U. S. NUCLEAR REGULATORY COMMISSION

OFFICE OF SPECIAL PROJECTS

NRC Inspection Report: 50-445/88-47
50-446/88-42

Permits: CPPR-126
CPPR-127

Dockets: 50-445
50-446

Category: A2

Construction Permit
Expiration Dates:
Unit 1: Extension request submitted.
Unit 2: Extension request submitted.

Applicant: TU Electric
Skyway Tower
400 North Olive Street
Lock Box 81
Dallas, Texas 75201

Facility Name: Comanche Peak Steam Electric Station (CPSES), Units 1 & 2

Inspection At: Comanche Peak Site, Glen Rose, Texas

Inspection Conducted: July 7 through August 2, 1988

Inspector: H. S. Phillips 9/2/88
H. S. Phillips, Senior Resident Inspector Construction — Date

Reviewed by: RF Warnick for 9/2/88
H. H. Livermore, Lead Senior Inspector — Date

Inspection Summary:

Inspection Conducted: July 7 through August 2, 1988 (Report 50-445/88-47; 50-446/88-42)

Areas Inspected: Unannounced, resident safety inspection of applicant's actions on 50.55(e) construction deficiencies, action on Information Notice 85-24, previously identified inspection items, removal of protective coating from SWS piping, and new open items concerning Plasite removal.

Results: Within the areas inspected, one apparent violation was identified (breakdown in the QA program [Criterion II] relative to the removal of the protective liner from the service water system [SWS] piping), paragraph 3). The findings that support the apparent Criterion II violation concerning the SWS liner removal are: failure to establish QA/QC program requirements and technical requirements in procurement documents, paragraph 3.a; failure to control special processes, paragraph 3.b; failure to provide adequate QA/QC procedures, paragraph 3.c; and failure to take corrective action, paragraph 3.d. Two new open items concern the disposition of defects on the outside of the piping without consideration of the interior defects, paragraph 3.e(1), and engineering assigning a quality level rather than QA, paragraph 3.e(2).

These findings represent a significant weakness in that project management did not insure the "up-front" involvement and implementation of quality at the onset of the pipe liner removal task.

DETAILS

1. Persons Contacted

*R. P. Baker, Licensing Compliance Manager, TU Electric
*W. G. Counsil, Executive Vice President, TU Electric
*G. G. Davis, Nuclear Operations Inspection Report Item Coordinator, TU Electric
*D. E. Deviney, Deputy Director, QA, TU Electric
*W. G. Guldemond, Executive Assistant, TU Electric
*T. L. Heatherly, Licensing Compliance Engineer, TU Electric
*R. T. Jenkins, Manager, Mechanical Engineering, TU Electric
*O. W. Lowe, Director of Engineering, TU Electric
*S. M. Matthews, Chief Inspector, State of Texas
*D. M. McAfee, Manager, QA, TU Electric
*D. M. Reynerson, Director of Construction, TU Electric
*J. S. Smith, Plant Operations Staff, TU Electric
*J. F. Streeter, Director, QA, TU Electric
*R. D. Walker, Nuclear Licensing, Manager, TU Electric

The NRC inspectors also interviewed other applicant employees during this inspection period.

*Denotes personnel present at the August 2, 1988, exit meeting. A complete list of exit meeting attendees is included in NRC Inspection Report (IR) 50-445/88-51; 50-446/88-47.

2. Quality Assurance and Administrative Controls (35061, 35065, 92700, 92701)

a. Follow-up on Construction Deficiencies Concerning Service Water System Piping

In NRC IR 50-445/88-34; 50-446/88-30, the NRC documented a detailed inspection of construction deficiency (10 CFR Part 50.55[e]) files SDAR CP-80-07 and CP-86-07. In 1980 and 1985, respectively, these two deficiency reports stated that defects were found in the Plasite 7122 liner in the SWS piping. Inspection of the SWS piping is also documented in NRC IR 50-445/88-40; 50-446/88-36.

A Plasite liner, an epoxy coating, was applied to the inside of the carbon steel piping, ASTM A106 Grade B. In the 1975-76 time frame, the specifications originally described the coating and application as safety related. The vendor applied a "Q" coating at their shop prior to shipping the SWS piping to the site. According to Gibbs & Hill (G&H) engineering, TWX No. 12523, the coating on field weld areas was applied by the site contractor

without QA/QC program controls. The coating was intended to protect the piping from the slightly corrosive water supplied from the Squaw Creek Reservoir. The Unit 1 system has operated for approximately six years, half of this time in wet lay up.

The NRC inspector found the applicant's evaluation of deficiency CP-80-07 inadequate. That is, Gibbs & Hill, Inc., the applicant's design engineer of record, did not appropriately consider the effect of the coating applied to SWS piping by a site contractor who did not procure or apply the coating under a quality assurance/control (QA/QC) program. The evaluation also failed to assume that the coating might fail by sheets of coating coming off the pipe wall. It also failed to address such effects on equipment other than the component cooling water heat exchanger. Finally, the evaluation assumed that an inservice inspection program would prevent further pipe wall corrosion without specific knowledge that an adequate inspection program existed or would be developed.

The NRC inspector found that at approximately the same time (1980) design change authorizations (DCA) 8809 and 8810 changed piping specifications MS-43B and MS-100 to read: "Plasite No. 7122 and its application are not safety related." The justification assumed that the loss of the coating was not detrimental to the safety of the plant. This assumption was in direct contrast to the later Institute of Nuclear Power Operation's (INPO) Significant Event Report (SER) 6883 and to NRC Information Notice 85-24, issued in 1983 and 1985, respectively, which reported the failure of Plasite 7122 at another nuclear plant. The changes also failed to consider adverse effects that could be caused by a coating procured and applied without 10 CFR Part 50, Appendix B controls.

In September 1985, defective coating was found again in the SWS, this time by a paint foreman, and was documented on TU Electric Operations Problem Report (PR) 85-532, eventually becoming construction deficiency CP-86-07. The inspector found that the NRC was not notified of this deficiency until January 23, 1986, and then only after weld failures due to corrosion were identified in SWS piping. This led to replacement of some piping and repairs to Plasite using Belzona coating (PR 85-532 and TU Electric memorandum TIM-860454 dated April 1986). TU Electric's 50.55(e) report SDAR CP-86-07 (TXX-4672) stated that normally the coating failure was not considered a safety issue and that inservice inspection would detect piping integrity loss and that defective areas in the Plasite liner would be repaired with Belzona

(a ceramic coating). NRC IR 50-445/88-34; 50-446/88-30 questioned the control of the application of Belzona and other coatings because all site applied coatings were still considered nonsafety related.

On February 24, 1986, the initial written report for deficiency CP-86-07 was sent to the NRC. After numerous interim reports on Unit 1 SWS, in report TXX 88476 (dated June 22, 1988) the applicant stated that the entire Plasite liner and Belzona coating would be removed. The NRC inspector reviewed Stone & Webster Engineering Corporation (SWEC) correspondence along with a formal corrosion report. Wisconsin Protective Coating Corporation examined the Plasite pipe liner and found extensive failures in the Plasite caused by porosity, excessive thickness, and lack of pipe surface preparation. The corrosion report described 1/16 to 1/8-inch diameter blisters uniformly distributed and spaced 3/8-inch apart and a few 1/2 to 3-inches apart. All of the blisters broke while scrapping a putty knife across them. Microbiologically induced corrosion (MIC) was found in the carbon and stainless steel piping which can cause pin holes and drips. The report stated that the shop or vendor applied coating was adherent with small blisters, but the site applied coatings were degrading. A few pits were present in Unit 1 piping which had been repaired with Belzona. The report st[illegible] in part, "Due to the Belzona coating repairs, measu[illegible] of pits which may have formed previously is not possible." SWEC memo SWTU-4770 recommended Plasite removal, a corrosion program to baseline the extent corrosion, selected piping replacement, and that all piping should be weld repaired where it was less than the specified thickness. SWEC Corrosion Report (SWTU-7749) was issued in November 1987 and it extensively reported on the liner failures, the corrosion mechanisms, and the defects. SWEC letter (SWTU-7749 dated April 8, 1988) specifically cautioned: "Excessive pipe wall thinning . . . must be avoided."

The NRC inspector concluded the following:

(1) The first deficiency (CP-80-07) was inadequately evaluated relative to not applying QA/QC controls to the site procurement and application of Plasite and relative to possible sheet mode failure which might result in blockage of the coolant flow path.

(2) There is no evidence (in reports TXX-3229 and 3218 for CP-80-07) that the piping was extensively inspected to determine if failures occurred in other areas of about 15000 linear feet of SWS piping in

Unit 1 and 2. Therefore, the first deficiency was concluded to be not reportable without knowing the extent of the coating defects.

(3) There is no evidence that an effective inservice inspection program was established in procedures between 1980 and 1985. During the six years of operation and lay up, the system degraded to the point that the Plasite had to be removed.

(4) Concerning the second deficiency (CP-86-07), the NRC was not notified in a timely manner. That is, the NRC was not notified from September 1985 until January 23, 1986. On February 24, 1986, deficiency CP-86-07 was reported (TXX-4711). The issue of untimely evaluation of nonconforming conditions and reporting of significant construction deficiencies under 50.55(e) was addressed by the NRC in 1987 in Inspection Reports (IR) 50-445/87-07, 50-446/87-06; IR 50-445/87-08; IR 50-445/87-10, 50-446/87-08; and IR 50-445/87-18, 50-446/87-10. An enforcement conference was held and a violation was issued.

(5) "TU Electric Task Description of the Protective Coatings Program conducted by Ebasco Services, Inc., CPE-TD-EB-088," Revision 4, dated October 2, 1987, did not describe the inspection of corrosion defects performed by Ebasco engineers prior to the coating being removed or the mapping of such defects for a baseline corrosion program. This is comparable to TU Electric's failure to adequately preplan for the coating removal work. (See paragraph 3.a).

(6) Neither the TU Electric deficiency reports for CP-86-07 nor a Corrective Action Report (CAR) addressed the cause of the SWS pipe liner deterioration between 1980 and 1985. Neither addressed the lack of QA/QC controls (for site applied Plasite 7122), the inadequate evaluation by G&H (in light of information in SER 6883 and IEN 85-24 which reported problems with Plasite), and the inadequate inservice inspections (which allowed extensive coating failure/corrosion of piping to proceed).

(7) TU Electric's final deficiency report (TXX-88476) did not specifically discuss the localized attack on the SWS pipe wall that occurred under the blisters that were uniformly distributed through out the SWS piping.

The NRC believes the poor evaluation of the coating defects in 1980 and 1985, the poor evaluations of the INPO SER and the NRC Information Notice, and the failure to take adequate corrective action reflect the problems this utility had in that time frame. Furthermore, the NRC believes this poor work also set the stage for the poor utility performance described in paragraph 3.

Deficiencies CP-80-07 and CP-86-07 are closed for Unit 1, and 2 based on this inspection and the violation identified in paragraph 3.

b. Follow-up on Previous Inspection Findings (92701)

On May 2, 1988, the NRC inspector observed work activity relative to removing the coating from Train A piping. NRC Inspection Report 50-445/88-34; 50-446/88-30 (for May 1988) documented two unresolved and five open items concerning the coating removal and the identification and disposition of defects (pitting from corrosion plus wall thinning from sandblasting). The status of each item follows:

(1) (Closed) Unresolved Item (445/8834-U-01; 446/8830-U-01): Downgrading of coating requirements in Specifications MS-43B and MS-100 to a non-Q classification. This concern is included in the violation in paragraph 3.a.

(2) (Open) Open Item (445/8834-O-02; 446/8830-O-02): Inadequate evaluation of INPO SER 6683 and IEN 85-24. The NRC inspector believes that the Institute of Nuclear Power Operation significant event report and NRC Information Notice should have been evaluated in greater depth considering the fact that Plasite failures at Palo Verde had caused clogging of safety-related equipment which was essential for safe plant shutdown. TU Electric evaluations depended too heavily on a 1980 G&H evaluation.

The NRC inspector met with the supervisors responsible for such evaluations. Retrospectively, they agreed that the evaluations, prior to 1986, were weak. They stated that they would review such notices received prior to 1986 to assure that others were properly evaluated. This item remains open pending the completion of this review. IEN 85-24, however, is considered closed. See paragraph 4.

(3) (Closed) Open Item (445/8834-O-03; 446/8830-O-03): The inspector had identified a concern with the

Belzona repaired areas and the applicant's identification of the surface defects inside the piping.

This concern is included in the violation in paragraph 3.c.

(4) (Closed) Open Item (445/8834-O-04; 446/8830-O-04): NRC follow-up inspection of how residual areas of Plasite liner were measured to ensure that the acceptance criteria were met. This concern is included in the violation in paragraph 3.c.

(5) (Closed) Open Item (445/8834-O-05; 446/8830-O-05): Possible blockage of safety-related equipment by loose residual coating. The NRC inspector was provided a semiquantitative measurement of residual Plasite and Belzona. On June 20, 1988, the inspector was informed that calculations showed that if all the coating remaining in the SWS system after the coating removal failed at once, it would amount to only a cupful and would be of no concern. The calculations appear to be consistent with the observations made by the NRC inspectors while examining the piping internal surface. This item is closed.

(6) (Closed) Unresolved Item (445/8834-U-06; 446/8830-U-06): The NRC inspector had identified a concern that the sandblaster might remain in one area long enough to cause wall thinning and that this condition might go undetected. This concern is included in the violation in paragraph 3.b.

(7) (Closed) Open Item (445/8834-O-07; 446/8830-O-07): Need for a FSAR change to describe residual Plasite and Belzona in the SWS. As stated in paragraph (5), TU Electric found that about only a cupful of Plasite and almost no Belzona would remain after liner removal. The NRC inspector determined that this small amount is negligible and there is no need to describe it in the FSAR. This item is closed.

3. Removal of Plasite/Belzona from Unit 1 SWS Piping (49061, 49063, 49065)

On May 2, 1988, the NRC inspector first observed O. B. Cannon Company & Sons, Inc., (OBC) removing the Plasite 7122 liner from the 10, 24, and 30-inch SWS piping. Section 9.2.1 and Table 17A-1 of Section 17.0 of the FSAR describes and classifies this system as safety related. The piping and components are American Society of Mechanical Engineers (ASME)

Division 1, Section III, Class 3. The SWS system operationally supports other ASME III, Class 2 and 3 systems. That is, the SWS removes heat from the emergency diesel generators and component cooling water system heat exchangers. The SWS also supplies cooling water to the safety injection centrifugal charging pump lube oil coolers and containment spray pump bearing oil coolers. The SWS supplies cooling water during normal operations and after a postulated loss of coolant accident.

OBC began the work on Train A on April 11, 1988, and continued until Train B was completed on July 8, 1988. OBC demobilized and left the site on July 13, 1988. At this point TU Electric considered the work on approximately 7400 linear feet of Unit 1 SWS piping to be complete and acceptable.

Two types of equipment were used for the abrasive blast operations: an automatic pull-through spin-blaster and standard hand-held blasting nozzles. The spin-blaster blows an abrasive grit through two centrifugally rotating blast nozzles 180 degrees apart as the unit is pulled through the 10-inch piping. Standard blast nozzles (of varying sizes) are hand-held to remove the Plasite from the 24- and 30-inch piping. Respectively, the nominal wall thickness 10-, 24-, and 30-inch diameter are 0.365, 0.375, and 0.375 inches. The manufacturer's minimum wall thickness is 0.875 times the nominal except for the 30-inch pipe which is no less than 0.375 inches. In order to limit the amount of metal removed, engineering had performed blast tests and concluded that only 0.012 inches of metal would be removed if the spin-blaster stalled for two minutes. The tests also indicated that 0.005 inches (average) would be removed if the spin-blaster was pulled at the rate of 3-inches per minute.

During this inspection, the NRC inspector reviewed the procurement documents, procedures, records concerning the removal of the coating, identification of corrosion defects, and corrective action. In addition, the NRC inspector crawled through about 900 feet of 24 and 30-inch piping between the service water intake structure and the component cooling water heat exchanger and observed multiple pitting defects caused by corrosion. The worst defects were mainly at weld joints where the coating had been applied by the site contractor but were randomly found elsewhere in the SWS piping. Most of the pitting was dish shaped. Where the NRC inspector entered the piping in the Service Water Intake (SWI) structure, TU Electric pointed out the pipe wall that had severely corroded and the location of one pit which the depth of exceeded 0.125 inches. Also, another weld which was approximately 50 feet into the piping had a defect that appeared to have lack of penetration, corrosion and erosion.

TU Electric identified these prior to the NRC inspector's inspection and generated a nonconformance report (NCR).

Criterion II, "Quality Assurance Program," of Appendix B to 10 CFR 50 and Section 2.0, Revision 0, of the TU Electric QA Manual states, in part: "The quality assurance program shall provide control over activities affecting the quality of the identified structures, systems, and components, to an extent consistent with their importance to safety. Activities affecting quality shall be accomplished under suitably controlled conditions. Controlled conditions include the use of appropriate equipment; suitable environmental conditions for accomplishing the activity, such as adequate cleanness; and assurance that all prerequisites for the given activity have been satisfied. The program shall take into account the need for special controls, processes, test equipment, tools, and skills to attain the required quality, and the need for verification of quality by inspection and test. The program shall provide for indoctrination and training of personnel performing activities affecting quality as necessary to assure that suitable proficiency is achieved and maintained."

The inspector found that QA/QC and technical concerns and requirements discussed in preprocurement meetings were not addressed in the requisition or purchase order issued to O. B. Cannon. Work and inspection activities began before procedures were established, procedures for work and inspection activities were inadequate, special process procedures were not established to provide adequate controls, inspection was inadequate, testing was not properly conducted, nonconforming conditions were not identified and properly evaluated, and corrective action was not taken relative to NRC identified items. The NRC inspector is unaware of a QA or technical document that consolidates and considers all of the information, recommendations, and corrective actions in problem report 85-532 and the memorandum TIM-860454.

It appears that TU Electric failed to establish adequate QA/QC and technical controls in procurement documents; failed to provide adequate control of the special process; failed to provide adequate inspections and process monitoring of the work activity; and failed to take prompt and effective corrective action in May, June, or July. This is an apparent violation of Criterion II of Appendix B to 10 CFR Part 50 (445/8847-V-01). This violation is supported by the following examples:

a. <u>Failure to Establish QA/QC and Technical Requirements</u>

Criterion IV, "Procurement Document Control," of Appendix B to 10 CFR Part 50 requires that applicable regulatory requirements, design bases, and other

requirements which are necessary to assure adequate quality are included or referenced in the documents for the procurement of material, equipment, and services.

(1) Paragraph 6.2 and 6.2.8.2 of Engineering Purchasing Procedure ECE-6.02-03, Revision 1, "Engineering Review of Procurement Documents," states, in part, "Figure 7.1 and the procurement requisition must define all technical, quality assurance and documentation requirements clearly and explicitly."

The technical and QA/QC requirements to control the Plasite removal from SWS piping are discussed in the minutes of the March 14, 1988, meeting for the requisition and purchase order (PO) CP-794. However, these requirements were not adequately considered and included in the TQAR package, services review summary, critical characteristics, and verification plan. At the subject meeting concerns were expressed by attendees about not meeting requirements such as: QA/QC level of responsibility; holdpoints/inspections; spinblaster pull rates other measurements and surveillance, ultrasonic test (UT) examination of a small number of points would not give a good overview of entire system cleanliness and metal removal; decrease in pressure over distance; UT of accessible areas to verify metal removal; sample program procedures not setup to give exact pull rate and pressure; control of hand-held sandblaster; and need for additional UT as QA/QC surveillance would not be available during blasting; UT acceptance criteria; and the possibility that grease might remain on the pipe inner surface after blasting.

Purchase requisition 6R-350338 failed to clearly and explicitly define the technical and QA requirements in the TQAR package, and services review summary (which also includes verification plans and critical characteristic information per Procedure ECE-6.02-I2, Revision 0).

The original QA requirement on page 2 of requisition 6R-350338 had been crossed out, initialed, and dated (March 25, 1988). The deletion consisted of the following: "The entire blasting operation shall be under TU Electric's Quality Assurance Plan." On page 4, another TU Electric QA responsibility was similarly crossed out. On page 5, a note was added relative to contacting a TU Electric representative to schedule QA surveillance activities prior to performing work. The TQAR package was not clear as

to who had full responsibility and did not explicitly explain QA/QC and technical controls. The TQAR form did not discuss all quality assurance program requirements. TU Electric QA responsibilities for the entire blasting operation were eliminated from the requisition and purchase order description (except for monitoring coating removal). Instead, an Ebasco engineering group was assigned the responsibility only for referenced holdpoints for engineering inspections, without clear requirements for quality assurance.

In the requisition package the Verification Plan form was attached to a Critical Characteristics Evaluation form. The verification plan was originally signed on March 21, 1988, and TU Electric QA was listed as the responsible group that would examine coating removal and critical defects. However, on March 25, 1988, a procurement engineer crossed out the listed QA responsible group and replaced it with Ebasco protective coatings engineer.

The approval block on requisition 6R-350338 had 10 signatures for original review and approval. On March 25, 1988, important changes were made to the requisition; however, all of the original signatories did not review and approve these changes. The singular initial placed next to the changes was not identified as one of the original reviewers. In addition, although Ebasco engineering was assigned QA/QC and technical responsibilities, no Ebasco signature was found.

(2) Paragraph 3.1.c "Intended Use" of Purchasing Procedure 5.0-2, Revision 1, requires the requisition to list applicable work document numbers (of nonconformance/deficiency/corrective action reports and design change/modification documents).

The NRC inspector determined that requisition 6R-350338 did not reference Problem Report 85-532; nonconformance report (NCR) 88-00820, Revision 0, dated January 12, 1988; and Design Modification Request-Construction Phase (DMRC) 88-1-020 which was the approval to remove the Plasite liner. The 1985 problem report and the 1987 coating walkdowns contained corrosion defect mapping (qualitative in some cases as depth was approximated), and other corrective actions that impacted the evaluation of corrosion defects after coating removal in 1988.

(3) Paragraph 6.2.5 "ASME Classification" of ECE-6.02-03, Revision 1, states, in part, "The [Responsible Engineer] RE shall determine the appropriate ASME classification (Section III or XI) which establishes the requirements to which a particular service is to be performed."

The NRC inspector found that for requisition 6R-350338, the RE assumed that the coating removal could not affect ASME Class 3 piping. This conclusion was incorrect since metal was to be removed from the pipe by blasting; therefore, the ASME block on the requisition should have been checked to inform the authorized nuclear inspector that such work would be accomplished. Figure 7.1 of Engineering Procedure ECE 6.02-03 contains three blocks titled ASME III, ASME XI, and NA. This figure was attached to the requisition and was marked not applicable.

The NRC inspector reviewed the ASME Code, consulted with other NRC inspectors, and held meetings with the State of Texas and authorized nuclear inspectors (ANI). The NRC concluded that TU Electric should have notified the ANI on site of the intent to remove metal from an ASME piping system to allow voluntary or required ANI inspections. The following is the basis for that conclusion.

Section IWA-2140 of ASME Section XI, dated July 1, 1974, states: "The Owner shall arrange for an Inspector to have access to all parts of the plant necessary for making the required inspection. The owner shall keep the Inspector informed of the progress of the preparatory work necessary to permit inspections and shall notify him reasonably in advance when the components will be ready for any required inspection."

Section IWA-2120 of ASME Section XI, same date, states: "It is the duty of the Inspector to assure himself that the examinations and tests required for Class 3 components and systems (IWD-1000) have been conducted and the results recorded . . . . The Inspector shall review the repair program to determine compliance with the requirements of this Division."

The NRC inspector interviewed the ANI for Section XI and determined that he was not informed of preparatory work; therefore, was not provided an opportunity to perform voluntary or required

inspections of the sandblasting process to assure that excessive metal was not removed along with the Plasite coating. He was also not made aware of a 0.012-inch metal removal allowance. No work order or traveler was processed. Therefore, no ANI input or inspection of the recently completed work on Train A was possible.

This failure to properly establish and define all QA/QC and technical requirements and reference the work documents is a violation of Criterion IV of Appendix B to 10 CFR Part 50 and Section 4.0, Revision 0, of TU Electric QA Manual (445/8847-V-01.a).

b. Failure to Control Special Processes

Criterion IX of Appendix B to 10 CFR 50 requires that measures be established to assure that special processes are controlled and accomplished by qualified personnel using qualified procedures in accordance with applicable codes, standards, specifications, criteria, and other special requirements.

The NRC inspector found that the measures established to control the special process of removing the coating from the SWS piping were inadequate. As a result a 1/2-inch hole was sandblasted through the pipe wall in one place and several other deep sandblasting indentations were made in the 10-inch piping.

(1) O. B. Cannon Procedure, Construction Procedure QCP-1, Revision 2, "Coating Removal by Abrasive Blasting of Interior of Station Service Water Piping," dated April 18, 1988, was originally issued on March 23, 1988. The NRC inspector found that the Procedure QCP-1, Revision 2, does not prescribe any of the specific parameters or give detailed instructions concerning required air pressure, type abrasive, required rate for pulling the spin blaster through 10-inch piping, rate of change of pulling versus distance, and qualification of operators based on parameters developed by Sandblast Tests.

(2) Construction and engineering Procedures ACP-10.1, Revision 1, "Preparation, Approval, and Control of Construction Operation Travelers," and ECC 2.13-5, Revision 4, "Construction Traveler," require the use of travelers to document the disassembly of previously completed components by providing instructions and points that should be inspected, verified, monitored, and/or witnessed. The NRC

inspector found that no traveler or work order was used to control this work.

(3) The NRC inspector determined that paragraph 6.9 of EME 3.21-08, "Engineering Verification of Protective Coatings Applied to Steel Surfaces Subject to Immersion Service," Revision 0, was inadequate because it did not discuss how the rate of sandblasting would be monitored. The NRC inspector found that the engineers who tested the various techniques had verbally instructed OBC personnel to contact engineering before exceeding the blasting time in an area or if the rate of travel dropped below a minimum rate when traveling through the 10-inch piping or if blaster problems were encountered. Yet, to the contrary, a TU Electric memorandum NP-6633 dated March 18, 1988, stated that no further monitoring of pipe wall thinning was necessary.

(4) DCA 73794, dated April 26, 1988, changed the instructions and the acceptance criteria in OBC Procedure QCP-1, Revision 2 dated April 18, 1988. TU Electric QA Manual, Section 6.0, Revision 0, requires that such changes be controlled. The DCA changed the criteria from "The abrasive blasting operation shall leave the surface of all piping free of paint . . . ." to ". . . except slight shadows, streaks, discolorations from residual paint or small tightly adherent coated areas; i.e., 10-1/4" diameter speckles per square foot or areas 1/4" in dimension of length no longer than the corresponding internal pipe circumference."

The NRC inspector found that paragraph 9.1 of QCP-1 was not revised to include the new criteria. All work was accomplished without this criteria being in the O. B. Cannon procedure.

(5) The NRC inspector learned that nondestructive ultrasonic testing had been performed through the paint on the outside of SWS piping in order to measure pitting depth on the inside of piping without considering that the thickness of paint had the potential to cause UT measurement error. In a June 20, 1988, meeting, TU Electric confirmed that corrosion defects had been measured by UT through the paint.

Subsequently, TU Electric selected defects in the wall previously measured and performed UT to determine the depth of the defects. When

TU Electric retested without paint, they found an error was introduced by the paint. This practice is similar to a violation that was previously identified and documented in NRC IR 50-445/88-20; 50-446/88-17 dated April 22, 1988.

The failure to establish adequate controls of the special process for the coating removal is a violation of Criterion IX of Appendix B to 10 CFR Part 50 and TU Electric QA Manual, Section 9.0, Revision 0 (445/8847-V-01.b).

c. Failure to Provide Adequate QA/QC Procedures

Criterion X of Appendix B requires a program for inspection of activities affecting quality to be established and executed to verify conformance with documented instructions, procedures, and drawings for accomplishing the activity. It requires inspection and process monitoring when control is inadequate without both.

Comanche Peak Engineering Procedure EME 3.21-08 is the procedure that implements the technical and QA requirements of Appendix B to 10 CFR Part 50. It covers qualification of engineers, verification records, deficiency reporting, and sandblasting to bare metal. This procedure was originally developed (September 1987) to verify the application of coatings to steel surfaces subject to immersion service but Engineering Document Change Notice (EDCN) No. 3, dated May 6, 1988, added paragraph 6.9 to reflect the removal of coating from the SWS piping. The paragraph concerning the removal of Plasite is approximately one-half page long. The NRC inspector determined that the subject procedure and implementation were inadequate as follows:

(1) Requisition 6R-350338 package for OBC services stated that residual coating and damage to piping caused by pitting or rust were critical defects. The NRC inspector determined that paragraph 6.9 of EME 3.21-08 did not discuss or describe how such critical defects would be identified and no criteria for acceptance was provided.

The NRC inspector learned that SWEC engineers performed visual inspections without procedures. In addition to having no criteria in a procedure for inspecting defects inside the 10-inch piping, the NRC inspector found that SWEC engineers had visually inspected the pipe for defects using video tapes of the pipe interior and had accepted the piping and

returned it to service. A 1/2-inch hole in the pipe wall and several other defects caused by the blaster were not detected when SWEC engineers reviewed the video tapes of the inside of Train A piping (10-inch). The hole in the pipe wall was identified when the SWS piping was filled with water. The SWEC engineers performing the visual inspection were not certified to ANSI N45.2.6 requirements in regards to special inspection methods.

On August 1, 1988, TU Electric stated that they had found that they had misidentified the video tapes for the 10-inch SWS piping entering and exiting the diesel generator building. The defect locations were reversed when the video tapes were reviewed.

(2) On July 18, 1988, the NRC inspector discussed the TU Electric inspection of Train B piping with TU Electric QC and licensing compliance personnel. The inspector believes the current inspection of the piping pits and blister indentations is not in accordance with ASME Section XI. This code requires a visual inspection to identify defects and surface/volumetric examination to assure that the extent of the defect is known. To date only measurements with a depth gauge have been made to measure possible violations of the manufacturers and code minimum wall thickness.

(3) EDCN No. 3 to EME 3.21-08 was approved May 6, 1988; however, the inspection process was initiated about a month earlier (April 11, 1988). The NRC inspector observed work being completed on May 2, 1988, before the QC procedure was established or implemented.

(4) Paragraph 6.9 of Procedure EME 3.21-08 stated the removal of coating shall be inspected in accordance with Specification MS-100. The NRC inspector notes that this specification contains a general section on QA/QC and an Appendix C which addresses Level D cleanliness. This Appendix also prescribes the size of areas of residual coating that can remain on the inside of the piping.

The NRC inspector determined that during the removal of coating from Train A piping an accurate method for measuring the residual coating remains in the piping did not exist. At a June 20, 1988, meeting on SWS coating removal, TU Electric made a presentation and specifically addressed their

methodology for measuring the remaining coating. They showed that a clear plastic "mockup" could simulate areas of residual coating that could be compared with observations by video camera/tape inside the 10-inch piping. However, according to site supervision the methodology to measure the residual coating inside the 10-inch piping was developed about 2 1/2 months after work began. Furthermore, a procedure which would include a plastic overlay as a standard to judge the size of the residual coating areas recorded on the video tape had not been prepared.

(5) The NRC inspector found no test procedures for the O. B. Cannon sandblast tests 1-4. However, paragraph 5.4 of O. B. Cannon Procedure QCP-1 discusses sandblast testing.

The failure to provide adequate inspection procedures and process monitoring to assure the quality of the special process and the piping system is a violation of Criterion X of Appendix B to 10 CFR Part 50 and Section 10.0, Revision 0, of TU Electric QA Manual (445/8847-V-01.c).

d. Failure to Take Corrective Action

Criterion XVI of Appendix B to 10 CFR Part 50 and TU Electric QA Manual, Section 16.0, Revision 0, requires that conditions adverse to quality be promptly identified and corrected.

The NRC inspector first raised concerns to TU Electric project management in regards to the adequacy of coating removal QA/QC controls on May 2, 1988. On May 27, 1988, the NRC inspector completed a review of the SWEC Corrosion Report and raised specific technical concerns about the removal of the coating and corrosion defects: (1) was a metallurgical analysis of pitting performed to determine whether microscopic cracks exist, (2) were all such defects identified and measured to determine if manufacturer's minimum wall was violated, (3) was the control of the sandblasting process adequate to prevent wall thinning/damage, (4) was the amount of coating remaining after gritblasting within specification, and (5) where were QA/QC controls related to coating removal/defect identification prescribed? The control of the gritblasting process was a central issue.

On or about May 30, 1988, the NRC inspector reviewed the construction deficiency files (CP-80-07 and CP-86-07 previously discussed) and raised concerns about the

downgrading of G&H specifications MS-43B and MS-100. (See paragraph 2.) Specifically, the inspector's concern was the effect that nonsafety-related material (i.e., the introduction of contaminants) could have on safety-related systems. The inspector was also concerned that TU Electric project management seemed to think that because the coating was non-Q, work activities including the coating removal were, therefore, non-Q without considering the effects on Q-systems. This concern continued on through meetings on June 20, July 13, and August 2, 1988.

The NRC inspector observed no comprehensive and effective corrective action concerning the lack of QA/QC program and technical controls previously identified by the NRC. At all the meetings, the NRC inspector was informed by TU Electric that the coating removal and defect identification were properly controlled.

On August 1, 1988, TU Electric notified the NRC that they had detected a leak in a section of 10-inch SWS piping. It was removed and sectioned for visual inspection. It appears that the leak was caused by the sandblaster because there was one 1/2-inch diameter hole through the 0.365 wall thickness and 180 degrees around the circumference of the inside diameter there was another defect where the wall was extensively worn. This would duplicate positions on either end of the spinblast nozzle if it stuck and ceased to spin. The defect configuration also suggests that if the blaster nozzle stuck, the pulling was stopped or else there would have been a longitudinal groove instead of a round hole. By August 2, 1988, other similar defects were found, but the total number and locations were not available.

The failure to promptly identify and correct the QA/QC and technical deficiencies identified by the NRC is a violation of Criterion XVI (445/8847-V-01.d).

Since the end of the inspection period, pieces of Train A piping have been cut out and sectioned for detailed examination. See the photos on page 21.

e. <u>New Open Items Concerning SWS Piping</u>

(1) The NRC inspector learned at the end of the July 1988 inspection period that minimum wall violations on the outside of the piping had not been evaluated. During construction, surface defects had been identified on the outside of the SWS piping and dispositioned "use-as-is." Now, internal defects have been identified. It is not clear how SWEC

calculated the stresses and returned Train A to service when they did not know if the outside defects and the inside defects might align and be additive. SWEC was reviewing this data after the SWS was returned to service. Since all new defects were not mapped, it is unclear as to how a corrosion monitoring program can be established. This item is open pending the completion of the TU Electric review of this matter (445/8847-O-02).

(2) Paragraph 3.1.f of Purchasing Procedure NPI-5.0-2 requires the entry of a QA code on the requisition by engineering. The NRC inspector believes that the "quality" determination should be the responsibility of a quality assurance organization, not an engineering responsibility. If the engineering organization specifies the level of quality to be applied, the decision could be affected by cost and schedule considerations. Also, the designating engineer may not have sufficient expertise in quality assurance to know the appropriate level of quality assurance required. This is an open item pending TU Electric consideration (445/8847-O-03).

4. Action on NRC Information Notice (IN) 85-24 - Plasite Liner (92700)

The NRC inspector reviewed the files and action taken concerning IN 85-24 which pertained to Plasite 7122 failure in SWS piping. This item is closed based on the inspection described above.

5. Open Items

Open items are matters which have been discussed with the applicant, which will be reviewed further by the inspector, and which involve some action on the part of the NRC or applicant or both. Two open items disclosed during the inspection are discussed in paragraph 3.e.(1) and (2).

6. Exit Meeting (30703)

An exit meeting was conducted August 2, 1988, with the applicant's representatives identified in paragraph 1 of this report. No written material was provided to the applicant by the inspectors during this reporting period. The applicant did not identify as proprietary any of the materials provided to or reviewed by the inspectors during this inspection. During this meeting, the NRC inspectors summarized the scope and findings of the inspection.

Photo No. 1

Hole viewed from outside of
sectioned 10-inch diameter pipe.

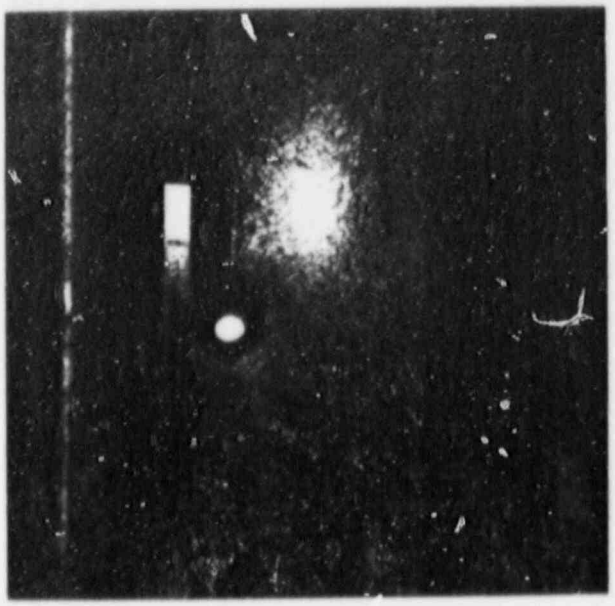

Photo No. 2

Hole viewed from inside of
sectioned 10-inch diameter pipe.