than ten piping systems that had been initially analyzed by the MFSDG-APAC-100 method, but subsequently reanalyzed by the procedure AB-5 method.

However, the TRT found a TUSI office memorandum dated May 14, 1980, in a MFSDG-APAC-100 manual regarding clarifications to the MFSDG-APAC-100 criteria. The memorandum suggests that the MFSDG-APAC-100 method might still have been in use in May 1980 for the analysis of small-bore piping. Since Procedure AB-5, Rev. 0, January 1980, was transmitted for use by Gibbs & Hill letter GTN 43977, dated February 8, 1980, the TRT concludes that there may have been a period (February to May 1980) when both MFSDG-APAC-100 and AB-5 possibly were in use simultaneously.

5. Conclusions and Staff Positions: The TRT determined that the alleger's concern regarding the lack of procedures for the simplified analysis of ASME Code Class 2 and 3 small-bore piping systems was unsubstantiated. The TRT found, contrary to the allegation, that both the previously utilized MFSDG-APAC-100 and the currently utilized AB-5 methods provide procedures for deadweight, seismic, thermal expansion, and anchor movement loadings.

The approximately ten piping systems analyzed by the MFSDG-APAC-100 method were purportedly reanalyzed by the AB-5 or computer methods. The TRT found, however, that there may have been a period (February-May 1980) during which both the MFSDG-APAC-100 and AB-5 simplified methods may have been in use simultaneously. This possible simultaneous use of two different simplified methods of analysis for ASME Code Class 2 and 3 small-bore piping systems was transmitted to the NRC staff for evaluation.

The TRT finding of a breakdown in the control of how safety-related piping systems 4 inches and smaller in diameter were analyzed, and the TRT observation that prior to 1984 Procedure AB-5 was incorrectly located were transmitted to the NRC staff for evaluation.

6. Actions Required: None.

Reference Documents:

1. Memorandum: B. Uryc to T. Westermann "Potential Allegation Concerning Past Design Practices at Comanche Peak, May 14, 1984."
2. TUSI CPSES 1 & 2, Specification No. MFSDG-APAC-100.
3. G&H Specification No. 2323-MS-46A.
4. G&H Specification No. 2323-MS-200.
5. G&H GTN-68532, February 27, 1984.
6. TUGCO CPPA-36, 322, January 14, 1984.

1. Allegation Category: Mechanical and Piping 40, Lack of a QA Program for Class 5 Supports

2. Allegation Number: AQP-23

3. Characterization: NRC Region IV (RIV) Inspection Report (IR) 80-15, which covered RIV inspections performed in June 1980 reported that there was no quality assurance effort being made by the licensee (Texas Utilities Electric Company [TUEC]) in regard to Class 5 hangers and supports.

4. Assessment of Safety Significance: The NRC Technical Review Team (TRT) found that RIV issued a notice of violation (NOV) to TUEC by a letter dated June 23, 1980, which requested that TUEC furnish a written statement or explanation in reply, including the details of the corrective action implemented by TUEC.

   The TRT found that TUEC responded to the NOV and the RIV request for corrective action by letter (TXX-3177, dated August 18, 1980). This letter stated that the applicable Gibbs & Hill (G&H) design and piping erection specifications had been revised and that construction and quality control procedures had been prepared and implemented by July 25, 1980, and were currently being applied to ongoing fabrication and installation activities. The letter also stated that inspection of previously installed hangers (pipe supports) would be accomplished as soon as practical, consistent with the project schedule for turnover to startup personnel.

   To assess the implementation of TUEC's corrective action, the TRT reviewed the nonnuclear pipe hanger and supports specification and the piping erection specification, and verified that those documents were revised to include a quality assurance program for class 5 supports. This review included verification that the quality assurance program was imposed on the hanger and support suppliers, ITT Grinnel (ITTG) and NPS Industries (NPSI). Additionally, the TRT reviewed fabrication, installation, and inspection procedures to assure that the quality assurance program for class 5 supports was implemented on site.

   The TRT found that Gibbs & Hill (G&H) specification 2323-MS-46B, "Non-Nuclear Pipe Hangers and Supports," was revised by the issuance of design change authorization (DCA) 7955, Rev. 1. This revision (Rev. 3), which was approved on August 19, 1980, clarified and formalized the program regarding Class 5 pipe supports. Specification paragraph 3.5.1a was revised and paragraph 3.11h was added to specify quality program requirements. The TRT determined that TUEC letters CPPA 6072 and 6073, dated August 11, 1980, transmitted DCA 7955 to ITTG and NPSI for application to items supplied to Comanche Peak Steam Electric Station (CPSES) on purchase orders CP-0046B and CP-0046B.1.

   The TRT found that G&H specification 2323-MS-100, "Piping Erection Specification," was revised by the issuance of DCA 7952, which was approved on July 22, 1980. This DCA revised specification paragraph 7.1.12 and added Appendix B, "Quality Program Requirements for Nonnuclear Safety Related Seismic Category II Supports." The DCA was incorporated in Rev. 6 of specification 2323-MS-100.

TUEC instruction QI-QP-11.11-1, "Installation Inspections of Class 5 Pipe Supports," was issued on July 25, 1980, to set forth criteria and requirements and to provide a detailed inspection checklist to be used when performing installation inspection of Class 5 supports. On November 2, 1981, QI-QP-11.11-1 was withdrawn from use and replaced by TUEC instruction QI-QP-11.16.1, "Installation Inspections of NNS Seismic Category II Supports for Class V (5) Piping." In addition to the installation inspection criteria detailed in QI-QP-11.11.-1, the replacement instruction, QI-QP-11.16.-1, added criteria for fabrication inspections and provided additional detailed inspection checklists.

The TRT staff reviewed a random sample of 11 Class 5 support record packages to determine the implementation of QA program requirements as identified in TUEC's corrective action response to RIV. This review verified that procedures were implemented to assure that the class 5 supports, installed prior to the initiation of the QA program, were inspected and subjected to a records verification program to assure that there was an inspection report record package for all installed class 5 supports. The record verification was performed by Brown & Root (B&R) QC and was documented by an inspection report (Attachment 17 to QI-QP-11.16-1). During the review of the 11 packages, the TRT observed that the inspection report was included in each of the packages. This review by the TRT staff also included the training and certification records for the five QC inspectors who had performed inspections of Class 5 supports in accordance with QI-QP-11.11-1 and QI-QP-11.16-1. The records covered a time span from August 15, 1980, through July 12, 1983. The TRT found these records to be satisfactory.

The TRT also reviewed a sample of receiving inspection records to ensure that the receiving inspection activity conformed to the requirements of B&R Procedure CP-CPM 8.1, "Receipt, Storage, and Issuance of Items." Material received records (MRR-1282, dated August 23, 1977; -9242, dated April 22, 1981; and -11403, dated January 10, 1983), which were for Class 5 supports and materials received from ITTG, contained a G&H quality control release form, copies of ITTG inspection reports, and certificates of compliance showing that materials and fabrication complied with the applicable requirements of ANSI B31.1, 1973. MRRs for material received from NPSI, (MRR-2622, dated July 6, 1978; -7398, dated March 21, 1980; -11422, dated February 14, 1983) contained copies of NPSI inspection reports and certificates of compliance indicating compliance with TUEC purchase order 0046 B.1, ANSI-B31.1, and specification MS46B. The TRT found that prior to TUEC's imposing the quality program requirements on ITTG and NPSI (August 11, 1980), the two suppliers had provided evidence of compliance with the purchase order and specification in the form of inspection reports and certificates of conformance.

The TRT interviewed the TUEC supervisor of QA audits and the TUEC site QA manager and reviewed the TUEC QA records for audits of ITTG, NPSI, and the site (CPSES). The interview and review were performed by the TRT to determine if the quality program for Class 5 supports was effectively implemented (as of July 25, 1980) in accordance with TUEC's response to the RIV notice of violation. TUEC was concurrently procuring ASME Code Class 1, 2, and 3 supports under purchase orders (POs) 0046A and 0046A.1; and Class 5 supports under POs 0046B and 0046B.1 from both of the suppliers (ITTG and

NPSI). The TUEC QA Audits supervisor and site QA manager explained that ITTG and NPSI were on the TUEC-approved vendor list and had a TUEC-approved QA program for code class supports prior to the imposition of the Class 5 program (August 1980). They also explained that the suppliers quality performance was satisfactory (for code class supports). Based on this satisfactory performance, TUEC QA did not deem it necessary to perform a supplier evaluation or a QA audit of ITTG and NPSI at that time. TUEC's QA Audit personnel did not provide clear identification of the ITTG and NPSI QA programs applicable to Class 5 supports.

The TUEC QA program is committed to ANSI N45.2.12-1973, Draft 3, Rev. 0, "Requirements for Auditing of QA Programs for Nuclear Power Plants." Section 3.4, "Scheduling," subparagraph 3.4.2 states: "Audits shall be regularly scheduled on the basis of the status and safety importance of the activities to assure conformance with the developed and implemented program. Applicable elements of the quality assurance program shall be audited at least annually or at least once within the life of the activity, whichever is shorter." In its review of QA vendor audit records for 1981 through 1984, the TRT found that contrary to the ANSI requirement, TUEC QA program audits of ITTG and NPSI for the procurement of Class 5 supports were not performed either on a regularly scheduled basis or at least annually.

ANSI N45.2.12, paragraph 3.4.3, subparagraph 3.4.3.3, states: "Supplemental audits are conducted when significant changes are made in functional areas of the QA program, such as significant reorganization or procedure revisions." Although the imposition of the QA program was neither a reorganization nor a procedure revision, the TRT regarded the specification revision which added the QA program as a significant change in a functional area. The TRT found no evidence that TUEC performed a supplemental QA audit of ITTG and NPSI to determine the implementation of the newly imposed quality program for Class 5 supports.

Texas Utilities Generating (TUGCO) procedure DQP-CS-4," Procedure to Establish System of Preaward Evaluations, Audits and Surveillances" implements the TUEC QA audit program for compliance with ANSI. This procedure, subparagraph 3.2.3 states: "In lieu of regularly scheduled audits of vendors TUGCA QA will perform the following: Monitor the individual vendor ratings if an adverse trend is evident an audit will be scheduled." The TRT found that this procedure is contrary to ANSI N45.2.12, which requires regularly scheduled audits of vendors. The TRT also found that the procedure is confusing in its intent to implement an audit program applicable to both construction and operations.

The TRT reviewed TUEC's QA internal (site) audit schedule and status records to determine if a system of planned and scheduled periodic audits was implemented to determine the effectiveness of the quality program requirements applicable to site activity for the fabrication, installation, and inspection of Class 5 supports. The TRT found that regularly scheduled QA audits of the Class 5 supports (site) activity were not performed in 1981 and 1982. The TRT also found that an audit (TCP-76) was performed on schedule in June-July 1983; however, an audit was not scheduled for 1984, due to (as stated in the TUEC QA Revised Audit Plan) startup testing

in Unit 1 and revised operations audit plans based on an anticipated September 1984, fuel load date. Since there was no audit scheduled or performed in the year 1981, and the scheduled audit was not performed in 1982, the TRT found this to be in violation of the ANSI N45.2.12 which requires the performance of planned and scheduled periodic audits.

The TRT noted that the NRC construction appraisal team (CAT) report, Section VIII," Quality Assurance," concluded that weaknesses in TUEC's established audit program included the scheduling and frequency of audits.

5. Conclusion and Staff Positions: The TRT found that TUEC, in response to the RIV NOV and request for corrective action in IR 80-15, had implemented a QA program for Class 5 pipe supports. The RIV inspection report 84-32/84-11, dated February 12, 1985, issued a notice of violation to TUEC which cited TUEC's failure to establish and implement a comprehensive system of planned and periodic audits. The TRT's finding of violations in the TUEC QA audit system are consistent with the notice of violation issued in RIV IR 84-32/84-11.

6. Actions Required: None.

Reference Documents:

1. Design Change Authorization 7952 and 7955-R1.
2. Training and Certification Records for QC Inspectors: J. McClain, R.D. Smith, J. Leigh, M. Hamburg, D. McCallum.
3. Material received records 1282, 9242, 11403, 2622, 7398, and 11422.
4. Class 5 Support QA Record Package SI-0-035-700-535R and SFX-040-[illegible]-055R (typical for 11 support packages reviewed).
5. TUEC QA Audit Plan and Schedule - Internal and Prime Subcontractor for years 1982, 1983, and 1984.
6. TUEC QA Audit Plan for Audit No. TGF-4.
7. TUEC QA Construction Site Surveillance Report No. 81-163.
8. TUEC QA Audit No. TCP-76 Audit Summary.
9. TUEC Letters TXX 3165, TXX 3177, CPPA 6072, and CPPA 6073.
10. Audit Records ITTG Warren - ITT-3, and 7; Audit Records ITTG Providence ITT-4, 8, and 10.
11. Audit Records NPSI-Portland TNP-2, -4, and -6; Audit Records NPSI-Secaucus TNP-5,-9, and -11; Audit Records NPSI-Austin TNP-1, -3, -7, -8, and -10.
12. Region IV Inspection Repot 80-15.
13. G&H Specification 2323-MS-46B, "Non-Nuclear Pipe Hanger and Supports."
14. G&H Specification 2323-MS-100, "Piping Erection Specification."
15. TUEC Procedure DQP-CS-4, "Procedure to Establish and Apply a System of Preaward Evaluations Audits and Surveillances."
16. TUEC Instruction QI-QP-11.11-1, "Installation Inspections of Class 5 Pipe Supports."
17. TUEC Instruction QI-QP-11.16-1, "Installation Inspections of NNS Seismic Category II Supports for Class 5 Piping."
18. B&R Procedure CP-CPM-8.1, "Receipt Storage and Issuance of Items."
19. FSAR Table 17 A-1.

20. TUEC Procedure CP-QP-11-16, "Inspection of Seismic Category II Supports and Structural Steel."
21. ANSI N45.2.12 Draft 3, Rev. 0, dated May 2, 1973.
22. NRC Cat Team Report.
23. SSER QA/QC Category 7 AQ-113 and AQ-132.
24. RIV IR 84-32/84-11.
25. NRC Reg. Guide 1.33.

1. Allegation Category: Mechanical and Piping 41, Improper Implementation of the Random Radiographic Program, Falisified Reports, and X-rays Not Performed

2. Allegation Numbers: AQW-9, AQW-8 and AQW-79

3. Characterization: It is alleged that there was improper implementation of the random radiographic (RT) (welder surveillance) program for determining welder performance (AQW-9); that an alleger was directed to falsify reports (AQW-8); and that X-rays were not performed on weld joints at the bottom of the dropgates where the gate would hit the gate guide (AQW-79).

   Allegations AQW-8 and AQW-9 are related to allegation AQW-7 which is assessed in Mechanical and Piping Category 28.

4. Assessment of Safety Significance:

   AQW-9

   In its assessment of the allegation that the random RT Program was improperly implemented, the NRC Technical Review Team (TRT) interviewed the Brown & Root (B&R) Senior Project Welding Engineer. He explained that the program, as described in B&R Procedure WEI-1, "Procedure for Random RT Welder Surveillance," was intended as a management tool to measure welder performance. The TRT reviewed WEI-1, which stated that the purpose of the program was a means to ensure that the welders employed at Comanche Peak (CPSES) were capable of maintaining the same level of proficiency under field production conditions as they had previously demonstrated during (welder) qualification testing. The procedure also states that this program was not intended to be used to evaluate weld joint integrity. Weld joint integrity (acceptance) was to be determined by the NDE (nondestructive examination) methods designated by the design specifications in accordance with the applicable codes.

   The TRT found that the program controlled by the procedure (WEI-1) provided for the tabulation of all of the pipe joint field welds (FW) made by a welder. From this tabulation, 1 out of every 20 field welds made by a welder was randomly selected and subjected to RT. The results of the RT indicated either the individual welder's capability to perform acceptable pipe welding or the need for additional training to improve the welder's performance. If an RT revealed that the welder's performance was not acceptable, the program required that the welder's qualification be suspended and that the welder be given additional training. The additional training was then followed by a new weld test and subsequent requalification of the welder.

   The TRT reviewed the RT program log books maintained by the welder performance coordinator to determine the continuity of recording the count of welds on the individual welder surveillance records, and found that the log books were current.

   The TRT also tracked a welder surveillance record to verify that a sample weld for RT was selected from each group of 20 welds as required by the

procedure. This surveillance record revealed that the welder's sample failed RT and that the welder's qualification was suspended. The welder qualification records also indicated that this welder's performance was evaluated, he was given further training, and he was later tested and his qualification was restored. The TRT found that after requalification, a sample from an additional 20 welds was selected for RT on July 22, 1984. (The RT report for the second sample was not returned to welding engineering for evaluation, as of the date of this review.) The TRT review of welding engineering records for the RT program and welder qualifications found that the program is currently implemented and maintained.

NRC Region IV (RIV) inspection report (IR) 79-12 contains the details of an RIV resident reactor inspector (RRI) interview with the alleger and the alleger's attorney on April 20, 1979. This report states:

> The RRI explained to the alleger that the (RT) program, for which the alleger was maintaining records and randomly selecting welds for radiographic examination, was not a program required by the NRC through accepted standards, Codes, or a Quality Assurance Program as described in the Comanche Peak Safety Analysis Report.

The IR also states that the program, which required radiographic examination of 1 weld in each 20 made by a welder (5% of each welder's work) to evaluate a welder's performance in Class 3 piping systems, was not within the jurisdiction of the NRC inspection program. Consequently, the RRI pointed out that the licensee could not be in noncompliance with NRC requirements through failure to properly implement the program.

Based on an interview with the Brown Root (B&R) Senior Project Welding Engineer, a review of Procedure WEI-1 and program documentation, and no licensing commitment in the FSAR for this program, the TRT concludes that this RT program is not a licensing requirement and failure to comply with the program would not result in noncompliance with NRC regulations.

AQW-8

From RIV IR 79-12, the TRT learned that the allegation that reports were falsified related to the reports to management which were prepared by the welder performance coordinator (a clerical position in the random RT welder surveillance program). The reports were based on data developed by the RT program, and gave B&R production management information regarding proficiency of the welders' field welding performance.

RIV IR 79-12 furnished additional details of the RIV RRI's interview with the alleger and the alleger's attorney and clarified the allegation (AQW-8) as follows:

> The alleger stated that instructions to "fake it" had been given by supervision after they had asked for a welder performance report and the alleger pointed out several reasons as to why the report could not be generated, e.g., the record log sheets for each welder contained 20 entry spaces; sometime during the accumulation of 20 welds, the alleger selected a weld and sent a memorandum to the

welder's general foreman designating the selected weld and welder. The general foreman was then to make arrangements to have the selected weld radiographed and in turn notify the alleger of the results. When the results were negative, i.e., the weld was defective, the alleger was to select a second weld from the same group of 20 and again notify the general foreman to have that weld radiographed. The alleger stated that the general foreman frequently ignored the memoranda to the extent that some welders were never tested and that the second request was in some instances also ignored. The alleger stated that some welders never made an acceptable weld but were not retrained and requalified as required by the program.

The IR also stated that "since the program had not been implemented in a manner to fulfill the originally intended purpose, the report could not contain meaningful information. The alleger was apparently told to do the best the alleger could do with the available data; hence "fake it." The TRT did not find additional information to substantiate or refute the allegation.

AQW-79

The TRT reviewed Gibbs & Hill (G&H) specification 2323-SS-7 "Refueling Gates" to determine the requirements for nondestructive examination (NDE) and to identify the fabrication and installation drawings which show the location of the field welds referred to but not specifically identified in the allegation. The TRT noted that the alleger stated "dropgates," but the specification identifies "liftgates." In an interview on August 24, 1984, the alleger clarified that the alleged welds are located at the bottom of the liftgate guides. (These guides are identified in the specification as frames.)

The TRT reviewed G&H Drawing 2323-S-0831, and found that the alleged welds were located on three liftgate frames installed in the spent fuel transfer canal in the fuel building. Details of the Frame Assembly are shown on AFCO Steel [Presray] drawings PR5598, 5599, and 5495. The TRT identified welds 1767 through 1772 from B&R drawing WFB 00831 to be those welds referred to by the alleger.

The TRT found that the required RT was performed and verified that the applicable RT reports (2803, 2811, 2780, 2775 , 2756, and 2767) and film are available as QA records in the TUGCO plant permanent records vault (PPRV).

5. Conclusion and Staff Positions: The details of the alleged improper implementation of the RT program (AQW-9) are given in the RIV IR 79-12. The TRT found that the RT, performed under this program, is used for the evaluation of a welder's performance, not for the acceptance of safety-related work. The TRT did not find any additional information to substantiate or refute the allegation. The IR further explains that the RT program was not within the jurisdiction of the NRC Inspection Program; therefore, TUEC was not in noncompliance with any NRC requirements. The TRT's

assessment of the allegation verified that the random RT welder surveillance program is currently implemented and maintained in compliance with the applicable procedure. Accordingly, the TRT concludes this allegation (AQW-9) has no safety significance.

The TRT concurs with the conclusion reached in NRC RIV Report IR 79-12. The TRT concludes that allegation (AQW-8) has no safety significance, since the random RT program is intended to serve as a management tool and is not a required program.

By verification of RT reports, the TRT found that the allegation that radiographs were not performed on weld joints at the bottom of the liftgate frames (AQW-79) is without merit. Accordingly, this allegation is not substantiated and has no safety significance.

The results of the TRT assessment of AQW-79 were discussed with the alleger in an interview conducted on March 5, 1985. The alleger could not agree with the TRT that the weld numbers 1767 through 1772 were the alleged welds. Upon request by the alleger the TRT contacted an individual (named by the alleger) who confirmed that the welds 1767 through 1772 were the weld joints referred to in the allegation. (Ref. B&R Drawing WFB-00831, Sheet 12). The individual also stated that he knows that the alleged weld joints were radiographed. The TRT informed the alleger (on March 5, 1985) that the individual agreed with the TRT's identification of the welds. The alleger then agreed with the results of the assessment and no new concerns were identified.

The originators of allegations AQW-8 and AQW-9 are unknown.

6. Actions Required: None.

Reference Documents:

1. Region IV Inspection Report 79-12.
2. B&R WEI-1 Procedure for Random RT Welder Surveillance.
3. B&R Procedure CCP-38, "Stainless Steel Liner Erection."
4. B&R Drawing WFB-00831.
5. B&R Nonconformance Report M972 RI.
6. B&R Receiving Inspection Report 06262.
7. G&H Specification 2323-SS-7, "Refueling Gates."
8. G&H Drawing 2323-S-0831.
9. AFCO Steel (Presray) Drawings PR5495, PR5598, and PR5599.
10. Inter-Office Memo, "WQS 122 WPS Qualification Suspension," dated April 30, 1982.
11. Memo K. Lifford to F. Nichols, "Renewal of Welder Qualification," dated May 6, 1982.
12. Random RT Surveillance Record 3 Sheets (Welder Symbol CHI).
13. B&R QA NDE Radiographic Report RT 2303 (Typical).
14. Mechanical and Piping Category 28, AQW-7.
15. RT 2803 - June 19, 1978, Weld 1767.
16. RT 2811 - June 20, 1978, Weld 1768.
17. RT 2790 - June 15, 1978, Weld 1769.

18. RT 2775 - June 14, 1978, Weld 1770.
19. RT 2756 - June 12, 1978, Weld 1771.
20. RT 2767 - June 13, 1978, Weld 1772.
21. TRT exit interview with alleger A-4 March 5, 1985, pages 12 through 33 and 169 through 171 (AQW 79)

1. Allegation Category: Mechanical and Piping 42, Questionable Welds and Weld Procedures in Primary Systems

2. Allegation Numbers: AP-12, AW-32, AW-41, and AQW-33

3. Characterization: It is alleged that:

   (a) An unauthorized repair was made on a safe end weld (a dissimilar metals weld) in the Reactor Coolant System (RCS). Grind out of "buttered" weld metal overlay was repaired using weld filler material for the final weld (AP-12).

   (b) RCS welding is not in accordance with procedure because the welders were allowed to "twiddle" with the controls during machine welding (AW-32).

   (c) RCS welds FW-19 and FW-20 were improperly made and repaired too many times (AW-41).

   (d) Three Authorized Nuclear Inspectors (ANIs) quit their positions at CPSES in protest. The reasons for their quitting (printed in the Dallas Times Herald) were that they did not have confidence in RCS welds and quality control was poor (AQW-33).

4. Assessment of Safety Significance:

Background Information

The TRT determined that the welding of the RCS system was to be in accordance with the applicable requirements of the ASME B&PV Code, Section III, and Section IX, 1974 Edition through Winter 1974 addenda, and in accordance with B&R's procedures CP-CPM6.9G and WES-031.

The TRT made a 100 percent review of the 40 RCS field weld documentation packages for Unit #1. The review of weld documentation established that difficulties were encountered during the initial welding of the RCS. Initially, manual welding employing gas tungsten-arc welding (GTAW) and shielded metal-arc welding (SMAW) processes were used. The difficulties with the manual welding processes prompted information radiography of these weld joints when the weld fill was approximately 30 percent completed. The radiography revealed numerous indications and the manual welding process was terminated. B&R purchased Diametrics welding machines and contracted Diametrics to train and qualify B&R welders and procedures for machine welding. Ultimately, Diametrics personnel were hired by B&R to perform the RCS welds. Once the Diametrics welding technique was refined, there was a decline in defects requiring repair. Out of the 40 welds reviewed, 20 welds required no weld repair and 7 welds required only minor repair (4 or less indications per weld). The remaining 13 welds had more than 4 areas of repair located randomly in the 32-inch diameter weld (100 linear inches of weld). The most extensive repairs were on FW-25, FW-26, FW-18, FW-19 and FW-29. The total volume of weldment and repairs were accepted by the final radiography. The TRT also reviewed a random selection of

Unit 2 RCS welds and found that these welds required either no or only very minor repairs. The TRT is satisfied that its review of the RCS welding documentation reveals a good indication that the initial welding problems were solved.

AP-12

The alleger of AP-12 is concerned about a repair in a dissimilar metal weld where a short section of stainless steel pipe (safe end) is joined to a carbon steel nozzle. The term "buttered weld metal overlay" is commonplace in the industry for this type of dissimilar metal weldment. In the alleged case, the "butter" material is built up (by welding) on the end face of the carbon steel RCS nozzle of the reactor vessel. This buildup is then machined to the joint design requirements. The buildup, after machining, must meet a minimum specified buttered layer thickness. The composition of the buttered layer material is compatible with carbon steel as well as to the stainless steel weld filler material specified for the weldment of the stainless steel piping components. The joints of the safe end stainless steel section to the buttered carbon steel nozzle is accomplished using stainless steel "final" weld filler material. This welding process provides a good transition weldment from carbon steel to stainless steel, and is in accordance with the requirements of the ASME, Section III and Section IX Code.

The alleger did not specify which safe end weld had an unauthorized repair. The TRT's review of the RCS welding documentation did find a repair of a dissimilar metal weld (FW-29) in weldment of a stainless steel safe end (in the RCS piping system) to the reactor vessel nozzle. Radiographic examination (RT) identified a defect to be lack of fusion in the final weld filler material to the buttered layer material. B&R's welding engineer dispositioned the defect by specifying the following actions on the repair process sheet (RPS), which is on the back of the weld data card (WDC), as follows: (1) Grind out to completely remove the defective area; (2) Repair by welding: (a) the buttered layer material, and (b) the final weld material area of grind out; and (3) reexamine by liquid penetrent (LP) and RT to assure that no defect remains and that the repair is sound. The TRT finds that this is an acceptable repair sequence. The weld engineer subsequently modified the disposition by waiving the need to reweld the buttered layer material. The basis for the weld engineer's change was that "little or no buttering weld material was removed." This alteration of the disposition is also acceptable. The completed weld and repair was accepted on the basis that visual, PT, and RT examinations revealed no defects.

The TRT also found that repairs were required on the machined buttered face ("J" type weld joint preparation design) for each of the eight Unit 1 reactor vessel nozzles. B&R's receiving inspection initiated NCRs M1028, Rev. 1 and M1038, Rev. 1, reporting minor machining discrepancies on the buttered face of the "J" type weld joint preparations for each of the eight nozzles of the Unit 1 reactor vessel. The B&R welding engineer dispositioned the NCRs by requiring that the machining discrepancies be blended out by grinding. The repairs were subsequently inspected and accepted by QC.

The alleger has refused an interview with the TRT to review its findings on his allegation AP-12.

AW-32

Allegation AW-32 is concerned about RCS welding not being in accordance with procedure because welders were allowed to "twiddle" with the controls during machine welding. The alleger apparently contends that adjustment to the controls during machine welding is not permitted by either ASME code or B&R procedures.

Weld Process Specification (WPS) 99028 used for Diametrics machine welding provides parameter ranges for amperage, voltage, travel speed, wire feed, and the width, frequency and dwell time of oscillation. These variables are specified by the ASME B&PV Code, Section IX, as nonessential for all machine welding processes. The welder is permitted to monitor the progression of the weld and to make adjustments as required to maintain optimum melt conditions provided these adjustments are within the limits of ranges specified in the WPSs. The TRT was not able to find any NCR or other report identifying that the welding adjustments extended beyond the limits specified in the applicable WPSs. This practice is typical for machine welding which is defined by the ASME B&PV Code as "Welding with equipment which performs the welding operation under the observation and control of an operator."

The alleger has refused an interview with the TRT to review its findings on allegation AW-32.

AW-41

The TRT believes that the alleger's concerns were more likely to be about welds FW-18 and FW-19 rather than FW-19 and FW-20. Welds FW-18 and FW-19 were machine welded simultaneously and required repairs in 12 and 9 locations, respectively. FW-20 was welded 21 weeks later and did not require any repair. The WDC packages for FW-18 and FW-19 showed that the repairs were made prior to the completion of the weld. The defects resulting in these repairs were detected and identified by information radiography examinations which were performed at partial (interim) levels of weld material fill. The majority of these defects were in the first increment of weld fill and were identified by radiography as lack of fusion. An adjustment to the angle of the welding head, relative to the side wall of the weld groove, resolved the problem of lack of fusion. The remaining levels of weld fill had no additional "lack of fusion" defects. The TRT review showed that the final radiography for these welds was evaluated and accepted by B&R QC.

The TRT also reviewed the welding documentation for FW 18 and 19 to determine if there had been any cases of "excessive repair." The TRT notes that numerous repairs in a length of weldment are not considered excessive provided they occur in sufficiently different areas so as not to produce excessive heat inputs in any one location. Numerous repairs to a single location which produce repetitive heat inputs can be considered to be "excessive repair."

Paragraph 3.3 of B&R's procedure CP-CPM-6.9G establishes three categories of weld repair:

(1) Cosmetic repair - The removal of surface defects or conditions by grinding only.

(2) Minor repair - In process repairs where defects are removed by grinding and weld repaired prior to the completion of the weld.

(3) Major repair - where a weld requires grindout and weld repair after final inspection. Approvals by both the project mechanical engineer (PME) and TUSI are required where more than two major repairs are required in stainless steel welds. (See discussion following this assessment.)

The TRT reviewed the ASME B&PV Code, Section III, NB2000 and NB4000 (for Class 1 components), and NC2000 and NC4000 (for Class 2 components), where subsequent paragraphs of these code articles provide the requirements for weld repair that are applicable to full penetration pressure boundary welds (i.e., the RCS). Weld surface repair which is defined as cosmetic repair in the B&R procedure, is permitted only by grinding and/or blending (no welding required) in accordance with the Code requirements: (1) to remove surface defects or to reduce surface defects to an acceptable size, and (2) to provide a more suitable (smooth) surface as required for the applicable nondestructive examinations (NDE). The ASME code does not provide criteria to establish minor or major categories of weld repair; nor does it set forth any limits to the quantity of repairs. The ASME Code Section III, Subsections NB and NC 4453 describe the activities required for weld repair and provide the requirements by which the performance of these activities is controlled. The welding engineer dispositions the RPS in accordance with these requirements. The repaired area shall be re-inspected by the NDE method(s) that detected the defect, for the acceptance of the weld repair. The TRT review of the welding documentation for the 40 RCS welds determined that no single area within any given weld had been repaired more than twice and that no "major repairs" were required except for the dissimilar metal repair (Ref. allegation AP-12). The TRT finds B&R's prerogative to request additional radiographic examinations at interim increments of weld fill to be a conscientious effort for timely identification of weld indications and for instituting minor repairs, in order to reduce the need for major repairs. The TRT's evaluation did not find excessive repair.

The alleger refused an interview with the TRT to review its findings on allegation AW-41.

During the course of review for other allegations the TRT found a case (i.e., AP-12 in this SSER and AQW-30 in SSER M&P Category 2) where a weld repair had been performed and the statements "in process repair" and "major weld repair" both appeared on the RPS for a single repair. At first, the TRT thought that the use of "both statements" was in conflict with the definitions provided in B&R procedure CP-CPM-6.9G, paragraph 3.3, that describe the categories of minor and major weld repair. To show that the use of both statements is not in conflict with the procedure, the following TRT discussion provides a better clarification of the minor and major weld

repair definitions. Minor weld repairs are those which are performed at some interim increment of welding progression, prior to the completion of the welding process. Major weld repairs are those which are made after final QC inspection. When manufacturing has completed the welding process in accordance with the WDC, QC performs their final inspection using the applicable NDE methods required for the final acceptance. Where any of these final QC inspections detect an unacceptable defect that requires repair by welding, that repair, by procedural definition, is a major weld repair. When the WT is satisfied (by his inspections) that the weld repair is complete in accordance with the RPS, QC re-examines the repaired area (by the NDE method that detected the defect) for the final acceptance of the weld. The TRT notes that by these categorical definitions of weld repair, all repairs prior to final QC acceptance are in process repairs, and those repairs resulting from any of the applicable final QC inspections are major weld repairs. Therefore, the use of both statements "in process repair" and "major weld repair" on the RPS is justified by the definition for major weld repair.

The TRT further notes that since the ASME Code does not address limits to quantity of repair, the categorical definitions for repairs by welding are in addition to the code requirements which (1) permit weld repairs as required at interim increments during the progression of weld. (These repairs require minimum grind out and minimum weld filler material [minor weld repair]), (2) reduce the need for major repairs, and (3) establish limits for major repair. No more than two major repairs are permitted except by engineering evaluations and designated authorizations. Since major repairs could have large and/or deep grindouts, these limits are intended to preclude significant local thermal stresses and excessive distortions to the welded product.

AQW-33

The TRT confirms this allegation to the extent that the ANIs had quit their positions at CPSES. According to the Dallas Times Herald, Thursday, December 6, 1979 issue, the ANIs quit because they "did not have confidence in RCS welds...and because quality control was poor." The TRT was unable to contact the ANIs who quit in order to obtain more specific information on this subject. The TRT notes that the duties, responsibilities, and authority vested in the ANI are clearly defined in the ASME Code, Section III, Subsection NA 5000, which requires that the ANI participate in the review and acceptance of the fabricator's Quality Assurance Program to assure that the applicable requirements of the ASME Code are implemented and that ANIs have free access to monitor activities and to review all ASME-related documentation. When it is discovered that the requirements are not fully complied with, the ANI has the authority to stop all paper work on those activities until corrective action satisfies the requirements. The TRT's 100 percent review did show that several repairs were required but that the completed product was acceptable (AQW-33).

5. Conclusion and Staff Positions: Despite initial welding difficulties, the following corrective actions ultimately resolved the difficulties: (a) terminating the manual welding process, (b) purchasing Diametrics welding machines, and (c) employing experienced Diametrics personnel for the RCS welding. The TRT's extensive and detailed review of the RCS

welding documentaion for Unit 1 revealed that the welding was done in accordance with the procedures and that the final RCS welds met the applicable requirements and criteria. The review also included a random selection of Unit 2 RCS welds and found that these welds required either no repairs or very minor repairs, which indicates that the initial welding problems were solved.

AP-12

The alleged concern was about unauthorized repair on a safe and welds in the RCS. The TRT's review of RCS welds found only two cases of weld repair relating to the buttered material required for the weld transition for dissimilar metal welds. Since the alleger did not identify the weld of his concern, the TRT reviewed both cases. Based on the review of all data related to these two cases, the TRT concludes these repair activities were performed in accordance with the procedure. The TRT cannot substantiate any unauthorized repair on a safe-end, dissimilar-metal weld, and finds no safety significance.

AW-32

The alleger is concerned about welders being allowed to make adjustments to the controls during machine welding, and that these adjustments were not according to procedure. Based on its review of applicable requirements specified in the ASME Code Section IX and the WPS for machine welding, the TRT concludes that adjustment to the controls during machine welding is permitted in accordance with the requirements. Also, on the basis of its review of the 40 Unit 1 welds and the random review of Unit 2 RCS welds, the TRT was unable to detect evidence that the requirements of the WPS were violated. Furthermore, the final NDE results for all RCS field welds were evaluated and accepted by QC. Therefore, the TRT concludes that there is no safety significance to allegation AW-32.

AW-41

The TRT determined that the alleger's concern was apparently about RCS welds FW-18 and FW-19. The alleged concern was that these welds were improperly made and repaired too many times. The TRT's review of RCS welding documentation determined that no single area within any given weld had been repaired more than twice and that there was only one major repair which was made to the safe end weld reviewed for AP-12. The TRT could not find any evidence that the welds were improperly made or that there were too many repairs. Based on the review of documentation and the final acceptance by QC, the TRT concludes that there is no safety significance to the alleged concerns.

AQW-33

According to the Dallas Times Herald, the ANIs quit because they did not have confidence in the RCS welds and because quality control was poor. The TRT was unable to contact the ANI who quit. However, based on its review of: (1) ASME Code Section III, Subsection NA for the ANI's duties, responsibilities, and authority; (2) ASME Section III and Section IX for

the fabrication and welding requirements, including the criteria for quality control for all allegations that had ASME welding concern; and (3) the RCS field welds and documentation as required for all concerns in this SSER, the TRT concludes: (1) the ANI has the freedom and power by his invested authority as required to build and maintain confidence by assuring that the requirements for the control of all activities affecting quality are implemented and the requirements of the ASME Code do not support justification for lack of confidence or for poor quality control; (2) there is no detectable safety significance relating to the RCS field welds; and (3) the reported reasons for the ANI quitting apparently had no adverse effect to safety significance (AQW-33).

Actions Required: None.

Reference Documents:

1. NRC Region IV investigation reports:

   (1) IR79-21 & -22 by R.C. Steward.
   (2) IR79-23 & -24 by R. G. Taylor.
   (3) IR80-02 by E. L. Williamson and L. D. Gilbert.

2. Dallas Times Herald, Thursday, December 6, 1979 Issue "Three Comanche Peak Inspectors Quit in Protest."
3. B&R Drawing #BRP-RC-1-520-001 "Reactor Coolant Loops Layout & Details."
4. B&R's Weld Procedure Specification (WPS) and Performance Qualification Report (PQR):

   (1) WPS 99028 - PQR/0808AA208
   (2) WPS 88025 - PQR/0808AA114
   (3) WPS 88032 - PQR/0808BB112
   (4) WPS 88021 - PQR/0808AA204
   (5) WPS 88023 - PQR/0808AA124
   PQR/0808AA125

5. RCS Unit 1 & Unit 2 weld data packages.
6. Westinghouse's Process Specification #PSPAS-01 "Assembly, Fitting and Welding Sequence for Primary Loop Piping."
7. B&R Specifications:

   (1) CP-CPM 6.9G
   (2) WES-031

8. ASME B&PV Code, Section III and Section IX, 1974 Edition, through summer 1974 addenda.

1. Allegation Category: Mechanical and Piping Category 43, Welding Conditions and Issues Regarding the Stainless Steel Liners for the Spent Fuel Pools, Fuel Transfer Canal, and Reactor Refueling Cavity (liners)

2. Allegation Number: AM-11, AW-40, AW-42, AQW-80, AQW-81 and AQW-82

3. Characterization: It is alleged that:

AM-11
Incorrect fitup and poor welding techniques resulted in thin welds joining stainless steel liner plates for fuel pools in the Fuel Building and the Reactor Building for Unit 1.

AW-40

One weld seam in the spent fuel pool liner is largely rust and concrete.

AW-42

Poor welding conditions existed for field installation of the stainless steel liners in the spent fuel pools of the fuel handling facility.

AQW-80

Liner plate weld seams do not match drawing locations on the flooring around the Unit 1 reactor vessel pool.

AQW-81

The stainless steel floor-plate liners in the spent fuel pool and transfer canal are supposed to overlap the angle member at the bottom edge of the wall-to-floor joint. There were areas without overlap and the weld was built up to bridge a gap.

AQW-82

A single block related to the leak chase channels under the floor liner of the fuel pools or fuel transfer canal is defective and could affect leak detection.

4. Assessment of Safety Significance: The NRC Technical Review Team (TRT) review and assessment addresses the alleged concerns and issues about the stainless steel liners for the spent fuel pools, fuel transfer canal, and reactor refueling cavities. The TRT has also reviewed the safety significance of the liners (i.e., the requirements which were implemented, the fabrication processes, and the acceptance criteria) to assure that the liners will not affect the safe operation of the plant.

4.1 Applicable Requirements. The TRT reviewed the following regulatory documents which either impose or exclude requirements for the liners.

(a) (1) Code of Federal Regulations (CFR), and

(2) American Society of Mechanical Engineering for Boiler and Pressure Vessels (ASME B&PV) - Neither Appendix B to 10 CFR Part 50 nor the ASME B&PV Code, Section III, subsection NA 4000, mandate requirements applicable to the liners.

Note: These Code Sections set forth the general rules for the QA/QC organization and the controls on all activities affecting quality.

(b) Comanche Peak Steam Electric Station (CPSES) Final Safety Analysis Report (FSAR)

The CPSES FSAR does not list the liners for the spent fuel pools, transfer canal, and reactor refueling cavities, as "Q" (i.e., safety-related) items. However, in Appendix 17A, note 27 to Table 17A-1, the "Q" list, which refers to the containment and fuel buildings internal structures states, "shall meet pertinent portions of the Quality Assurance requirements set forth in Appendix B to the 10 CFR 50, by specification."

(c) NRC Memoranda

The TRT also reviewed documentation relative to seismic requirements applied to liners and found the following statements on several memoranda. (See Reference Documents.)

> "...fuel pool liners are not required to be designed and erected to seismic Category 1 requirement"; "...liners do not add structural integrity to concrete cavity structure"; "...damage or loss of plate would not result in a significant loss of water because concrete structure would withstand the effects of a safe shutdown earthquake"; "...primary function of the liners is to provide a leak tight barrier and more suitable surface for decontamination, rather than to serve as a critical safety structure"; and "the probability of leaks occurring and being undetected over a period of time such that a potential hazard might be incurred is acceptably low."

(d) Gibbs & Hill (G&H) Specification 2323-SS-18

G&H specifications are the source documents of requirements applicable to the fabrication and erection of the liners. G&H specification 2323-SS-18 imposes the Quality Assurance Program of Appendix B to 10 CFR 50.

(e) B&R Procedures

WES-029, CCP-38, WES-14, and QI-QAP-11.1-4, and subsequent procedures are consistent with the requirements of G&H specification 2323-SS-18. The applicable requirements are:

1. Materials shall be ASTM grade, Type 304L stainless steel, 3/16-inch and 1/4-inch thickness.

2. Liner plates shall be seal welded by inert-gas-shielded (gas tungsten-arc) welding (GTAW), using fillet and full penetration groove welds.

3. Welding procedure specifications and welders' performances shall be qualified in accordance with ASME B&PV Code Section IX.

4. Plate-to-plate fitup gap using backing strip for manual GTAW shall be:

   (a) other than prequalified joints - minimum 1/16 inch,

   (b) for prequalified joints as shown in prequalified details minus 1/16 inch, plus 1/4 inch (without backing strip: minus 1/16 inch plus 1/16 inch),

   (c) "high-low" mismatch between abutting end preps shall not exceed 1/8 inch.

   (d) If root opening (gap) exceeds its applicable requirements, one or both end preps shall be buttered until the gap is within acceptable tolerances.

5. Surfaces shall be smooth and free from irregularities and may be ground to a smooth finish.

6. Stud welding (ASTM A108 Nelson studs) shall be with automatically timed equipment. Lack of 360° fillet may be corrected by additional manual GTAW. Installation, inspection, and acceptance of anchor studs shall conform to the applicable requirements of the AWS D1.1 Structural Welding Code.

7. All seam welds shall be dye-penetrant tested, and shall also be tested by vacuum box for leak tightness for their entire length. Also, all liner systems shall be filled with water and monitored for 48 hours for leakage. An optional test may be performed for locating leakage by filling the leak chase system (see 4.2, Description of Details) with helium and scanning the welds with an instrument sensitive to and capable of signaling the presence of helium that permeates through the weld. Any leakage shall be repaired and testing repeated until successful completion. No test is considered complete until accepted by Engineering.

The TRT notes that G&H specification 2323-SS18 did not specify any acceptance criteria for the dye-penetrant test until January 3, 1985 where DCA No. 21251 specifies the acceptance criteria to be in accordance with the ASME B&PV Code Section III. However, B&R's QA procedure CP-QCP-2.11,* "Inspection of Stainless Steel Pool Liners," effective 9/28/77 specifies their dye penetrant procedure CP-NDEP-300 and criteria which are consistent with ASME Code Section III.

4.2 Description of Details: The wall liner plates are joined by full penetration butt welds using a backing strip. A C3x4.1 S.S channel straddles the backing strip on the back side of every seam and is fillet welded to provide a leak chase. Any leakage through a liner seam weld will be collected in the leak chase. The leak chase grooves in the floor are molded in the concrete. Also 3/8 x 2-inch bar strips are imbedded to be flush with the surface of the concrete floor. These imbeds form a lattice work to which the floor liner plates are fillet welded. Both the wall liner plates and floor imbeds are anchored in the concrete using Nelson studs welded to the back side. The design features of the fuel pool liners include a system of drains where each drain connects to a sectional group of leak chase channels or grooves to provide an early detection system for leakage from a given number of seam welds. It also provides a means to recycle the leakage collected.

4.3 Fabrication Technique: Each liner system, for the spent fuel pools and reactor refueling cavities, was fabricated and erected to be a single "box"-like unit (excluding the floor plate).** This fabrication took place outside the building structures. The plate-to-plate fitups were accomplished by tack welding the backing strips in place and fillet welding the leak chase "U" channels as defined in 4.1. The inside of each liner unit was heavily braced, which supported the erected liners and provided rigid "backup" strength since the liners also served as the form for the concrete structure cavities. Prior to setting the liner units in location, the rebar for the cavity structure was already in place. To prevent subsequent damage, the studs were welded to the liners after the move into the cavity location. The Nelson studs were located on 12-inch centers (certain details required much closer centers), and become (subsequently) anchored in the concrete cavity structure. The features of the leak chase channels form a "tongue and groove" type mating with the structure. The liners become essentially an integral attachment to the concrete structure. The plate-to-plate groove welding on the exposed side of the liners was completed after the concrete had set and the bracing removed. The floor plates were the final installations as described in 4.2.

*Note: The QA/QC aspects regarding the issues relating to the liners will be reported in the QA/QC 6 Category for allegations AQ-55 and AQ-78. Where QA/QC and Mechanical & Piping aspects are interrelated, any statement of "no safety significance" in this SSER is from a technical (i.e., hardware) standpoint.

**Note: The transfer canal liner was similarly fabricated except that the wall liners were fabricated in two half sections and welded to a single unit after they had been located in place.

4.4 TRT Visual Inspection: A general observation in Unit 1 of the overall liner installation and a more detailed examination of approximately 20 percent of the welds in the spent fuel pools and fuel transfer canal were made. The areas of weld inspection covered the floor plate liners, those portions of the wall liners which were easily accessible from the floor, and areas adjacent to the sparger spray system which runs horizontally, about half way up two walls of each of the spent fuel pools. The liner installations are complete and the details of the leak chase system and imbeds are not accessible for visual examination.

The TRT's visual inspection revealed that the placement of floor plates was not necessarily uniform. There were some areas where the gap between floor plates was such that the fillet welds washed together and one area gave the appearance of a butt weld. All wall liner seam welds were ground flush (or slightly concave) to the liner surface. Most of the floor fillet welds were cosmetic ground. The inspection could not determine if the fit-up gap was excessive or if it was tighly butted (tightly butted joints could cause insufficient weld penetration). The examination did establish that gas tungsten-arc welding (GTAW), if not exclusively used, had been extensively used. This conclusion was based on the appearance of unground welds. No butt welds were observed to have reinforcement exceeding the 3/32-inch maximum. The TRT did not dimension seam weld concavity. However, in some locations, due to grinding of weld surfaces, it appeared that concavity may exceed 1/32-inch. A similar examination was made of liner welds in the fuel pools of Unit 2 and in all cases the general appearance of welding was smooth, clean, and sound; showing no signs of porosity and having good fusion to the base material which supports sufficient cleaning prior to welding.

The TRT did detect two very small, questionable spots of corrosion. Both were on the north wall liner of Unit 1 spent fuel pool. A buildup of corrosion products was observed on a horizontal seam weld located about halfway up the wall. The corrosion products were located between the midsupport for the pipe and the nearest light pole. The second questionable spot observed by the TRT was in a horizontal seam below the sparger about level with the top of the fuel storage rack. It was located opposite the northeast corner of the rack. There was no buildup of corrosion products but there was a light rust-colored stain. Using an inspection magnifying glass, the TRT could not determine the source of these stains. No obvious hole or pore could be found in the weld. The TRT also observed certain inconsistencies in joint configuration; i.e., an area where the joint appeared to be a butt type in lieu of an overlapped, fillet welded joint (e.g., DC/DDAs 1858 and 9700).

4.5 TRT's Review of Documentation

The review included the applicable requirements as described in Section 4.1. A comparative review of B&R's procedures to the G&H specification found the requirements to be consistent.

The TRT also reviewed B&R's welding process specification (WPS) 99020 for machine GTAW, and both WPS 88023 and WPS 88025 for manual GTAW welding which were used for the liner applications; and WPS 10071 which was used

for stud welding using the automatically controlled welding equipment. WPS 18013 was used where stud weld repair was required. These WPSs are consistent with the applicable requirements for liner welding.

The TRT performed a general review of welding documentation, numerous NCRs, and many DCAs, where certain nonconformances appeared to have relevance to the allegations. G&H and B&R drawings were also reviewed for detail requirements.

4.6 TRT's Review and Assessment Specific to the Allegations:

(a) AM-11

This allegation is that:

(1) The fitup of 3/16-inch and 1/4-inch-thick stainless steel liner plates for butt welding was supposed to result in a joint gap of 3/16-inch to 3/8-inch to facilitate making a full penetration weld, but welders encountered tightly butted joints. These joints were partial-penetration welded by laying weld filler wire on the joint line and fusing it in.

(2) Gapped butt joints were incorrectly welded by either building up weld metal in the middle of the gap and then bridging the gap at the top with a thin (less than full penetration) weld or by laying weld rod in the gap and welding over it.

The TRT visual inspection of the liner welds reasonably supports that all of the welding was performed using the GTAW process. The inspection could not confirm the preweld, fit-up gap conditions to have been tightly butted, excessively gapped, or to have been bridged over. The overall surface appearance of the completed welds was smooth, clean, and sound. The TRT notes that during use of the GTAW process, a tightly butted joint could preclude making a full penetration weld in the 3/16-inch thickness, and more probable in the 1/4-inch-thick stainless steel material specified for the liners. (The TRT estimates for the worst case using GTAW and for 1/4-inch thick liner material, a 95% probability to produce 65% penetration.) However, the TRT did interview an individual currently employed with B&R who had been a fitup man for the liner fabrications for more than 1 year. He stated that all the fitups that he was responsible for were gapped; but he could not (at present) recall what the gap requirement was. He also stated that he did not recall having seen any tightly butted fitups. The TRT notes subsection 4.1(e)4(d) "Requirements" that buttering is permitted where gaps exceed the speicified requirement. The TRT was also told (in random conversation) that fit-ups having less than the minimum gap requirement were opened up by grinding.

The TRT review cannot substantiate the allegation; nor does the review determine that it has any safety significance.

(b) AW-40 The allegation states that water from poured concrete had entered leak chase channels and run past backing strips into weld

joint areas. The allegation does not identify any specific weld or area. During an interview with a B&R employee, and in additional casual discussions with B&R's welding engineer and QA personnel, the TRT learned that:

(1) During the concrete pour of the pools' cavity structure, there were certain areas where spillage of concrete ran down the exposed side of the liner plates. Some spillage became lodged in the plate-to-plate fit-up grooves where welding had not been performed. Seepage of water from the concrete mix penetrated between the plate and backing strip fit-up.

(2) During the liner fabrication activites, the overhead (roof) structures of the buildings that contain the liner systems were not in place. This was to facilitate the locating of liner units described in 4.3 "Fabrication Technique." Plastic had been stretched across the span of these openings. However, the plastic did not shed the rains which poured into the pool areas and ran down the exposed sides of the liners. Where the seam welding was not performed, the water entered the leak chase system by seeping between the liner plate and backing strip.

DC/DDA 2946, Rev. 1, describes welding preparations contaminated with concrete and/or water. In this case, appropriate measures were documented to clean and achieve acceptable welds. More specific cases are addressed in allegations AW-42 and AQW-80.

The visual inspection of the liners detected two questionable spots of corrosion as described in the final paragraph of 4.4, "TRT's Visual Inspection."

The TRT determined the concerns of this allegation not to be safety significant. However, a more decisive examination method (i.e., cleaned and re-examined using dye penetrant) should be considered to determine the exact causes for the two questionable spots of corrosion to preclude the possibility of leakage.

(c) AW-42

The allegation shows considerable concern regarding poor welding conditions during the construction of the fuel pools and fabrication of liners, i.e., slurry seeping from the poured concrete caused interference to welding operations. The TRT's visual inspection of the completed liners did not reveal any evidence of conditions that existed during the construction phase. However, the following statements are typical notations on several NCRs:

(1) "Welder had to reach through a maze of rebar to make the weld." This was relating to a stud weld that did not have a 360° fillet. The existence of rebar was an unavoidable condition (see Section 4.3 "Fabrication Technique"). During an interview with a B&R employee, he recalled having to occasionally provide clearance for the welder by using a come-along to pull rebar aside.

(2) "Water seeping from locations where concrete had been poured and contaminating components of liners being fabricated."

(3) "Water in leak chase channels interfering with welding." The TRT notes the source of water described in Item (b) of AW-40 is reasonable to believe.

(4) "Too many activities causing interference."

The conditions already described and considered by the TRT are not unusual to the industry for construction activities conducted in environments which are open to the elements. The B&R employee who was interviewed and other B&R personnel (during casual discussions) could not recall any additional conditions that could be considered "poor." More than one B&R employee mentioned that on occasion individual employees were indisposed to perform work as directed due to personal reasons, thereby enhancing any existing "poor" condition.

The TRT notes that DC/DDA No. 2946, Rev. 1, dated November 13, 1978, authorizes 1/2-inch holes to be drilled in a leak chase channel to drain and/or dry out residual moisture causing interference to welding. Afterwards the holes were repaired by GTAW and ground flush to the surrounding surface. The conclusions reported in NRC Region IV's IR 79-15 dated May 21, 1979, state that the allegations regarding poor welding conditions may be substantially true. The TRT found documented evidence of conditions that were not necessarily ideal. However, it is the TRT's experience that these conditions are not unusual for this type of construction activity.

The TRT finds that this allegation, has no safety significance.

(d) AQW-80

The allegation is that weld seams do not match drawing locations on the floor around the Unit 1 reactor vessel pool. The TRT review of the drawings determined that the liner weld seams must mate with the 2-inch-wide bar imbeds which provide a backing plate for the weld. The TRT notes that the weld seam could vary across the width of the imbed without consequence or safety significance. The TRT's inspection of liner welds did notice that weld runs from plate-to-plate joints were not consistent but did not consider these variations to be excessive. The TRT also observed variations such as the appearance of a butt joint in lieu of an overlap (fillet type) joint (identical to allegation AW-81). The review of documentation found several NCRs covering such conditions. DC/DDA 9700, Rev. 1, regarding a mislocated imbed is an example accounting for seams not located as shown in a drawing.

TRT's visual inspection of liner welds and review of documentation cannot find evidence of poor welds or that the welds were not sound or that the required seal was not achieved. The TRT noted that at least one area, which had been contaminated with concrete (see description of source Ref. AW-40, Item (a)), could not be adequately cleaned and an acceptable weld could not be achieved. This condition

was resolved by grinding the discrepant weld flush to the liner plate, cutting a "patch" from liner material to completely cover the discrepant weld, and the patch fillet welded all the way around to the liner plate surface. This condition was documented by an NCR and the resolution authorized by a DC/DDA. The final acceptance of the liners is based on the visual, liquid penetrant, and vacuum box leak testing. The TRT does not determine any safety significance to the concerns of this allegation.

(e) AQW-81

This allegation is similar to AQW-80 except that the alleger is concerned about the floor plate fitup that mates to the wall plate. The floor plate is supposed to overlap and be fillet welded to the leg of the angle attached at the bottom edge of the wall liner. The TRT did observe some apparent butt joints in this area. DC/DDA Nos. 3221 and 795 are examples where plates were cut short. The solution authorizes the overcut area to be filled during welding. The TRT notes that buttering is permitted (see 4.1(e), 4(d)). Based on the inspection of welds, the review of documents and the final acceptance examinations, the TRT determined that these conditions were resolved and were not safety significant.

(f) AQW-82

The alleger is concerned about a defective block under the floor liner in one of the fuel pools or transfer canals that could affect leak detection. Since the details of the leak chase channel network are not accessible for visual examination, and because the allegation lacks specificity, the TRT review has attempted to identify the alleged "defective block" and evaluate the affect on the function of the leak chase system as well as its safety significance, regardless of the location and extent of the defect. A review of details shown in G&H drawings 2323-5-0831 through -0834 and B&R drawing WRB-10559 determined that only three items in the construction of the leak chase channels and floor grooves could apply to the alleged block:

(1) Blockouts - Lengths of material cut to the required dimension for the leak chase grooves, and used to form the leak chase channels during the pouring of the concrete floor of the fuel pools. B&R procedure CCP-38 states that after the setting of concrete, the blockouts shall be removed and any chipping or damage to the chase repaired, and that the chase grooves shall be coated with a sealant film. A final visual examination was required for these operations. It is not reasonable to believe that a blockout was left in place, or if defective, would subsequently affect requirements.

(2) 3/8-inch x 2-inch Imbedded Bars - Stainless steel bar stock which is imbedded flush with the surface of the concrete pool floor, and anchored using Nelson studs. The bars are centered between the leak chase grooves and form a grid framework to which the floor liner plates are fillet welded.

In its review of documentation, the TRT discovered CPSES Design Change Authorization (DCA) No. 5687 where a 3/8-inch x 2-inch imbedded strip identified as "F-15" was omitted. The DCA solution was that: "Plates P186 and W135 shall be butt welded together and laid as one unit." The location of this deviation is at the junction of the fuel transfer canal and the cask pit entrance.

The TRT reviewed the drawings and the functional purpose of the chase channels as described in 4.2, "Description of Details" (to detect leakage through the pool liner and to locate the leakage within a sectional area using the system of drains where a section of chase grooves empty into a single drain). Since the design drawings locate the chase groove to run parallel on each side of the imbedded bar to which the plates are normally welded, they would remain parallel to each side of the butted plate-to-plate seam weld (relating to DCA No. 5687). Therefore, any leakage that might occur through the weld joint would be collected and detected in the same manner as it would if the imbedded bar were in place. The TRT could find no safety significance regarding this DCA.

(3) During the recorded TRT interview with the alleger in Granbury, Texas, on March 5, 1985, the alleger described the "block" to be an area where the leak chase grooves were (by design) interrupted. This area served as a dam to prevent leakage from one leak chase section to drain from an adjacent section. The leak chase grooves are now sealed beneath the floor plate which precludes visual examination. However, the TRT notes that B&R's procedure CCP-38 provides the necessary steps to repair any chipping or damage caused during removal of the blockouts and for a final inspection after the application of sealant coating. The TRT does not find this concern to be safety significant.

4.7 <u>Additional Concerns and Findings</u>: During the TRT interview, the alleger identified in the transcript dated March 5, 1985, at Granbury, Texas, additional allegations regarding the liners. Those allegations are characterized as follows:

(a) Floor plate liners are supposed to overlap the angle member at the bottom edge of the wall-to-floor joint.

(b) Plate-to-plate seal welds are so thin that a man pushed a pin through a weld.

(c) Liner waviness and floor elevations exceed allowable tolerances.

(d) A particle of concrete trapped in the weld could eventually eat its way through and cause leakage.

The TRT assessment for safety significance of these concerns are as follows:

(a) The overlap weld joint concern duplicates allegation AQW-81. The TRT found these conditions resolved and with no safety significance.

(b) The alleger identified a person who pushed a pin through a liner seal weld. The TRT located and interviewed this person who said "Yes, I made a statement like that!" He said that while he was standing in a group having a typical "nonsense" conversation, he pulled a pack of cigarettes from his pocket where he has the habit of carrying a safety pin and said, "Aw hell, I bet I could just walk over there and stick this pin through the weld." He continued to tell the TRT that it would be impossible to push a pin through any of those welds and that he is surprised that this "nonsense" remark could have been overheard and interpreted that he had actually poked a pin through a liner weld. The TRT finds no safety significance to this allegation.

(c) The TRT reviewed DC/DDA 602 which clarifies the waviness requirements. The "as-built" conditions of the liners fall within these requirements of plus and minus 1/2-inch each side of the mean. Also, the liner placements were accepted as located. The TRT notes that the maximum 1/8" high-low tolerance for plate mismatch does not apply to elevation requirements. The TRT finds no safety significance to this allegation.

(d) The TRT notes that where a significant particle of concrete comes in contact with the molten pool of welding materials, the concrete literally explodes, a condition caused by a violent expansion of gases. This violent reaction causes weld splatter, blow holes, and at the very least, craters and excessive porosity in the weld. Other forms of contamination such as moisture, grease, oils, dirt, dust, etc., give similar reactions and results. Welding discontinuities caused by these forms of contamination are easily detected by visual inspection and certainly by dye penetrant examination. The TRT also notes that where the results of the required nondestructive examination (NDE) methods do not reveal any discontinuity in a weld (i.e., a foreign particle, slag inclusion, lack of fusion, porosity, cracks, etc.), an assumption that any of these conditions exist and have significant effect on the quality of the weld is pure speculation. Where these conditions are revealed by the required NDE, the industrial codes provide criteria by which these conditions are evaluated for acceptance. A qualified and certified NDE examiner can only use indications that are "real" in the evaluation for acceptance; and the intent of the criteria is to preclude acceptance by judgment. The TRT's visual inspection of the liners (described in Section 4.4) did not detect any of the aforementioned conditions. Only two questionable spots of residual stain (discoloration) were pointed out by the TRT. Even though the TRT determined these spots to have no safety significance, the TRT suggested that these spots should be re-examined by a more decisive method. Regarding the alleger's concern about a particle of concrete eating through the weld, the TRT further notes: any weld, acceptable to the applicable requirements, that encapsulates a foreign particle, such a particle is no more apt to eat through the weld than is the concrete structure to eat through the liners. The liners are like a stainless steel film coating which is permanently secured to the massive containment and load bearing concrete

structure of the pool cavities. The liners have no structural integrity of their own. Therefore, the liner welds need only be a leak tight seal weld. The TRT has determined that there is no safety significance to the alleged concern.

5. Conclusion and Staff Positions: The TRT review of requirements established the following facts.

Neither the CFR nor the ASME Codes mandate requirements applicable to the liners. The CPSES/FSAR does not list the liners as a "Q" item. Appendix 17A to the CPSES/FSAR, note 27 to Table 17A-1, states that the QA program shall be imposed per specification to the internal structures of the containment and fuel buildings. The G&H specification 2323-55-18 is the prime source of requirements and criterion specifically applicable to the fabrication and installation of the liners. The G&H specification imposes the quality assurance program of Appendix B to the 10 CFR 50. for the control of all activities and processes affecting quality. The TRT's review has determined that the B&R procedures for the fabrication and installation of the liners, including the welding and QA/QC NDE procedures, are consistent with the G&H specification. The activities affecting quality (i.e. welding process qualifications, welders performance qualifications, monitoring fabrication activities, visual and nondestructive examinations, verifications of leak test and final acceptance of the liners) were the responsibility of B&R's QA/QC organization until early 1983, at which time these responsibilities were transferred to TUEC (non-ASME). B&R's organization is described in the CPSES/FSAR Section 17, which was reviewed for compliance with Appendix B to 10 CFR 50 by the NRC.

The review of all requirements, including pertinent reports and memoranda regarding seismic classifications, levels of safety relationship, and NRC staff positions, have established the following TRT position.

The liners for the spent fuel pools, transfer canal, and reactor refueling cavities are not required to be seismic category I because damage or loss of the plate would not result in a significant loss of water since the concrete cavity structure would withstand the effects of a safe shutdown earthquake without significant damage. The primary purpose of the plate is to provide a smoother and less permeable surface which is easy to decontaminate; and also provide a construction form for the cavity. The liners do not provide any structural integrity to the concrete structure. Therefore, the concrete structure is the only concern from a seismic standpoint and not the liner plate.

The TRT's analysis, conclusions and staff position relating to the specific allegations and concerns addressed in this report are summarized as follows:

AM-11 "Incorrect welding and poor fit-up."

1. The procedure requirements state that where the root opening (gap) exceeds the applicable requirements, one or both end preps shall be buttered until the gap is within acceptable tolerances. The TRT

cannot substantiate that excessive gaps were improperly bridged across nor could excessive gaps be determined by visual inspection.

2. TRT interviews and several discussions with B&R personnel could not prompt their recall of tightly butted joints.

3. Due to the smooth appearance of the transitional continuity of the flush ground surface of the welds to the liner plates, the TRT could substantiate neither tightly butted nor excessively gapped joints.

4. The TRT's visual inspection of the liner welds did not detect any porosity or lack of fusion or any other type of discontinuity that would indicate the welds were thin, or to be less than a full penetration weld.

The TRT cannot find any safety significance to this allegation.

AW-40 "One weld seam is largely rust and concrete."

The TRT's review of fabrication technique described in 4.3 shows how spillage of concrete caused contamination in some weld fit-up grooves. Evidence of concrete contamination was found in the review of documentation (4.5) where one area could not be sufficiently cleaned to produce an acceptable weld. Based on the evaluation of the "patch fix" that covers the unacceptable area, and the DC/DDA which authorized the patch, the TRT determined this to be an acceptable method of fix. The allegation is substantiated, but has no safety significance.

AW-42 "Poor welding conditions existed for field installation of liners in fuel handling facility."

The liner fabrication activities were open to the elements where rain waters contaminated weld fit-ups; it was necessary to reach through the rebar to weld the nelson studs; and, spillage of concrete contaminated some weld fit-up grooves. To the extent of these conditions, the TRT substantiates the allegation of "poor" conditions. However, the TRT's review, inspections, and analysis found no safety significance to the liner welds.

AOW-80 "Liner floor plate seams around the reactor vessel do not match drawing locations."

The TRT's visual inspection noted variations in seam welds. However, the review of documentation (DC/DDA) revealed evidence of mislocated in-beds which would result in the apparent deviation to weld seams. The allegation is substantiated. However, the final acceptance and testing and the TRT's inspection of the welds found the completed seams to exhibit good, smooth, and sound appearance. Accordingly, this allegation has no safety significance.

AQW-81 "Floor plate is supposed to overlap the angle at the bottom of wall plate."

The TRT observed deviations in fit-up configuration where the floor plate mated with the wall plate during the visual examination. However, the as-welded seams gave the appearance of good, smooth, and sound welds. In the review of documentation the TRT found evidence of plates that were cut short. The resultant welded joint variations were performed in accordance with the design deviation authorization.

The TRT's evaluation finds the allegation to be substantiated. However, the TRT does not find these deviations to have affected the quality of the welded seam. Accordingly, this allegation has no safety significance.

AQW-82 "A defective block under the floor liner could affect leak detection".

The TRT's review of drawing details determined three possible identities for the term "block." These were evaluated on the terms "should they be defective." Since the "block" is sealed under the floor plate and not accessible, a search for evidence of defects relative to each identity was performed. The identities and results were:

(1) Inbed - One inbed for the attachment of floor plate was omitted. The design deviation authorization instructed the two sections of floor plate to be "pre-fab" welded together to become a single unit, located and welded to the resultant larger inbed frame work. The "pre-fab" plate seam weld (parallel and between the leak chase grooves in the floor) did not deviate from the location requirements, and any leakage would be detected in the same manner as it would if the inbed were in place. If this is the true identity, the allegation is substantiated. However, the TRT's evaluation of the deviation and welded seam found no safety significance.

(2) Blockout - A form used to mold the leak chase grooves during concrete pour. The TRT found no evidence of defects. The procedure calls for these forms to be removed, any chipping or damage to the groove repaired, a sealant film coating applied to the grooves, and a final inspection prior to placement of floor plate. If this is the true identity, the TRT evaluation cannot substantiate the allegation and found no safety significance.

(3) Interruption - Where leak chase grooves end and start again leaving an area as a dam (block) to isolate each system of leak chase grooves from adjacent systems. This interruption was identified to be the true concern by the alleger during an interview. The TRT found no evidence of defects and cannot substantiate the allegation. The TRT notes that the forming of this interruption is by the same procedural process of forming, repairing, and application of sealant coating described in item (2) above and therefore is included in the final

inspections. The TRT has determined that this allegation has no safety significance.

For the additional concerns addressed in Section 4.7, which were identified during a more recent interview with the alleger, the TRT found:

(a) The deviation from overlap configuration of floor to wall plate joins is identical to allegation AQW-81 in this report.

(b) The alleger identified a man who had poked a pin through a liner weld. The TRT located and interviewed this person (B&R employee) and found the allegation to be an apparent misinterpretation of an overheard conversation where the B&R employee admitted to saying in jest, "I bet I can walk over there and poke this pin through a weld." The TRT found this concern to have no merit and no safety significance.

(c) The as-built waviness and floor elevation concerns about the liners are covered in a DC/DDA which clarifies the allowable tolerances where location tolerances are dimensioned to a mean rather than any one given point, and a waviness tolerance ½-inch each side of the mean. The liner's location and waviness were accepted to these requirements. The TRT's review and evaluation determines no safety significance to this concern.

(d) The concerns about the entrapment of concrete particles in a weld and eventually eating their way through the weld is a possible derivative from allegation AW-40 where it is possible that there be some remaining contamination in the area of unacceptable weld and where the attempts to repair was unsuccessful. However, this area is now underneath a patch which was authorized by DC/DDA. The TRT's evaluation found no safety significance to AW-40. The TRT also addressed the effects of contamination and the detectability of the resulting conditions; to assume a weld is bad where that weld has met the applicable requirements is pure speculation and that a particle of concrete eating its way through the weld is not likely. The TRT finds this concern to have no safety significance.

Allegations AM-11, AW-80, AW-81, and AW-82 were reviewed with the alleger at Granbury, Texas, March 5, 1985. The alleger accepted the TRT's characterization, but did not agree with the conclusions; however, from a technical standpoint the TRT concludes that there is no safety significance.

The allegers for AW-40 and AW-42 were contacted by the TRT to review the TRT's evaluation and findings. Both indicated that they had no concerns with CPSES and were not interested in a review meeting with the TRT.

6. <u>Actions Required</u>: None.

Reference Documents:

1. G&H Specification No. 2323-SS-18, Revision 3, April 6, 1979 "Stainless Steel Liners," issued for B&R Construction.

2. G&H drawings:

   (1) 2323-S-0831, "F.B. Spent Fuel Pool Liner Details."

   (2) 2323-S-0832, "F.B. Spent Fuel Pool Liner Details."

   (3) 2323-S-0833, "F.B. Spent Fuel Pool Liner Details."

   (4) 2323-S-0834, "F.B. Spent Fuel Pool Liner Details."

3. B&R drawing WRB-10559, Sheet 1, "Fuel pool liners Imbeds - Weld Identification No's."

4. B&R Procedures (all revisions):

   (1) CCP-38 "Stainless Steel Liner Erection"
   (2) WES-029 "Welding Specification for Field Fabrication and Erection"
   (3) WES-14 "Stud Welding"
   (4) QI-QAP-11.1.-4 "Welding Inspection of Stainless Steel Liners"
   (5) QI-QAP-10.1-4 "Welding Inspection and Fit-ups of Stainless Steel Liners
   (6) CP-QCP-2.11 "Inspection of Stainless Steel Pool Liner Systems"
   (7) CP-QCI-2.11-1 "Welding Inspection and Fit-ups of Stainless Steel Liners"
   (8) CP-NDE-300 "Dye Penetrant Examination"
   (9) WPS 10071 "Weld Process Specification for Stud Welding"
   (10) WPS 88023 "Weld Process Specification for Manual GTAW Welding"
   (11) WPS 99020 "Weld Process Specification for Manual GTAW Welding"

5. Design Change/Design Deviation Authorization (DC/DDA)

(1) 102 Rev. 2	(10) 603	(19) 2946 Rev. 1
(2) 145	(11) 795	(20) 3221
(3) 153	(12) 841	(21) 3288
(4) 164	(13) 1885	(22) 5051
(5) 300	(14) 2048	(23) 5687
(6) 306	(15) 2520	(24) 6791
(7) 416 C	(16) 2651	(25) 9434
(8) 423	(17) 2716	(26) 9700 Rev. 1
(9) 602	(18) 2946	

6. Design Change Authorization (DCA)

(1) 1489	(4) 12785	(7) 21251
(2) 3221	(5) 15668	
(3) 9700	(6) 16628	

7. Comanche Peak Steam Electric Station/Final Safety Analysis Report (CPSES/FSAR), Section 17.2, "Quality Assurance Requirements, and Section 3.2, "Design of Structures."

8. NRC Memorandum:

   (1) January 25, 1979 from G.W. Reinmuth to D.B. Vassallo

   (2) February 26, 1979 from G.W. Reinmuth to R.T. Carlson

   (3) December 21, 1984 from G. Lear to O.D. Parr

   (4) February 26, 1985 from O.D. Parr to V.S Noonan

9. U.S. NRC Regulatory Guide 1.29, Revision 3, September 1978, "Seismic Design Classification."

10. Region IV Report 50-445/79-15; 50-446/79-15.

11. Allegation Source:

   (1) AM-11 --- 84-006, 3/7/84, A-4 Testimony Pages 51, 52-55.
   (2) AW-40 --- Testimony dated 5/24/82, Page 65A.36.b, IR-79-15.
   (3) AW-42 --- Testimony dated 5/24/82, Page 65A.36.b, IR-79-15.
   (4) AQW-80 --- A-49, 8/8/84, and A-4, 8/24/84.
   (5) AW-81 --- A-4, 8/24/84.
   (6) AW-82 --- A-4, 8/24/84.

1. Allegation Category: Mechanical and Piping 44, Defective Welds in Whip Restraints and Hangers

2. Allegation Number: AW-39, AW-57, AW-64, AW-53, and AQW-22

3. Characterization: It is alleged that there were defective welds in hangers and vendor-supplied pipe whip restraints (AW-39, AW-53, AW-64), that there was excessive warpage of some of the details for pipe hangers and pipe whip restraints (AW-57), and that a nonconformance report (NCR) was submitted to Quality Assurance (QA) for approval but was never approved or distributed (AQW-22).

(Evaluation of these allegations is ongoing and will be included in a future SSER).

1. Allegation Category: Mechanical and Piping Category No. 45, Miscellaneous Welding Deficiencies

2. Allegation Numbers: AW-60, AW-84, AW-43, AW-65 and AQW-77

3. Characterization: It is alleged that: (a) full penetration welds on the steam generator top head insulation supports were not made as required by design (AW-60); (b) excessive grinding of weld surfaces has taken place (AW-84); (c) an unqualified pipefitter fit and welded socket joints in one of the boron systems (AW-43); (d) circumferential butt welds with incomplete penetration were made in the fuel transfer tube of Unit 1 and of Unit 2 (AW-65); (e) anti-vibrational straps attached as supports to the auxiliary building 790-foot elevation heat exchanger tubing exhibited unacceptable burn through of the welds, and the weld-numbering sequence on the weld data cards revealed duplicate weld numbers for the top and bottom strap supports (AQW-77).

4. Assessment of Safety Significance: To assess the safety significance of these allegations the NRC Technical Review Team (TRT) reviewed codes, specifications, quality control (QC) inspection reports, and other pertinent documents applicable to each of the several allegations to determine requirements. The resolution of each allegation is addressed separately in the remainder of this report.

AW-60

The TRT reviewed testimony (see reference documents for AW-60, Item 4) of the alleger and of Brown & Root (B&R) personnel. The TRT also reviewed the vendor drawings (590159-232c) for mirror insulation, which showed the supports for the steam generator top head insulation. The drawing did not call for full penetration welds as alleged, but rather specified fillet joints and partial penetration joints. However, review of the welding documentation for these supports revealed nonconformance report (NCR) M-82-01178, which reported other conditions that were not acceptable in accordance with the applicable criterion of the American Welding Society (AWS) D1.1, "Structural Welding Code." These unacceptable conditions were arc strikes, undercut, overlap, weld spatter, and lack of fusion.

Welding engineering issued a repair process sheet (RPS) (attached to NCR M-82-01178) that specified the actions required to repair the defects. The NCR was closed on August 26, 1982, following a final visual inspection by quality control (QC).

AW-84

The TRT reviewed the applicable requirements of AWS D1.1, and the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME B&PV), Sections III and VIII, and found no requirements that controlled grinding of weld surfaces. The TRT noted that Section III NB4424 of the ASME Code permits grinding of the surface of the weld to remove

irregularities that interfere with liquid penetrant, radiograph, and ultrasonic inspection; to remove notches which could act as stress risers; to remove overlap and blend undercut; and to enhance the surface for the application of protective coatings.

The TRT performed a visual inspection of approximately 100 welds selected from various areas throughout the plant. The TRT was unable to detect any welds that had been ground down below the level of the adjacent base material.

AW-43

The TRT's only information about the concern that an unqualified pipefitter made fitups and welded socket joints in the boron system was a handwritten note that showed the system to be the "boron exchange return." The TRT randomly selected and reviewed several documentation packages from the boron recycle system. The TRT's review of the weld data card (WDC) packages revealed no evidence of rejectable fitups or welds or evidence that welding had been performed by an unqualified welder. The TRT also visually inspected several accessible socket weld joints in the boron recycle system. All of the welds inspected showed good workmanship and appeared to be good, sound welds. The TRT notes that pipefitters are trained on the job, but are not required to be qualified, nor are they required to be tested. However, all welding must be performed by a qualified welder. Each welder's name and assigned welder's number is listed in the welder's performance qualification record according to the welding process(es) for which the welder is qualified. The TRT could not determine poor fitups from its review, nor could the TRT determine that unqualified welders performed the welding of the boron recycle system socket joints. The TRT did not detect any rejectable conditions in a visual inspection.

AW-65

There are two fuel transfer tubes leading out of the fuel building. One fuel transfer tube leads into the Unit 1 Reactor Building; the other into the Unit 2 Reactor Building. Allegation AW-65 is concerned with circumferential butt welds with incomplete penetration in both the Unit 1 and the Unit 2 fuel transfer tubes. The TRT visually examined both the internal and the accessible external surfaces of both fuel transfer tubes and found that there were no circumferential butt welds in the tubes. The visual examination revealed that the tubes were in accordance with Note 7 of Westinghouse drawing 1209E53, which states: "the tube shall be fabricated in one length without circumferential splice welds."

The TRT extended its review and visual inspection to include the expansion bellows joint assemblies, which provide seal barriers where the transfer tubes penetrate the building structures and permit freedom of movement (expansion and contraction) for the transfer tubes. A ring at one end of the bellows assembly is welded to the outside diameter of the transfer tube, and a larger ring at the other end of the bellows is welded to the end of the penetration sleeve. The carbon steel penetration sleeve is encased in the concrete structure of the buildings and is large enough in diameter

for the transfer tube to pass through and be "saddle" supported to provide an anulus space between the fuel transfer tube and the penetration sleeve.

During its visual inspection and a review of documentation of the bellows assembly welds, the TRT found a configuration change in the welding of the larger bellows ring to the penetration sleeve. The original design shows the ring to sleeve joint to be a butted V-groove weld. However, due to a significant diametrical mismatch, a ½-inch-thick, washer-type spacer (an additional ring) was welded between the bellows ring and penetration sleeve. The outside and inside diameter dimensions of the spacer ring were sufficient to compensate for the mismatch. Design change authorization (DCA) 6990, Revision 2 (pp. 3 and 5), shows the modified weld joint design to be two, single-bevel groove welds typical to each side of the spacer ring. The weld symbol for both the original weld design and the modified design does not denote a full penetration weld. However, the TRT noted that the type of weld design implies a full penetration weld.

There are four expansion joint assemblies for each fuel transfer tube. The redesigned joint typically applies to each expansion joint. The number sequence for these expansion joint assemblies (from fuel building to reactor building) for both Unit 1 and Unit 2 is 4, 2, 1, and 3. The only assemblies that were accessible to the TRT's internal visual examination of weld roots were the No. 3 assemblies for Unit 1 and Unit 2. For these assemblies, weld 3a (penetration sleeve to spacer ring) and 3b (the larger bellows ring to spacer) were the resultant redesigned joint configuration. The TRT did notice some intermittent areas which possibly were not fully penetrated. Weld No. 3c (the smaller bellows ring which is attached to the fuel transfer tube) was more difficult to see; however, the TRT did not determine that there was a lack of penetration in this weld either for Unit 1 or Unit 2.

The TRT also reviewed the manufacturer's (Pathway Bellows Inc.) drawing (D-3-4570) for the expansion bellows joint assembly. The TRT found that the bellows material (SA 240T304) is 0.024-inch thick. Therefore, the manufacturer's weld, which joins the bellows material to the end rings (the bellows rings that interface with the fuel transfer tube and with the fuel transfer tube and with the penetration sleeve), is a 0.024-inch-thick weld. Since full penetration was not specified by the weld symbol, the design of the expansion bellows joint assembly was in accordance with CPSES design requirements, and the manufacturer's bellow weld was much smaller than the ½-inch redesigned welds, the TRT determined that this allegation has no safety significance.

During the TRT's visual inspection, miscellaneous debris was observed in the area of the expansion joint. The TRT observed that there was a shop rag and a toothbrush-type stainless steel brush lying on the protective bellows cover and that there appeared to be dirt and bits of paper in the convolutions of the bellows and debris on the floor.

AQW-77

The TRT reviewed a transcript of two interviews with the alleger dated August 8 and 23, 1984, in order to identify the heat exchanger in question. The TRT inspected the immediate location specified by the alleger and

found that four heat exchangers were located just outside the Auxiliary Building in Rooms 68 and 69 on the 790-foot elevation of the Unit 1 Safeguards Building. The TRT identified these heat exchangers as residual heat removal (RHR) heat exchangers (HX) TBX-RHAHRS-1 and TBX-RHAHRS-2 and containment spray (CT) heat exchangers HX CP1-CTAHCS-1 and CP1-CTAHCS-2, and determined that they were manufactured by the Joseph Oat Corporation.

The TRT reviewed drawings 5776, C-7420, and 5773 for the HXs and interviewed Westinghouse personnel, and learned that the strap supports for the tubing were added by the manufacturer to correct an unacceptable tubing vibration. Both TUEC and cognizant personnel from Joseph Oat Corporation were contacted, and confirmed that only one set of strap supports, located at the top bend of the tube bundle for each HX, was required by the modification.

The TRT searched NCR records for the two RHR HXs and found no NCRs issued to modify or add anti-vibration straps. Based on these facts, the TRT eliminated the RHR HXs from consideration.

A further search of the NCR records yielded NCR numbers M-5102S and M-5103S for the CT HXs, both of which were issued on January 23, 1983. The discrepancies which had been reported in NCR M-5103S were that (1) the traveler was stamped with the statement "Work requires TUGCO operations to process an ASME Code NIS-2 Form," and no form was completed; (2) CP-CPM-6.9G required that the Authorized Nuclear Inspector (ANI) initial the WDC to indicate whether a hold point was required, and there was no evidence of the ANI's initials on the WDC; and (3) QI-QAP-11-1-26 required B&R QC to complete a visual examination, and no evidence of such an examination was found. The same discrepancies as identified in (1) and (2) also were identified in NCR M-5102S. The TRT found evidence of a completed visual inspection checklist for this NCR.

NCR M-5103S was signed by the alleger. The TRT found that the NCR package included DCA 16462, which shows that a cognizant representative from Joseph Oat Corp. directed field changes to be made whereby only nine welds were required. The Joseph Oat Corp. drawing (2323-MS-50 C-7420) used to generate the WDC, did not reflect the field changes. The DCA included detailed sketches that were generated for the revision to the C-7420 drawing, and showed that only nine welds were required and that duplication of weld numbers was eliminated. The TRT notes that the allegation had stipulated that there were duplicate weld numbers on the top and bottom strap supports.

The TRT interviewed two B&R QA employees to determine whether the CT HX modification required an ANI review. Both QA employees said that the statement requiring an NIS-2 form to be completed was mistake and that the form was not required since the welding was not to the pressure boundary. Both of these employees also recalled discussing this problem with TUEC Operation and Maintenance (O&M) engineering at the time of the modification. They indicated that to the best of their recollection O&M agreed with their position, but they could not explain why the paperwork had not been changed, nor could they document that the discussion had taken place. The TRT interviewed the O&M engineer who, at the time of

the modification, was the TUEC QA inspector indicated on the NCR disposition. He confirmed that the NIS-2 form should not have been required (as stamped on the traveler), but he could not provide any documentation of conversations with B&R QA to this effect.

During the TRT interview, both B&R QA employees indicated that the visual inspection checklist should have been completed and that the original of the form should be in the fabrication package in the QA vault. A review of these records did not produce the missing checklist. Further discussions with B&R QA revealed that the manufacturer's representative from Joseph Oat Corp. had inspected the weld burn-through and had accepted it for the intended service. This was confirmed in a Telex (February 2, 1983), which was the basis for the dispositioning of part (1) of the NCR. The TRT contacted the Joseph Oat Corp. representative identified in the Telex. He confirmed that he had personally inspected both of the CT HXs for the burn-through condition on the anti-vibration straps. After checking his notes and files on these items, the manufacturer's inspector indicated that his inspection had revealed no damage to the HX tubing and that the welding on the straps was adequate for the intended service. The TRT then talked to the QC inspector who had signed off the "QC Verification" block on both of the NCRs. He indicated that he had completed the visual examination checklist on NCR M-5102S, which he co-authored; however, he could not remember completing a similar checklist for the NCR initiated by the alleger (NCR M-5103S). The inspector also indicated that the individual who signed the "QC Verification" block on the NCR was only ensuring that the proper paperwork was completed, and that he could have interpreted the manufacturer's representative inspection as meeting the requirements for NCR M-5103S.

The TRT then interviewed Welding Engineering and Civil/Mechanical Engineering personnel to determine whether an ANI inspection was required on the CT HX tubing modification. All individuals contacted stated that since no welding had been done to the pressure boundary, no ANI inspection was required. Welding Engineering referred to procedure CP-QAP-2.4 which governed the repair or alteration of ASME N-stamped components. This procedure currently is voided, but was in effect during the modification in January/February 1983. Paragraph 6.4.1 of this procedure required the "Owner to assure that the repair procedure is acceptable to the Owner's ANI, and for review by the ANI for assignment of hold points." The TRT spoke with the ANI assigned at the time of the modifications. The ANI indicated that he was present during the modifications but did not personally inspect the burnthrough weld condition on the straps. The ANI also stated that no welding was performed on the pressure boundary, but he could not state that the burn-through condition on the straps had damaged the thin-wall tubing. According to the ANI, QA, O&M, and Civil/Structural Engineering, the type of modifications made did not require a rehydrotest of the unit.

5. Conclusion and Staff Positions:

AW-60

The TRT review of vendor drawings showed that the welds in question were meant to be fillet or partial penetration welds, not full penetration welds. The discrepancies identified on NCR M-82-01178 had been repaired and accepted. Accordingly this allegation has no safety significance.

The TRT presented its findings for allegation AW-60 in an interview on March 5, 1985. The alleger indicated that he was satisfied with the findings of the TRT.

AW-84

The TRT review did not substantiate the allegation concerning excessive grinding of weld surfaces. Accordingly, this allegation has no safety significance.

Attempts to contact the alleger to review the TRT's findings on allegation AW-84 have been unsuccessful.

AW-43

The TRT could not substantiate this allegation. The weld data cards and drawings for the boron recycle system which were selected for review by the TRT were in order, and the weld data cards had been signed off by quality control as being acceptable.

AW-65

In its visual examination of the fuel transfer tubes for Units 1 and 2, the TRT found no circumferential butt welds, as alleged. The tubes were fabricated as required by Westinghouse drawing 1209E53, Note 7. The allegation therefore, was not substantiated. It is the TRT's opinion that the alleger may actually have been referring to one or more of the welds between the penetration sleeves and the expansion joint assemblies. These were originally butt welds that were redesigned because of diametrical mismatch. The TRT's visual examination found the modified welds to be visually sound, and to have a much greater cross-sectional area than the designed bellows weld requirement in the same seal barrier boundary. The TRT concludes that this allegation has no safety significance. However, the TRT observed miscellaneous debris in and around the expansion joint assemblies.

The TRT findings for AW-65 were presented to the alleger on March 5, 1985, in Granbury, Texas. The alleger indicated that his real concern was the redesigned expansion joint assembly welds to the penetration sleeves. The alleger indicated that he was satisfied with the TRT's work.

AQW-77

The TRT was able to determine that a visual inspection was performed on the welding modification of one CT HX, but not on the second CT HX. The QC

inspector who completed the visual examination checklist on one of the HXs could not explain why there was no completed checklist on the other HX. Concerning the lack of ANI review on both of the HX modifications, the TRT obtained conflicting explanations from all individuals interviewed when compared to procedure CP-QAP-2.4, which requires ANI involvement and which Welding Engineering said was in effect at the time.

The TRT concludes that the allegation that the CT HX which was initially written on an NCR by the alleger had not been properly inspected by B&R QC personnel is substantiated. The WDC indicates that the first nine welds were satisfactorily inspected by the alleger; the remaining nine welds were initially accepted by the alleger who subsequently removed his signature. Further documentation on the WDC reveals that B&R QC accepted these welds based on the manufacturer's inspection and with no further B&R inspections. This finding indicates a violation of procedures for failure to visually examine the identified welds by B&R QC as indicated by Operation No. 4 on the WDC. However, the TRT concludes that this allegation has no safety significance, since the welds were inspected and approved by the manufacturer's representative.

The TRT interviewed the alleger regarding allegation AQW-77 on November 14, 1984. The TRT told the alleger that his concern had been substantiated and that the TUEC would have to respond to the violation. The alleger was satisfied with the results of the review.

6. Actions Required: None.

Reference Documents:

AW-60

1. NCR M-82-01178.
2. Drawing 590159-232C "Mirror Insulation".
3. AWS D1.1 Code.
4. OI Report 84-006, 3-7-84, A-4 Testimony, by 6-8, 10.

AW-84

1. NRC reports 50-445/82-11 and 50-446/82-10.
2. AWS D1.1 Code.
3. ASME Section III and VIII.

AW-43

1. Weld data cards 09666, 09682, 18942 and 33679.
2. B&R drawings BRP-BR-X-AB-052, 025 and 036.

AW-65

1. Westinghouse Drawing 1209E53, "Fuel Transfer Element."
2. Westinghouse Drawing 1209E54, "Fuel Transfer Tube Assembly."
3. DCA 6560, Revision 3.
4. B&R Data Package, ME 80-2008-4000.

5. Westinghouse Manual, DCC-CP-0001-069.
6. WPS 11010.
7. WPS 11032.
8. WPS 88025.
9. WPS 88032.
10. Pathway Bellows, Inc., Drawing D-3-4570, Revision E.
11. Pathway Bellows, Inc., Drawing D-4-4570, Revision 4.
12. Pathway Bellows, Inc., Drawing D-5-4570, Revision E.
13. B&R Data Package, ME 81-2116.
14. G&H Specification 2323-MS-100, "Piping Erection Specification."

AQW-77

1. Interviews with the alleger on August 8, August 23, and November 14, 1984.

2. Telephone conversation with the alleger on September 20, 1984.

3. Results of eddy current tests on the CT HXs, dated November 4, 1982.

4. Daily inspection records on the ANI for January 20-22, 1983.

5. ANI interface instructions No. MEI-028.

6. NCRs M-5102S and M-5103S, dated January 23, 1983.

7. Traveler packages ME83-1010-4800 and ME83-1012-4800.

8. B&R procedures CP-QAP-2.4, CP-CPM-6.96, QI-QAP-11.1-26, and CP-QAP-18.6.

9. Joseph Oat drawings No. 5776, C-7420, and 5773.

10. Telephone conversation with Joseph Oat manufacturer's representative on September 20, 1984.

1. Allegation Category: Mechanical and Piping 46, Improper Weld Quenching Technique

2. Allegation Number: AQW-74

3. Characterization: It is alleged that a weld between a Westinghouse 4-inch valve and stainless steel piping was quenched, contrary to procedures.

4. Assessment of Safety Significance: AQW-74 concerns a welder who applied a demineralized water soak directly on the weld bead and heat-affected zone during the interpass within minutes after completing the weld. This action allegedly took place in north valve room 202 of the Auxiliary Building at the 810-foot elevation. The alleger provided the TRT with the NCR number, M-3407, for this incident and said he did not know if anything was ever done about it.

   In assessing this allegation, the TRT reviewed the NCR, the accompanying QC inspection reports, and various travelers. The NCR referenced Brown & Root (B&R) Procedure CP-CPM-6.9D, paragraph 3.21.11, as the procedure which was violated. This procedure allows the use of demineralized water for the control of interpass temperature provided the water is applied 1/2 inch away from the weld, rather than applied directly to the weld, as alleged. The B&R disposition of the NCR was to base the acceptance of the weld upon the results of the final nondestructive examination (NDE). Since the valve was a Westinghouse component, Westinghouse was required to concur with the disposition, and a review of the NCR substantiated their concurrence. The TRT reviewed the documentation in the fabrication package and found evidence of a satisfactory visual examination and ultrasonic test on May 5, 1982, and a satisfactory radiographic report on May 11, 1982. The dispositioned NCR was reviewed by B&R QA/QC and Authorized Nuclear Inspector personnel and closed out on June 6, 1982. However, the disposition of the NCR did not provide any assurance that this occurrence would not happen in the future, nor did it address the generic implication of whether the welder previously had used a demineralized water soak directly on other welds.

   The alleger was concerned that, due to the rapid quench of the stainless steel weld metal, martensite growth would be initiated and result in embrittlement of the heat-affected zone. The TRT notes that the piping on which the weld was made is type 304 austenitic stainless steel, a type of steel which does not exhibit martensite growth.

5. Conclusion and Staff Positions: The TRT reviewed NCR M-3407 addressing an improper weld quenching technique and found that all documentation to disposition the NCR as written existed in the fabrication package. The TRT reviewed all other open allegations and found no evidence of similar occurrences. Accordingly, this allegation does not have safety significance, since an occurrence of this type would not adversely affect the material properties of austenitic stainless steel base material or weld metal. However, the TRT concludes that this allegation has generic implications, since the disposition of the NCR did not address, (1) welder education to prevent future occurrences, and (2) whether the welder could

have repeated the violation previously due to ignorance or misunderstanding of the procedure.

The TRT interviewed the alleger on December 18, 1984, to discuss its evaluation of the allegation. The alleger indicated that he was satisfied with the results and that the TRT did more than he thought would be done.

6. Actions Required: None.

Reference Documents:

1. NCR M-3407.
2. Documentation package CS-2-AB-088, including B&R visual exam checklist for WDC 29989, B&R UT thickness report no. A0911, and B&R Radiographic Report No. 26663.
3. B&R procedure CP-CPM-6.90, QI-QAP-11.1-26.
4. TUGCO Procedure CP-EP-16.1.
5. Interview with alleger A-45 on August 2 and December 18, 1984.
6. Telephone interview with alleger A-45 on August 8, 1984.

1. Allegation Category: Mechanical and Piping 47, Unacceptable Vendor Welds in Pipe Whip Restraints

2. Allegation Number: AQW-75 and AQW-76

3. Characterization: It is alleged that a portion of the vendor welds on a pipe whip restraint in compartment 4 at the 832-foot level of Unit 1 Reactor Building has an unacceptable mismatch/offset (AQW-75); and that the pipe whip restraint directly in front of and above valve No. 4-G-78 in north valve room 202 of the Auxiliary Building at the 810-foot level has unacceptable vendor welds (AQW-76).

4. Assessment of Safety Significance.

AQW-75

This allegation concerns two areas of mismatch/offset on a vendor weld of a pipe whip restraint. The alleger provided the TRT with NCR M-82-00161 dated July 9, 1982, for this condition and said he did not know if anything was ever done about it.

The TRT reviewed the NCR which required that the tack welds joining items 426A and 427A be broken, the proper fit-up be provided, and a Repair Process Sheet (RPS) to butter Item 426A to even the 3/8-inch mismatch be defined in NDER 4408. The disposition in the NCR was QE-approved on March 19, 1982, with the appropriate signatures.

The TRT reviewed RPS CD-81-123-5500 (April 12 and June 21, 1982) and the accompanying Weld Filler Metal Log. Both documents provided evidence that the repair was completed. Inspection Report MI-0579 dated June 22, 1982, indicated that the repair had been satisfactorily visually inspected per QI-QP-11.14-1. The TRT, together with Brown & Root (B&R) QC, inspected the whip restraint in the Unit 1 Reactor Building. Even though the restraint in question had been painted, the repaired vendor weld was identifiable and it appeared that the defect had been corrected.

AQW-76

This allegation concerns unacceptable vendor welds on a pipe whip (PW) restraint in north valve room 202 on the 810-foot level of the Auxiliary Building. The TRT and a B&R QC inspector visited north valve room 202, identified the restraint described by the alleger, and visually inspected the unpainted welds. (It is schematically illustrated on Gibbs & Hill drawing 2323-S-0790 as CS-1-074-910-A47W and CS-1-074-907-A47W. The structural details of these PW restraints are provided on G&H Drawings 2323-S-0792 and 0793.) Although the welds were not neatly finished, the TRT could find no evidence of undersized welds, undercutting or porosity. Subsequently, the TRT reviewed the fabrication packages for the restraints for any evidence of NCRs or CMCs addressing unacceptable vendor welds, but could find none (AWQ-76).

5. Conclusion and Staff Position:

AQW-75

Although allegation AQW-75 was substantiated, the TRT found that all documentation to disposition the mismatched weld properly was present and indicated that the appropriate procedures were followed to repair the defect. Accordingly, this allegation does not have safety significance (AQW-76).

AQW-76

The TRT identified and reviewed the vendor welds of the pipe whip restraint described during the August 2, 1984, meeting with the alleger. The welds were found to be acceptable under the provisions of QI-QP-11.21-1. A TRT review of the fabrication packages for the pipe whip restraints failed to reveal any NCR or CMC addressing unacceptable vendor welds. Accordingly, this allegation does not have safety significance.

The TRT interviewed the alleger for both AQW-75 and AQW-76 on December 18, 1984. The alleger indicated that he was satisfied with the results and he felt that the TRT did more work than he thought would be done.

6. Action Required: None.

Reference Documents:

1. NCR M-82-00161.
2. NDER No. 4408.
3. B&R Inspection Report No. MI-0579.
4. G&H Drawing 2323-51-0595-02.
5. TUGCO Procedures QI-QP-11.14-3, QI-QP-11.14-1, QI-QP-11.21-1, CP-EP-16.1.
6. G&H Specification 2323-SS-16A, 16B.
7. Telecon with alleger A-45, dated August 8, 1984.
8. G&H Drawings 2323-S-0790, 0792 & 0793.
9. Fabrication packages for PW restraints CS-1-074-910-A47W and CS-1-074-907-A47W.
10. Interview with A-45 August 2, and December 18, 1984.

1. Allegation Category: Mechanical and Piping 48, Dimension Problems of Pipe Clamps for Snubbers

2. Allegation Number: AV-5

The NCR Technical Review Team (TRT) notes that the concerns and issues of AW-5 are not those of an alleger, but were identified during the TRT review.

3. Characterization: The issues of concern are related to a deficiency found during an audit conducted by the NRC Vendor Inspection Branch (VIB), i.e., that the vendor's QA program failed to implement an evaluation of a deviation and to inform the licensees or purchasers of the deviation in accordance with the requirements of Section 21.21 of 10 CFR Part 21. The deviation limited the angle cone of action for specific types and sizes of mechanical snubbers, and had potential generic implications for the industry.

4. Assessment of Safety Significance: The NRC Technical Review Team (TRT) reviewed several letters between the supplier, ITT Grinnell (ITT-G) and the NRC, and between ITT-G and Texas Utilities Services, Inc. (TUSI). The TRT also reviewed an NRC inspection memorandum (IE information notice 83-20) and a deficiency review report (DRR-012).

On October 9, 1978, Bechtel Power Co. (BPC) notified ITT-G that an interference on ITT-G Figure 306/307, "Snubber Assembly," would not allow the snubber to function properly through its full cone of action. This assembly consists of a Pacific Scientific-manufacturered shock arrestor and ITT-G-manufactured pipe clamps. Over 4 years later, on November 16, 1982, ITT-G sent a letter to TUSI informing them of the problem with certain Model 306/307 snubbers. ITT-G suggested that these snubber assemblies should be reviewed to assure sufficient clearance to comply with CPSES design requirements and that any interference should be corrected by grinding.

On March 8, 1983, NRC Region IV (RIV) cited ITT-G for failing to notify users of the potential restriction in conical action of its Model 306/307 snubber assembly in a timely fashion, in violation of 10 CFR Section 21.21. According to IR 99900285/82-02, following the Bechtel letter of October 9, 1978, ITT-G revised their drawings to eliminate the interference. However, the IR noted the occurrence of the following events subsequent to the Bechtel letter:

February 26-28, 1980 - Handwritten notes and sketches transmitted between ITT-G and Duke Power Co. (for the Catawba Nuclear Power Station) indicated further changes to the snubber assemblies were required.

April 16, 1980 - ITT drawing for the snubber assemblies revised again.

August 20, 1982 - ITT Grinnell received another notice from Bechtel of a similar interference at the Susquehanna project.

Appendix B to RIV's March, 1983, citation of ITT-G also notes that ITT-G had not assigned a formal evaluation group to the Figure 306/307 snubber assembly interference problem. The TRT found no documentation that an

evaluation had been performed to determine whether the deviation could create a significant safety hazard.

Following the release the RIV's inspection report of March 8, 1983, the NRC Office of Inspection and Enforcement transmitted IE Information Notice 83-20 (April 13, 1983) to all nuclear power plant facilities holding a construction permit or operating license, notifying them of the potential problem with ITT-G 306/307 snubber assemblies.

On April 14, 1983, ITT-G sent a second letter to RIV to explain how they would resolve the notice of violation. ITT-G stated that they would resolve the violation by reviewing the problem, making design changes and implementing a verification (worst case testing) program; by revising their Policy Guide and adoption of procedures to assure compliance with Section 206 of the Energy Reorganization Act of 1974 and 10 CFR Part 21; and by providing personnel with additional formal training specifically on the requirements of, and compliance with, 10 CFR Part 21.

On June 14, 1983, ITT-G transmitted a letter to TUSI reiterating their response to RIV on April 14, 1983, and presenting the results of testing on the mechanical snubbers using worst case tolerances and conditions. On the basis of these tests, ITT-G concluded that even under worst case conditions, the snubbers would continue to function effectively as designed.

On August 19, 1983, RIV sent a letter to ITT-G indicating that the corrective actions listed in ITT-G's April 14, 1983, response appeared to provide a successful resolution of the identified violations and that RIV would further review the corrective actions during an inspection.

The TRT learned that on September 13, 1982, a project pipe support engineer for TUSI issued the site's response to IE Information Notice No. 83-20. This notice described the actions that were followed to ensure that all safety-related snubbers at CPSES were inspected during the hot functional test program (HFTP). TUSI also directed field engineering to verify that those supports which were not under the HFTP had no interference problems. Based on the results of the inspections and testing, the project pipe engineer stated in an interoffice memorandum that there was no problem with any of the subject ITT-G hardware. In addition, TUSI's office memorandum dated September 13, 1983, and the attached DRR (DRR-012) provide evidence that during the HFTP all involved supports and mechanical snubbers were inspected for compliance with the applicable requirements, and that the ITT-G supplied snubber assemblies had also been inspected for potential interferences between the snubbers and attachment hardware. Neither of these inspections found any interference problems, and TUSI determined that worst case conditions would not adversely affect the piping or functioning of the snubber/support system.

ITT considered the reported interference to have no safety significance, and, based on a very low probability that industry designs would require the full 10-degree angle cone of action, ITT-G apparently felt that handling the interference problem on a single event basis was adequate. Since industry design requirements for snubber action are variable (unknown to a supplier), the TRT's position is that:

a) The limitation to ITT-G's specified degree cone of action should have been considered to have potential safety significance until determined otherwise by a formal evaluation program.

b) ITT-G's immediate action in October 1978 should have included both a notification of deviation to the NRC and ITT-G's customers and initiation of a formal evaluation program to identify any safety significance.

5. Conclusions and Staff Positions: Based on the results of the CPSES hot functional test inspection and the specific (worst case) inspection to identify interference to the required functions of the ITT 306/307 snubbers, the TRT concludes that the concerns about interference between ITT-G's furnished snubbers and pipe clamps, had no affect on CPSES requirements and that there is no safety significance.

6. Action Required: None.

Reference Documents:

1. Letters between supplier and NRC Region IV, dated March 9, 1983, March 28, 1983, April 14, 1983, and August 19, 1983.
2. Letters from ITT Grinnell to TUSI, dated November 16, 1982 and June 14, 1983.
3. IR NRL 18/82.
4. IE Information Notice No. 83-20, "ITT Grinnell Figure 306/307 Mechanical Snubber Attachment Interference," April 13, 1983.
5. Deficiency Review Report 012.

1. Allegation Category: Mechanical and Piping 49, Miscellaneous Concerns of Alleger A-45

2. Allegation Numbers: AM-31, 1 through 280

3. Characterization: A former Brown & Root (B&R) employee (alleger A-45) alleged that he noted and logged in five personal log books a number of defective items during the time he worked at Comanche Peak Steam Electric Station (CPSES).

4. Assessment of Safety Significance: In an interview with the NRC Technical Review Team (TRT) on August 2, 1984, the alleger stated that he had five log books in his possession that he had developed while employed at CPSES by Brown & Root (B&R). He stated that the books contained information about a number of defects. The TRT determined, based on an examination of the books, that 280 items were listed.

   The alleger provided the TRT with a preliminary list of 70 items which contained identifying numbers representing travelers, drawings, heat numbers, design change authorizations (DCA), etc. The alleger stated that each type of document represented a specific type of defect. If the document listed was a drawing or a traveler, then the item covered by the drawing or traveler would have fitup or welding errors. Listed heat numbers would indicate material traceability problems. Other document or equipment numbers reflected unspecified errors. The alleger gave the TRT specific details on a few items he thought were significant.

   The TRT began its review of these 70 items (having already completed a review of six items) when a second meeting was held with the alleger. During the meeting the alleger provided a new list of 63 items, which he identified as the most important of all the items from the five log books. The alleger stated that, in fact, the other items were minor defects that would normally be found in a typical construction project such as Comanche Peak. The new listing combined items from the original 70 and some new items. The TRT separated the 63 items into four general groups: (1) fitup and welding, (2) torque, (3) equipment, and (4) miscellaneous.

   The TRT chose to review the total item list by a sampling process. A sample size of 25 percent of the item list was chosen as representing a reasonable approach to determining the validity of the total allegation.

   The following table shows the results of the sample broken down into groups. Column (1) lists the items that had been completed from the first list. Column (2) lists the items reviewed from the list of 63, and Column (3) is the sum of Columns (1) and (2). Column (4) shows the numerical breakdown of the 63 items by group. Column (5) represents the number of items in a 25 percent sample of Column (4).

Group	(1)	(2)	(3)	(4)	(5)
Fitup & Welding	3	6	9	37	9
Torque	0	2	2	5	2
Equipment	0	3	3	10	3
Misc.	3	5	8	10	3
	6	16	22	63	17

Fitup and Welding Group

The TRT reviewed nine moment limiting component support structures identified by drawing or traceable number. The alleger had indicated that welding or fitup problems would be associated with the related structures. The TRT examined the related drawings and determined that the primary fitup and welding on the structures consisted of T-joints with the end of one plate butted against the surface of another plate. A single or double fillet weld or a one-sided full penetration weld was specified on the drawings.

It was difficult for the TRT to determine visually if a weld joint was correctly fitup after the weld was completed. Where the plates were welded from one side (either fillet or full fusion), it was possible for the TRT to visually examine the opposite side; however, when fillet welds were applied to both sides and to the ends of the plate junctions, the fit was not visible.

The TRT visually examined the nine structures, accompanied by a Brown & Root Level III inspector for six of the them. The TRT found that it was possible to view the backside of some of the welds on six of the nine supports. In five cases, no gaps appeared. The sixth support, however, showed a gap estimated to be 1/16-inch high for about 3 inches along the seam, and 1/8-inch deep. Paragraph 3.10.1 of B&R procedure CP-CPM-6.90 states that the fitup gap for T-joints should not exceed 1/16-inch. The TRT determined the gap in the structure was not significant.

The TRT requested the assistance of a B&R Level III ultrasonic testing (UT) supervisor in determining if a UT procedure could be devised to show if a gap existed between the plates that had been welded and the weld seam that was covered with weld metal. The supervisor attempted to perfect such a test, but was unsuccessful because of a lack of clarity of the signal.

All fillet welds reviewed by the TRT appeared to be acceptable.

Torque Group

a. Bolt Torquing. On March 29, 1982, the alleger witnessed a bolt break while being tightened. NCR M82-00216 was prepared to cover the nonconformance.

The alleger claimed that no specific values were available for crews to use while torquing A-490 high strength bolts. The TRT found that

B&R structural steel erection procedure CCP-22 is the controlling document for bolt tightening. Revisions 0 (3/12/76), 1 (12/7/81), and 2 (1/21/82) provided two methods for the tightening of A-490 bolts.

1. "Turn of the nut." The procedure specified a predetermined rotation of the nut after a snug fit was obtained. The amount of turn was shown in Attachment 1 of the procedure and was identical to Table 4 of the American Institute of Steel Construction (AISC) Specification, "Structural Joints Using ASTM A-325 or A-490 Bolts," Seventh Edition.

2. "Calibrated wrench (Skidmore)." The procedure specified the use of an impact wrench adjusted to values listed in Table 2 of the procedure. A bolt-tension calibrator was required to adjust the impact wrench to the required tension.

The "turn of the nut" method for tensioning A-490 bolts was used for work performed under procedure CCP-22, Rev. 0 to Rev. 3. The calibrated wrench tightening method was never used in its original form.

According to the AISC specification, bolts torqued to the turn of the nut values in AISC Table 4 will result in tension values shown in AISC Table 3. The values represent 70 percent of the specified minimum tensile strength of the bolts.

On June 28, 1981 and October 21, 1981, tests were run to determine the torque values being obtained from the "turn of the nut" method. The torquing crew was subsequently required to record the amount of torque as each bolt was tightened as a record of the torque being generated. After the nut broke, TUEC decided to torque all A490 bolts with a calibrated torque wrench rather than use the "turn of the nut" method. DCA 15028 was issued on December 1, 1982 listing the new torque values. Revision 3 of procedure CCP-22 dated July 4, 1983, incorporated the new torque values.

A program was established by B&R to retorque all A-490 bolts to the new values. The TRT reviewed a general traveler form that was prepared to document the completion of the retorquing on each assembly. The TRT also observed several completed travelers which were attached to the original whip restraint traveler.

The TRT determined that at the time the bolt broke, the "turn of the nut" method was being used to tighten A490 bolts. Thus, the allegation was substantiated. The TRT found that TUEC's subsequent program to tighten new A490 bolts and retorque existing A490 bolts to the DCA/5028 valves provided verification that the AISC specification requirements had been met.

b. Breakaway Torque: The alleger indicated that there was a problem with the travelers associated with the reactor coolant (RC) pumps and motors. This problem related to the measurement of breakaway torque. The TRT reviewed, in detail, traveler ME-2207-5500 for RC pump

TBX-RCPCPX-02, which was contained in the alleger's second list. The TRT also reviewed the travelers for the remaining three RC pumps.

The purpose of the travelers was to measure both the breakaway torque and the torque required to sustain motion. These torque values, as stated on the referenced travelers, must be less than 750 ft-lbs for breakaway and 250 ft-lbs to sustain motion. The TRT found nothing inappropriate in the four travelers reviewed. In fact, the opposite was true, as the travelers were all very clear, with precise instructions relating to torquing. All the proper construction and QA/QC signoffs were present. On pump 1, the maximum torque for breakaway was 225 ft-lb and the maximum torque to sustain motion was 30 ft-lbs. Pump 1 represented the high values for both breakaway torque and torque to sustain motion.

During the TRT's December 18, 1984, meeting with the alleger he admitted that there was nothing wrong with the torquing performed on RC pump travelers.

Equipment Group.

a. Pipe whip restraint welding. The alleger included four documents (operation traveler CD-81-116-550, B&R drawing SI-597 and SI-598 and CMC 61771) covering the installation of two wide flange sections of a pipe whip restraint. The alleger did not specify what his concerns were with regard to the documents. In examining the documents, the TRT found that at the time of fitup the beam flanges were not in the same plane. The TRT review of NCR M82-00112, which listed the details of the mismatch, indicated that while one end of the bottom flange was lined up even with the adjacent flange, the other end of the bottom flange was twisted approximately 1/8 inch, and the top flange had a mismatch of 1/8 inch to 1/4 inch from its corresponding top flange. Component modification card (CMC) 61771 was prepared on December 12, 1981, to change the weld detail from a double bevel to a single bevel. Backup bars were specified to achieve full weld penetration. Design Change Authorization (DCA) 12265, issued on February 26, 1982, specified that the backup bars should be deliberately twisted to lie flat on the seam and provide the correct weld base.

NCR M-82-00112 was closed on April 2, 1982, with the following disposition: "The proper revision of the drawing will be added to the package. The twist and contour in the backing strip is acceptable to use as is. Weld the beam together per DCA 12265 Rev. 1. Remove the backing strip after welding the first side, grind to clean metal, and weld the second side. Provide a smooth transition of 2½ to 1 by adding additional weld metal when the high-low condition exists on the flange of the beam." Traveler CD81-116-5500 covering the operation was completed on November 2, 1982.

The TRT visually examined the welded connection and found that the external appearances were in conformance with the CMC, DCA and drawings.

b. Reactor top closure head. The alleger contended that undocumented repair work was performed on the reactor top closure head.

The TRT reviewed Westinghouse drawing 1219E-49 and found that a number of vendor-installed penetrations extend through the reactor vessel closure head. Tubular thermal sleeves have been inserted into 57 of the penetrations and control rod drive mechanisms will be installed in the thermal sleeves at a later date. Housings and sleeves were installed in 1979 under traveler ME-79-214-5505. Four housings were installed around the periphery of the head. The bottom of the thermal sleeves and housings received a screwed, coned plate held in place by a welded locking pin. The thermal sleeves were supported by a mechanical shoulder and were loosely fitted into the penetration.

The alleger claims that in the spring of 1982, when he was working on modifications to housings 74 and 75, he witnessed undocumented repair work being performed on several "control rod drives." Further discussion with the alleger revealed that the "control rods" referred to in the disposition were actually the thermal sleeves. Although the alleger did not see the damage occur, he believes it happened during a trial fitup of the head to the top of the reactor vessel.

The TRT reviewed the work performed on the head during the period stated by the alleger. The TRT found that both the thermal sleeves with guides and the housings with guides were in place, having been installed in 1979. The only other work performed which required activities under the head was associated with the addition of the reactor vessel level measurement system (RVLMS). On March 26, 1982, two heated junction thermocouple probes were installed in penetration 63 and 65 as part of the addition of the RVLMS. Traveler ME-82-2563-5500 covered the work, which was done by personnel to Westinghouse (W) Procedure MP-2.7.1/TBX-1. Head adapter plugs (HAP) had previously installed on penetrations 63 and 65. The modification work consisted of removing the HAP and welding RVLMS flange assemblies to the penetrations.

The alleger suggested that the TRT discuss the allegation with two B&R employees who were performing mechanical inspection and quality control inspection on the head during the spring of 1982. One of the employees has since left the site; the second employee, still employed by B&R, was unable to provide any information on any repair work to the thermal sleeves. He stated he was closely involved in most of the work related to the head and at no time does he recall any damage being done to the thermal sleeves. In addition, the Texas Utilities Generating Company (TUGCO) field mechanical engineer who was involved in the installation of the thermal sleeves and housings and the later modifications did not know of any repair work to the thermal sleeves.

Since any work done on the head and thermal sleeves would have been under the direction of W, the TRT interviewed the W site resident. The TRT learned that W had an expert on call who was a specialist on

reactor internals and who was present during any work being performed on W equipment. The W site representative reviewed the W records and found none which related to thermal sleeve damage and any resulting repairs.

The TRT reviewed the travelers associated with work that had been completed on the head in early 1982, and all documentation appeared to be complete. The TRT determined that damage could not have occurred to control rod drives at this time, since in 1982 they were still crated and in the warehouse.

The bottom of the thermal sleeve guides are located slightly over 37 inches above the head flange surface. The TRT determined that the head would have to have been dropped or hit at an unusual angle to have suffered the damage suggested by the alleger. If that had been the case, it is likely the overlay machined flange surface would have suffered sufficient damage to require extensive repairs; however, no record of such repairs exists.

The TRT conducted a visual inspection of the thermal sleeves and found no evidence of any welding, heating, or deformation.

c. Support beam. It is alleged that the safety injection vertical line restraint support beam has base metal indications. The TRT found that W identified concerns with these support beams when onsite sandblasting revealed areas of peeling metal. This condition was reported in W field deficiency report (FDR) TBXM-10071, dated April 7, 1981. The FDR stated that metal was removed and blended by sandblasting, and that the resulting depth exceeded the maximum depth limit for A588 material of the beam's thickness. The FDR also noted numerous areas on the other three beams which exhibited this peeling condition of indeterminate depth.

The action resulting from the FDR was the return of these beams to the vendor for inspection in accordance with the appropriate material specification (A588) and for weld repair, if required. The vendor, Teledyne Brown (TB), performed two weld repairs on the initial beam and grinding on the other three beams. Westinghouse QA/QC personnel reviewed the repairs, including material certification, MT records, visual inspection records, dimensional inspection, welding personnel qualification certification, and NDE personnel qualification certification. As a result of their review, W determined that the beams were in accordance with the A588 and A6 requirements. Westinghouse then re-released the four beams for shipment to Comanche Peak Steam Electric Station (CPSES) by quality release N-46991, Rev. 3, dated May 28, 1984. The TRT found that the beams were received and accepted by B&R quality assurance and documented on receiving inspection report (RIR) 16771, dated June 4, 1981.

On January 25, 1982, NCR M-82-00079 was written against these beams. This NCR had two concerns: (1) that the beams had linear indications that started at the attachment weld and were from 3-1/2 inches to

3 feet, 6 inches in length, and (2) that the beam dimensions differed from the drawing dimensions.

Westinghouse responded to the first part of this NCR with a letter, (WPT-4602), dated May 19, 1982. This letter stated that the NCR was written on the same "roll marks" that were previously detected during site receipt inspection. The letter further stated that these "roll marks" were inspected and approved by the shape supplier, Bethlehem Steel, and that roll marks are an industry-accepted trait of rolled structural members. The letter stated in conclusion that these "roll marks" would not impair the adequacy of restraints.

The TRT reviewed all the documentation mentioned above, discussed this allegation with W Field Engineers, and reviewed the ASTM specifications for A6 and A588 to determine if these requirements were met.

The TRT found that the second portion of NCR M-82-0079 appeared to be a misinterpretation of the design drawing by the originator of the NCR. It appears that the NCR originator did not realize that a W14 x 233 beam has dimensions of 16 inches in depth and 15-7/8 inches in width, which are the dimensions quoted in the NCR as being nonconforming. The TRT inspection of the design drawing indicated that beam dimensions of W14 x 233 x 16 feet long were called for and that notes existed on the drawing that called for the field to cut the beam to suit and machine as shown in View H.

Miscellaneous Group

a. Material Traceability. Three plate heat numbers were shown on the original list of items. The TRT had completed the review of one heat number at the time the decision was made to concentrate efforts on the second list. The TRT reviewed the certified test reports furnished by the supplier, NPS, and found that the order included several fabricated items cut from the same ASTM A36 plate. The plate was originally purchased by NPS from Orgeon Steel Mills and included a report of the chemical and physical tests on the plate. Certificate 7249, dated May 4, 1979, verified these tests and listed the heat number as 204166. NPS changed the heat number to their identification NF1106. The TRT determined that four items were cut from the plate by NPS and furnished to Texas Utilities Electric Company (TUEC). The NPS Certificate of Compliance verified that all material met the requirements of NCA-3800 SA36 plate.

The TRT performed a walkdown inspection, and found the heat number for pieces 4 and 6 on Support CC-1-162-723-A43R and for piece 5 on support CC-1-246-020-C33R. The heat number on piece 2, a 9-1/2-inch square plate, for support CT-1-121-001-5225 could not be located. An 8-inch pipe was welded directly on the top of the plate, leaving very little room for the number.

The TRT determined that the heat number on piece 2 had been recorded on the material identification log prior to installation; therefore, it must have been visible prior to installation. However, the TRT

verified that heat number NF1106 was traceable from the in-place items back to the material supplier.

b. DCA and NCR documents. The TRT reviewed the repair/rework items described in NCR M82-00141 and NCR M-82-00296 and in DCA 8875 and DCA 12287 which were on the list of the alleger's major concerns. A documentation review indicated that the repair/rework had been properly performed.

DCA 8875 states that, contrary to the requirements that a full penetration weld be made between the stiffeners and the base plate and flange sections, a partial penetration weld was provided on a portion of the seam. To provide the necessary stiffness, eight additional stiffener plates were added. DCA 12287 was issued to add a plate and a stiffener to the base plate when B&R cut off the bottom left anchor bolt of a pipe whip restraint. A senior TUEC support engineer and the TRT visually examined the work performed under the DCAs and found it as shown on the DCA.

NCR M-82-00141 stated that a 1/2-inch-diameter arc strike occurred 3 feet off the floor and a grout smear was visible 3-1/2 inches off the floor. The TRT reviewed the resolution of the NCR and found that the condition was corrected by removing the arc strike and grout smear and repainting the damaged surfaces. NRC M-82-00296 stated that vendor-supplied whip restraints were found to be in violation of the specifications. Paragraph 6.4 states in part "welded construction shall conform to AISC Specifications for design, fabrication and erection of structural steel and AWS D1.1." Resolution of this NCR required Chicago Bridge and Iron (CBI) personnel to perform repair work in accordance with procedures in the CBI QA manual for contract 91936 (35-1195-0578 Change Order No. 2).

5. Conclusions and Staff Position: The TRT believes that the sampling taken of the 63 "most important" items represents a reasonable overview of the alleger's concerns. A number of items that were reviewed may have appeared to the alleger to have been unclosed NCRs or discrepancies, but were later resolved in the normal QC/QA program. The TRT conclusions on the items reviewed are discussed below.

Fitup and Welding Group.

In a review of nine pipe restraints, the TRT found no fitup or welding errors. The TRT concludes, therefore, that this allegation is unsubstantiated.

Torque Group

a. Bolt Torquing: The TRT determined that at the time the bolt broke, the "turn of the nut" method was being used to tighten A-490 bolts. This would account for no specific torque values being available to the torquing crew.

The TRT found that tightening the new A-490 bolts to the specific DCA 15028 values and retorquing in-place A-490 bolts provided verification that the AISC specification requirements had been met. The TRT concludes, therefore, that this allegation is unsubstantiated.

b. Breakaway Torque: In a review of the travelers related to breakaway and motion torque, the TRT found nothing inappropriate. The TRT concludes, therefore, that this allegation is unsubstantiated. The alleger also admitted that there was nothing wrong with the torquing performed on the reactor coolant pumps.

Equipment Group

a. Pipe whip restraint. In a review of the documentation associated with the pipe whip restraint member and a physical examination of pipe whip restraints, the TRT found nothing to substantiate this allegation. The TRT concludes, therefore, that this allegation is unsubstantiated.

b. Reactor top head. The TRT found no record of any improper work in a review of the activities associated with the top head during the period the undocumented repair was to have occurred. The TRT concludes, therefore, that this allegation is unsubstantiated.

c. Support beams. The TRT review of the documentation associated with the support beams showed them to be in accordance with codes and specifications. In addition, it appears that the beam dimensions mentioned as nonconforming were actually the correct mill sizes. The TRT concludes, therefore, that this allegation is unsubstantiated.

Miscellaneous Group

a. Material traceability. The TRT reviewed the material covered by the heat number shown on the alleger's list to determine its traceability, and traced the heat number from the installed support to the original mill plate. The TRT concludes, therefore, that this allegation is unsubstantiated.

b. Other documents. The TRT review of all listed documents shows that the items were issued and/or closed correctly. The TRT concludes, therefore, that this allegation is unsubstantiated.

Accordingly, these allegations have no safety significance.

In a meeting with the alleger on December 18, 1984, the TRT presented the results of the assessment of the allegations and the TRT's conclusions. There were no major items of disagreement and no new concerns or allegations were identified. The alleger expressed his satisfaction that his concerns had been addressed.

6. Action Required: None.

References:

A. 63 Most Important Items

Travelers	Drawings	NCRs & DCAs	Misc Equipment
CD 81-102-2800	W1483F13R18866	NCR-M82-00141	TBS RCPCPX-03 reactor coolant.
CD 81-139-2800	W1554E33	CMC 61771	Moment restraint 836-ft. Safeguard 1.
CE 81-022-4900	SI-595-02	DCA 12042	R.C.Pump 82-001-141.
CE 81-50-3400	SI-595-04	DCA 8875 Rev.1	R.C.Pump - Comp.2 RBI.
CE 81-36-4900	SI-0538-09	DCA 12287	TBS RCCSSG-03.
CE 81-029-5700	SI-0688-23-26	NCR M82-00216	TBX-RCRIRI-01.
CD 80-050-2802	SI-0597-01	NCR M82-00296	2323 CSDS 4E14.
CD 81-140-2800	SI-597-98	NCR M82-00079	CPI 4FATCS-0.
CD 81-100-5700	SI-0538-14		TCX RCESSG-01.
CE 81-021-5700	SI-0688-06		Bridge - turbine deck restraint.
ME 82-2207-5500	SI-0589-03		W1354E35 restraint.
ME 81-2118-5500			I-DO-052.
CE-81-018-3700			I 350 CPI4FATCS.
CE-81-43-3700			RBI-864.
CD-81-119-5500			Steam generator main supports.
CD-82-166-2800			
RI-82-775-0200			
CD-82-168-2800			
ME-81-2158-7400			
CD-81-116-5500			
CD-81-105-2800			
CD-81-149-4900			
CD-82-172-2800			
CD-82-164-5500			
CE-81-34-4900			
ME-80-201C-4000			
CD-81-111-5700			
CE-81-51-3400			
CD-81-144-3700			

B. Balance of Performances

1. Fitting & Welding	2. Torque		
Travelers	Drawings	Travelers	Other
CE-81-39-3400	MSB-0688-006	ME-82-2206-550	2323-SI-0666
CE-81-022-4900	MRB-0538-014	ME-82-2208-5500	Dwg. MSB-0680 MRW
CE-81-50-3400	MSB-0688-024	ME-82-2209-5500	Dwg. M-82-0216
CE-81-36-4900	MSB-0688-003	CD-80-010-2902	B&R Inspection Report
CE-81-021-5700	MRB-0538-013	CD-80-023-3401	DCA 11817 Rev. 0
CE-81-018-3700	MSB0688-017	CD-80-029-3401	DCA 11817 Rev. ±
CE-81-34-4900	MSB-0688-001	CD-80-02703401	TUGCO QI-QP-11.14-1 Rev. 2
CE-81-51-3400	MSB-0688-025	CD-80-061-5700	Torque Wrench Information
	MSB-0688-012	CD-80-068-5700	DCA 15028
		CD-80-078-5700	AISC Specification for A490 Bolts
		CE-81-002-2800	
		CE-81-116-5500	

Travelers	Drawings	Travelers	Other

3. Whip Restraints

NCR M82-00112.
CBI contract 82105.
Drawings 345, 346, 458.

4. Reactor Head

a. ME-82-2203-5500.
b. NCR M-3182.
c. Westinghouse Procedure MP 2.7.1/TBX-1.
d. ME-82-2263-5500.
e. Westinghouse Dwg. 1219E49 - Sht. 1 & 2.
f. ME-79-389-5500.
g. ME-79-214-5505.

5. Travelers

a. CD-81-116-5500.
b. CD-82-208-5500.
c. CD-83-293-5500.
d. CD-81-119-5500.
e. CD-82-216-5500.
f. CD-81-110-5500.
g. CD-83-294-5500.

1. Allegation Category: Mechanical and Piping 50, Radiography Examination

2. Allegation Number: AQW-93

3. Characterization: It is alleged that piping weld radiography possibly was manipulated or falsified.

4. Assessment of Safety Significance: A package which contained eight radiographs and two typed pages of incoherent statements regarding manipulation and falsification of radiographs of piping welds was submitted anonymously to the NRC Technical Review Team (TRT) on or about December 3, 1984.

   In assessing these allegations, the TRT reviewed the eight radiographs, as well as other pipe weld radiography at the plant site. The review also included Brown & Root (B&R) radiography procedures, related process quality control records, as-built piping isometrics, and interviews with B&R and Texas Utilities Electric Company (TUEC) personnel responsible for on-site field radiography.

   The TRT determined that the eight radiographs represented partial sections of eight different welds. Although the radiographs were scratched and in relatively poor physical condition from handling, no visual evidence of image enhancement or image quality indicator (IQI) alterations was observed. Reference data imprinted in the individual films and marked on the emulsion with wax pencil indicated that the welds were located in the feedwater, containment spray, chemical volume control, and component cooling piping systems. These systems were designated Class II and Class III on the as-built piping isometric drawings.

   An examination of the radiography records for the eight affected welds, as well as other selected adjoining welds, revealed a complete records package, individually traceable to as-built piping isometrics, for each weld. The TRT found that two of the questionable welds had been repaired and reradiographed. The TRT also found that two other questionable welds were eliminated and were replaced by a single weld as a result of a piping design modification. A review of radiographs representing both the repaired and replacement welds disclosed excellent radiographic and weld-soundness qualities with respect to ASME Code criteria. For the four remaining radiographs, the TRT found that the affected welds had been repaired, the repair areas had been reexamined, and the acceptance radiographs and weld quality exceeded applicable code standards. No evidence was observed during the film review to suggest that the final acceptance radiographs or the accompanying interpreter's records were altered in any manner.

   In further review of these allegations, the TRT reviewed the quality control plan established for control of radiography during production welding of piping on site and discussed it with cognizant B&R personnel. The review included general radiography procedures, specific control of radiography of weld repairs, film interpreter's records, densitometer equipment calibration, film processor control and related film archival quality tests, and daily radiography production logs. In reviewing the documentation applicable to these areas, the TRT found that the plan had been implemented systematically in accordance with the B&R procedures.

Records were readily available, reasonably complete, included nonconformance dispositions, and presented no evidence to suggest improper practices or records manipulation.

During an inspection of the B&R trailer housing the radiography facilities, the TRT observed a trash container full of scrap film and numerous film packages marked "Rejected," which were readily accessible in holding bins in the quality control (QC) film interpretation area. The TRT discussed the status of these rejected film packages with the B&R Level III nondestructive examination (NDE) supervisor, who explained that the film packages were formerly used to control defect repairs to the particular welds by QC interpreters and welding supervision, and that they should have been discarded following QC acceptance of final weld radiography as prescribed by procedures. The NDE supervisor assured the TRT that the film would be properly disposed of and that good housekeeping would be restored.

An examination of the "rejected" film packages disclosed that the exposed radiographs were indeed marked-up with white wax pencil to denote weld reference data and rejected zones requiring weld repair. The rejected radiographs were severely scratched and hand-soiled, as would be expected, from field weld repair activities. The physical condition of these films was quite characteristic of the eight radiographs submitted to the TRT by the anonymous alleger.

5. Conclusion and Staff Position: Based on its review of applicable QC procedures, QC records, and interviews with cognizant NDE supervisory personnel, the TRT concludes that the eight radiographs which formed the basis of the alleger's assertions are not representative of actual plant welds. The TRT found no substantive evidence to support the allegation of improper radiography practices in production welding on site. Accordingly, this allegation has no safety significance.

   Since the allegation was submitted anonymously, the TRT was unable to discuss its findings with the alleger.

6. Action Required: None.

   Reference Documents:

   1. B&R procedures.

      (a) CP-NDEP-101, "Radiographic Examination Piping" (void).
      (b) QI-QAP-10.2-3, Revision 4, "Radiographic Examination."
      (c) QI-QAP-10.2-3A, Revision 2, "Nondestructive Examination Instructions for Radiography Documentation."
      (d) QI-QAP-10.2-3C, Revision 3, "Radiographic Film Archival Quality Control."
      (e) QI-QAP-10.2-3B, Revision 1, "Controlling Calibrated Film Density Strips and Adjusting the Sensitometer."

2. Isometric Drawings:

   (a) CC-1-AB-02.
   (b) CC-X-AB-12B.
   (c) FW-2-RB-09.
   (d) FW-1-RB-007.
   (e) CS-2-SB-077.
   (f) CT-1-RB-17.

3. Selected radiographic records associated with shop and field piping welds for the above isometrics.

Attachment 3

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

NOV 29 1984

Docket Nos.: 50-445
and 50-446

Mr. M. D. Spence
President
Texas Utilities Generating Company
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Dear Mr. Spence:

Subject: Comanche Peak Review

On July 9, 1984, the staff began an intensive onsite effort to complete a portion of the reviews necessary for the staff to reach its decision regarding the licensing of Comanche Peak, Unit 1. The onsite effort covered a number of areas, including allegations of improper construction practices at the facility.

On September 18, 1984, the NRC met with you and other Texas Utilities Electric Company representatives to provide you with a number of technical issues in the electrical/instrumentation, civil/structural, and test program areas having potential safety implications. The issues discussed constitute a portion of the technical issues and allegations being evaluated by the Technical Review Team (TRT).

The activities of the TRT have progressed to the point where it is appropriate to provide you with a status of additional items under review and to request additional information. These items, in the coatings, mechanical, and miscellaneous areas, are listed in the enclosure to this letter. Further background information regarding these issues will be published in a Supplement to a Safety Evaluation Report (SSER), which will document the TRT's overall assessment of the significance of the issues examined.

The items in the enclosure to this letter cover only a portion of the TRT's effort. The TRT's ongoing evaluation, QA/QC review and conversations with allegers may reveal additional items in the coatings, mechanical, and miscellaneous areas for which additional requests for information may be appropriate. Also, the TRT evaluation of QA/QC issues, and its consideration of the programmatic implications of these findings, are still in progress. A summary of these issues will be provided to you at a later date.

You are requested to submit additional information to the NRC, in writing, including a program and schedule for completing a detailed and thorough assessment of the issues identified in the enclosure to this letter. This program plan and its implementation will be evaluated by the staff before NRC considers the issuance of an operating license for Comanche Peak, Unit 1. The program plan should address the root cause of each problem identified and its generic

implications on safety-related systems, programs, or areas. You should also address the collective significance of these deficiencies. Your program plan should also include the proposed TUEC action to assure that such problems will not occur in the future.

This request is submitted to you in keeping with the NRC practice of promptly notifying applicants of outstanding information needs that could potentially affect the safe operation of their plant. Future requests for additional information of this nature will be made, if necessary, as the activities of the TRT progress.

Sincerely,

Frank J. Miraglia

for Darrell G. Eisenhut, Director
Division of Licensing
Office of Nuclear Reactor Regulation

Enclosure: As stated
cc w/enclosure:
See next page

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REQUEST FOR ADDITIONAL INFORMATION

IV. Protective Coatings Area

a. Surveillance and Test Program for Coatings

The protective coatings Technical Review Team (TRT) reviewed the backfit program, design basis accident qualifications, traceability, application and repair procedures, training, coating exempt log and dispositioning of non-conformance reports. Concurrently, the staff is evaluating the effects on containment emergency sump performance of paint and insulation debris. The results of the two concurrent reviews will be combined in one supplemental safety evaluation which is scheduled to be issued by January 1985. Actions required for resolution of protective coatings issues will be delineated in the supplement.

V. Mechanical Area

a. Inspection for Certain Types of Skewed Welds in NF Supports

The TRT investigated inspection procedures of Brown & Root (B&R) for welds in pipe supports designed to ASME III Code, Subsection NF. The TRT found that no fillet weld inspection criteria existed for certain types of skewed welds. By definition, skewed welds are those welds joining (1) two non-perpendicular or non-colinear structural members, or (2) two members with curved surfaces or curved cross sections, such as a pipe stanchion (a section of pipe used as a structural member) welded to another pipe stanchion or to a curved pipe pad. Notice that for type (2), the effect of curvature at the weld connection induces skewed considerations, even though the two joining members are physically perpendicular. The B&R weld inspection procedures CP-QAP-12.1 and QI-QAP-11.1-28 for NF supports have addressed type (1) skewed welds; however, the TRT found that QI-QAP-11.1-28 did not include weld inspection criteria for type (2) skewed welds. Although the TRT was told by B&R personnel that procedure QI-QAP-11.1-26 for piping weld inspection was used, since such weld connections were similar in configuration to a pressure boundary stanchion attachment weld, no evidence documenting the use of this inspection procedure was provided to the TRT. According to records reviewed by the TRT, these welds were actually categorized as "all other welds" rather than "skewed welds" on the required QC checklist. Instead of using fillet weld gauges for measuring the size of nonskewed welds, welders were supposed to use a straight edge and a steel scale for measurement of a type (2) skewed weld, as described in QI-QAP-11.1-28. In addition, due to the variable profile along its curved weld connection, the weld size should have been measured at several different locations. The lack of inspection criteria and lack of verification of proper inspection procedures being conducted for type (2) skewed welds are a violation of ASME Code for NF supports committed to by TUEC in FSAR Section 5.2.1 and a violation of Criterion XVII in Appendix B of 10 CFR 50.

The TRT reviewed weld inspection procedures, weld data cards, and visually inspected several type (2) skewed welds in randomly sampled NF supports where pipe stanchions were used. Although the small sample of welds inspected by the TRT are acceptable, due to deficiencies in inspection records and the apparent lack of inspection criteria, the TRT is not certain whether other type (2) skewed welds were inspected properly. This is a generic issue involving many NF supports in various safety-related systems. The lack of documented inspections and criteria for type (2) skewed welds in NF supports represents a safety concern regarding the possible existence of under-sized welds in supports which are required to resist various design loads.

Accordingly, TUEC shall

(1) Revise B&R weld inspection procedures CP-QAP-21.1 and QI-QAP-11.1-28 to properly address type (2) skewed welds of stanchion to stanchion and stanchion to pipe pad; and,

(2) provide evidence to verify that previous inspections of these types of skewed welds were performed to the appropriate procedures.

b. <u>Improper Shortening of Anchor Bolts in Steam Generator Upper Lateral Supports</u>

The TRT was informed that some anchor bolts in the steam generator upper support beams were shortened during installation to less than the length shown on the design drawing without proper authorization. The TRT was told that the bolt cutting incident occurred either because the hole of the anchor device was filled with debris, or the threaded portion of the bolt had concrete mix stuck to it. There are 18 bolts at each end of each of 4 beams, totalling 144 bolts. There is one beam for each steam generator. The bolt threads into an anchor device embedded in the concrete wall. The acceptable bolt length or the length of bolt available for threading into the anchor device is vital to ensure structural capability of the support beams.

The TRT attempted to review TUEC records for ultrasonic (UT) measurement results and general installation practices. The TRT was told that ultrasonic testing of these types of bolts was not a procedural requirement; however, TUEC was unable to provide any other installation records for TRT review. The TRT concludes that such unauthorized bolt cutting and lack of installation inspection records is a violation of QA procedures and Criterion XVII in Appendix B of 10 CFR 50. Since the support beams are essential to provide lateral restraint for the steam generator during a LOCA or seismic event, adequate anchoring capability of the bolts has safety significance and, as a result, appropriate measures are needed to ensure conformance with General Design Criterion 1 of 10 CFR 50.

Accordingly, TUEC shall provide evidence, such as ultrasonic measurement results, to verify acceptable bolt length. Should unauthorized bolt cutting be verified, TUEC shall:

(1) replace shortened bolts with bolts of proper length, or provide analysis to justify the adequacy of shortened bolts as installed; and,

(2) provide justification or propose measures to ensure that no similar concern exists for bolting.

c. Design Consideration for Piping Systems Between Seismic Category I and Non-Seismic Category I Buildings

In April 1984 the Comanche Peak Special Review Team (SRT), formed and coordinated between NRR, IE and Region II and IV, performed a limited review of Comanche Peak. The TRT, in reviewing the SRT findings in the area of piping design considerations, has discovered that piping systems, such as Main Steam, Auxiliary Steam and Feedwater, are routed from the Electrical Control Building (seismic category I) to the Turbine Building (non-seismic category I) without any isolation. To be acceptable, each seismic category I piping system should be isolated from any non-seismic category I piping system by separation, barrier or constraint.

If isolation is not feasible, then the effect on the seismic category I piping of the failure in the non-seismic category I piping must be considered (CPSES FSAR 3.7B.3-13.1).

For CPSES, FSAR section 3.7B.2.8 establishes that the Turbine Building is a non-seismic category I structure and failure is postulated during the seismic (SSE) event. The effect of Turbine Building failure on any non-isolated piping routed through the Turbine Building from any seismic category I building must be considered.

In addition, for non-seismic category I piping connected to Seismic Category I piping, the dynamic effects of the non-seismic category I piping must be considered in the seismic design of the seismic category I piping and supports, unless TUEC can show that the dynamic effects of the non-seismic category I piping are isolated by anchors or restraints. The anchors or restraints used for isolation purposes must be designed to withstand the combined loading imposed by both the seismic category I and non-seismic category I piping.

Accordingly, TUEC shall provide analysis and documentation that the piping systems routed from seismic category I to non-seismic category I buildings meet the stated FSAR criteria.

d. Plug Welds

The TRT investigated alleged generic problems regarding uncontrolled repairs to holes existing in pipe supports, cable tray supports and base plates in Units 1 and 2. These holes, which had been misdrilled during fabrication, were repaired by plug welds. Since these supports are Seismic

Category I supports and the effects of the welds have not been evaluated, this constitutes a violation of Criteria IX and XVI of Appendix B to 10 CFR 50. Region IV inspections have confirmed the existence of such welds in cable tray supports located in the Unit 2 Cable Spreading Room.

Although the effects of unauthorized, undocumented and uninspected plug welds in some locations (e.g., the webs of I-beams or in structural members in compression) will be inconsequential, their effects in critical locations (e.g., flanges of I-beams in flexure or in structural members in tension) in critically loaded supports or base plates could affect their structural integrity and intended function.

Accordingly, TUEC shall perform one of the following:

(1) Modify its proposed plan to Region IV (TXX-4183 and TXX-4259) to include a sampling inspection of all areas of the plant having plug welds, to include cable tray supports, pipe supports and base plates. Propose alternate methods of inspection where the oblique lighting method is not viable (e.g., locations covered by heavy coats of paint). Perform an assessment of the effects on quality due to uncontrolled plug welds found during the proposed inspection, as modified above. Submit a report documenting the results of the inspection and assessment to the NRC for review.

(2) Perform bounding analyses to assess the generic effects of uncontrolled plug welds on the ability of pipe supports, cable tray supports and base plates to serve their intended function. Submit a report documenting the results of the assessment to the NRC for review.

e. Installation of Main Steam Pipes

The TRT investigated an allegation that a Unit 1 main steam line had been installed incorrectly and had been forced into proper alignment after flushing operations by use of the main polar crane and come-alongs. It was also claimed that pipe supports had been modified to maintain the line in its forced position and vibrations following detachment of the flushing line could have damaged the main steam line. Based on its investigation, the TRT determined that the alleged incident pertained to restoration of the Unit 1, loop 1 main steam line to its initial, correct installation position. (The line had shifted during flushing operations due to the weight of the added water and because the temporary supports sagged.) The TRT also determined that the modifications to permanent pipe supports were necessary to provide proper support to the main steam line in its restored position (initial designs for and construction of the supports had been based on the shifted position of the line) and, although the alleged vibrations could not be confirmed, their associated stresses might not have damaged the main steam line. (The highest stresses would have occurred in the weaker, temporary flushing line.) The TRT review of a TUEC analysis, performed 1 year after the incident, concluded that the analysis was incomplete. An evaluation for the full sequence of events leading up to the

incident had not been performed. The TRT review of Gibbs & Hill Specification No. 2323-MS-100 indicated that there were inadequate requirements and construction practices for the support of the main steam line during flushing, and for temporary supports for piping and equipment in general. In particular, evaluations to assure the adequacy of temporary supports during flushing and installation were not required. The deficiencies in the analyses, specifications and construction practice identified above constitute a violation of Criterion V of Appendix B to 10 CFR 50.

Accordingly, TUEC shall:

(1) Modify Gibbs & Hill Specification No. 2323-MS-100, and institute procedures for support of the main steam line during flushing and for temporary supports for piping and equipment in general to assure that the quality of piping and equipment are not affected.

(2) Perform an assessment of stresses in the portions of the Unit 1, loop 1, main steam and feedwater lines that were affected in the sequence of events involved during their initial installation, flushing and final installation. Conditions requiring stress analysis are:

  (a) Flushing condition when the lines were full of water and temporary supports had sagged or settled.

  (b) Disconnecting condition when vibrations of the temporary line could have occurred.

  (c) Lifting condition when forces were applied by the polar crane and come-alongs.

  These assessments shall be based on appropriate piping configurations involved.

(3) Perform a non-destructive examination of locations in the Unit 1, loop 1, main steam and feedwater piping where stresses were exceeded during the conditions of concern in a. through c. above.

(4) Review the existing baseline UT examinations for those portions of the Unit 1, loop 1, main steam and feedwater involved in all the conditions of concern in a. through c., above, for unacceptable indications.

(5) Review records of hydrostatic testing of the main steam and feedwater line to verify the quality of piping involved in the incident.

(6) Provide similar assessments for circumstances involved in a lifting incident identified during the TRT inspection for the Unit 1, loop 4, main steam line.

(7) Provide assessments of effects on quality of safety-related piping and equipment which were involved in similar incidents of sagging, settlements and failures, if any, of temporary supports.

(8) Submit the results of analyses, examinations and reviews in a documented report for NRC review.

VI. Miscellaneous Area

a. Gap Between Reactor Pressure Vessel Reflective Insulation (RPVRI) and the Biological Shield Wall

The TRT investigated an allegation that the Unit 1 reactor pressure vessel outer wall was touching the concrete biological shield wall. A TRT review of existing documentation and discussions with TUEC personnel indicated that this allegation was not factual. However, a significant construction deficiency report, submitted pursuant to 10 CFR Part 50.55(e), on August 25, 1983, documented that unacceptable cooling occurred in the annulus between the RPVRI and the shield wall during hot functional testing, apparently because of the existence of an inadequately sized annulus gap and possibly because the presence of construction debris in the annulus. TUEC corrected the situation by modifications to allow increased air flow for proper heat dissipation and by removal of the construction debris. TUEC representatives indicated that testing to verify the adequacy of the cooling flow will take place when additional hot functional testing is conducted. Information gathered by the TRT during the investigation indicated that a design change in the RPVRI support ring (i.e., locating the ring outside rather than inside the insulation) resulted in a limited clearance between the RPVRI and the shield wall. The TRT review of the 50.55(e) report revealed that TUEC failed to: (1) address the fundamental issue of the design change impact on annulus cooling flow, and (2) determine whether Unit 2 was similarly affected.

Accordingly, TUEC shall:

(1) Review their procedures for approval of design changes to non-nuclear safety-related equipment, such as the RPVRI, and make revisions as necessary to assure that such design changes do not adversely affect safety-related systems.

(2) Review procedures for reporting significant design and construction deficiencies, pursuant to 10 CFR Part 50.55(e), and make changes as necessary to assure that complete evaluations are conducted.

(3) Provide an analysis which verifies that the cooling flow in the annulus between the RPVRI and the shield wall of Unit 2 is adequate for the as-built condition.

(4) Finally, verify during future Unit 1 hot functional testing that completed modifications to the RPVRI support ring now allow adequate cooling air flow.

The TRT noted that control of debris in critical spaces between components and/or structures was identified as an issue, both in the investigation of this allegation and the civil/structural area item II.c (Maintenance of Air Gap Between Concrete Structures), contained in Darrell G. Eisenhut's September 18, 1984, letter to TUEC. Accordingly, TUEC shall also:

(1) Identify areas in the plant having critical spacing between components and/or structures that are necessary for proper functioning of safety-related components, systems or structures in which unwanted debris may collect and be undetected or be difficult to remove;

(2) Prior to fuel load, inspect the areas and spaces identified and remove debris; and,

(3) Subsequent to fuel load, institute a program to minimize the collection of debris in critical spaces and periodically inspect these spaces and remove any debris which may be present.

b. <u>Polar Crane Shimming</u>

The TRT investigated the installation of the polar crane rail support system by visual inspection, review of associated documentation, and discussions with TUEC representatives and their contractors. Region IV Inspection Report 50-445/84-08; 50-446/84-04 and Notice of Violation, dated July 26, 1984, documented that gaps on the Unit 1 polar crane bracket and seismic connections exceeded design requirements. In Texas Utilities Generating Company responses of August 23, 1984, and September 7, 1984, the gaps were attributed to crane and bolting self-adjustment resulting from crane operation. A site design change (DCA-9872, Revision 4, dated August 24, 1984) was issued to document the acceptability of the gaps in excess of 1/16 inch which were identified in the above NRC inspection report.

During further investigation of the allegation that shims for the rail support system of the polar crane had been altered during installation, the TRT observed gaps which may have been excessive between the crane girder and the girder support bracket. Detailed specifications addressing the gap tolerance in the girder seat connections did not exist; however, Gibbs & Hill letter GHF-2207, dated November 28, 1977, stated that the "seated connections will not require shimming since the area in bearing is at least the width of the bottom flange of the crane girder." Contrary to this Gibbs & Hill assumption, the TRT observed nine girders with gaps which

extended under the bottom flange that reduced the bearing surface to less than the 20-inch flange width stated in the letter. The TRT also observed conditions which indicated that the crane rail may still be moving in a circumferential direction, that three rail-to-rail ground wires were broken, that two shims have partially worked out from under the rail, and that two Cadwelds were broken.

Accordingly, TUEC shall:

1. Inspect the polar crane rail girder seat connections for the presence of gaps which reduce the bearing surface to less than the width of the bottom flange and perform an analysis which will determine whether existing gaps are acceptable or require corrective action.

2. Determine if additional rail movement is occurring and, if so, provide an evaluation of safety significance and the need for corrective action.

3. Perform a general inspection of the polar crane rail and rail support system, correct identified deficiencies of safety significance, and provide an assessment of the adequacy of existing maintenance and surveillance programs.

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14. ABSTRACT (200 words or less)

Supplement No. 10 to the Safety Evaluation Report for the Texas Utilities Electric Company application for a license to operate Comanche Peak Steam Electric Station, Units 1 and 2 (Docket Nos. 50-445 and 50-446), located in Somervell County, Texas, has been jointly prepared by the Office of Nuclear Reactor Regulation and the Comanche Peak Technical Review Team of the U. S. Nuclear Regulatory Commission. This supplement provides the results of the staff's evaluation and resolution of approximately 400 technical concerns and allegations in the mechanical and piping area regarding construction practices at the Comanche Peak facility. This report does not address the Walsh/Doyle allegations regarding deficiencies in the pipe support design process. Issues raised by the Walsh/Doyle allegations as well as issues raised during recent Atomic Safety and Licensing Board hearings will be dealt with in future supplements to the Safety Evaluation Report as needed.

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