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Facility Name: South Texas Project

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I. INSPECTION SCOPE AND OBJECTIVES

The objective of this inspection was to evaluate the adequacy of construction at the South Texas Project site. This objective was accomplished through review of the construction program, evaluation of project construction controls, and review of selected portions of the Quality Assurance Program, with emphasis on the installed hardware in the field. The scope and significance of identified problems were also determined.

Within the areas examined, the inspection consisted of a detailed examination of selected hardware subsequent to quality control inspections, a selective examination of procedures and representative records, and limited observation of in-process work.

For each of the areas inspected, the following was determined:

- Were project construction controls adequate to assure quality construction?
- Was the hardware or product fabricated or installed as designed?
- Were quality verifications performed during the work process with applicable hold points?
- Was there adequate documentation to determine the acceptability of installed hardware or product?
- Are systems turned over to the startup organization in operable condition and are they being properly maintained?

II. ELECTRICAL AND INSTRUMENTATION CONSTRUCTION

A. Objective

The primary objective of the appraisal of electrical and instrumentation construction was to determine whether safety-related components and systems were installed in accordance with regulatory requirements, Safety Analysis Report commitments, and approved vendor and construction specifications and drawings. Additional objectives were to determine whether procedures, instructions, and drawings used to accomplish construction activities were adequate and whether quality-related records accurately reflect the completed work.

B. Discussion

Within the broad categories of electrical and instrumentation construction, attention was given to several specific areas. These included electrical cable, raceways and raceway supports, electrical equipment, and instrumentation tubing and components. Additionally, a review as made of a selected number of documents associated with design change control and nonconformance reporting.

A number of documents were generated by the applicant to record individual observations of the NRC Construction Appraisal Team (CAT) inspectors, and are referenced directly in the discussions that follow.

1. Electrical Raceway Installation

a. Inspection Scope

Seventy-two segments of installed Class 1E cable tray, representing a total length of about 1,000 feet, were selected from various plant areas for detailed examination by the NRC CAT. These segments were inspected for compliance to requirements relative to routing, location, separation, support spacing and configuration, identification, protection, and physical loading. Additionally, 28 runs of installed conduit, with an aggregate length of about 1,600 feet, were inspected for compliance to specified requirements such as routing, location, separation, bend radii, support spacing, and associated fittings.

Twenty-eight raceway supports were examined in detail for such items as location, material, anchor spacing, weld quality, bolt torque, and installed configuration.

See Table II-1 for a listing of cable tray, conduit, and raceway support samples.

The following documents provided the basic acceptance criteria for the inspection:

- Bechtel Specification 3E189ES1000, "Conduit and Tray Supports," Rev. 6

- Ebasco Quality Control Procedure (QCP) 10.16, "Inspection of Electrical Raceways," Rev. 4

- Ebasco QCP-10.30, "Inspection of Installation and Fabrication of Electrical Cable Tray Hangers, Conduit Supports and Auxiliary Steel," Rev. 1

- Ebasco Construction Site Procedure (CSP) 40, "EE580 Electrical Installation," Rev. 4

b. Inspection Findings

In the area of electrical raceway the NRC CAT inspectors observed that, in general, Class 1E raceway installations were in accordance with applicable design criteria. Quality attributes such as material type, location, identification, and installed configuration were found to be as shown on approved construction drawings. However, several deficiencies in design or construction or both were identified and are discussed below.

(1) Raceway Separation

The South Texas Project (STP) Final Safety Analysis Report (FSAR) section 8.3.1.4, entitled "Separation of Redundant Systems," provides the basic criteria for acceptable Class 1E circuit and electrical raceway installations. This FSAR section describes commitments for physical arrangement of raceways which pertain to the requirements of Regulatory Guide (RG) 1.75 for independence of redundant systems. In general, these FSAR criteria specify the physical separation which must be maintained between components of redundant electrical divisions. Additionally, physical separation is required between components performing Class 1E and non-Class 1E functions.

During the examination of the selected raceway sample, NRC CAT inspectors observed that a number of installations were not in accordance with the FSAR requirements. Deficiencies were identified in several areas of the plant but were most common in the Mechanical/Electrical Auxiliary building. In this area numerous Class 1E raceway components had been installed without the required physical separation. See Table II-2 for a listing of the identified raceway segments that violated separation criteria.

NRC CAT inspectors discussed this issue with licensee personnel and reviewed relevant inspection procedures, design drawings and plant historical records to determine why these deficiencies exist. The review indicates that the licensee had identified problems in the area of electrical separation as early as 1984. Corrective Action Report (CAR) G-434, dated May 8, 1984, details specific violations of relevant FSAR criteria. Additionally, other site initiated documents such as the "Final Report for STP Pre-CAT Verification," dated July 18, 1985, highlight deficiencies in this area.

In reviewing these documents NRC CAT inspectors expressed concerns with regard to actions taken to correct existing deficiencies. As an example, in response to the deficiencies identified in CAR G-434 the licensee elected to postpone the inspection of raceway division separation until the time of area turnover. Relevant inspection and construction procedures were then revised to reflect this decision by eliminating the attribute of division separation from inspection of cable tray and conduit. Discussions with licensee personnel indicate that this decision was made based upon the fact that construction activities are ongoing and thus it is not prudent to identify separation violations prior to completion of any given area.

At the time of area turnover, a walkdown of each area is planned by Ebasco engineering to identify violations in separation and determine the course of action necessary to alleviate those problems. Additionally, Ebasco Quality Control (QC) personnel will perform an inspection after the installation of required barriers in accordance with the applicable Quality Control Procedure.

NRC CAT inspectors noted that many of the deficiencies identified during the examination of the raceway sample involved components which were part of a system turned over to Houston Lighting and Power Company (HL&P) Startup. Consequently, component modification or installation of barriers which may result from future inspection activities may adversely affect plant systems which have been turned over and accepted.

Several aspects of the licensee's proposed inspection and engineering walkdown programs were evaluated, including a review of Standard Site Procedure SSP-45. This procedure, issued on October 25, 1985 during the NRC CAT inspection, provides the basic acceptance criteria which will be used for future inspection of separation between electrical components. The procedure content appears thorough, but because inspection activity has not commenced an evaluation of program effectiveness could not be made.

In summary, while it is clear that the licensee is aware of existing separation deficiencies, the implementation and effectiveness of actions planned to correct these and other currently unidentified deficiencies requires further evaluation.

NRC CAT inspectors also observed several raceway installations in which redundant divisional cable tray or conduit had been attached to a common raceway support. NRC CAT inspectors expressed concern that this configuration does not meet the intent of RG 1.75 position C.3 which states that "In general, locating redundant circuits and equipment in separate safety class structures affords a greater degree of assurance that a single event will not affect redundant systems. This method of separation should be used whenever practicable and where its use does not conflict with other safety objectives."

This concern, and its relationship to plant missile protection, was discussed with licensee personnel. With regard to the common support of redundant raceways, it is postulated that a single event (i.e., missile impact) could adversely affect the function of redundant divisional circuits.

NRC CAT inspectors reviewed section 3.5 of the STP FSAR. This section and its Table 3.5-1 contain criteria for missile protection for South Texas Project. Specific attention was given to the FSAR discussion under the heading Internally Generated Missiles Outside of Containment, and the protective measures required by the referenced table. NRC CAT inspectors also reviewed Bechtel Project Engineering Directive PED-039 entitled "Engineering Evaluation Walkdowns" and the Systems Interaction Design Guide PED-016 entitled "Internally Generated Missiles."

One area of concern was identified during this review and was discussed with licensee personnel. FSAR Table 3.5-1 describes safety class systems and components and seismic category I structures which require missile protection. The table appears to provide exclusions for the categories of cable raceway systems and electrical supports based on component redundancy. However, as previously discussed the NRC CAT inspectors noted that redundant raceway installations that are attached to a common support would be equally affected by missile impact.

As a result of this observation the licensee has issued FSAR Change Notice 779 to more appropriately reflect the intent of Table 3.5-1 to include raceways and raceway supports in missile protection evaluations. This resolves the NRC CAT concern in this area.

(2) Electrical Conduit

With exception of the specific deficiencies listed below, the conduit sample inspected conformed to applicable design and installation requirements relative to such attributes as size, routing, identification and proper supports.

Conduit C1XM3ER5204 was found to have a support distance violation between two supports, and conduit A1XE2ARY102 was not identified with its safety division marking at the required 15 feet intervals. These two isolated deficiencies were subsequently recorded on Nonconformance Reports (NCRs) CE-03207 and CE-03213 by the licensee.

The strap bolts for eight QC accepted conduits did not exihibit torque seal as required by project instructions. QCP-10.30 requires QC to verify the torque on at least one bolt from each connection and requires the verified bolt to be marked with torque seal. Discussion with the licensee indicates that the lack of or partial application of torque seal for QC accepted conduits is due to removal and reinstallation without reinspection by QC. NRC CAT inspectors concluded that the licensee's control of QC accepted conduit installation is not completely

effective. The inadequate torque sealing was subsequently recorded on NCR CE-03213 by the licensee.

(3) Raceway Supports

The examination of raceway supports included conduit and cable tray supports. Attributes such as location, material type and size, anchor spacing and embedded length, welds (location, size and general quality), and installed configuration were found to be in accordance with design requirements. However, several isolated hardware deficiencies and one documentation deficiency were identified.

It was noted by the NRC CAT inspectors that the traveler package for cable tray hanger 2-002-H3 included the inspection report for a different hanger. The licensee's subsequent investigation revealed a number of documentation errors and omissions attributable to hangers inspected by the same QC inspector. The licensee has issued Standard Deficiency Reports (SDRs) E-361 and E-362 to document and correct these deficiencies.

The torque of approximately 150 bolts and 50 concrete anchors of various sizes on raceway supports was verified by the NRC CAT inspectors. Three cable tray supports, 2-103-H61, 1-010-H84 and 1-024-H52, each contained several 1/2-inch strut bolts which did not meet minimum torque requirements. These deficiencies were documented on NCRs CK-03111, and CE-03229. Independent of the bolt torque sample, hanger 1-065-H11 was also found to contain several loose 1/2-inch strut bolts even though the bolts were marked with torque seal. In addition, the embedded lengths of 17 concrete anchors were verified using an ultrasonic inspection method with no items of concern noted.

It was noted by the NRC CAT inspectors that virtually all the 1/2-inch strut bolts had no markings on the bolt heads making identification of the material indeterminate. Beginning with Rev. 3 in 1983, Bechtel specification 3E189ES1000 requires these strut bolts to be from material conforming to American Society for Testing and Materials (ASTM) A-307, Grade B, but specifically negates the ASTM requirement for manufacturers' markings. The use of ASTM A307 bolting materials without manufacturer's identification marks is also discussed in Section VI, Material Traceability and Control, of this report.

Other than the indeterminate traceability of bolt material, the documentation and hardware discrepancies identified by the NRC CAT in this area are considered isolated cases.

c. Conclusions

Except as noted, raceway systems have been installed in accordance with applicable design and installation requirements. However, numerous installations have not maintained the physical separation required by the licensee's commitment in the FSAR. In this area, it

was determined that pertinent procedural and administrative controls have only recently been developed. As such, the adequacy of electrical raceway separation after implementation of these controls at South Texas Project will require further evaluation by the licensee and NRC personnel.

The number of reworked conduit installations that were found lacking QC reinspection of bolt torque indicate that rework of QC accepted conduit installations requires increased control.

2. Electrical Cable Installation

a. Inspection Scope

The NRC CAT inspectors selected a sample of installed Class 1E cable runs that had been previously accepted by QC inspectors. The sample included medium and low voltage power, control, and instrumentation cabling. For each of the cable runs, physical inspection was made to ascertain compliance with applicable design criteria relative to size, type, location, routing, bend radii, protection, separation, identification, and support.

Additionally, the NRC CAT inspectors selected approximately 108 cable ends for examination of terminations. These were inspected to applicable design and installation documents for items such as lug size and type, proper terminal point configuration, correct identification of cable and conductors, proper crimping of lugs or connectors, and absence of insulation or jacket damage. See Table II-3 for a listing of cable terminations examined.

The following medium and low voltage power cable totaling about 1,700 feet were selected from different systems, electrical trains, and locations:

Cable	Type
A1DJAKC1LA	1/C No. 4 AWG
B1CSABC1EA	1/C 250 MCM
B1CHABC2LB	3/C No. 6 AWG
B1RHADC1LE	3/C No. 10 AWG
C1PKACC1GA	3-1/C 750 MCM
D1VAABC1HB	3/C No. 4 AWG
D1DJABC1LE	1/C 750 MCM

The following control cables totaling approximately 1,100 feet were selected from different systems, electrical trains, and locations:

Cable	Type
A1FW07C1SC	5/C No. 12 AWG
A1JW02C1SA	7/C No. 12 AWG
C1PK01C3SK	3/C No. 16 AWG
D1VA10C2SA	7/C No. 12 AWG

The following instrument cable totaling approximately 1,000 feet were selected from different systems, electrical trains, and locations:

Cable	Type
A1DG04C1PA	2/C No. 16 Shielded
A1DG04C1PC	2/C No. 16 Shielded
A1II14CAXF	2/C No. 16 Shielded
B1RH03C2WD	2/C No. 16 Shielded
D1VA10C2XA	2/C No. 16 Shielded
D1DJ10C4XC	2/C No. 16 Shielded

The following documents provided the basic acceptance criteria for the inspection:

- Bechtel Specification 5E189ES1007, "Cable Installation In Trays, Conduits and Ductbanks," Rev. 5
- Bechtel Specification 5E189ES1004, "Cable Splicing, Termination, and Supports," Rev. 5
- Bechtel Specification 5A230ES1008, "Installation of Electrical Cable, Raceway, and Equipment Identification," Rev. 6
- Ebasco QCP-10.17, "Electrical Cable Installation Inspection," Rev. 2
- Ebasco CSP-19, "Safety and Non-Safety-Related Cable Pulling," Rev. 4
- Ebasco CSP-8, "Cable Termination and Splices," Rev. 1

b. Inspection Findings

(1) Routing

In general, the routing of Class 1E cables through design designated raceway systems was found to be in accordance with specified criteria. Each of the Class 1E cables examined by NRC CAT inspectors had been installed in accordance with the routing detailed on the EE580 pull cards.

The examination of Class 1E cables did disclose an apparent deficiency in the routing of medium voltage cables into cable spreading areas. NRC CAT inspectors observed that these installations do not meet the requirements of IEEE 384-1974 section 5.1.3 which limits cable installation in a cable spreading room to circuits which perform control and instrumentation functions.

Subsequent discussions with licensee personnel disclosed that the "cable spreading areas" were inaccurately defined on drawing 5E-03-0E-0100 sheet 6AA Rev. 0. Consequently, the medium voltage cables identified by NRC CAT inspectors were

acceptably installed outside of actual cable spreading areas and were in accordance with IEEE-384 and RG 1.75. As a result of this observation the licensee has issued Design Change Notice (DCN) 1 to revise and clarify the referenced drawing.

(2) Separation

In general, the separation of Class 1E cables was found to be in accordance with requirements.

NRC CAT inspectors did identify a number of Class 1E cable installations which exhibit inadequate separation at the entrance to Class 1E equipment. However, these deficiencies were the subject of Bechtel Deficiency Evaluation Report (DER) 85-034 issued September 10, 1985, which was subsequently determined to be potentially reportable pursuant to 10 CFR 50.55(e). Evaluation of actions taken to correct existing deficiencies are in accordance with this process and as such, NRC CAT inspectors have no additional observations in this area.

In general, the separation of Class 1E cables located inside of electrical equipment was found to conform with requirements. One area where a deficiency was identified is in cubicle 3 of 4160V switchgear 3E151ESCOE1C. The physical separation between a non-Class 1E pull out fuse block and Class 1E wiring was less than the required six inches. As a result of this observation the licensee has issued NCR SE-03233 to identify and correct this condition.

No other deficiencies were observed in this area.

(3) Power Cable Spacing and Derating

STP power cable installations have been designed in accordance with Insulated Power Cable Engineers Association (IPCEA) publication P-46-426, 1963 "Power Cable Ampacities - Volume I - Copper Conductors" and P-54-440, 1972 "Ampacities - Cables in Open Top Trays." The STP FSAR further requires that 5kV and 15kV cables in tray be installed with spacing maintained at 1/4 of the cable bundle diameter. In general, the installation of Class 1E power cables was found to comply with these requirements. However, spacing had not been maintained in tray segments B1XE3FTEAE, B1XE3FTEAF and B1XE3FTEAJ. Deficiencies in cable tie down requirements were also observed in these tray segments. As a result of these observations the licensee has issued NCR CE-3211.

No other deficiencies were identified in this area.

(4) Cable Damage

Although no damaged cable was found, two situations with the potential for cable damage were identified by the NRC CAT inspectors. A number of cable tray segments above equipment

were found to be missing required edge softeners where cable breaks out of the tray over the tray side rail into the equipment. Numerous examples were noted in the switchgear rooms. Based on this observation, the licensee documented an individual occurrence on NCR CE-03210 and addressed the generic issue with a procedure change. The change will add a visual check for the presence of edge softeners to QCP-10.32, "Walkdown/Turnover of Safety-Related Systems, Sub-Systems, Areas, or Components."

The second situation involves vertically run free air cable between spreading rooms on elevations 60 ft. and 74 ft. The cables run through flame cut holes in metal decking with no protection provided for the cut edges. This item was subsequently documented on NCR CE-03256 for evaluation.

In addition, the quantity of Class 1E cable coiled throughout the plant is of concern in that the potential for damage is increased whenever cable coils are exposed to general construction activities. As a result of an NRC CAT observation, the licensee issued NCR CE-03310 to document minimum bend radius violations and other workmanship problems with cable temporarily coiled in panel C1PNZLP803.

The area of cable protection merits continued licensee attention.

(5) Cable Identification

In general, the identification of Class 1E cable installations was found to be in accordance with applicable design criteria. In connection with an issue which had been previously identified in both licensee and Region IV inspection reports, NRC CAT inspectors noted that the color coding of numerous Class 1E cables had faded due to weathering, aging or both. In some installations fading had resulted in cable coloring which did not accurately represent the functional division of the installed cable. For example a purple cable (Division A) had faded to blue (Division B).

Discussions with licensee personnel and the review of the response to a previously issued nonconformance report indicates that, although color fading of Class 1E cabling does cause some confusion during performance of a visual inspection, a detailed examination of any particular cable will confirm proper routing and divisional separation based upon the divisional code applied to each cable jacket. In addition, the cable identification at termination ends indicates the cable's safety division.

NRC CAT inspectors confirmed this during the field examination of Class 1E cables but [illegible]ed that the divisional code had not been applied to cable supplied by Rockbestos. However, no examples of color fading in Rockbestos cable were identified by the NRC CAT inspectors or site inspection personnel.

No other concerns were identified in this area.

(6) Terminations

In general, cable termination activities performed by construction personnel conformed to requirements. However, several isolated construction deficiencies and one procedure conflict were identified by the NRC CAT inspectors.

- Cable B1DJACC1LL, the power feed from the safety Division B battery, is trained such that it is in contact with the battery rack. This observation was subsequently recorded on NCR SE-03241 by the licensee.

- Terminal block 200 in panel A1SIABC1HH has a broken separator between the positive and negative terminal points for cable A1SPAAC1SA. This was subsequently documented on NCR CE-03222 by the licensee.

- Cables A1SPIABC1CA and A1SIABC1HH are terminated on their respective breakers in reverse order to the specification requirements. The specification requires black, red, orange terminated top to bottom and the cables are terminated black, red, orange bottom to top. This was subsequently recorded on NCR CE-03258.

- During the inspection of control cable terminations, several adjacent cable conductors were found to violate the requirement for minimum bend radius. The cables involved are A1SP25CBSC and A1SP25CBSE in panel A1PNETCA04, and cable A1SP21CDSH in panel A1PNETCA02. Based on this observation the cables were documented on NCR CE-03205 by the licensee.

- QCP-10.13 Section 5.2.2.1 requires inspection for nicked or missing conductor strands. This characteristic is required for and is being recorded acceptable on inspection records for post termination inspections where the conductor strands are inaccessable for inspection.

c. Conclusions

With the exception of concerns or deficiencies identified in the areas of cable identification and cable damage, and the apparently isolated deficiencies identified with terminations, the installation of Class 1E circuits and wiring was found to be in accordance with applicable design requirements.

3. Electrical Equipment Installation

a. Inspection Scope

Over 40 pieces of installed or partially installed electrical equipment and associated hardware items from the various safety divisions were inspected.

The following specific electrical components were inspected in detail:

(1) Motors

The installation of ten motors and associated hardware was inspected for such items as location, anchoring, grounding, identification and protection. The motors inspected were:

Essential Cooling Water Pump Motor	3R281NPA101A
Essential Cooling Water Pump Motor	3R281NPA101B
Containment Spray Pump Motor	2N101NPA101A
Containment Spray Pump Motor	2N101NPA101B
Containment Spray Pump Motor	2N101NPA101C
Safety Injection Pump Motor	2N121NPA101C
Essential Chilled Water Pump Motor	3111VPA004
Reactor Makeup Water Pump Motor	3R271NPA101A
EAB Air Handling Unit Fan Motor	3V111VFN014
EAB Air Handling Unit Fan Motor	3V111VFN016

(2) Electrical Penetration Assemblies

The following containment penetration assemblies were inspected:

C1PHEP046	Instrumentation
C1PHEP054	480V Power
B1PHEP028	Instrumentation
A1PHEP018	Control
B1PHEP032	Control
B1PHEP036	480V Power

The location, type, mounting, identification, and maintenance of these penetrations were compared with the installation drawings and vendor manuals.

(3) Circuit Breakers

Circuit breakers for the following Class 1E motors were examined to determine compliance with design and installation documents for size, type, system interface, and maintenance:

Containment Spray
Safety Injection

(4) Switchgear and Motor Control Centers

The following switchgear and motor control centers were inspected:

Motor Control Center	B1PMMCEB1
Motor Control Center	C1PMMCEC3
Motor Control Center	A1PMMCEA2
Motor Control Center	A1PMMCEA3
Motor Control Center	A1PMMCEA4
4160V Switchgear	B1PKSG0E1B
4160V Switchgear	A1PKSG0E1A

(5) Station Batteries and Racks

The 125V battery rooms including the installed batteries, battery racks and associated equipment were inspected. The location, mounting, maintenance and environmental control for installation of the batteries were compared with the applicable requirements and quality records.

125VDC Battery	C1DJBT045D
125VDC Battery	A1DJBT045A

(6) 125VDC System Equipment

The following equipment comprising portions of the 125Vdc systems were inspected for compliance to design documents for such items as location, mounting (welds, concrete anchors and bolting) and proper configuration:

Battery Charger	B1DJBC047E
Battery Charger	A1DJBC047B
Battery Charger	A1DJBC047A
Distribution Panel	A1VADP1201
Distribution Panel	B1DJPL039B
Distribution Panel	C1DJPL039C
Static Inverter	A1VAIV1201
Inverter/Rectifier	A1VAIV001

(7) Control Panels

A number of safety-related electrical control panels were inspected for compliance to requirements for items such as location, mounting and type. The panels inspected were:

Diesel Generator Control Panel	A1PNZLP101	
Diesel Generator Control Panel	B1PNZLP103	
Remote Shutdown Panel	A1PNZLP100	B1PNZLP100
	C1PNZLP100	D1PNZLP100
Main Control Boards (2)		

(8) Motor Operated Valves

The following 16 motor operated valves were examined in detail:

C1CVMOV0112B	B1SIMOV0001B
B1CVMOV0113A	C1SIMOV00016
A1RCMOV0001A	A1SIMOV0004A
B1RCMOV0001B	B1SIMOV0004A
B1SIMOV0016B	C1SIMOV0016C
B1SIMOV0018B	C1SIMOV0018C
C1RHMOV0061B	A1RHMOV0061C
C1CCMOV0209	C1CCMOV0199

The following documents provided the basic acceptance criteria for the inspections:

- Bechtel Specification 3E319ES1040, "Class 1E Induction Motors (250HP and Below)," Rev. 0
- Bechtel Specification 4A479ES1018, "Environmental Qualification of Safety-Related Electrical and Mechanical Equipment," Rev. 2
- Bechtel Specification 3E159ES0012, "5KV Class 1E Metal-Clad Switchgear," Rev. 2
- Bechtel Specification 3E269ES1091, "Special Electrical Penetration Assemblies," Rev. 2
- Bechtel Specification 5A230ES1008, "Installation of Electrical Cable, Raceway and Equipment Identification," Rev. 6
- Bechtel Specification 5E329ES1002, "Valve Electric Motor Actuators," Rev. 3
- Bechtel Procurement Appendix G, "Large AC Induction Motors for Class 1E Service (250 HP and Larger)," no revision
- Ebasco QCP-10.15, "Electrical Equipment Installation Inspection," Rev. 4
- Ebasco QCP-10.20, "Electrical Penetration Installation Inspection," Rev. 3
- Ebasco SP-2, "Installation of Permanent Electrical and Mechanical Plant Equipment," Rev. 4
- Ebasco CSP-44, "Installation of Electrical Penetration Assemblies," Rev. 3
- Ebasco Construction Maintenance Instruction CMI-1, "Caring and Maintenance of Permanent Plant Items," Rev. 7
- Applicable design drawings and design change documents

b. Inspection Findings

(1) Motors

In general, the Class 1E motors inspected were found to conform with applicable design documents. The motors examined were of the type, size, and configuration specified. A limited review of maintenance records indicated that construction maintenance had been performed in accordance with approved procedures. However, several specification deficiencies were found with several 480V motors and mounting deficiencies were noted with several 4160V motors.

Bechtel specification 3E319ES1040 requires motors under 250 horse power (HP) rating to have vendor installed terminal lugs on the motor leads. The two air handling unit fan motors inspected, 3V111FN014 and FN016, did not have the required terminal lugs. The braided jackets on the fan motor leads were also found to be frayed. A third fan motor, FN002, identified by the NRC CAT mechanical inspectors was also found in this condition. Although these are not considered significant hardware deficiencies by the NRC CAT, the appropriate terminal lugs need to be installed when the fan motors are terminated to their permanent power source. Fans FN014 and FN016 were subsequently documented on NCR BE-03335 and fan FN002 on NCR BE-03334.

The Bechtel specification also requires motors under 250 HP rating to have an insulation rating of Class F (135°C) or H (150°C). The nameplate and vendor manual for the reactor make up water pump motor 3R271NPA101A indicate the motor insulation is only Class B (110°C). This requires evaluation by the licensee to assure the motor is adequate for its intended service environment.

Approximately half of the motor hold down bolts for containment spray pumps 2N101NPA101B and C and high head safety injection pump 2N121NPA101C were unmarked and of indeterminate material. The remainder of the bolts were marked as ASTM A-449 in lieu of the required A-193, Grade B7. These and other pump motor hold down bolt discrepancies were subsequently documented on NCR CM-03078. These are discussed further in Sections III, Mechanical Construction, and VI, Material Traceability and Control, of this report.

In an isolated finding, containment spray pump motor 2N101NPA101A did not have a sight glass for the upper bearing oil reservoir although the maintenance records indicated adequate oil level. The missing sight glass was subsequently documented by the licensee on Deficiency Report (DR) 1-505M.

(2) Electrical Penetrations

The penetrations examined were found to have been installed in accordance with the applicable design documents. A review of

relevant maintenance records indicates that a number of maintenance discrepancies such as 0 psi pressure and no internal heaters were documented and adequately dispositioned on Maintenance Discrepancy forms or determined to be unnecessary by the equipment vendor.

No deficiencies were observed in this area.

(3) Circuit Breakers

The examination of the selected circuit breakers for the containment spray and safety injection pump motors indicated that they had been purchased, installed and maintained in accordance with the applicable design documents. Important installation attributes such as proper alignment, main contact penetration, and safety interlocks were verified by physical inspection and review of construction and test records. Maintenance records were also reviewed and indicate that appropriate activities had been performed.

Circuit breakers which serve various 480V motor control centers were also examined and are discussed in Section II.B.3.b.4, below.

No deficiencies were observed in this area.

(4) Switchgear and Motor Control Centers

The examination of Class 1E motor control centers disclosed several deficiencies with regard to installation of circuit protection devices. NRC CAT inspectors observed that load-side terminal extensions on ITE type HE molded case circuit breakers had been attached using connecting screws which lack sufficient thread engagement to achieve and maintain a tight connection. Additionally, insulating barriers installed between the terminal extensions were found to be loose or missing. As a result of this condition two concerns were noted and discussed with licensee personnel.

(a) Potential for Inadvertent Circuit Interruption

Actual measurements indicate that terminal connecting screws have an engagement of less than 1/4 inch into the circuit breaker housing. This engagement was found not to be adequate to assure that a tight connection will be maintained between the terminal and circuit breaker in a number of these installations. Many of the circuit breakers examined, including QC accepted and turnover items, exhibited terminal extensions which were loose as received from the vendor or due to normal construction activity; i.e., attachment of field cables or work in adjacent cubicles and wireways. The potential for inadvertent circuit interruption exists in that terminal

connecting screws may work loose during construction or startup activities or due to the vibrations typically experienced during plant operation.

(b) Phase to Phase Faulting

As detailed in (a), above, many of the Class 1E circuit breakers examined contained loose terminal extensions. The length and spacing of these extensions was such that phase to phase contact is possible. Additionally, many of the insulating barriers installed between terminals were loose or missing due to inadequate vendor installation or construction or startup damage. As a result, the potential for phase to phase faulting exists.

These concerns were discussed with licensee personnel in an attempt to determine the reason for use of load terminal extensions on molded case circuit breakers at South Texas Project, and why the previously mentioned deficiencies had not been identified by site inspection or source surveillance personnel.

These discussions and a review of the relevant Bechtel purchase specification, 3E179ES1054, indicate that although the specification does detail a requirement for breaker terminals which can accomodate attachment of a two hole termination lug, no specific request for use of terminal extensions had been made by the licensee to the motor control center vendor. It was also observed that load terminal extensions were not detailed on any of the applicable design and vendor documents available for review. Additionally, based upon review of relevant vendor documentation and the equipment seismic qualification report it could not be determined whether the Class 1E motor control centers had been tested with circuit breakers in this configuration. As a result of this observation and at the request of NRC CAT inspectors, Bechtel engineering issued letter ST-YB-OU-74 to the motor control center vendor (Telemecanique) requesting additional information on this subject. No response had been received from the vendor during the NRC CAT inspection.

During meetings with the licensee regarding the possible reasons for use of the terminal extensions, the licensee's criteria for cable sizing were discussed. At the request of the NRC CAT, the licensee evaluated the cable sizes and limiting factors for the Unit 1 circuits connected to breakers with terminal extensions. Their evaluation showed that although the cables for several circuits were one size larger than required, all the circuits but one could be terminated directly to their breakers. The one circuit with terminal lugs too large for direct connection to its breaker (MCC E1A4, cubicle F3L) was size limited for ampacity and not voltage drop. Prior to the NRC CAT inspection, the licensee had identified one circuit with a cable size limited due to

voltage drop (MCC E1C2, cubicle H2R) and has since re-routed the circuit eliminating the voltage drop problem.

As a result of deficiencies identified in this area the licensee has issued NCRs BE-03208 and SE-03201 to document and identify the extent of this problem. Preliminary reviews indicate that approximately 30 Unit 1 Class 1E circuit breakers exhibit this configuration with an equal number existing in Unit 2. See Table II-4 for a listing of motor control centers, breakers, and safety-related loads affected by this condition.

On November 18, 1985, the licensee notified NRC Region IV that this issue is potentially reportable pursuant to 10 CFR 50.55(e).

In general, the installation of Class 1E 4160V switchgear was found to be in accordance with requirements. Attributes such as location, mounting and installed configuration were as specified by approved design documents. However, several specification deficiencies were identified.

Appendix C of Bechtel specification 3E159ES0012 establishes requirements for control wiring within 5kV metal-clad switchgear.

- Subsection E states in part..."The preferred terminal blocks are G.E. Catalog CR-151B2, connection U2 or connection NU2. Each terminal block shall have no less than 12 points." Contrary to this requirement NRC CAT inspectors identified several cubicles of the 4160V switchgear which contain terminal blocks with less than the 12 points specified.

- Subsection Q states in part..."Adequate space shall be provided on both sides of the terminal blocks for connecting wires and wire markers. To allow for stripping and bending on incoming cables, terminal strips shall be located a minimum of 8-inches away from cable entrances either at top or bottom." Contrary to this requirement NRC CAT inspectors observed the location of terminal strips to be less than 8 inches from cable entrances in several switchgear cubicles.

These specification deviations were observed in several cubicles of 4160V switchgear.

As a result of this observation the licensee has issued NCR SE-03225 and initiated Specification Change Notice SCN-3 to document and correct this condition.

No other deficiencies were identified with 4160V switchgear.

(5) Station Batteries and Racks

The condition of the battery rooms was found to be in good order and clean and free of debris. Ventilation systems were installed and in operation. Access to these areas was controlled by keyed entry, and the appropriate danger signs had been posted to prohibit smoking or open flames.

The 125V batteries were examined and found to be in good condition. Maintenance activities were reviewed, and in general, had been performed in accordance with requirements. The inspection of the 125V battery racks disclosed that indeterminate bolting materials had been used in the assembly process. This issue is discussed in detail in Section VI, Material Traceability and Control, of this report.

(6) 125VDC System

In general, the examination of components which comprise portions of the 125Vdc system indicates that construction activities had been accomplished in accordance with the applicable procedures and design documents. However, deficiencies in the area of equipment mounting and product quality were identified on several pieces of Class 1E equipment.

- The examination of distribution panels B1DJPL039B and C1DJPL039L disclosed a weld configuration which does not match the mounting details specified by applicable design documents. Field Change Request (FCR) CE-04475 specifies a 1/4 inch fillet weld of 4 inches length on 6 inches centers to be installed on two sides of the equipment and a continuous 1/4 inch fillet weld on the front. Actual field conditions exhibited a 1/4 inch fillet weld on 8 inches centers on both front and sides of the panels. Relevant inspection records which indicate acceptable installations do not account for this discrepancy.

  As a result of this observation the licensee has issued NCR SE-03325 to document and correct this condition.

- Each of the three Class 1E battery chargers examined by the NRC CAT exhibited loose soldered connections on the equipment "firing boards." Inadequate solder joints were observed at both pin-to-conductor and pin-to-circuit board connections. Discussions with licensee personnel revealed that this condition had been identified and evaluated on Startup Work Request (SWR) 01757, and that, pending delivery of qualified solder material, approved corrective action would be implemented.

No other deficiencies were identified in this area.

(7) Control Panels

In general, the installation of Class 1E control panels was found to be in accordance with applicable requirements. Mounting, location, and installed configuration were as specified. Several discrepancies were identified with regard to fastening materials used in the assembly of some panels. This issue is discussed in detail in Section VI, Material Traceability and Control, of this report.

The NRC CAT inspectors also noted several non-Class 1E equipments with identification tags color-coded as Class 1E equipment. Ten nonsafety relay panels had white identification tags which indicate safety Division D and the nonsafety heater in an emergency diesel generator high voltage panel had a blue tag indicating safety Division B. The licensee subsequently documented the relay panels on DR E-0632 and all three diesel generator high voltage panels on NCR BE-03300 for corrective action.

(8) Motor Operated Valves

The NRC CAT inspected 16 valve operators for installation to the latest design requirements and identified deficiencies in all 16 operators examined. In addition, discrepancies were found in the control and execution of design changes to certain motor operated valves (MOVs) supplied by Westinghouse Corporation (W).

Several deficiencies were noted in virtually all of the MOVs inspected. These included loose vendor terminations, jumper wires containing bend radius violations, and the use of No. 16 AWG wire in lieu of No. 14. In addition, the licensee was unable to provide the NRC CAT with evidence of qualification for the No. 16 wire. Other deficiencies were noted in one or more operators and included more than two wires on one terminal point, duct seal melted onto terminal points, unidentified terminal points, Raychem wire installed in lieu of the required Fire Wall III wire , a cracked terminal lug, and damaged conductors. The damaged conductors and several of the minimum bend radius violations appear to be generic to Limitorque model SMB operators due to the minimal clearance between the cover and the rotor. Table II-5 lists the MOVs inspected and the deficiencies found with each. The licensee subsequently issued NCR BE-03209 to document the deficiencies observed by the NRC CAT in valve motor operators.

During the first week of inspection the NRC CAT inspectors observed in-process field wiring changes in motor operated valves and attempted to verify their field installation. A number of problems arose resulting in the investigation continuing through the final weeks of the NRC CAT inspection. The sequence of events is as follows:

- NRC CAT inspectors observed design changes being performed during implementation of Configuration Control Package (CCP) 1-N-WN-0021 by Westinghouse.

- NRC CAT's field verification of CCP 0021 resulted in the identification of numerous hardware deficiencies as discussed above.

- NRC CAT inspectors requested CCPs for ongoing design changes with MOVs and were provided CCPs 1-E-EM-0243 and 1-E-ST-0339. The subsequent NRC CAT evaluations of these packages resulted in the identification of conflicts with CCP 0021.

- Based on NRC CAT observations and licensee reviews of the identified problems for MOVs, the licensee issued a voluntary stop work order.

- No further documentation was provided to the NRC CAT, pending the completion of a review of the overall MOV problem by the licensee.

- The licensee informed NRC Region IV of a potentially reportable deficiency relating to the wiring of MOVs.

CCPs 0021 and 0339 were initiated by W FCNs to modify valve closure indications and bypass an unqualified terminal block respectively. CCP 0243 was initiated by Bechtel to bring the valve operators up to Bechtel's current design. W was performing the work and QC inspection under CCP 0021 while Ebasco was making the design changes under CCPs 0339 and 0243.

While performing the wiring changes under CCP 0021, W added additional jumpers outside the stated scope of the CCP. The NRC CAT review indicated that these jumpers were the same as several jumpers being removed by Ebasco under CCP 0243. The review also showed that one of the required jumpers of CCP 0021 was being deleted by CCP 0339. In addition, jumpers had been added to several MOVs such that a continuous close indication would be displayed regardless of the actual valve position. These jumpers were required by and installed in accordance with the site's EE-580 field wiring program. These NRC CAT observations indicate that there was a lack of coordination for the sequence of work for the CCPs and between the CCPs and the ongoing EE-580 program. This also indicated inadequate control of wiring changes for the MOVs and the potential for installed wiring not conforming to design.

When an earlier wiring discrepancy in a motor operator was identified by Ebasco under CCP 0243, Bechtel issued Engineering Request for Site Action (ERSA) 0121-E in September 1985 to determine the actual wiring configuration of 58 W MOVs.

Discussions with the licensee and Bechtel at the site and Bechtel's Houston office regarding the design changes being made to the W MOVs indicated several items:

- The status of QC inspection for the design changes is indeterminate.

- The licensee was unable to specifically identify the original wiring diagram which represented the configuration of the MOVs as they were received and upon which design changes were being based.

- Bechtel changes to MOV wiring were not appropriately reviewed by W or provided for incorporation into W design drawings. A similar problem in another area was identified in a licensee audit report S15-501 dated April 15, 1985. This is discussed further in Section VII, Design Change Control, of this report.

- Bechtel verification of the ERSA as-built wiring details revealed discrepancies between the reported configuration and the actual configuration of the MOVs. As a result of these observations the licensee has initiated a walkdown to establish the current wiring configuration of Class 1E MOVs.

Further discussions with the licensee revealed that an MOV inspection program was being planned because of a history of problems reported by vendors, other sites, and the NRC. However, the documents provided to the NRC CAT, specifically Bechtel Interoffice Memorandum IOM-38855 dated October 21, 1985, with the subject "Problems Associated with Limitorque Valve Operators," proposed a sample surveillance of only warehoused valves. Such a program would not have identified all the problems found with the installed MOVs.

As a result of the continued problems with the valve motor operators, the constructor instituted a voluntary stop work order on November 13, 1985, and the licensee informed NRC Region IV on November 19, 1985 of a potentially reportable item under 10 CFR 50.55(e).

The interface for design between the A/E and NSSS is further discussed in Section VII, Design Change Control, of this report.

In summary, numerous hardware deficiencies were found with the MOVs inspected. In addition, a lack of effective design change control for the wiring of W supplied valve motor operators has resulted in the licensee not being certain as to their wiring baseline or current configuration. Corrective action by the licensee is required to assure that all safety-related MOVs meet their required design configuration.

An ancillary concern was raised by the NRC CAT inspectors during discussions with the licensee regarding the control of design documents for MOV wiring. It was noted that Bechtel's elementary wiring diagrams, which are the controlled design documents, did not provide point-to-point wiring information.

The NRC CAT inspectors were concerned that HL&P startup and operations personnel would need point-to-point information for performing tests, troubleshooting and modifications. The discussions with Bechtel indicated that they would review this issue.

c. Conclusions

In general, the installation of Class 1E equipment conforms to design requirements. However, of concern were the hardware deficiencies identified in Class 1E motor control centers and motor operated valves, and the specification deviations identified in Class 1E switchgear and motors.

The examination of ITE type HE molded case circuit breakers disclosed deficiencies with regard to attachment of load-side terminal extensions. Consequently, installations which exhibit this configuration have the potential for inadvertent circuit interruption or phase to phase faulting.

Numerous hardware deficiencies were identified in the wiring of MOVs. A lack of effective design control for the MOV wiring has resulted in the inability to correlate their actual configuration to the required design.

Several cubicles of 5kv switchgear were found to deviate from the applicable specification requirements for the location of terminal strips and the minimum number of terminal block points. Four motors were also found to deviate from their applicable specification. Three air handling unit fan motors did not have the required vendor installed terminal lugs, and the insulation of a reactor makeup water pump motor is Class B in lieu of the required Class F or H.

4. Instrumentation Installation

a. Inspection Scope

The NRC CAT inspectors selected a sample of 10 installed and inspected instruments for examination to requirements for location, mounting details, and instrument type and range. The instrument tubing for these instruments were also examined to specification, procedure, and isometric drawing requirements. A total of 16 supports from these runs were also inspected. Table II-6 details the inspection sample for the instrumentation installation.

In addition, the internal wiring configuration of an instrumentation process panel was verified.

The following documents provided the acceptance criteria for the inspection:

° Bechtel Specification 4Z519ZS1040, "Instrument Installation Seismic Category I," Rev. 3

° Ebasco QCP-10.13, "Mechanical Instrument Installation Inspection," Rev. 4

° Ebasco CSP-47, "Instrument Installation," Rev. 4

b. Findings

The sample of instruments inspected by the NRC CAT represents half of all the instruments the licensee had inspected, accepted and turned over to the startup organization at the time of the NRC CAT inspection. The limited sample examined revealed numerous construction deficiencies and several program weaknesses.

Deficiencies were found in the installation of the instrument or tubing in eight of the ten instruments inspected. The deficiencies found with more than one installation included out of tolerance dimensions, and loose conduit fittings. Other deficiencies which appear isolated to individual installations included a hanger weld not meeting the drawing configuration, the actual instrument identification not corresponding to the drawing, a missing tubing clamp, and a loose pressure transmitter. Two weaknesses were also identified through the installation inspections. These were QC inspections performed with drawing revisions other than the latest revision, and existing supports used without the required engineering approval. The deficiencies were subsequently recorded on nonconformance documents by the licensee. Table II-7 details the findings for the eight instrument installations with deficiencies.

Discussions with the licensee indicated that a sample surveillance of instrument installation was being performed under their QC Effectiveness Inspection Program. Two of the five instruments, A1EWFT6854 and C1EWFT6873, inspected by the Effectiveness Program coincided with the NRC CAT sample. Although the Effectiveness Program has identified installation deficiencies similar to those found by the NRC CAT, they failed to identify the out of tolerance dimensions found with the installation of C1EWFT6873.

The NRC CAT inspectors verified wiring changes conducted under CCP 1-N-WN-0083 (W FCN TGXM-10585 Revs. A, B, C) to instrument process panel 3Z1$\overline{2}$1ZRR018. Attributes such as circuit board changes, point-to-point wiring changes, wire type and size, and contrasting wire color met the CCP requirements. However, the jumper locations on two circuit cards were not as required. The jumpers on the circuit cards in locations C3-247 and 248 are in the "high" position while the CCP requires them to be in the "low" position. This discrepancy was subsequently documented on NCR SE-03341. In additon, HL&P's Station Procedure OPGP03-ZM-0011 "Plant Instrumentation Scaling Program" has provisions for documenting the configuration of circuit cards with jumpers or plug-in components for use in calibrating and testing process instrumentation by plant staff.

c. Conclusions

The number of construction deficiencies found in the limited sample of instrumentation indicates that the licensee's inspection and surveillance programs are not completely effective. In addition, weaknesses were identified in the use of latest drawing revisions for inspections and obtaining required engineering approval for additional attachments to existing supports. This area requires additional management attention.

TABLE II-1

RACEWAY INSPECTION SAMPLE

Cable Tray:

B1XC4ATHAP	B1XC4ATHAG	B1XC4ATHAF	B1XC4ATHAE
B1XC4ATHAD	B1XC4ATHAC	B1XC4ATHAB	B1XC4ATHAA
B1XC4BTHAA	B1XC4BTHAB	B1XC4BTHAC	A1XE1HTTAM
A1XE1HTTAG	A1XE1HTTAH	A1XE1DTTBH	A1XE1DTTBG
A1XE1DTTBF	A1XE1DTTBE	A1XE1DTTBD	A1XE1DTTBC
A1XE1DTTBJ	A1XE1DTTBK	A1XV1ATSAA	A1XV1ATSAB
B1XE3FTHAN	B1XE3FTHAP	B1XE3FTHAR	B1XE3FTHAS
B1XE3FTHAT	B1XE3FTHAU	B1XE3FTHAF	B1XE3FTHAE
B1XE3FTHAD	B1XE3FTHAC	B1XE3FTHAB	B1XE3FTHAA
B1XE4GTHAA	B1XE4GTHAB	AIXF1BTJAG	A1XF1BTJAF
A1XF1BTJAE	A1XF1BTJAB	A1XF1BTJAA	A1XF1BTJAH
A1XF1BTJAV	A1XF5AKTVA	A1XF5AKTAB	A1XF5ATTAA
A1XF5ATJAA	A1XM4KTJAC	A1XM4KTJAB	A1XM4KTJAA
A1XM4JTJAB	A1XM4JTJAA	A1XM4DTJAS	A1XM4CTJAB
A1XM4CTJAA	A1XM4BTJAC	A1XM4BTJAB	A1XM4BTJAA
C1XG1ATSAN	C1XG1ATSAM	C1XG1ATSAG	C1XG1ATSAF
C1XG1ATSAE	C1XG1ATSAD	C1XG1ATSAC	C1XG1ATSAB
C1XG1ATSAA			

Cable Tray Supports:

1-019-H109	1-106-H4	2-103-H23
1-100-H51	1-019-H704	2-002-H3
1-105-H30	2-103-H41	2-002-H47
1-105-H702	2-103-H92	2-002-H23
1-152-H109	2-103-H61	

Conduits:

Number	Length (Feet)	Number	Length (Feet)
A1XC4DRJ004	100	B1XE2ARY005	79
A1XC4DRT005	100	B1XE2ARY006	79
A1XE1FRS006	32	B1XF1BRS008	89
A1XE1FRH001	35	B1XM2ERS073	48
A1XE1GRL033	49	B1XM3ERJ068	33
A1XE1GRL032	44	C1XF1ARH004	55
A1XE2ARY102	51	C1XF1ARS004	67
A1XE2BRX004	39	C1XF1ARS010	63
A1XF1BRF001	64	C1XF1FRS009	45
A1XF1BRF002	58	C1XM3ERS204	39
A1XF1BRF003	49	D1XE1GR2037	15
A1YC4DRY003	95	D1XE1GRX002	30
B1XE2ARY003	79	D1XE2BRX004	84
B1XE2ARY004	79	D1XE2CRS081	32

TABLE II-1 - (Continued)

RACEWAY INSPECTION SAMPLE

Conduit Supports:

1120005	1532512	1625783
1120008	1541547	1651000B
1134931	1613130	1651001
1134932	1613132	1654548
1153322	1625779	

TABLE II-2

SEPARATION FINDINGS

Raceway segments listed in the A columns do not maintain required separation from the corresponding raceway segments in the B columns. The (*) indicates physical separation of less than one inch between the two raceway segments.

Column A	Column B	Column A	Column B
A1XE1HTTAM	N1XE1HTTAD	A1XE1DTSBB	N1XE1DTSAA
D1XE1HTXAJ	N1XE1HTYAH	A1XE1DTXBB	N1XE1DTCAA
A1XE1DTHBH	N1XE1DTJAV	A1XE1DTXBB	N1XE1DTCAC
A1XE1DTXBB	N1XE1DTYAA	A1XE1DTXBC	N1XE1DTXAE
A1XE1DTXJB	N1XE1DTHBF	A1XE1DTHBK	N1XE1DTHAX
A1XM4KTYAC	N1XM4KTYAC	A1XF1BTFAF *	N1XF1BRJ011
A1XM4JTYAA	N1XM4JTTAA	A1XM4JTJAA	N1XM4JTYAA
A1XM4CTYAA	N1XM4CTYAA	A1XM4BTJAC	N1XM4BTSAE
A1XM4BTJAC	N1XM4BTJAE	A1XM4BTYAF	N1XM4BTYAC
A1XM4BTFAB	N1XM4BTHAC	A1XM4BTFAB	N1XM4BTTAC
B1XC4ATHAJ	N1XC4ATAAJ	A1XM4BTFAB *	N1XM4BR031
B1XC4ATHAP	N1XC4ATHAJ	B1XC4BTJAE *	N1XC1BRX278
B1XC4BTXAF	N1XC4BTHBA	B1XCABRT852 *	N1XC1BRX278
B1XE4GTHAB	N1XE4GTHBA	A1XE2ARY102 *	C1XE2ARY103
B1XM1ERY048	A1XM1MTYAB		

TABLE II-3

TERMINATIONS

Location	Termination	Description
A1B52RR014	A1BSAAC23B	Control Cabinet
A1BS2RR014	A1SP12C1XA2	Control Cabinet Plug
A1CCMOV0050	A1CC04C1WA2	MOV
A1MB2CP1B22	A1AM10C1XA2	Control Panel
A1PMMCEA152	A1AF01C1WA1	MCC E1A1
A1PMMCEA1G1	A1RH03C1WD1	MCC E1A1
A1PMMCEA1V42	A1S1AAC1HJ2	MCC E1A1
A1PMMCEA2F3	A1SP23CASC2	MCC E1A2
A1PMMCEA2J3	A1SP23CASA2	MCC E1A2
A1PMMCEA2R2	A1S1ABC1LA	MCC E1A2
A1PMMCEA2R3	A1S1ABC1HH1	MCC E1A2
A1PMMCEAA2E1	A1CC04C1WC1	MCC E1A2
A1PMMCEAE1	A1CC04C1D1	MCC E1A2
A1PN2LP100S2	A1AF01C1WE2	Control Panel
A1PN2LP100S2	A1AF0361WF2	Control Panel
A1PN2LP659	A1AF01C1SA2	Control Cabinet
A1PN2LP700	A1AP02C1WB1	Control Panel
A1PN2LP700	A1AP02C1WA2	Control Panel
A1PN2LP801	A1AF01C1WF2	Control Panel
A1PNERR118A	A1AF05C1WA2	Control Panel
A1PNERR130A	A1AF08C1WA1	Control Panel
A1PNERR130A	A1CC2VC1WA1	Control Panel
A1PZRR002-2	A1SP17CCSA1	Control Cabinet
A1S02R001I	A1SP12C1XC1	Control Cabinet Plug
A1S02RR008I	A1SP12C2XA1	Control Cabinet Plug
A1S12RR051	A1S129C1XB2	Control Panel
A1SP2RR001I	A1SP12C1XB1	Control Cabinent Plug
A1SP2RR002-1	A1SP27CCSC1	Control Cabinet
A1SP2RR002-2	A1SP17CHSB2	Control Cabinet
A1SP2RR008I	A1SP12C2XB1	Control Cabinet Plug
A1SP2RR002-1	A1SP27CCSB1	Control Cabinet
A1SP7RR002-2	A1SP17CDSA1	Control Cabinet
B1OSPL037C7	B1PKACC1LA1	DC Switchgear
B1B52RR017	B1BSABC26A2	Control Cabinet
B1B52RR018	B1HC30C1XB-1	Control Cabinet
B1DJBC047E	B1DJACC1LG1	Charger/Inverter
B1DJBC047F	B1DJACC1LH1	Charger/Inverter
B1DJBT045LN	B1DJACC1LL2	Battery
B1DNERR137	B1HC18C1SD2	Control Cabinet
B1FMMCEB1J1	B1HC20C2SC1	MCC E1B1
B1MB2CP22T11	B1HC18C1SC2	Control Panel
B1MB2CP4T30	B1MB04C1S01	Control Panel
B1MB2CP4T30	B1MB04C1SS1	Control Panel
B1MB2CP4T30	B1MB04C1ST1	Control Panel
B1PK2GD0E1B3	B1SP22CUSB2	MCC E1B2
B1PKSG0E1B7	B1EW01C2WH1	4160V Switchgear EIB
B1PMMCEB122	B1AF03C2WC1	MCC E1B1
B1PMMCEB1F1	B1CCADC1LC1	MCC E1B1
B1PMMCEB1F3	B1HC18C1SE1	MCC E1B1

TABLE II-3 - (Continued)

TERMINATIONS

Location	Termination	Description
B1PMMCEB1L1L	B1CCADL1LK1	MCC E1B1
B1PMMCEB1P3	B1CCADC1LM1	MCC E1B1
B1PMMCEB1R2	B1AF03C2WA1	MCC E1B1
B1PMMCEB1T1	B1CC1C1WA1	MCC E1B1
B1PMMCEB203	B1CC0525E1	MCC E1B2
B1PMMCEB253	B1CHABC2LB1	Distribution Panel
B1PMMCEB2F3	B1CC642WD1	MCC E1B2
B1PMMCEB2F3	B1CC04C2WC1	MCC E1B2
B1PMMCEB2G	B1C006C2SB1	MCC E1B2
B1PMMCEB2G1	B1CC06C2SC1	MCC E1B2
B1PN2LP654	B1AF01C2WD1	Control Panel
B1PN2LP660	B1CC06C2SA2	Control Cabinet
B1PN2LP678	B1S129C1XB1	Control Panel
B1PN2LP678	B1HC30C1XB2	Control Panel
B1PN2LP678	B1B509C1XA2	Control Panel
B1PN2LP802	B1CC01C2WB2	Control Panel
B1PNERR1208	B1C010CBSB	Control Panel
B1PNERR121B	B1CC01C2WA2	Control Panel
B1PNTB678	B1AMABC2SR1	Termination Box
B1S12RR052	B1S129C1XC1	Control Panel
B1SP2RR004-1	B1SP22CMSD	Control Cabinet
B1SP2RR004-1	B1SP24CASD1	Control Cabinet
B1SP2RR004-1	B1SP24CASB1	Control Cabinet
B1SP2RR004-2	B1SP22CUSA1	Control Cabinet
B1SP2RR004-2	B1SP22CVSD1	Control Cabinet
B1VA1V1203	B1VAACCILA2	Charger/Inverter
C1BS2BR019	C1FW11C2PA1	Control Cabinet
C1BS2RR019	C1CV10C5PA2	Control Cabinet
C1BS2RR019	C1RC10C7PB1	Control Cabinet
C1DN2LP679-1	C1FW23C9XC2	Control Panel
C1MB2CD4T50	C1MB04C1SF1	Control Panel
C1MB2CP1T35	C1BS04C1XA2	Control Panel
C1MB2CP1T35	C1MB01C1SC1	Control Panel
C1MB2CP3T45	C1MB03C15E1	Control Panel
C1MB2CP3T45	C1MB031SE1	Control Panel
C1MB2CP4T50	C1MB04C1SG1	Control Panel
C1MB2CP4T50	C1MB04C1SH1	Control Panel
C1PN2LP10055	C1AMACG1SC2	Control Panel
C1PN2LP679	C1AMACC1SG2	Control Panel
C1PN2LP679	C1RA13C1XB2	Control Panel
C1PN2LP679	C1RA13C1XH2	Control Panel
C1PNETCC01	C1MB04C1SH2	Control Cabinet
C1PNTB679	C1AMACC15G1	Termination Box
D1DJBC047D	D1DJABC1LG1	Charger/Inverter
D1DJBC047G	D1DJABC1LB1	DC Switchgear
D1DJPL037B13	D1AF09C1SL1	DC Switchgear
D1DJPL037B3	D1DJABC1LG2	DC Switchgear
D1DJPL037B4	D1VAABC1LA1	DC Switchgear

TABLE II-3 - (Continued)

TERMINATIONS

Location	Termination	Description
D1DNERR141	D1PNAEC3SA2	Control Cabinet
D1MB2CP1817	D1CC17C1SA2	Control Panel
D1PNERR124D	D1CC17C1SB1	Control Panel
D1PNERR124P	D1PN10CNA2	Control Panel
D1SP2RR001I	D1SP12C1XC1	Control Cabinet Plug
D1SP2RR008I	D1SP12C2XA1	Control Cabinet Plug
D1SP2RR008I	D1SPT2C2VB1	Control Cabinet Plug
D1SP2RR008I	D1SP12C2XC	Control Cabinet Plug
D1SP2RR008I	D1SPABC1SB2	Control Cabinet
D1VADP1202	D1BSABC1SA1	Distribution Panel
D1VATV11202	D1VAABC1LA2	Charger/Inverter

TABLE II-4

UNIT 1 CLASS 1E EQUIPMENT AND LOADS AFFECTED BY MOLDED CASE CIRCUIT BREAKER DEFICIENCIES

Motor Control Center: 3E171MCE1A2

Cubicle/Breaker Type: A4L/HE3-B050
Class 1E Load: Distribution Panel Transformer

Motor Control Center: 3E171EMCE1A4

Cubicle/Breaker Type: C1R/HE3-B015
Class 1E Load: Containment Hydrogen Monitoring Panel

Cubicle/Breaker Type: C1L/HE3-B015
Class 1E Load: 120Vac Distribution Panel Inverter Channel II

Cubicle/Breaker Type: C3R/HE3-B030
Class 1E Load: Spare

Cubicle/Breaker Type: C3L/HE3-B015
Class 1E Load: Battery Room Reheat Coil

Cubicle/Breaker Type: E1R/HE3-B040
Class 1E Load: Accumulator 1A Discharge Isolation MOV

Cubicle/Breaker Type: E1L/HE3-B015
Class 1E Load: Containment Cubicle Exhaust Fan

Cubicle/Breaker Type: F3R/HE3-B050
Class 1E Load: Voltage Regulating Transformer

Cubicle/Breaker Type: F3L/HE3-B100
Class 1E Load: Battery Room Charger

Cubicle/Breaker Type: H3R/HE3-B030
Class 1E Load: Spare

Cubicle/Breaker Type: H3L/HE3-B015
Class 1E Load: Battery Room Reheat Coil

Cubicle/Breaker Type: J2R/HE3-B050
Class 1E Load: Distribution Panel Transformer

Cubicle/Breaker Type: J2L/HE3-B015
Class 1E Load: Starter for Chiller Oil Lamp

TABLE II-4 (Continued)

UNIT 1 CLASS 1E EQUIPMENT AND LOADS AFFECTED BY MOLDED CASE CIRCUIT BREAKER DEFICIENCIES

Motor Control Center: 3E171EMCE1B4

Cubicle/Breaker Type: B2R/HE3-B015
Class 1E Load: Starter for Chiller Oil Pump

Cubicle/Breaker Type: B3R/HE3-B015
Class 1E Load: Spare

Cubicle/Breaker Type: B3L/HE3-B015
Class 1E Load: Containment Cubicle Exhaust Fan

Cubicle/Breaker Type: C2L/HE3-B015
Class 1E Load: Battery Room Reheat Coil

Cubicle/Breaker Type: C2R/HE3-B030
Class 1E Load: Spare

Cubicle/Breaker Type: C3R/HE3-B030
Class 1E Load: EAB Main Area Heating Coil

Cubicle/Breaker Type: C3L/HE3-B030
Class 1E Load: Spare

Cubicle/Breaker Type: E4R/HE3-B020
Class 1E Load: Spare

Motor Control Center: 3E171EMCE1C2

Cubicle/Breaker Type: H2R/HE3-B050
Class 1E Load: Heat Tracing Transfomer

Motor Control Center: 3E171EMCE1C4

Cubicle/Breaker Type: C3R/HE3-B040
Class 1E Load: Accumulator 1C Discharge Isolation MOV

Cubicle/Breaker Type: C3L/HE3-B015
Class 1E Load: Containment Cubicle Exhaust Fan

Cubicle/Breaker Type: D1R/HE3-B015
Class 1E Load: 120Vac Distribution Panel Inverter

Cubicle/Breaker Type: D1L/HE3-B050
Class 1E Load: Power Distribution Panel Transformer

TABLE II-4 (Continued)

UNIT 1 CLASS 1E EQUIPMENT AND LOADS AFFECTED BY MOLDED CASE CIRCUIT BREAKER DEFICIENCIES

Cubicle/Breaker Type: D3R/HE3-B015
Class 1E Load: Spare

Cubicle/Breaker Type: D3L/HE3-B015
Class 1E Load: Containment Hydrogen Monitoring Panel

Cubicle/Breaker Type: E1R/HE3-B015
Class 1E Load: Starter for Chiller Oil Pump

Cubicle/Breaker Type: E1L/HE3-B015
Class 1E Load: Battery Room Reheat Coil

TABLE II-5

VALVE MOTOR OPERATOR DEFICIENCIES

Motor Operated Valve C1CVMOV0112B:*

a. Jumper wires contain bend radius violations.

b. Loose vendor terminations on the power terminal block, heater coils, and torque switch points 24, 25, 26, and 27.

c. No. 16 AWG wire is installed in lieu of No. 14 AWG wire on the limit switch between points 22 and 37 and between points 11 and 36.

d. More than two-wires terminated under one terminal point.

Motor Operated Valve B1CVMOV113A:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. No. 16 AWG wire used in lieu of No. 14 AWG wire.

c. Jumper wires contain bend radius violations.

d. More than two wires terminated under one terminal point.

Motor Operated Valve A1RCMOV0001A:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. No. 16 AWG wire is installed in lieu of No. 14 AWG wire.

c. Jumper wires contain bend radius violations.

d. More than two wires terminated under one terminal point.

Motor Opreated Valve B1RCMOV0001B:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. No. 16 AWG wire is installed in lieu of No. 14 AWG wire.

c. Jumper wires contain bend radius violations.

d. More than two wires terminated under one terminal point.

TABLE II-5 - (Continued)

VALVE MOTOR OPERATOR DEFICIENCIES

Motor Operated Valve B1SIMOV0001B:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. Lug at terminal point 26 was cracked and then broke off during inspection.

c. Jumper wires contain bend radius violations.

d. More than two wires terminated under one terminal point.

Motor Operated Valve C1SIMOV0001C:*

a. Jumper wires contain bend radius violations.

b. Loose vendor terminations on the power terminal block, heater coil and torque switch points 24, 25, 26, and 27.

c. More than two wires terminated under one terminal point.

Motor Operated Valve A1SIMOV0004A:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. An additional jumper was installed which was not on drawing 9-E-SI13, sheet 1 DSP.

c. Jumper wires contain bend radius violations.

d. More than two wires terminated under one terminal point.

Motor Operated Valve B1SIMOV0004B:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. Duct seal used to cover temporary power cable opening has melted onto the termination points.

c. Jumper wires contain bend radius violations.

d. More than two wires terminated under one terminal point.

TABLE II-5 - (Continued)

VALVE MOTOR OPERATOR DEFICIENCIES

Motor Operated Valve B1SIMOV0016B:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. Jumper wires contain bend radius violations.

c. More than two wires terminated under one terminal point.

Motor Operated Valve C1SIMOV0016C:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. Jumper wires contain bend radius violations.

c. Terminal point 10 is not identified.

d. More than two wires terminated under one terminal point.

Motor Operated Valve B1SIMOV0018B:

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. Temporary power cable is shorting against the MOV housing and the vendor wires to the heater have been deformed by the cover installation.

c. Jumper wires contain bend radius violations.

d. No. 16 AWG wire in lieu of No. 14 AWG wire is installed between points 22 and 37.

e. More than two wires terminated under one terminal point.

Motor Operated Valve C1SIMOV0018C:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. Numerous jumper wires contain bend radius violations.

c. Wire manufactured by Raychem was installed on site instead of Firewall III as required.

TABLE II-5 - (Continued)

VALVE MOTOR OPERATOR DEFICIENCIES

d. Jumper wires contain bend radius violations.

e. More than two wires terminated under one terminal point.

Motor Operated Valve A1RHMOV0061C:*

a. Loose vendor terminations on the terminal blocks, heaters, and limit switches.

b. No. 16 AWG wire is installed in lieu of No. 14 AWG wire.

c. A jumper between point 35 and 36 has been installed that is not identified on the scheme drawing; 9-E-RH02, sheet 1.

d. Jumper wires contain bend radius violations.

e. More than two wires terminated under one terminal point.

Motor Operated Valve C1CCMOV0209:

a. Damaged conductors from removal/re-installation of motor operated valve cover. (This appears to be a generic problem due to lack of cover/rotor clearance on limitorque SMB models).

b. Jumper wires contain bend radius violations.

Motor Operated Valve C1CCMOV0199:

a. Insufficient motor operated valve cover clearance with wires on top of rotors. (Similar to problem with C1CCMOV0209).

b. Jumper wires contain bend radius violations.

NOTES:

*Deficiencies for these valves were subsequently recorded on NCR BE-03209 by the licensee.

TABLE II-6

INSTRUMENTATION INSPECTION SAMPLE

Hangers:

Field Sketch	Hanger	Field Sketch	Hanger
IC-EW-02	A	IC-EW-03	F
IC-EW-02	B	IC-EW-03	G
IC-EW-02	C	IC-EW-03	H
IC-EW-03	A	IC-EW-03	I
IC-EW-03	B	IC-EW-03	J
IC-EW-03	C	IC-EW-05	A
IC-EW-03	D	IC-EW-12	A
IC-EW-03	E	IC-EW-12	C

Tubing:

Field Sketch	Field Sketch
IC-CC-22	IC-EW-09
IC-EW-02	IC-EW-10
IC-EW-03	IC-EW-11
IC-EW-04	IC-EW-12
IC-EW-05	IC-EW-13

Instruments:

A1EWFT6854	C1CCFT4522
A1EWFT6856	C1EWFT6873
A1EWFT6904	C1EWFT6874
B1EWFT6864	C1EWFT6876
B1EWFT6866	C1EWFT6906

TABLE II-7

INSTRUMENTATION INSPECTION DEFICIENCIES

Field Sketch	Instrument	Findings
IC-EW-12, Rev. 2	A1EWFT6856	1. Hanger C welded at one end only. Drawing 4201-9-2-45080 Sheet 126, Detail A requires both ends welded. 2. Hanger A not installed in accordance with the correct drawing detail.
IC-EW-10, Rev. 3	C1EWFT6906	1. Seven dimensions outside of tolerance. 2. Sketch identifies instruments as FT-9606 and FI-9606. 3. Loose conduit fittings at FT-6906. 4. Inspected and accepted to ICEW-10, Rev. 0. Rev. 3 in effect at time of inspection.
IC-EW-02, Rev. 3	A1EWFT6904	1. Two dimensions outside of tolerance. 2. Loose conduit fitting at FT-6904. 3. Inspected and accepted to IC-EW-02, Rev. 0. Rev. 2 in affect at time of inspection.
IC-EW-09, Rev. 3	C1EWFT6874	1. Missing clamp east of hanger E. 2. Hanger E 17 inches east of sketch location. 3. Hangers A and B attached to existing support without required engineering concurrence. 4. Inspected and accepted to IC-EW-09, Rev. 0. Rev. 3 was in effect at time of inspection.
IC-EW-03, Rev. 3	A1EWFT6854	1. Conduit fittings loose at FT-6854. 2. Flow transmitter loose at base plate. 3. One dimension outside of tolerance.
IC-EW-04, Rev. 2	C1EWFT6873	1. Five dimensions outside of tolerance.
IC-EW-05, Rev. 2	B1EWFT6864	1. Hanger B attached to existing support without required engineering concurrence. 2. Conduit fitting loose at FT-6864.
IC-CC-22, Rev. 5	C1CGFT4522	1. Three dimensions outside of tolerance.

III. MECHANICAL CONSTRUCTION

A. Objective

The objective of the appraisal of mechanical construction was to determine if the installed and Quality Control (QC) accepted mechanical items conformed to engineering design, regulatory requirements and licensee commitments.

B. Discussion

The specific areas of mechanical construction evaluated were piping, pipe supports/restraints, concrete expansion anchors, mechanical equipment, and heating, ventilating and air conditioning (HVAC) systems. To accomplish the above objective, a field inspection of a sample of QC accepted hardware was performed in each area. In addition, certain programs, procedures and documentation were reviewed as required to support or clarify hardware inspection findings.

1. Piping

a. Inspection Scope

Piping depicted on the sixteen Bechtel isometric drawings listed in Tabe III-1 was inspected by the NRC CAT. Approximately 140 feet of 2 inch diameter and smaller piping, and approximately 1680 feet of greater than 2 inch diameter piping, which had previously been accepted by Ebasco QC, was inspected. The inspection sample included piping located in the Unit 1 Reactor Containment Building (RCB), the Mechanical and Electrical Auxiliary Building (MEAB), the Fuel Handling Building (FHB), and the Diesel Generator Building (DGB); the Unit 2 MEAB; and the Essential Cooling Water structure. Piping sizes ranged from 3/4 inch to 30 inches and pipe classifications were ASME 1, 2 and 3. Attributes inspected included configuration (component orientation and dimensions), component locations and types, valve operator orientations, clearances, flanged joints (gasketing, bolting material, proper makeup), and hydrostatic testing. In addition, site construction practices were observed.

As identified in Table III-1, six of the piping isometrics included in the NRC CAT inspection sample had been walked down for turnover to the Houston Light and Power (HL&P) Startup organization, for flushing and hydro-testing in accordance with Ebasco Quality Control Procedures (QCP) 10.14. One piping isometric included piping which had been hydrostatically tested. The hydro-test documentation package was also reviewed.

Verification of installations in accordance with current design change documents were also selectively examined for the sixteen piping isometric drawings, involving 28 design change documents including Design Change Notices (DCN), Field Change Notices (FCN), and Field Change Requests (FCR), as listed by Section VII, Table VII-7B.

The NRC CAT inspectors reviewed, and discussed with responsible inspectors and engineers the execution of the following procedures related to final walkdown inspections and engineering reconciliation of as-built conditions, developed to meet the requirements of IE Bulletin 79-14, "Seismic Analysis for As-Built Safety-Related Piping Systems."

- Ebasco QCP-10.14, Rev. 3, "System/Subsystem Walkdown Inspection"
- Standard Site Procedure (SSP) -34, Rev. 0, "Technical Requirements and Walkdown Procedure for As-Building of Piping Systems"
- SSP-39, Rev. 0, "Engineering Procedure for As-Built Reconciliation of Safety-Related Piping Systems and Associated Pipe Supports"

The following documents provided the acceptance criteria and background information for the NRC CAT inspection:

- Bechtel Specification, 5A010PS002, Rev. 7, "Piping Erection and Field Fabrication"
- Bechtel Specification, 5L019PS004, Rev. 8, "Criteria for Piping Design"
- Bechtel Specification, 4U010PS007, Rev. 6, "Pre-service and In-Service Inspection"
- Ebasco Construction Site Procedure, CSP-16, Rev. 5, "Piping Installation Procedure"
- Ebasco Construction Site Procedure, CSP-17, Rev. 4, "Hydrostatic and Pneumatic Testing"
- Ebasco Construction Site Procedure, CSP-22, Rev. 3, "Valve/Pump Work"
- Ebasco Quality Control Procedure, QCP-9.1, Rev. 6, "Weld Inspection ASME"
- Ebasco Quality Control Procedure, QCP-10.11, Rev. 5, "Mechanical Equipment Installation Inspection"
- Ebasco Quality Control Procedure, QCP-10.14, Rev. 3, "System/Subsystem Walkdown Inspection"
- Ebasco Quality Control Procedure, QCP-11.1, Rev. 4, "Hydrostatic and Pneumatic Pressure Test Inspection"

In addition the NRC CAT inspection included observation of the modification of Unit 1 Reactor Coolant Piping by Westinghouse Construction in accordance with Westinghouse traveller T-TGX-059. This modification involving Fast Response RTD's was accomplished under a Westinghouse Field Change Notice (FCN).

b. Inspection Findings

NRC CAT inspections associated with specific piping isometric drawings are listed in Table III-1. In general, piping conformed to design and procedural requirements. However, several deficiencies were identified.

On six lugged wafer valves in the Unit 1 Essential Cooling Water System (EW-0016, 0019, 0052, 0055, 0089, and 0092), the hex-head cap screws in the flange-to-valve joints were determined through ultrasonic testing (UT) to be shorter than required by the associated isometric drawing and bill of materials, reducing thread engagement in several locations to less than one-half bolt diameter. Licensee and NRC CAT inspectors subsequently performed a physical verification for the six lugged wafer valves, resulting in a confirmation of the UT findings. In a number of other installations of this type of valve in Unit 1, hex-head cap screws have been substituted for threaded studs and nuts, without appropriate changes to the isometric drawing and/or bill of materials. In addition, the applicable Ebasco inspection procedure, QCP-10.11, does not require verification or documentation of the length of headed bolts used in assembly of bolted flange connections. Thus, the bolt length in lugged wafer valves installed with hex-head cap screws (in place of studs) is currently indeterminate, and based on NRC CAT findings, are likely to be incorrect. A Nonconformance Report (NCR CM-03068) was initiated to disposition the first valve found with unauthorized substitution of cap screws for studs. Standard Deficiency Reports (SDR E-353 and -354) were initiated to evaluate the extent of the construction deficiency and the inspection procedure deficiency. A Deficiency Evaluation Report (DER 85-057) was also initiated to evaluate the reportability of this deficiency.

Undersize socket weld fillets were found on twelve of the thirty QC accepted field welds on isometric 4C369PCV417, SH. A02 for 2 inch Schedule 160 pipe fittings. During the NRC CAT inspection, a Nonconformance Report (NCR CP-03139) was issued to disposition the undersize welds. This deficiency is discussed in more detail in Section IV of this report.

Two Annubar flow probe mounting flanges on isometric 3M369PEW229 Sh. 18, were mislocated with respect to the distance from the pipe outer wall, based on the installation dimensions supplied by the vendor. However, these probes were located within the field piping erection tolerances provided in Bechtel Specification 5A010PS002. There are 33 such installations in the Essential Cooling Water, Component Cooling Water, and Chilled Water Systems. After discussions between Bechtel and the vendor to determine the extent to which these tolerances could be relaxed, Nonconformance Reports (NCR SJ-3008 and -3111) were initiated to rework the seven Annubar mounting flanges which did not meet the relaxed installation tolerance. A Deficiency Evaluation Form (DEF 85-80) was initiated to determine if field installation tolerances may impact other unspecified installation tolerances for vendor supplied pipe mounted instrumentation.

At several locations on the support columns for Unit 1 steam generators, the NRC CAT inspection noted zero clearance to steel work platform supports. A Nonconformance Report NCR BC-03193 was initiated. In a number of locations, piping exhibited zero or very small (less than 1/2 inch) clearance to adjacent components and structures. A further discussion of this issue is contained in paragraph III.B.2.b below.

The NRC CAT inspectors considered the procedures related to final system walkdown inspections and engineering reconciliation of as-built conditions to meet IE Bulletin 79-14 requirements, to be thorough and well written. Responsible personnel were knowledgeable of requirements and responsibilities.

No problems were noted in the inspected hydro-test packages or in the implementation of design change documents.

c. Conclusions

Piping was found generally to conform to design documents. However, the improper flange bolting on lugged wafer valves indicates improper documentation/control of hardware changes and inadequate procedures and inspection effort for bolted joint makeup. The Annubar flow probe installation criteria deficiency indicates a design error, which requires resolution by engineering.

2. Pipe Supports/Restraints

a. Inspection Scope

Thirty-two ASME Class 1, 2 and 3 supports/restraints which represented a variety of types, sizes, systems and locations were selected for detailed inspection. As a result of the licensee's Pre-CAT inspection performed earlier this year, the basic support/restraint inspection program was revised and previously accepted hardware was subjected to a reinspection for many attributes. The sample selected by the NRC CAT included ten that had been through the reinspection program and 22 that had been QC accepted under the new inspection criteria. These supports/restraints were inspected for proper configuration, clearances, member size, location, weld size, fasteners, expansion anchor installation and damage. See Table III-2 for a listing of the inspection sample.

Documentation packages for five of the inspected supports/restraints were examined for completeness, accuracy, and conformance to procedural requirements. The Field implementation of seven Field Change Requests (FCRs), four Field Change Notices (FCNs) and one Nonconformance Report (NCR) applicable to the inspected hardware were also inspected. See Section VII, Table VII-7B.

Acceptance criteria for the above described inspections were contained in the following documents:

- Bechtel Construction Specification 5L340JS1002, Rev. 7, SCN 24, "Pipe Support Field Fabrication and Installation"

- Ebasco Construction Site Procedure (CSP) 7, Rev. 5, ICP 4, "Pipe Support Installation"

- Bechtel Work Plan Procedure/Quality Control Instruction (WPP/QCI) 23, Rev. 6, "Fabrication and Furnishing Pipe Support Items"

- Ebasco Quality Control Procedure (QCP) 10.12, Rev. 4, "Component Support Fabrication and Installation Inspection"

- Applicable design drawings and change documents

b. Inspection Findings

At the time of the CAT inspection, of the approximately 9,000 ASME pipe supports/restraints to be installed in Unit 1 and common systems, approximately 1200 had been QC accepted. Approximately 500 had been accepted under the revised inspection program and 700 had been previously accepted and reinspected to the new criteria by retrained inspectors. A review of the licensee's Pre-CAT inspection report indicated a thorough study of pipe supports/restraints. Improvements in specifications, procedures and personnel training were implemented and reinspections performed as required.

Discrepancies were noted on seven of the 32 supports/restraints inspected by the NRC CAT. Discrepancies included out of tolerance angularity of a strut and a restraint brace member, undersized/missing welds (two supports), undersized U-strap restraint, improper expansion anchor embedment and an oversized spacer plate installed that could have decreased support capacity. With the exception of the undersized U-strap, the discrepancies were not a major concern from a structural integrity standpoint although they were items that should have been identified by QC during the inspection/reinspection process. In addition, conditions were noted on several installations relating to unclear criteria and/or work control.

Restraint SI-9106-HL5009 consisted of a pipe clamp with welded lugs restraining the pipe laterally in a box frame. However, the ears of the pipe clamp were only about 3/8 inch from the horizontal members of the box frame. The construction specification allowed a 1/2 inch tolerance on clearances in the unrestrained direction. As no clearance in the unrestrained direction was specified on this drawing, it was not clear what was acceptable in this situation. The following actions were taken as a result of the NRC CAT inspection findings: A change to the specification was issued to provide a tolerance on the installation of the pipe clamp for this type of configuration; a drawing review by engineering identified 47 restraints of this design including 11 that could still have potential interference due to thermal or seismic movement (including four that had previously been QC accepted); nonconformance reports were issued to provide for reinspection of the four supports and Design Change Notices (DCNs) were issued to specify the necessary clearance on the remaining seven.

A temporary hanger for a 30 inch pipe had been welded to support EW-9406-HL5001. Although the installation of this temporary support was specified on a Request for Conditional Release form and a Startup Work Request (SWR), the only reference to removal was a note on the installation sketch. The NRC CAT inspectors consider that a more formal method of control is warranted with at least an inspection signature that the temporary support has been removed. The inspector notes that this is a programmatic issue and that in this case the temporary support would most likely have been removed and system walkdowns should identify this type of oversight if left installed.

A large number of potential or actual interferences were observed during inspection by the NRC CAT, between piping, supports/restraints and other hardware, and installation and inspection criteria for this attribute did not appear to be adequate. It was determined that this issue had been identified months earlier by an INPO evaluation and had been reported to Region IV pursuant to 10 CFR 50.55(e). Although a program to address this concern has been developed, it has not yet been implemented. More aggressive and timely action to provide craft and QC with acceptance criteria is warranted.

After identification of the undersize (under capacity) U-strap on restraint SI-9118-HL5009 the NRC CAT inspector selected and examined ten additional restraints that had heavy duty U-straps specified on the drawing. All were found to have the correct material installed.

The NRC CAT inspector noted two large (1500 pounds each) air operated valves on a three inch diameter Safety Injection line (SI-1117) in a high traffic area that were not supported, were visibly leaning and could easily be moved by hand. This was questioned by the inspector. Although not considered required by Bechtel site engineering, temporary supports were installed on these valve operators and installation of the permanent designed supports was initiated.

The change documents associated with the supports/restraints inspected had all been properly implemented and closed out. No problems were noted in the documentation packages reviewed.

See Table III-3 for a summary of inspection observations.

c. Conclusions

In general, pipe support/restraints were found to be installed in accordance with drawing, design change and procedural requirements. However, due to the one undersized U-strap and number of other discrepancies noted, it appears that further improvement by craft and QC in attention to detail is required. Also, improved controls for the installation and removal of temporary supports is warranted.

3. Concrete Expansion Anchors

a. Inspection Scope

Fifty-six concrete expansion anchors (CEAs) on 12 pipe supports/restraints and 97 CEAs on 17 HVAC supports were inspected in detail. Inspection attributes included length, marking, embedment, spacing, edge distance, damage, angularity and residual torque. In addition, the CEAs on pipe supports were verified to be the proper length by ultrasonic testing (UT). Various systems, sizes, and locations were included in the anchor sample. Table III-4 provides a listing of the anchors inspected. Anchors were torqued to the designer specified test torques which were 70% of minimum installation torques.

Seven FCRs, four NCRs and one DCN related to expansion anchors were inspected for conformance to as-built conditions. See Section VII, Table VII-7B.

Acceptance criteria for these field inspections were contained in the following documents:

- Bechtel Construction Specification 5A010SS1000, Rev. 7, "Installation of Expansion Anchors, Rock Bolts, Grouted Anchor Bolts, and Core Drilling"
- Bechtel Construction Specification 5L340JS1002, "Pipe Support Field Fabrication and Installation"
- Ebasco CSP-41, Rev. 6, "Installation of Expansion Type Anchors"
- Ebasco CQP 10.19, Rev. 7, "Inspection of Anchoring Devices Installed Within Concrete Structures"
- Applicable design drawings and change documents

b. Inspection Findings

Nut rotation at test torque or less was observed on approximately 20 of the 153 CEAs tested and most turned very close to the test torque value. Only one anchor took as much a one turn to achieve minimum installation torque. Only one anchor was determined to have less than the specified embedment (on pipe support EW-1329-HL5001) although many were at the exact minimum and many had been previously identified by QC as not meeting original specifications and were dispositioned by FCR or NCR. During the NRC CAT's inspection of pipe supports/restraints and mechanical equipment several cases of CEAs with out of tolerance embedment and anchor to concrete edge distances were identified. Other attributes were within design tolerances or had been previously identified and dispositioned by engineering. The FCRs, NCRs and DCNs were verified as being acceptably implemented.

See Section V.B.4.b (Civil/Structural) for a discussion of qualification testing and other design aspects of the concrete expansion anchor program at STP.

c. Conclusions

Generally with the exception of minor deficiencies as noted above, the concrete expansion anchors for pipe supports/restraints and HVAC supports were installed and inspected in accordance with design and procedural requirements.

4. Mechanical Equipment

a. Inspection Scope

Twelve pieces of mechanical equipment including six HVAC mechanical components which are part of the STP's equipment specification, five ASME pumps, and one ASME tank were inspected for conformance to design and procedural requirements. In addition the insertion of a Roto-lock reactor vessel stud insert (#35) in the Unit 1 vessel was observed.

The installation documentation for the inspected equipment was examined and the process control and QC verification documentation for assembly of the Unit 1 reactor vessel upper internals by Westinghouse Construction was also reviewed. Table III-5 provides a listing of the mechanical equipment inspection sample.

The following documents provided the acceptance criteria and background information for the NRC CAT inspection:

- Bechtel Specification 4C119SS1008, Rev. 2, "Reactor Coolant System Component Supports and Other NF Steel Items"
- Ebasco CSP-22, Rev. 3, ICP-1, "Valve/Pump Work"
- Ebasco CSP-2, Rev. 4, ICP-5, "Installation of Permanent Electrical and Mechanical Plant Equipment"
- Ebasco SSP-24, Rev. 0, "Disassembly/Reassembly of Safety and Non-Safety Related Valves"
- Ebasco QCP-10.11, Rev. 4, PCR-5, "Mechanical Equipment Installation Inspection"
- Ebasco QCP-9.1, Rev. 6, "Weld Inspection ASME"
- Bechtel Drawing 3A01-0-C-0010, "Concrete Standard Details-Embedded Plates-Misc. Supports"
- Bechtel Drawing 3A01-0-C-0012, "Concrete Standard Details-Embedded Plates-Misc. Supports"
- Applicable design drawings, vendor technical manual and drawings.

b. Inspection Findings

Discrepancies were noted on most of the mechanical equipment installations examined by the NRC CAT inspectors. Programmatic/procedural weaknesses as well as inadequate QC inspection are of concern.

The discrepancies listed below were noted in the reassembly of the following Unit 1 pumps; Containment Spray (CS) pump B, Low Head Safety Injection (LHSI) pump B, and High Head Safety Injection (HHSI) pump B:

- Fasteners installed for bolting the motor stand to the motor and the motor stand to the foundation were of various material types or were unmarked. Washers specified for the motor stand to motor connections were missing. These installations had been accepted by QC and the joints sealed with "torque seal". Refer to Section VI, Material Traceability and Control, for further discussion of this concern.

- Although the process control sheet referred to the vendor manual, which required installation of new O-rings, the old O-rings were reinstalled.

- Although the applicable construction procedure, CSP-22, requires bagging of fasteners and small parts, disassembled fasteners from the pump-motor couplings were observed stacked on the pumps and pump flange fasteners were observed scattered on the floor, and the QC inspector involved with the pump work was unaware of the bagging requirement.

Discrepancies noted on four of the six mechanical equipment HVAC components inspected, included missing and undersize welds, unshimmed foundations, backed off foundation mounting nuts, improper concrete expansion anchor embedment and spacing to concrete cored holes, attachment welding to edge of embedment in possible violation of structural drawing requirements, damage, and support bracing that did not conform dimensionally to design. The current site program for inspecting non-ASME equipment does not provide for inspection of equipment support configuration dimensions etc. Based on a review of structural drawings 3A01-0-C-0010 and 3A01-0-C-0012 and discussions with pipe support and mechanical equipment QC inspectors it was apparent that the design requirements for welding near the edge of embedded plates was not clearly delineated. Site engineering committed to evaluation of existing criteria and revising drawings and retraining inspectors as required.

On the Reactor Water Make-up Tank the NRC CAT inspectors found that a design specified ring of cushion material (Flexcell) had been removed after QC acceptance of the tank installation. The tank mounting flange was in contact with the concrete floor at some locations and had more than a one inch gap at others. At the time of the inspection the tank was partially filled with water for flushing operations. The licensee was unable to provide evidence that formal documentation and/or controls existed to identify,

track and restore the installation of the tank to design requirements. At the request of the NRC CAT inspectors the licensee agreed to perform the following actions:

- Determine the nature and distribution of the remaining cushion material and other sandy material under the tank.

- Evaluate the activities related to removal (and eventual replacement) of the cushion material.

- Evaluate the stresses imposed on the tank due to loading the tank with the existing gaps around the foundation.

During the NRC CAT inspection of piping it was noted that vendor assembled piping spool flanges on Diesel Generator 1A had been disconnected, apparently to facilitate the installation of an adjacent field installed expansion joint. There was no documentation authorizing this disassembly as required per QCP 10.27. During the course of this inspection these joints were remade, apparently to eliminate leakage during testing, again without authorization or control/documentation of proper joint makeup. A Procedure Violation Notification (M-17) was initiated to address this problem.

During the observation of the installation of the Roto-lock insert, it was observed that a case of Molycote 505 anti-seize lubricant, which is no longer recommended by Westinghouse for nuclear applications (Westinghouse letter DL-82-01 and WCAP-9464, 1979), had been requisitioned and delivered to the reactor vessel flange area. However, Ebasco personnel did use a recommended lubricant and the Molycote containers remained unopened. The Molycote was removed and NCR BN-03021 was initiated. The inspectors note that the installation traveler for the RHR pumps listed as an acceptable lubricant FEL PRO N1000, which is also on the Westinghouse "not recommended" list. Again a check of installation records indicated that an approved lubricant had been used on the RHR pumps. However, it appears that additional attention to ensure control and use of approved lubricants is warranted.

On RHR pumps A and C, the construction process sheet (CPS) specifies as sequencing step 1 the installation of the pump supports per the vendor manual and drawing 3C01-9-S-1600. This is checked in the CPS column for "work sequence installation" as a prerequisite step to pump and motor installation. A QC HOLD point was not specified. Subsequent steps of the CPS had been completed including machining and leveling of the pump feet and support pads to a precise 0.002 inch tolerance. However, the ASME Equipment Support Checklist used in conjunction with the CPS, indicated that the torquing of the pump support foundation bolts had not yet been performed. The condition was considered acceptable based on the engineering response that the pump had not been accepted for levelness and location, nor had the pump alignment been performed. However, as the RHR pump installation is still in progress, it appears that specific sequence requirements of the CPS should have been more clearly controlled with the review of exceptions taken to an intended prerequisite appropriately documented prior to completing subsequent work steps to

ensure that leveling during subsequent torquing of foundation bolting is not degraded.

It should be noted that the installation of the lugged wafer valves with the fastener control problems previously discussed in the piping section of this report was under the control of the mechanical equipment installation program and the valves were inspected by mechanical equipment inspectors.

No problems were identified during the review of reactor vessel upper internal installation documentation.

Table III-5 provides a number of NRC CAT observations for the mechanical equipment items inspected.

c. Conclusions

Significant deficiencies were noted in regard to mechanical equipment installation. A lack of attention to detail by craft and QC inspectors was apparent. Programmatic/procedural weaknesses regarding control and documentation of bolting activities, lubricants, inspection of non-ASME equipment support framework, and acceptance criteria for location of attachments to embedded plates was also apparent.

Licensee action is necessary in areas of mechanical equipment installation to provide assurance that hardware is installed and inspected in accordance with design and procedural requirements. Subsequent rework activities must be controlled, documented and provide for QC reverification of hardware acceptability.

5. Heating, Ventilating and Air Conditioning (HVAC)

a. Inspection Scope

Fifteen HVAC seismic supports/restraints, forty-seven duct sections, and five fire-dampers were selected from both Units 1 and 2 at random and inspected in detail.

The supports/restraints were inspected for location, configuration, member size, weld size and connection details. Duct sections and fire dampers were examined for proper configuration, companion angle size, joint make-up and free operation of fire dampers.

In addition, adjacent HVAC hardware, including approximately 20 other HVAC supports/restraints, 25 duct sections, and 10 dampers was observed at random for the following attributes: loose or missing fasteners, joint makeup, improper clearances or angularity, disassembled, and damaged items.

Ten Field Change Requests (FCR) associated with the NRC CAT HVAC hardware samples were verified for conformance to as-built conditions. Also, twenty-four construction traveler packages were reviewed for completeness and accuracy.

Acceptance criteria for these field inspections were contained in the following documents:

- Bechtel Specification 5V279VS1003, Rev. 5, "Installation of Safety Class and Non-Safety Class HVAC Equipment and Duct Work."
- Bechtel Specification 3V279VS1000, Rev. 8, "Safety Class HVAC Duct-Work Fabrication."
- Ebasco Procedure CSP-6, Rev. 4, "Installation of HVAC Duct Hangers and Equipment Hangers."
- Ebasco Procedure CSP-9, Rev. 4, "Inspection of Duct and Duct Accessories."
- Ebasco Procedure CSP-95, Rev. 2, "General Welding Requirements for HVAC."
- Bechtel Procedure QCP-10.21, Rev. 5, "HVAC/DUCT/HANGER Installation Inspection."
- Applicable Duct Support/Restraint and Layout Drawings.

b. Inspection Findings

Approximately 39 percent of the seismic supports, 22 percent of the duct sections, and 9 percent of the fire dampers had been QC accepted by Ebasco at the time of the NRC CAT inspection. During the inspection by the NRC CAT, workmanship appeared to be good and no installation deficiencies were found for HVAC hardware (supports, duct sections, and fire dampers). However, during the observation of adjacent HVAC hardware, QC accepted tornado damper number 3V11V0A0302 was found installed upside down. This apparent isolated case of questionable installation was subsequently dispositioned "use-as-is" by Bechtel Engineering on NCR BH-03037.

Ten "Field Change Requests" (FCR) associated with the HVAC hardware inspected were reviewed and found to conform to the as-built condition. See Section VII, Table VII-7B.

The NRC CAT was informed of an reinspection program under "Deficiency Evaluation Report (DER 85-031) conducted by Ebasco QC for direct attachment welds and expansion anchor bolt/base plate installation. During the inspection of HVAC supports the NRC CAT did not observe weld attachment discrepancies as described in DER-031.

Six of the twenty-four "construction traveler packages" reviewed by the NRC CAT for completeness and accuracy, were noted to have documentation omissions on the "Construction Cover Sheet" (Form CS-AD-852). A Standard Deficiency Report (SDR) was subsequently issued by the licensee to Construction (SDR E-350) and to Quality Control (SDR E-351) to prevent the recurrence of these deficiencies.

c. Conclusions

HVAC safety-related support/restraints, duct sections, and fire dampers conformed to design and procedural requirements. More attention to the review of documentation is required to ensure completeness and accuracy of the construction traveler packages.

TABLE III-1

PIPING INSPECTION SAMPLE AND OBSERVATIONS

Isometric (Note 1)	Diameter (Inches)	Class	Notes	Observations
2C369PAF402 Sh. 01, Rev. 3	6, 8	2		None
2C369PCV417 Sh. 03, Rev. 2	4	2	-	Clearance to hanger
2M369PRH259 Sh. 02, Rev. 2	8	2	2, 4	Deficient ISI prep (NCR SP-03152)
3M369PEW229 Sh. 18, Rev. 0	6, 8 10, 30	3	2, 4	Annubar flow probe mounting flange (NCR SJ-03008 & 03111)
3M369PRM263 Sh. 03, Rev. 4	4, 6	3	2, 4	Broken flex conduit (SWR-01921)
3Y361PEW729 Sh. 03, Rev. 3	3, 24, 30	3	2	None
4C369PCV417 SH. A02, Rev. 4	2	2	4	Undersize socket welds (NCR CP-03139, SDR E-349 DER 85-049)
4C369PCC407 SH. 34, Rev. 3	16	2	2, 4	Lugged wafer valve bolting (NCR NCR CM-03068, SDR E-353 & -354, DER 85-057)
				Uncapped MOV housing. (Maintenance Discrepancy MD 1-0868)
4C369PRC457 SH. A06, Rev. 4	3/4, 2	1, 2	-	Only partially inspected during CAT. Reviewed hydrotest records.
				3/32" saw-cut in coupling
4C369PRH459 Sh. 04, Rev. 6	4, 12	1, 2	-	Masking tape on pipe. Uncapped opening
5D369PEW329 Sh. 01, Rev. 1	4, 6, 10	3	2	Broken temperature probe.
5D369PEW329 Sh. 03, Rev. 1	4, 6, 10	3	4	Valve reversed and handle blocked (NCR SP-03148)

TABLE III-1 - (Continued)

PIPING INSPECTION SAMPLE AND OBSERVATIONS

Isometric (Note 1)	Diameter (Inches)	Class	Notes	Observations
5D369PEW329 SH. 04, Rev. 1	4, 10	3	-	Clearance to support
				Wood blocking
5D369PEW329 SH. 06, Rev. 1	4, 6, 10	3	-	None
5F369PFC530 SH. 04, Rev. 4	4, 10, 20	3	-	None
5M369PCC207 Sh. 10, Rev. 4	14, 20	3	3	No gaskets on temporary flange assembly (poor construction practice)

Notes

1. Letter in second position of isometric drawing number identifies pipe location.

   C = RCB
   M = MEAB
   Y = Yard (Essential Cooling Water Intake Building)
   D = DGB
   F = FHB

2. This isometric had been walked-down in accordance with Ebasco QCP-10.14, and turned over to HL&P Startup for flushing and hydro-testing.

3. All isometrics are Unit 1 except 5M369PCC207

4. HL&P and Ebasco discrepancy reports are a result of NRC CAT observations and are shown in parentheses ( ).

TABLE III-2

PIPE SUPPORT/RESTRAINT INSPECTION SAMPLE

Support/Restraint Number	Type	(Inches)	Location (1)	ASME Class
RH-9215-HL5004 (2)	Strut	8	C	2
SI-9105-RR0031 (2)	Strut	8	C	2
CC-9105-HL5007 (2)	Strut	16	C	3
SI-9106-HL5009 (2)	Box	6	C	2
SI-9105-RR0038 (2)	Box	8	C	2
RH-9206-HL5006 (2)	Strut	8	C	2
RH-9102-SH0001 (2)	Spring	12	C	2
CC-9426-SH0001	Spring	12	FHB	3
SI-9102-RH0007	Strut	8	FHB	2
CC-9427-HL5005	Strut	12	FHB	3
CC-9427-HL5004	Strut	12	FHB	3
EW-9406-HL5001 (3)	Strap	3	EWPH	3
SI-9102-HL5001	Strut	8	FHB	2
EW-9113-HS5001 (3)	Anchor	2	MAB	3
EW-9383-HL5001 (3)	Box	10	MAB	3
EW-9283-HL5001	Box	10	MAB	3
SI-9117-RR0004	Strut	3	MAB	2
SI-9118-HL5009 (3)	Strap	6	MAB	2
EW-9102-HL5001	Strut	30	MAB	3
EW-9205-HL5008	Strut	4	MAB	3
EW-9102-HL5003 (3)	Strut	30	MAB	3
EW-9202-HL5001	Strut	30	MAB	3
RH-9205-HL5011	Box	8	MAB	2
RH-9205-HL5001	Box	8	MAB	2
SI-9118-RH0011	Strap	6	MAB	2

TABLE III-2 - (Continued)

PIPE SUPPORT/RESTRAINT INSPECTION SAMPLE

Support/Restraint Number	Type	(Inches)	Location (1)	ASME Class
RH-9205-HL5009	Box	8	MAB	2
CH-9203-HL5004 (2)	Box	6	EAB	3
SI-9337-HF5005 (2)	U-Bolt	2	FHB	2
CV-9032-H15015 (2)	Box	4	MAB	3
CC-9413-GU1004 Unit 2	Strap	4	MAB	3
CC-9413-HL5002 Unit 2	Strap	4	MAB	3
SI-9201-HL5009	Strut	12	FHB	2

NOTES:

(1) C = Containment Bldg.
FHB = Fuel Handling Bldg.
EWPH = Essential Service Water Pump House
MAB = Mechanical Auxiliary Bldg.
EAB = Electrical Auxiliary Bldg.

(2) Through licensee reinspection program

(3) Document package reviewed

TABLE III-3

PIPE SUPPORT/RESTRAINT INSPECTION OBSERVATIONS

Support/Restraint	Observations (1)
SI-9105-RR031	Strut angularity exceeds tolerance by 4 degrees (NCR CS-3181)
SI-9106-HL5009	Minimal clearance between pipe attachment and support structure in unrestrained direction (NCR CS-03314)
SI-9105-RR0038	Undersize skewed fillet welds (NCR CS-00875)
RH-9102-SH001	1/2 inch clearance to adjacent support
EW-9406-HL5001	Temporary support attached
SI-9118-HL5009	Undersize U-strap installed (NCS CS-3189)
EW-9102-HL5003	Three expansion anchors with less than specified embedment (NCR CS-3182)
EW-9202-HL5001	Oversized plate installed but not properly documented/evaluated. (NCR SS-3227)
CC-9413-HL5002 (Unit 2)	Missing flare bevel fillet cap weld (NCR CS-03263)
SI-9201-HL5009	Brace angle exceeds design tolerance (NCR CS-03228)

NOTE:

(1) Ebasco NCR issued as a result of the NRC CAT observation(s) shown in parentheses.

TABLE III-4

CONCRETE EXPANSION ANCHOR INSPECTION SAMPLE AND OBSERVATIONS

Support/Restraint	Number/Diameter (Inches) of Anchors Inspected	Observations
Pipe S/R's:		
CC-9318-HL5002	8 - 3/4	
CC-1317-HL5006	4 - 1/2	
CC-1317-RR13	4 - 3/4	
CC-1114-GU19	4 - 3/4	
CC-1317-HL5001	4 - 1 1/4	
CC-1428-HL5016	4 - 3/4	
CV-1006-HL5017	4 - 1	
CC-9422-HL5005	4 - 3/4	
CC-1414-HL5010	4 - 3/4	*(One CEA)
CC-1424-HL5004	4 - 3/4	
CC-1301-HL5002	8 - 1	
EW-1329-HL5001	4 - 1/2	Embedment violation on one CEA: 3 3/16 actual vs. 3 1/2 required (NCR SS-03264)
HVAC S/R's:		
1-6-0144-S012	4 - 3/4	
1-6-0144-S016	12 - 1/2	*(Four CEA's)
1-6-0144-S046	3 - 5/8	*(One CEA)
1-6-0144-S017	12 - 1/2	*(Four CEA's)
1-6-0144-S019	16 - 1/2	*(Eight CEA's)
1-6-0144-S037	4 - 3/4	
1-6-065-S045	4 - 1/2, 4 - 1 1/4	

TABLE III-4 - (Continued)

CONCRETE EXPANSION ANCHOR INSPECTION SAMPLE AND OBSERVATIONS

Support/Restraint	Number/Diameter (Inches) of Anchors Inspected	Observations
HVAC S/Rs:		
1-6-0065-S025	4 - 5/8	
1-6-0065-S075	4 - 3/4, 3 - 1	
1-6-065-S008	2 - 3/4, 2 - 1	*(One CEA)
1-6-0144-S083	6 - 1 1/4	
1-6-0128-S083	8 - 1/2, 4 - 1 1/4	*(Two CEA's)
1-6-0128-S002	2 - 3/4	
1-6-0128-S058	4 - 3/4	*(Two CEA's)

*Nut turned at or below torque value but minimum installation torque achieved in less than 1 full additional turn of the nut.

TABLE III-5

MECHANICAL EQUIPMENT SAMPLE AND OBSERVATIONS

Equipment (All Unit 1)	Observations
Reactor Water Makeup Tank	Alteration to tank foundation configuration without proper documentation/control.
Containment Spray Pump B Low Head Safety Injecton Pump B High Head Safety Injection Pump B	1. Incorrect/indeterminant fastener material. 2. O-ring reused when technical manual specified replacement. 3. Fasteners not controlled.
RHR Pumps A and C	Torquing of foundation bolts not completed prior to leveling and setup of critical support framing.
Charging Pump Supply Cooler-3V101VAH010	One mounting pad not shimmed as required and damage to flange of foundation beam. (NCR CM-03087).
EAB Return Air Fan-3V111VFN002	1. Gusset plate welded to edge of embed exceeding tolerance. 2. Undersize attachment weld. 3. Missing welds on 4 gusset plates. 4. Damage frame member on fan. 5. Notches in bracing not shown on drawing. 6. Bolt hole locations in brace gusset plates not per drawing. (NCR CM-3092)
Control Room Return Fan - 3V111VFN026	None
MEAB HVAC Chiller - 3V111VCH001	None
Charging Pump Supply Cooler - 3V101VAH004	1. North end of attachment welds 1/16 to 1/8 inch undersize entire length. 2. Attachment welds to edge of embed plate violates drawing requirement. 3. Two maxibolts to cored holes in concrete violate minimum spacing requirements. (12 1/2 inch required, 5 inch actual) 4. Nut is tight on foundation stud but is 1/4 inch from mating with contact surface. (NCR CM-03091)
Fuel Handling Building Filter Train-3V121VXV003	1. Undersize unit to embed fillet welds. 2. Expansion anchors violate minimum spacing to cored holes. 3. Expansion anchors do not have required embedment.

NOTE: Ebasco NCR's generated as a result of the NRC CAT observation(s) shown in parenthesis.

TABLE III-6

HVAC INSPECTION SAMPLES AND OBSERVATIONS

(Supports/Restraints)

Support Number	Duct Size In.	Unit	Building[1]	FCR Review	Inspection Traveler Reviewed	Observation
1-1-0083-S014	8 dia.	1	RCB	None	Yes	None
1-1-0083-S039	16 dia.	1	RCB	BH-00827	Yes	None
1-1-0083-S040	16 dia.	1	RCB	CH-01546	Yes	None
1-1-0083-S046	8 dia.	1	RCB	BH-00559	Yes	None
1-1-0083-S048	16 dia.	1	RCB	CH-00845	Yes	None
1-1-0083-S049	16 dia.	1	RCB	None	Yes	None
1-1-0087-S-004	14x10	1	RCB	CH-01800	Yes	None
1-6-0143-S016	30x72	1	EAB	DL-00152W	Yes	None
1-6-0144-S017	12x12	1	EAB	CH-02181W	Yes	None
1-6-0144-S019	12x12	1	EAB	EAB-314	Yes	None
2-6-0050-S033	14x16	2	EAB	None	Yes	Document discrepancies on content sheet of construction traveler.
2-6-0051-S007	24x20	2	EAB	None	Yes	Document discrepancies on content sheet of construction traveler.

TABLE III-6 (Continued)

HVAC INSPECTION SAMPLES AND OBSERVATIONS

(Supports/Restraints)

Support Number	Duct Size In.	Unit	Building[1]	FCR Review	Inspection Traveler Reviewed	Observation
2-6-0124-S003	20x18	2	EAB	None	Yes	Document discrepancies on content sheet of construction traveler.
2-6-0124-S066	22x22	2	EAB	None	Yes	Document discrepancies on content sheet of construction traveler.
2-6-0125-S005	20x18	2	EAB	BH-01844	Yes	Document discrepancies on cover sheet of construction traveler.

[1]RCB = Reactor Containment Building
EAB = Electrical Auxiliary Building

TABLE III-6 (Continued)

HVAC INSPECTION SAMPLES AND OBSERVATIONS

(HVAC Sections)

Drawing Number & Duct Sections	Unit	Building[1]	FCR Reviewed	Inspection Traveler Reviewed	Observations
5-V-14-1-V-0083-A-1D Rev. 5 HVAC Section Nos. P-005 thru P-019	1	RCB	None	None	None
5-V-14-1-V-0083-B-1D Rev. 5 HVAC Section Nos. P-101 thru P-114	1	RCB	None	None	None
5-V-11-1V-0144-A-1D Rev. 0 HVAC Section Nos. P-011 thru P-025, P-027, P-028	1	EAB	BH-01142	Yes (P-011, 012, 015, 016, 021, and P-025)	None

[1]RCB = Reactor Containment Building
EAB = Electrical Auxiliary Building

TABLE III-6 (Continued)

HVAC INSPECTION SAMPLES AND OBSERVATIONS

(Fire Dampers)

Drawing Number	Fire Damper Number	Unit	Building[1]	FCR Reviewed	Inspection Traveler Reviewed	Observations
5-V-11-1-V-065-A-ID, Rev. 4	FF-01	1	EAB	None	No	None
	FF-04	1	EAB	None	No	None
5-V-11-1-V-0128-A-ID Rev. 3	FF-319	1	EAB	None	Yes	None
	FF-320	1	EAB	None	Yes	None
	FF-321	1	EAB	None	Yes	None

[1]RCB = Reactor Containment Building
EAB = Electrical Auxiliary Building

IV. WELDING AND NONDESTRUCTIVE EXAMINATION

A. Objective

The objective of the appraisal of welding and nondestructive examination (NDE) was to determine if Quality Control accepted work related to welding and NDE activities was controlled and performed in accordance with design requirements, Safety Analysis Report commitments, and applicable codes and specifications.

An additional objective was to determine if personnel involved in welding and NDE activities were trained and qualified in accordance with established performance standards and applicable code requirements.

B. Discussion

To accomplish the above objectives; welds and welding details for piping; pipe supports/retraints; field and shop fabricated tanks; structural steel installations; heating, ventilating and air conditioning (HVAC) installations; electrical supports; and instrumentation control tubing and supports were inspected. The inspected welds were selected to provide a representative sample of the applicant's contractor welding activities in terms of welding processes used, materials welded and existing weld-joint configurations. Considerations such as physical location, difficulty of welding and limited accessibility were also used in sample selection. Design changes related to welding such as increase or decrease of weld sizes and a change from one welding process or procedure to another welding process or procedure were also reviewed for technical adequacy and implementation.

NDE activities were appraised through the review of radiographs for both field and vendor fabricated welds, the review of NDE procedures and personnel qualifications, the inspection of the calibration status of NDE equipment and the witnessing of in-process NDE activities. The NRC construction assessment team (CAT) inspectors reviewed a sample of radiographic film in final storage in the vault of the licensee's facility. In addition, a sample of NDE documentation was requested for review which was stored by the Nuclear Steam System Supplier, Westinghouse and was not yet transmitted to the licensee.

During the inspection of structural welds in the pipe supports area, the NRC Construction Appraisal Team (CAT) identified welds which did not meet the weld size requirements specified by the Architect Engineer, Bechtel Power Corporation (Bechtel). Undersized socket welds were also identified in 2 inch schedule 160 piping spools. Some undersized weld reinforcements were also found in nozzle to shell joints (ASME Code Category D Joints) on tanks and heat exchangers. A detailed discussion concerning these welds is included later in this section.

In the area of NDE, the NRC CAT inspectors reviewed film for field and shop fabricated pipe welds, film involving equipment and hardware supplied under the Westinghouse (NSSS) scope of supply and film supplied by various vendors and contractors for the balance of plant.

A relatively small number of deficiencies were found in the reviewed sample of radiographs. However, in the area of NDE documentation, with the exception of the Westinghouse file, the team encountered difficulties in establishing the number of NDE vendors and suppliers.

The inspectors also observed that in general the project has difficulties in identifying existence and location of film and documentation related to the balance of plant suppliers. For equipment and hardware supplied under the NSSS scope of supply the licensee has instituted a program in which, Westinghouse is required, to submit monthly reports identifying the current status of film and NDE documentation. The program was instituted in May 1985 after the project identified missing radiographs of the reactor head supplied by Combustion Engineering. The NRC CAT believes that some similar program is needed for the balance of plant suppliers, to insure film and documentation could be readily identified. A detailed discussion concerning NDE deficiencies, retrievability and availability of film and documentation is provided later in this section.

The welding and NDE activities were examined in order to ascertain compliance with the governing construction codes and specifications. This effort involved the review and inspection of the following contractors:

Field Activities

1. Bechtel Power Corporation: architect engineer.

2. Ebasco Services Inc.: piping installation and piping supports/ restraints, fire protection system fabrication and installation, electrical, instrumentation, HVAC installation and structural steel erection.

3. Pittsburgh Des Moines Corp. (PDM): containment liner and containment penetration fabrication and installation, reactor and spent fuel liner fabrication.

4. Westinghouse: reactor internals modification and installation.

5. Babcock and Wilcox: Steam Generator Eddy current preservice inspection and examination.

Shop Fabrication

1. Southwest Fabricating & Welding Company, Inc.: shop fabricated piping spools.

2. Copes-Vulcan: valve manufacturer.

3. Westinghouse: nuclear steam supply system.

4. Anchor/Darling Valve Company: valve manufacturer.

5. Teledyne Brown: steam generator supports fabricator.

6. Esco Corporation: material supplier.

7. Sandansky F&M Company: material supplier.

8. Brown Minneapolis Tank Manufacturers: tank fabricator.

9. RECO industries: tank fabricators.

10. Fisher Controls: valve manufacturer.

11. Joseph Oat Corporation: heat exchanger manufacturer.

12. TRW Mission Manufacturing Co.: material supplier.

13. Richmond Engineering: tank fabricators.

14. Pacific Pumps: pump manufacturer.

15. Pacific Valve: valve manufacturer.

16. Master Craftsman Inc.: heat exchangers suppliers.

17. Pall Trinity Micro Corporation: cartridge filters supplier.

18. Lamco Industries: tank fabricators.

19. Quaker Ally Casting Co.: castings supplier.

20. Wollaston Alloys: material supplier.

21. McJunkih Corporation: material suppliers.

22. Combustion Engineering: reactor vessel fabricator.

23. Sabine Steel: tank fabricators.

24. GW Energy Product Corp.: tank fabricators.

25. Atlas Industrial manufacturing: heat exchangers manufacturer.

26. Struthers Wells Inc.: heat exchanger manufacturer.

27. PDM - tank fabricators.

The results of the inspection activities involving each of these areas and contractors are documented as follows:

1. Pipe and Pipe Support Fabrication

a. Inspection Scope

(1) Welding Activities

The NRC CAT inspectors reviewed activities relating to fabrication contracts in the areas of piping system welds, support/restraint welds, welding procedures, welder qualifications, NDE procedures, personnel qualifications, and the review of radiographic film for shop and field fabricated welds. Field welding involving pipe fabrication was performed by Ebasco. Southwest Fabricating and Welding supplied the shop fabricated piping spools.

The NRC CAT inspected 41 pipe supports/restraints involving approximately 450 welds to verify conformance of welding to drawing requirements, and to confirm the visual acceptability of welds. Thirty-four of the pipe supports had been inspected by QC inspectors, 4 supports were "in process" and were not yet inspected by QC, and 3 supports were identified as Class 7 supports which does not require QC inspection except on a random basis. The "in process" and Class 7 pipe supports were inspected in order to verify the initial quality of work performed by craft personnel. See Table IV-1 for a listing of supports subjected to detailed inspection. Additionally, another 14 supports/restraints involving 150 welds were visually inspected to verify the quality of the completed welds. See Table IV-2 for a listing of supports inspected. The NRC CAT inspectors also inspected the welds on the upper and lower lateral supports for two steam generators. The steam generator supports were fabricated by Teledyne Brown. Three sets of Bechtel calculations for the design of skewed welded supports were also reviewed for adequacy.

The NRC CAT inspection of piping welds consisted of visual inspection during walkdown of piping systems and inspection of pipe welds located near the supports restraints being inspected. Approximately 62 piping spools involving 1200 American Society of Mechanical Engineers (ASME) Class 1, 2 and 3 welds were inspected. Four of those piping spools were subjected to detailed inspection which included the review of pertinent QC documentation while the remaining 58 spools were only visually inspected. Both field and shop welds were inspected in order to assure compliance with the requirements of the ASME Code. See Tables IV-3 and IV-4 for listings of piping spools inspected. In addition, 60 welding filler metal test reports, 27 welder qualification test records and 6 welding procedures were reviewed for compliance with applicable specifications, procedures and the ASME Code requirements.

(2) Nondestructive Examination Activities

The NRC CAT inspection of NDE activities in the pipe fabrication area included the review of 46 shop and 145 field fabricated welds which involved 1,905 film. The field welds were fabricated by Brown and Root (BR) and Ebasco and the shop fabricated pipe spools were supplied by Southwest Fabricating and Welding. In addition, 6 NDE procedures and 4 NDE personnel qualification records were reviewed in order to verify compliance with the governing codes and specifications. Three NDE technicians were observed while performing in-process inspections and were evaluated for their ability to follow the applicable inspection procedures. Twenty pieces of NDE equipment were inspected for calibration and one NDE procedure was reviewed for adequacy.

b. Inspection Findings

(1) In general, the inspected pipe and pipe supports/restraints welding activities were found to comply with governing codes and specifications. However, discrepancies were identified involving undersized welds in pipe supports/restraints.

Specifically, eight QC accepted skewed welds were found to be undersized and two other skewed welds were located on the acute side of the joint instead of the obtuse side as required on the drawing. Ten nonskewed welds were also found to be undersized with respect to the specified acceptance criteria. As a result of these findings the licensee issued nonconformance reports and the deficient welds will be reviewed and evaluated by Bechtel.

In the area of "in-process" and class 7 pipe supports inspections, the NRC CAT inspectors also identified welds which did not conformed to the specified acceptance criteria. Twelve "in-process" welds were found to be undersized and two gusset plates were missing in one of the inspected supports. 10 of the inspected welds in class 7 supports were also found to be undersized. As a result of this finding Ebasco and HL&P indicated that they will conduct additional training for both craft and inspection personnel.

One of the three sets of calculations reviewed for the design of supports having skewed joints did not have any calculations for the welds in the skewed connections. The calculations also did not provide compensation for the loss of weld throat thickness in skewed welds.

The lack of calculations for skewed joints had been previously identified on a number of supports during a third party design assessment performed in March and April 1985. The project has committed to review the design calculation and such review was underway during the time of the NRC CAT inspection.

Undersized reinforcing fillets on groove welds and undersize fillet welds were found on the upper and lower steam generator lateral supports. NRC CS-03201 was written against this finding. Ebasco performed additional inspection consisting of mapping out the undersized conditions, which were evaluated and accepted by Bechtel without rework.

During the inspection of pipe welds the NRC CAT inspectors identified undersized socket welds in 2 inch schedule 160 pipe spools. As a result of this finding the licensee issued NCR CP-03139. A Standard Deficiency Report (SDR E-349) was issued to determine the extent of the undersize condition in other small-bore socket welds, and a Deficiency Evaluation Report (DER 85-049) was issued to evaluate the reportability of the condition. Results of the reinspection conducted by Ebasco QC indicated that the undersized condition is limited to 2 inch Sch. 160 socket welds fabricated in the field (not the site fabrication shop). Of the approximately 200 QC accepted field welds of this type, at least 15 percent were reported to be undersize. No undersized socket welds were found in other pipe schedules and sizes by the NRC CAT inspectors or the Ebasco reinspection effort.

The NRC CAT inspectors also visually inspected 55 socket welds for proper fitup and gap. In addition, 7 socket welds were radiographed to determine that the required gap exist between the pipe and the fitting. No discrepancies were identified during the visual and RT inspections. Two of the 100 inspected "weld-o-let" pipe branch connections were found to have inadequate weld sizes. NCR HP-3238 and NCR HP-03164 were written to document this condition.

During the review of Welding Procedure Specifications, one of the supporting qualification records for WP-89 was found to violate ASME Code requirements regarding the size of tensile specimens which were in effect at the time the qualification tests were performed. Ebasco Welding Engineering performed a review of the applicable qualification record against current code requirements, which had deleted the tensile specimen restriction, and it was found acceptable.

During review of the Material Test Reports for welding filler metal, it was observed that the purchasing specifications and test reports did not specifically address the requirements of ASME Section III regarding the cooling rate of post weld heat treatment to be followed during welding of the test coupons. Bechtel agreed to add the cooling rate requirements to the purchasing specification, as well as the specific tensile strength requirements for material tested in the heat treated condition. Based on review of 60 welding filler metal test reports, this discrepancy has no consequence on hardware.

(2) Nondestructive Examination Activities

In general, the inspected NDE activities were found to comply with the applicable codes and specifications. No deficiencies were identified with the inspected shop fabricated pipe welds. However, during the review of the radiographic film for field fabricated welds some deficiencies were identified which involved the following four welds:

- Weld EW 1202 - FW 0027 was found to have low weld thickness.
- Weld EW 1205 - FW 14 had a linear indication adjacent to a repair area.
- Weld EW 2205 - FW 0009 had a penetrameter shim extending into the area of interest; one repair view indicated that the complete area repaired had not been covered; and one view exhibited porosity with a crack extending from it. NCR #BP-03221 was written to document this deficiency.
- During the review of circumferential weld C52007 - FW006 the adjacent area of the logitudinal weld seam showed a crack like indication in the seam. The licensee indicated that the crack like indication may be caused by microbiological induced corrosion (MIC) attack which has taken place during the storage of the pipe. The licensee committed to investigate further the cause and nature of this indication.

It should be noted that weld EW1202 - FW0027 and weld EW1205 - FW14 identified above have been reviewed during HP&L audit #M11-301 of the radiographic activities prior to the NRC CAT inspection.

The HP&L audit did not identify any deficiencies with those two welds which indicates that the audits were not effective. See Section VIII of this report for additional details concerning project audits and corrective actions.

c. Conclusion

(1) Welding Activities

In general, the inspected welding activities were found to comply with the requirements of the applicable codes and specifications. However, the NRC CAT found structural welds on pipe supports/restraints which did not meet the weld specifications. Skewed connections did not meet drawing requirements for size and location and some were not supported by calculations. In addition, undersized socket welds were found in 2 inch schedule 160 piping spools.

(2) Nondestructive Examination

In general, the inspected NDE activities were found to comply with the requirements of the governing codes and specifications. However, the NRC CAT found some welds which had linear indications and another weld which had low weld thickness. In addition, the reviewed NDE audits were found to be ineffective.

2. Reactor Internals Modification and Installation

a. Inspection Scope

Approximately 30 tack welds on the bottom mounted Instrumentation (BMI) locking caps were visually inspected. The documentation packages for the welds on the Core Barrel Assembly and tie plates for the lower internals were reviewed. The documentation package for the welds on the Energy Absorber Installation was also reviewed. In addition, one welding procedure and the qualification test records for two welders were also reviewed for adequacy. The modification work was performed by Westinghouse.

b. Inspection Findings and Conclusions

No problems were identified in the area of inspected welding activities. Activities were found to meet the specified acceptance criteria.

3. Preservice Inspection (PSI)

a. Inspection Scope

Approximately 30 steam generator tubes requiring preservice and inservice inspections were witnessed while performing Eddy current inspections in order to verify compliance with the requirements of Section XI of the ASME Code. In addition, the qualification test records for four Eddy current technicians were reviewed and 2 technicians were observed while performing Eddy current inspections. The NDE procedure and 10 data records were reviewed for adequacy.

b. Inspection findings and Conclusions

No problems were identified in the inspected preservice inspection activities. Activities were found to comply with the requirements of the governing codes and specifications.

4. Electrical Installation and Electrical Supports

a. Inspection Scope

The NRC CAT inspected approximately 110 welds in the area of electrical installation. This involved the inspection of welds on 6 cable tray supports, 2 junction box supports, 9 conduit supports and the installation welds for 3 electrical panels. Two welding procedures and the qualification test records for five welders were reviewed. In addition, the personnel qualification test records for

four welding inspectors were also reviewed and two inspectors were observed and evaluated for their ability to follow the visual inspection procedures. The welding activities in the electrical area were performed by EBASCO.

b. Inspection Findings

During the inspection of Electrical supports 1-016-H99 and 1-016-H100 it was established that those supports were QC accepted for integrity and tightness of technical connections on September 15, 1984. Since that date, two bolted connections on support H-100 have been changed to welded connections without obtaining the required Modification/Removal Form prior to installation of the welded connections. As a result of this finding a Quality Control Notification of Procedural Violation #C-8 was generated and the connections will be inspected by QC to determine the acceptability of the welded connections.

c. Conclusions

No major problems were identified in the area of inspected welding activities. With the exception of the uncontrolled modification discrepancies, all inspected activities were found to comply with the applicable construction codes and specifications.

5. Instrumentation Tubing Installation and Instrumentation Supports

a. Inspection Scope

Approximately 80 welds involving 10 instrumentation supports were visually inspected to ascertain compliance with the specified acceptance criteria. Two welding procedures and qualification test records for four welders were reviewed. The qualification records for five NDE inspectors were also reviewed. Two visual welding inspectors were observed and evaluated for their ability to follow the applicable inspection procedures. The radiographs for one instrumentation tubing weld was also reviewed for adequacy. The welding in the instrumentation area was performed by Ebasco.

b. Inspection Findings

During the review of documentation of instrument stand EWR #A03134 it was discovered that the stand has been fabricated and installed without the welds being inspected as required by QC procedure QCP-95 paragraph 5.2.1. As a result of this finding the licensee issued NCR C503004. The paint was removed from the welded areas and the welds were inspected as required by the inspection procedures and no other problems were noted.

During the inspection of supports for instrument #N2ED-FT-7822A it was noted that a double type globe strut (G5812A strut) was used instead of the required single type globe strut. As a result of this finding Ebasco generated Deficiency Report (DR) I-0021 and all

double type globe strut (G-5812-A) will be removed. The construction personnel was instructed in the correct use of the G-5812-A strut.

c. Conclusions

No major problems were identified in the area of inspected welding activities. With the exception of the globe strut installation discrepancies, all inspected activities were found to comply with the applicable construction codes and specifications.

6. Heating, Ventilating and Air Conditioning Installation and Supports

a. Inspection Scope

Approximately 120 welds involving 16 supports were inspected for compliance with the specified acceptance criteria. Two welding procedures and the qualification test records for five welders were reviewed. In addition, four personnel qualification test records were also reviewed and two welding inspectors were observed and evaluated for their ability to follow the visual inspection procedures. The welds on four duct pieces, two air blowers and two dampers were also included in this inspection. The welding in the HVAC area was performed by Ebasco.

b. Inspection Findings and Conclusions

No problems were identified in the area of inspected welding activities. Activities were found to comply with the applicable construction codes and specifications.

7. Structural Steel Fabrication, Erection and Modification

a. Inspection Scope

Approximately 120 welds comprising 70 field and 50 shop welds involving 16 structural beams and columns were visually inspected in order to ascertain compliance with the specified acceptance criteria.

Two welding procedures and the qualification test records for five welders were reviewed. Visual inspection procedures and the qualification records for four inspectors were also reviewed. Four welding inspectors were observed and evaluated for their ability to follow the visual inspection procedures. The structural steel field welding was performed by Ebasco. American Bridge Steel Company supplied the structural steel to the project.

b. Inspection Findings

No problems were identified in the area of inspected field welding activities. However, several original welds involving clip to beam web connection welds were found to be deficient. Specifically, the design drawings required fillet welds all around, while the connec-

tion was seal welded on the top and bottom of the clip. As a result of this finding the licensee issued NCR #HC-03182, HC03183 and HC-03184. The welded connections were evaluated by Architect Engineer, accepted "as is" and determined to be adequate for the intended application.

c. Conclusions

In general, the inspected welding activities were found to comply with the governing Code and Specifications. With the exception of the deficient undersized clip to web welds, which required engineering evaluation, the inspected welding activities were found to comply with the specified requirements.

8. Refueling Cavity and Spent fuel pool Liner Fabrication

a. Inspection Scope

The NRC CAT visually inspected approximately 80 feet of welded seam on the spent fuel pool and the Reactor Pool Liner. The attachment welds for four brackets and the welds on two embedment plates were also inspected in order to ascertain compliance with the specified acceptance criteria. One welding procedure was also reviewed for adequacy. In the area of NDE, the NRC CAT reviewed the NDE documentation for the required vacuum box testing of the inspected welds. The Refueling Cavity and spent fuel pool Liner fabrication was performed by PDM.

b. Inspection and Findings and Conclusion

No problems were identified in the areas of inspected welding and NDE activities. Activities were found to comply with the applicable construction codes and specifications.

9. Containment Liner and Containment Penetration Installation

a. Inspection Scope

The NRC CAT visually inspected approximately 60 feet of liner seam, the welds on two incert plates, four welded plugs, the welds on one construction opening, and the attachment welds for two mechanical and two electrical penetrations. Two welding procedures and the qualification test records for four welders were also reviewed. In the area of NDE, the NRC CAT reviewed the radiographs for 41 welded seams which involved 674 films. One radiographic examination procedure was also reviewed as a part of this inspection. The containment liner and penetrations were installed by PDM.

b. Inspection Findings and Conclusions

No problems were identified in the area of inspected welding and NDE activities. Activities were found to comply with the requirements of the governing codes and specifications.

10. Vendors and Shop Fabricators Other Than Those Previously Addressed

a. Inspection Scope

The NRC CAT visually inspected nine vendor supplied tanks and heat exchangers. See Table IV-5 for inspected vendor supplied equipment. In addition to the welds inspected and listed in Table IV-5, the NRC CAT inspectors reviewed radiographs related to work performed by 25 vendors which have supplied various equipment and hardware to the South Texas Power Station project. A total of 2,271 feet of welded seam involving 3,168 radiographs and 20 welds involving 145 film were reviewed. The radiographs for 74 valves, pumps and castings involving 1,170 film, and the radiographs for 105 spot welds involving 105 film were also reviewed for compliance with the governing codes and specifications.

b. Inspection Findings

During the inspection of tanks and heat exchanges supplied by the vendors listed in Table IV-5, the NRC CAT found that the size of the nozzle and manway weld reinforcement did not meet the requirements stated in the vendor drawings. In addition, the welds on some of the inspected supports were also found to be undersized. A total of seven tanks and heat exchangers were found to deviate from the required drawing sizes. See Table IV-5 for details. The NRC has issued Information Notice 85-33 on the subject of undersized weld reinforcement in ASME Code nozzle to shell joints. The project has not performed any inspection of tanks and heat exchangers prior to the NRC CAT inspection, indicating the licensee may not have performed an adequate review of the content of this notice for applicability to the South Texas site.

In the area of NDE the NRC CAT inspectors identified disorganized reports, linear indications and yellow film in radiographs and NDE documentation supplied by vendors. See Table IV-6 for details.

Prior to the NRC CAT inspection the NRC requested that the project provide a list of vendors which have supplied radiographs in conjunction with vendor supplied equipment and hardware. Such a list was still unavailable at the end of the first two weeks of the NRC CAT inspection.

At the beginning of the second two week period, film from several vendors picked at random was requested. This list included; Guyon Alloys, Rockwell, Lonergan, Target Rick, Valtek, Yarway, Clow, and Posi-Seal, among others. A computer search failed to locate any record of film for these vendors. Furthermore, there appears to be no way to readily determine whether film is required or not required for these purchase orders. If the film is required for any of these orders, there seems to be no convenient method to determine where the film is located, or even if it exists.

A document search for four of the above vendors was conducted using only one purchase order per vendor and the following results were obtained: Target Rock-P.O. 4050 included some 8 inch ASME III

valves which probably would require radiographs. Further search is necessary to determine this. Valteck-O.O. 4409 includes many valves requiring weld end radiographs. A search for these radiographs has been started by the applicant. Yarway-P.O. 6455 includes ASME III Valves which, if cast would require weld end radiographs. Clow-P.O.6452, as above, if the valves are castings, weld end radiographs probably would be required.

Early in the first week of the inspection the NRC CAT requested the radiographs for three Component Cooling Water (CCW) heat exchangers fabricated by Struthers Wells. In the third week another request was made for film based on P.O. No. 4018, FID NO. P0610 and PID NOS. 3R201NMX101A, 3S201NMZ101B and 3R201NMX101C. The computer found no film. Also no information could be obtained as to whether the film existed or where it could be found. A document search found that the film had been reviewed by the vendor, that verification of the review had been made, but no indication of a request for the film to be sent to the site was found.

During the last two weeks much effort was expended to come up with a computer program which would expedite retrieval of information concerning the radiography program. A program was developed that does improve accessibility of information concerning radiographs in the film storage vault. However, the ability to determine if a vendor should have performed radiography is still a tedious and time consuming task. After a brief scan of the vendor list the possibility that there could be in excess of 60 vendor purchase orders that may require radiography and for which there is no program for expeditious retrieval of this information.

It should be noted that the Code of Federal Regulation 10 CFR 50 Appendix B, Criterion VII requires that documentary evidence that the material and equipment conform to the procurement requirements be available at the site prior to installation or use of the material and equipment. The documentary evidence is to be retained at the site and shall be sufficient to identify the specific requirements, such as codes, standards or specifications met by the purchased material and equipment. Since the NDE requirements are specified by the ASME code, the NRC CAT team believes that the project should have instituted a program to identify location and existence of NDE film and documentation for the Balance of Plant vendors and suppliers.

The NRC CAT also reviewed NDE documentation and film which was under the Westinghouse scope of supply and in general the retrievability and availability of NDE documentation was found to be satisfactory. It should be noted that the project has instituted a program requiring Westinghouse to submit monthly reports concerning status and availability of NDE film and documentation. This program was instituted after missing radiographs were identified for the reactor vessel head. The NRC CAT inspectors believe that the project should have instituted the program to cover both, the Westinghouse suppliers and the balance of plant suppliers so that the existence and location NDE film and documentation could be promptly identified.

c. Conclusions

In general, the inspected welding and NDE activities were found to comply with the requirements for the governing codes and specifications. However, seven tanks and heat exchangers were found to deviate from the requirements stated in the applicable drawings and specifications. In the are of NDE, several radiographs and NDE documentation supplied by vendors were found to be deficient with respect to the required quality. In addition, difficulties were encountered in retrievability, availability and location of NDE film and documentation for the balance of plant suppliers which indicated that the licensee had performed inadequate corrective action after the discovery of missing radiographs for the reactor vessel head in May 1985.

The difficulties encountered in retrievability, availability and location of NDE film and documentation pertaining to the Balance of Plant Scope of supplied equipment, indicates a need for a formal program to identify requirements, location and existence of NDE film and documentation.

TABLE IV-1

LIST OF SUPPORTS WHICH WERE INSPECTED AGAINST DRAWING REQUIREMENTS

SA-1756-HF5025 (1)	CC-1318-HL5002	CC-1403-HL5001
FW-10160-HL5001	CC-1402-RR3002	FW-1018HL5001 (4)
CC-1401-HL-5003	CS1001-RR0029 (2)	CC-1106-HL5016
CV-1209-RR002 (5)	FP-1560-GU0412	CV-1046-GU1001 (6)
CC-1106-HL5015	RH-1201-RR0004	CC-1504-RR0013
CC-1412-HL5001	FC1016-HL5001	EW-1285-HL5001
BA-1003-HF5005	CH-1203-HL5017	CS-1001-RR0012 (2)
EW-1383-HL5006	CS-1001-HL5007	CV-1088-RR0019
CC-1474-GU01	CV-1047-RR1004 (7)	CC-1317-HL5006 (3)
EW-1383-HL5007	CC-1480-RR0011 (8)	SI-1201-HL5015 (11)
SI-1301-HL5010 (9)	CC-1103-HL5003	SI-1201-HL5009 (10)
CC-1210-SS01 (12)	CC-1101-HL5001 (13)	CC-1209-HL5004
RH-1205-HL5002 (14)	CC-1210-HL5001	CC-13-3-HL5003 (15)
SI105-RR0038 (16)	CV-1046-RR1002	

(1) 7 of 14 fillet welds undersized. Class 7 item. Item still "in-process".

(2) Two undersized skewed fillet welds and two undersized fillet welds. Item still "in-process".

(3) Fillet weld from spring can to base plate undersized. NCR-CS-3215.

(4) Two fillets undersized. NCR-CS-03205. Item still "in-process".

(5) Seven fillet welds undersized. NCR-CS-03198.

(6) One undersized fillet. Class 7. Engineering accepted "as-is" during audit.

(7) Two fillet welds undersized. Class 7. NCR-CP-03147.

(8) Three of four skewed fillet welds undersized. NCR-CS-03200.

(9) One skewed fillet welds undersized. NCR-CS-03199.

(10) Two skewed welds specified as groove welds were actually seal welds. NCR-CS-00840.

(11) Four skewed fillet welds undersized, two gusset plates missing. Item still "in-process".

(12) W8X31 section bent through the web. NCR-CS-03197.

(13) Two undersized fillets. Item still "in-process".

(14) Two welds located on the accute side of a skewed joint instead of the obtuse side as specified on the drawing. NCR-CS-03169.

(15) One skewed fillet weld undersized on throat. Two fillet welds undersized. NCR-CS-03201.

(16) One skewed fillet weld undersized. NCR-CS-00875.

TABLE IV-2

SUPPORTS WHICH WERE VISUALLY INSPECTED

DW-1501-HF5005	DW-1501-HF5006	DW-1501-HF5004
SI-2205-HL5020	CC-2317-RR0012	CC-2115-RR0006
CC-2115-RR0005	CV-2088-HL-5006	CV-2086-HL5010
CC-2209-RH0009	CC-2209-RH008	CC-2109-RR0009
CC-2109-RR0008	CV-1214-HL5002	

TABLE IV-3

LIST OF PIPING WHICH WAS VISUALLY INSPECTED

ITEM	DESCRIPTION	PIPE SIZE (IN.)	MATERIAL
CC-2116	Component Cooling	10	Carbon Steel
CC-2114	Component Cooling	10	Carbon Steel
CC-2117	Component Cooling	14	Carbon Steel
CC-2317	Component Cooling	10	Carbon Steel
CC-2115	Component Cooling	10	Carbon Steel
BA-2001	Breathing Air	2	Stainless Steel
CV-2086	Chemical/Volume Control	4	Stainless Steel
CV-2088	Chemical/Volume Control	4	Stainless Steel
CV-2006	Chemical/Volume Control	4	Stainless Steel
CV-2092	Chemical/Volume Control	4	Stainless Steel
CC-2109	Component Cooling	12, 24	Carbon Steel
CC-2209	Component Cooling	30	Carbon Steel
CC-2410	Component Cooling	12	Carbon Steel
CC-2110	Component Cooling	24	Carbon Steel
CC-2109	Component Cooling	20	Carbon Steel
EW-2202	Essential Service Water	30	Aluminum Bronze
CV-1111	Chemical/Volume Control	2	Stainless Steel
CV-1112	Chemical/Volume Control	2	Stainless Steel
CV-1209	Chemical/Volume Control	2	Stainless Steel
CV-1106	Chemical/Volume Control	2	Stainless Steel
CV-1205	Chemical/Volume Control	2	Stainless Steel
CC-1515	Component Cooling	2	Carbon Steel
CC-1479	Component Cooling	2	Carbon Steel
CC-1401	Component Cooling	3	Carbon Steel
CC-1402	Component Cooling	3	Carbon Steel
CC-1403	Component Cooling	3	Carbon Steel
SA-1756	Station Air	1	Carbon Steel
FP-1506	Fire Protection	4	Carbon Steel
CC-1106	Component Cooling	16	Carbon Steel
FC-1016	Fuel Pool Cooling	10	Stainless Steel
CC-1504	Component Cooling	6	Carbon Steel
CS-1002	Containment Spray	8	Stainless Steel
CC-1417	Component Cooling	14	Carbon Steel
FW-1016	Feedwater	18	Carbon Steel
FW-1018	Feedwater	18	Carbon Steel
RH-1201	Residual Heat Removal	12	Stainless Steel
CC-1474	Component Cooling	6	Carbon Steel
CC-1318	Component Cooling	14	Carbon Steel
CS-1001	Containment Spray	8	Stainless Steel
EW-1285	Essential Service Water	30	Aluminum Bronze
EW-1383	Essential Service Water	30, 10	Aluminum Bronze
CV-1088	Chemical/Volume Control	4	Stainless Steel
CV-1047	Chemical/Volume Control	4	Stainless Steel
CC-1480	Component Cooling	8	Carbon Steel
CC-1103	Component Cooling	16	Carbon Steel
CC-1201	Component Cooling	24	Carbon Steel
SI-1201	Safety Injection	12, 16	Stainless Steel
SI-1301	Safety Injection	12	Stainless Steel
CC-1412	Component Cooling	4	Carbon Steel

TABLE IV-3 - (Continued)

LIST OF PIPING WHICH WAS VISUALLY INSPECTED

ITEM	DESCRIPTION	PIPE SIZE (IN.)	MATERIAL
CC-1209	Component Cooling	20	Carbon Steel
CC-1309	Component Cooling	20	Carbon Steel
CC-1203	Component Cooling	20	Carbon Steel
CC-1209	Component Cooling	20	Carbon Steel
CC-1527	Component Cooling	12	Carbon Steel
CH-1029	Chilled Water	12	Carbon Steel
CH-1053	Chilled Water	12	Carbon Steel
CC-1425	Component Cooling	4	Carbon Steel
RH-1102	Residual Heat Removal	12	Stainless Steel

TABLE IV-4

PORTIONS OF PIPING SYSTEMS VISUALLY EXAMINED AND FOR WHICH DOCUMENTATION WAS REVIEWED

ITEM	DESCRIPTION	PIPE SIZE (IN.)	MATERIAL
MS-1004	Main Steam	30	Carbon Steel
FW-1014	Feedwater	18	Carbon Steel
FW-1012	Feedwater	18	Carbon Steel
SI-1201	Safety Injection	16	Stainless Steel

TABLE IV-5

TANKS PRESSURE VESSELS AND HEAT EXCHANGERS
WHICH WERE VISUALLY INSPECTED

ITEM	MANUFACTURER	NOTES
Accumulator Tank SIATAT-02	Southwest Fabricating and Welding	(1)
CCW Surge Tank 3R201NTS101A	Brown-Minneapolis Tank	(2)
CCW Heat Exchanger 3R201NHX101A	Struthers-Wells, Inc	(3)
RHR Exchanger 2R161NHX101B	Joseph Oat Corporation	(4)
Dimineralizer Tank 3R171NDM102A	Westinghouse Pensacola	
Spray Additive Tank TGXSIATSA-03	RECO Industries, Inc.	(5)
DFO Storage Tank 3Q15MTF0337TK21	Brown-Minneapolis Tank	(6)
Volume Control Tank TGXCSATVC-01	RECO Industries, Inc.	(7)
Fuel Pool Cooling HXTXSFAHSF-02	Atlas Industrial Manufacturing	

(1) Bolting ring fillet welds intermittently undersized on one leg. NCR HM-03081

(2) Reinforcing fillet weld at various nozzles, manway neck to flange fillet weld and support fillet welds undersized. NCR HM-03075.

(3) Fillet weld from nozzle reinforcing pad to shell undersized. One reinforcing fillet weld at a 1" nozzle to shell weld undersized. NCR HN03074.

(4) Reinforcing fillet at three nozzle to shell welds intermittently undersized. NCR HN-03029.

(5) Arc strike on vessel shell. NCR HM-03088.

(6) Shell access hole reinforcing fillet at nozzle to shell and fillet at flange face undersized. Manway to shell reinforcing fillet undersized. Roof vent nozzle to roof reinforcing fillet weld undersized. One fillet weld undersized. NCR HM-03094.

(7) Manway nozzle fabricated as a nozzle with reinforcing pad instead of integrally reinforced butt welding fitting as required by drawing. Stiffening ring to vessel shell fillet welds undersized. NCR HM-03095.

TABLE IV-6

VENDOR RADIOGRAPHS REVIEWED

Contractor	Welds	Castings Valve Pumps	Spot Welds	Feet of Welds	Film	Notes
G&W Energy Products	4				8	
TRW Mission Manufacturing		2			8	(1)
Anchor Darling		56			775	
Pacific Valve		1			4	
Quaker Alloy		6			42	
Teledyne Brown				8	8	
Pall Trinity	8				72	
Sandusky Foundry				39	169	
Master Craftsman			16		16	
Lamco			46		46	
Joseph Oat				114	114	
Richmond Engineering				206	206	(2)
Brown Minneapolis				508	508	(3)
Westinghouse				1041	1436	(4)
PDM				100	200	
Southwest Fabricating				149	260	(5)
Copes-Vulcan		4			98	
Esco		1			88	
Reco Industries	8				65	
Pacific Pumps				8	67	
Wollaston Alloys		1			22	
McJunkin Corp.				18	18	

TABLE IV-6 - (Continued)

VENDOR RADIOGRAPHS REVIEWED

Contractor	Welds	Castings Valve Pumps	Spot Welds	Feet of Welds	Film	Notes
Combustion Eng.				80	182	
Fisher Controls		3			133	
Sabine Steel			43		43	(6)

NOTES:

(1) Reader sheet was not found in the package. The sheets were later found and film was reviewed and no further problems were identified.

(2) Yellow film was found in the film packages for the Volume Control tank and the Pressure Relief Tank. The licensee issued SDR #-192 to cover this deficiency.

(3) Microbiological Induced attack was found to have occurred during the storage period of the tanks. However, the licensee has rework all BMT supplied tank and the final condition of the tanks is considered acceptable.

(4) Linear indications found in the backing ring welds in the demineralizer tank serial #37740. Yellow film was found in a 16 inch surge line, however the line was deleted by a design change. NCR #AN-03028 and AN-0329.

(5) Cylinder P4131, weld W-K-H-69 showed no evidence of retakes although the reader sheet indicates some were shot. Cylinder _4133, weld W-K showed a linear indication 3/4 of an inch long at interval no. 2. This appears on the films for intervals 1-2 and 2-3.

(6) Problem areas included questionable film, disorganized reports, some pages were unreadable due to light copy, it was therefore unable to coordinate film with data sheets. Also some repair film for rejects seemed to be unavailable. After some time HL&P determined that the light data sheets were apparently duplicates of other readable data sheets. Also it was determined that the apparently missing film areas were covered by film shot by Ebasco after they had repaired the questionable areas. The film was reviewed and no further problems were identified.

V. CIVIL AND STRUCTURAL CONSTRUCTION

A. Objective

The objective of the appraisal of civil and structural construction was to determine by evaluation and review of Quality Control (QC) accepted work and documentation whether civil and structural construction areas were completed in accordance with regulatory requirements, Safety Analysis Report commitments, and project specifications, drawings and procedures.

B. Discussion

The specific areas of civil and structural construction evaluated included: reinforced concrete construction including mechanical splices, and concrete pour packages; structural steel installation including high strength bolting for structural steel friction and sliding connections; backfill and earthwork construction; the concrete expansion anchor bolts; and the containment post tensioned system. This evaluation included hardware and selected documentation.

This portion of the NRC CAT inspection of concrete expansion anchors was limited to the review of the qualification test report. The inspection of installed concrete expansion anchors was performed by NRC CAT electrical and mechanical groups (see Sections II and III).

Parts of the above hardware inspection included verification of hardware to a sample of design change documents. The documents reviewed are listed in Section VII, Table 7C.

1. Reinforced Concrete Construction

a. Inspection Scope

Reinforced concrete construction areas inspected by the NRC Construction Appraisal Team (CAT) included reinforcing steel configuration, activities for two concrete placements, in-process mechanical splicing, Quality Control (QC) documentation for mechanical splices and concrete placement, and general concrete surface quality.

The reinforcing steel for three concrete placements were inspected for proper bar diameter, spacing and length. Embedded plates and anchor bolts which were part of the concrete placements were inspected for proper size and spacing.

Activities for two concrete placements were observed by the NRC CAT. Activities observed were batch plant mixing operations, concrete placement, tests for slump, air content and unit weight, length of time required for concrete placement from truck mixers, and preparation of concrete cylinder test specimens. For one of

the two concrete placements, the general surface quality after the formwork had been removed was inspected. In-process mechanical splicing activities were observed by the NRC CAT. QC documentation and appropriate field procedures were reviewed for concrete placements and mechanical splices completed by Ebasco Constructors. A review of the licensee's Phase A statusing of QC documentation for concrete placements and mechanical splices was performed. The purpose of the licensee's Phase A statusing was to determine the status of construction and QC documentation of work performed by Brown and Root at the time when engineering and construction services were turned over to Bechtel Engineering and Ebasco Constructors. In addition, the qualification records for four cadwelders were reviewed.

Concrete placement records reviewed included concrete pour pre-placement checklist, in-process concrete pour placement checklist, concrete pour curing and post-placement checklist, and concrete compressive strength test report. The reviews checked the forms for adequate completion by the QC inspectors, existence of senior QC inspectors' signature for evaluation of completed forms when necessary, and acceptable coverage of various inspection attributes.

Cadweld QC documentation reviewed by the NRC CAT included the cadwelder test record report, the tension test report of cadweld rebar splices, the cadwelder qualification report, and the cadweld (visual) inspection report. This review also verified whether or not the forms had been adequately completed by the QC inspectors, had been signed off by a senior QC inspector, and had acceptable coverage of various inspection attributes.

By a general walkdown, the surface quality of completed concrete work was observed by the NRC CAT.

The requirements and acceptance criteria for reinforced concrete construction were obtained from the drawings listed in Table V-1 and the following specifications and procedures:

- Bechtel Construction Specification 2A010CS1004, Rev. 2, "Specification for Mechanical Splicing of Reinforcing Bars," January 18, 1985

- Bechtel Construction Specification 2A010CS1009, Rev. 4, "Specification for Forming, Placing, Finishing, and Curing of Concrete," March 28, 1985

- Ebasco CSP-4, Rev. 5, "Concrete Placement," June 28, 1985

- Ebasco QCP-10.1, Rev. 5, "Cadweld Inspection," September 20, 1985

- Ebasco QCP-10.2, Rev. 5, "Preplacement Concrete Inspection," August 14, 1985

° Ebasco QCP-10.3, Rev. 5, "Concrete Placement Inspection," August 12, 1985

b. Inspection Findings

The inspection of installed reinforcing steel for the two concrete placements found no hardware deficiencies.

Activities observed for the two concrete placements as well as in-process mechanical splicing of reinforcing steel were found to be adequate.

The licensee's Phase A statusing for concrete pour packages and grouting packages reviewed a list of documents for 100 percent of the activities. This list was developed from the requirements in Brown and Root Procedure CCP-25. A concrete document checklist had been prepared by the licensee for Phase A statusing of concrete pour packages to identify existing and missing (if any) QC documentation. The NRC CAT sampled one concrete pour package including six sets of associated QC documentation to verify if the contents in the concrete pour package matched those indicated on the concrete document checklist. No concerns were identified.

The licensee's Phase A statusing for mechanical splice QC documentation reviewed the documentation of cadwelds made by Brown and Root. Two forms, a cadwelder qualification and testing report and a cadweld walkdown and documentation checklist, were prepared by the licensee for Phase A statusing to identify existing and any missing records related to mechanical splices. The NRC CAT reviewed the Phase A statusing work by sampling one cadwelder and one cadweld. One concern was identified with the cadwelder qualification and testing report for cadwelder No. 43. The space box for the "two in ea. subsequent 100" column of the "horizontal requalification" row had been marked "S" for satisfactory. However, it should have been marked "U" for unsatisfactory. The NRC CAT was informed that cadwelder No. 43 was the only Brown and Root cadwelder requalified. Based on the information that no other cadwelder was requalified and that the error was only with the tensile testing frequency implemented after cadwelder No. 43 was requalified, the NRC CAT feels the error to be an isolated one. Nonconformance Report (NCR) No. GC03199 was issued to address the concern. Also, the dates listed in the "Dates Qualified To" spaces for the "vertical qualification" and "horizontal qualification" parts of the cadwelder qualification summary were found to be reversed. The licensee subsequently documented this concern. The NRC CAT found no concern with the cadweld sample checked against the contents of the cadweld walkdown and documentation checklist.

During a general walkdown, the NRC CAT identified a crack in the Unit 2 azimuth 304° tendon access wall at elevation (-)13 ft. 3 inches. This area was subsequently chipped out. It was then identified that the 3 inch seismic joint material had not been installed as required by drawing 3M01-9-C-4230R0 between the Reactor Containment Building mat and the tendon access wall.

Bechtel Engineering (BEC) issued NCR HC03170 and stated that the disposition of this NCR would be to use as is. The stated basis of the disposition was that all settlements had taken place, the bearing surface area was small, and the vertical seismic movements would be small at this location.

The NRC CAT's review of this issue found that BEC's disposition did not adequately address the seismic movement of the mat and the previously predicted unfavorable relative heaves of the two adjoining buildings once the dewatering system is discontinued. Whether predicted unfavorable soil heave between the Reactor Containment Building and the Mechanical and Electrical Auxiliary Building could create added unacceptable forces on the tendon access wall needs to be addressed.

c. Conclusion

In general, reinforced concrete construction appeared to be adequate. The review work performed for Phase A statusing on the Brown and Root concrete pour and mechanical splicing QC documentation appeared to be thorough. The documentation concerns with the mechanical splice QC records did not appear to affect the hardware. Under certain conditions the omission of the seismic joint between adjacent concrete structures could cause significant structural damage.

2. Structural Steel Inspection

a. Inspection Scope

Installed and QC accepted structural steel members and connections were inspected by the NRC CAT. Attributes inspected were member size, configuration, and bolted connections. For bolted connections, both friction and sliding connections were tested by using a calibrated torque wrench to determine whether the bolts had proper pretension. In addition, the bolts were inspected for proper material and nut engagement on the bolt.

The sample used in the structural steel verification for correct member size and configuration is described in Table V-2. A total of 93 structural steel members and 39 connections were inspected.

The location, bolt size and material type, and number of friction and sliding type connections which were checked for proper pretension are shown in Tables V-3 and V-4, respectively. These bolts were sampled from structural steel connections although both samples are separate from those mentioned above as inspected for configuration. Test torque values were obtained by using a Skidmore Whilhelm tension tester to establish the proper torque-tension relationship.

The requirements and acceptance criteria for structural steel installation are included in the drawings listed in Table V-5 and in the following specifications and procedures:

- Bechtel Construction Specification 3A010SS0012, Rev. 3, "Category I Structural Steel," December 4, 1984

- Bechtel Construction Specification 3A010SS0030, Rev. 5, "Erection of Structural Steel and Miscellaneous Steel," July 26, 1985

- Ebasco CSP-10, Rev. 6, "Erection and Boltup of Structural Steel," September 19, 1985

- Ebasco QCP-10.5, Rev. 5, "Inspection of Structural Steel Erection and Bolting," July 19, 1985

b. Inspection Findings

Of the 93 structural steel members and 39 connections inspected for correct member size and configuration, only one hardware configuration deficiency was identified. This deficiency involved one column base connection being installed without nuts on one of its anchor bolts. Deficiency Notice 2-510-C was issued to repair the condition.

A total of 648 7/8 inch diameter A325 high strength bolts were checked for proper installed torque for structural steel friction type connections. The installed torque values of twenty-three (approximately 4 percent) of the 648 7/8 inch diameter A325 bolts were significantly below the inspection torque of 450 ft-lbs. Four of the 23 were found to be installed loose. NCRs CC03132 and CC03134 were written to repair the improperly installed bolts. All twenty-three bolts were to be properly tightened. The remaining 625 bolts were determined to be acceptable.

Thirty-two 7/8 inch diameter A490 high strength bolts were checked for proper installed torque. The sampled bolts were installed above the inspection torque value of 550 ft-lbs and determined to be acceptable.

For the sliding type structural steel connections, a total of 68 7/8 inch diameter A325 high strength bolts were inspected for proper installation torque. Forty-three of the 68 A325 bolts were installed at torque values greater than the inspection torque value of 150 ft-lbs. Twenty-five of the 43 over-tightened bolts were installed at torque values greater than 500 ft-lbs. NCR CC03190 was written to document and disposition the deficiency.

All of the sampled sliding connections had inspection markings indicating that they had been inspected. The inspection criteria for sliding connections states that the bolts be installed snug tight. Snug tight is defined as the full force of a man on a spud wrench. Based on such a vague inspection criteria, neither the NRC CAT nor the licensee was able to determine how these connections could have been inspected. The NRC CAT finding indicates that more specific inspection criteria is necessary to

inspect the sliding connections adequately. The licensee has committed to write adequate inspection criteria in the current specifications and to reinspect all sliding connections.

It was found that project specifications allow welding across the flanges on fully loaded structural steel members. The NRC CAT asked if an engineering evaluation had been performed (similar to that indicated in AWS D.1.1, Section 7.5.1) to determine, due to extent of cross-section heating, whether or not a member is permitted to carry a live-load stress while welding on it. No specific analytical evaluation of whether the welding across the flange could weaken the affected structural steel member was provided to the NRC CAT. BEC justified the specifications based on general engineering judgement and historical knowledge. This engineering response, without the supporting evaluation, is considered inadequate.

c. Conclusion

In general, structural steel members and connections for size and configuration verification were found to be installed properly. The high strength A325 and A490 bolts for friction type structural steel connections were generally determined to be installed adequately. The lack of adequate inspection criteria for sliding connections resulted in the acceptance of a deficient installation. All sliding connections should meet the new inspection criteria when established by the licensee.

An evaluation should be conducted showing that the practice of cross flange welding has not and will not overstress loaded members.

3. Backfill and Earthwork Construction

a. Inspection Scope

The daily reports and backfill compaction records for the Essential Cooling Water (ECW) pipe trench backfill were reviewed. The backfill compaction work activities and in situ sand cone tests in area 1I40, northeast of the Unit 1 Diesel Generator Building, were witnessed by the NRC CAT.

The requirements and acceptance criteria are contained in the following specifications:

- Bechtel Construction Specification 5Y069YS0043, Rev. 12, "Structural Excavation and Backfill".

- Bechtel Construction Specification 2Y060YS0044, Rev. 5, "Field and Laboratory Testing of Earthwork Construction".

b. Inspection Findings

The daily reports and backfill compaction records appeared to be complete and in accordance with the project specifications. The backfill work activities observed by the NRC CAT northeast of the Unit 1 Diesel Generator Building at elevation +26.0 was properly placed and compacted.

The NRC CAT inspectors identified a potential problem which may not have been addressed by the licensee. The ECW pipe trench is supported on a highly plastic A_2 clay layer. This clay layer will shrink when dried and expand as the clay particles absorb water. Since 1975 the site dewatering system has been in operation and the ground water level has fallen below the A_2 clay layer. During this dewatering period the clay layer could have lost significant moisture. The site dewatering system is scheduled to be discontinued prior to plant operation. When this occurs, the ground water level will be re-established to about its pre-1975 level. If the moisture content of the clay layer during the dewatering period has been reduced significantly and then the dewatering system is discontinued, the clay layer when exposed to the returned ground water is expected to expand. The issue of whether this clay layer will expand and whether the expansion will occur uniformily appears not to have been properly considered to date. This along with other data on the thickness of the clay layer, the placticity index of the clay, the confining pressure and the quantity of water absorbed by the clay particles, and the in situ moisture content of several points at various levels in the clay layer during the dewatering period will also need to be considered. The concern is whether the expansion of the underlying and adjacent clay could cause differential displacements of the ECW pipes. Also, whether this potential for ground movement could cause the ECW pipes to become overstressed. The licensee was not able to provide information on such a review during the NRC inspection.

c. Conclusions

The structural backfill compaction records and the structural backfill reviewed by the NRC CAT inspectors were generally found to be acceptable.

The licensee should investigate the potential of the expansive clays to swell upon return of ground water to normal levels and the potential affect of this swelling on the ECW piping.

4. Concrete Expansion Anchor Bolt Qualification Test Report

a. Inspection Scope

The qualification test report for the wedge type concrete expansion anchors was reviewed for technical adequacy, conformance to project specifications and demonstration of satisfactory anchor performance.

The following qualification test report was reviewed:

- Wiss, Janey, Elster and Associates, Rev. 2, "Tension, Shear and Relaxation Testing of Expansion Anchors at the South Texas Project, Bay City Texas", May 29, 1981

The requirements and acceptance criteria are contained in the following documents:

- Bechtel Construction Specification 5A010SS1000, Rev. 7, "Installation of Expansion Anchors, Rock Bolts, Grouted Anchor Bolts, and Core Drilling"

- Ebasco CSP-41, Rev. 6, "Installation of Expansion Type Anchors"

- Ebasco QCP 10.19, Rev. 7, "Inspection of Anchoring Devices Installed Within Concrete Structures"

b. Inspection Findings

The allowable loads used in the design of concrete expansion bolts (CEAs) was based on the average results of the tests divided by a factor of safety of 4. For the 1/4 inch diameter CEAs with 1-1/8 inch embedment the average maximum load for 4070 psi concrete is 890 lbs. The allowable tensile load is 250 lbs. This allowable load does not meet the factor of safety of 4 criteria specified in Inspection and Enforcement Bulletin 79-02.

For the 1-1/4 inch diameter CEAs, the anchor slip at the design tension loads is greater than 1/16 inch for 8-1/2 inch embedment and 3/16 inch for 10-1/2 inch embedment. The shear tests show similar results. The licensee has stated that the 3/16 inch movement at the design loads was unacceptable and that the allowable loads will be reduced. The licensee stated that for the 1/16 inch slip, the current design load is acceptable.

The NRC CAT finds the licensee's response for the 1/16 inch slip at the current design loads to be inadequate. The results in the test program for anchor bolts are for one time loading. However, reliance solely on the referenced test program without considering, in actuality, that within the plant the maximum design load may be applied more than one time, is considered inadequate. Since most of the slip is likely to be permanent, these deflections will tend to accumulate with each load application. Also, the 1/16 inch deflection in shear and tension may be considered unacceptable in many piping analysis.

c. Conclusion

The licensee should reevaluate the allowable design loads used for concrete expansion anchors. This reevaluation should take into account the magnitude of anchor slip at the design load and consider the shear, tension, deflections, and the piping systems that are supported.

5. Containment Post-Tensioned System

a. Inspection Scope

The installation records of 8 Unit 1 prestressed tendons were reviewed. The NRC CAT also observed various stages of tendon installation work activities which include the pulling, buttonheading, stressing, and greasing of the tendons.

The requirements and acceptance criteria were included in the following specification and procedures.

- Bechtel Construction Specification 2C239CS0003, Rev. 4, "Containment Post Tensioning System," July 15, 1985
- FIM-STP-01, Rev. 0, "Procedure for Cleaning and Checking Post Tensioning Embedded Items," August 8, 1984
- FIM-STP-H-1, Rev. 1A, "Installation, Buttonheading, Stressing and Greasing of Horizontal Tendson," August 29, 1985
- FIM-STP-V-1, Rev. 3A, "Installation, Buttonheading, Stressing and Greasing of Vertical Tendons," August 29, 1985
- FIM-VCP-01, Rev. 2, "Tendon Void Clearing Procedure," May 22, 1985
- FQCP-STP-03, Rev. 3, "Quality Control Procedures - Vertical and Horizontal Tendons," July 9, 1985
- STP-FTP-1, Rev. 4, "Friction Test Procedures," August 13, 1985

b. Inspection Findings

The review of installation records and the observation of various stages of tendon installation work activities indicated that the post-tensioned system was being installed in accordance with the specifications and procedures.

c. Conclusions

The installation of the containment post tensioned system was found to be in accordance with applicable instructions and specifications.

TABLE V-1

DRAWINGS USED FOR REINFORCED CONCRETE CONSTRUCTION INSPECTION

Drawing No.	Rev.	Title
193AB	B	(Shop Drawing)
193BC	C	(Shop Drawing)
193C	A	(Shop Drawing)
2C22-9-S-1012	1	Steel Reactor Containment Building Dome Liner - Plans and Sections and Details
2C22-9-C-1033	5	Concrete Reactor Containment Building Dome Reinforcement - Plan
2C22-9-C-1034	2	Concrete Reactor Containment Building Dome Shell - Sections and Details
2C22-9-C-1036	0	Concrete Reactor Containment Building Dome Tendon Anchorage Location
2C23-9-C-1021	1	Concrete Reactor Containment Building Post Tensioning System
3A01-0-C-0001	20	Concrete Structural Standards General Notes
3A01-0-C-0011	14	Concrete Structural Standards General Notes
3M01-2-C-4026	9	Concrete Mechanical & Electrical Auxiliary Building Floor Plan @ El. 41'-0"
3M01-9-C-4241	2	Concrete Mechanical & Electrical Auxiliary Building Std. Wall Reinf. Details El. 29'-0" to Roof (U.N.O.)
3M01-9-C-4242	1	Concrete Mechanical and Electrical Auxiliary Building Miscellaneous Details
3M01-9-C-4309	3	Concrete Mechanical and Electrical Auxiliary Building Miscellaneous Sections and Details
3M05-9-C-4009	5	Concrete Mechanical and Electrical Auxiliary Building Foundation Plan @ El. 10'-0"

TABLE V-2

INSTALLED STRUCTURAL STEEL INSPECTION SAMPLE

Unit Number and Building	Approximate Elevation	Beams	Braces	Columns	Connection	Truss Members	Comments
Unit 1 Reactor Containment	68 ft	14	-	2	3	-	
	52 ft	5	1	-	-	-	
	37 ft	2	-	-	-	-	
	-2 ft	2	-	1	3	-	
Unit 1 Fuel Handling	118 ft	5	-	-	8	11	Sample Taken From Roof Trusses and Framing
Unit 1 Mechanical & Electrical Auxiliary	69 ft and 6 inches	5	-	-	5	3	
	74 ft	3	-	3	3	-	
Total		36	1	6	22	14	

TABLE V-2 (Continued)

INSTALLED STRUCTURAL STEEL INSPECTION SAMPLE

Unit Number and Building	Approximate Elevation	Beams	Columns	Connections	Comments
Unit 2 Mechanical & Electrical Auxiliary	10 ft	-	-	1	Deficiency Notice 2-510-C was issued to repair the anchor bolts of column base connections.
	20 ft	5	2	6	
	35 ft	3	2	3	
	58 ft	8	3	5	
Unit 2 Reactor Containment	52 ft	5	-	1	
	68 ft	8	-	1	
Total		29	7	17	

TABLE V-3

HIGH STRENGTH BOLTING FOR FRICTION CONNECTION INSPECTION SAMPLE

Unit Number and Building	Bolt Size and Type	Number of Friction Connections*	Number of Bolts Checked for Proper Installation Torque	Number of Bolts Installed Below Inspection Torque	Comments
Unit 1 Reactor Containment	7/8 inch dia. A325	15	144	5	See note 1
Unit 1 Mechanical & Electrical Auxiliary	7/8 dia. A325	8	77	8	
Unit 2 Reactor Containment	7/8 inch dia. A325	12	172	0	
Unit 2 Mechanical & Electrical Auxiliary	7/8 inch dia. A325	20	255	13	
Unit 2 Reactor Containment	7/8 inch dia. A490	1	32	0	See note 2

Note 1: The inspection torque value for 7/8 inch dia. A325 bolts was 450 ft. lbs.

Note 2: The inspection torque value for 7/8 inch dia. A490 bolts was 550 ft. lbs.

*The connections sampled are separate from the structural steel connections inspected in Table V-2.

TABLE V-4

HIGH STRENGTH BOLTING FOR SLIDING CONNECTION INSPECTION SAMPLE

Unit Number and Building	Number of Sliding Connections*	Number of Bolts Checked for Proper Installation Torque	Number of Bolts Installed Above Inspection Torque and the Installed Torque Range	Comments
Unit 1 Reactor	10	67	10 installed between 160 and 200 ft-lbs 5 installed between 200 and 250 ft-lbs 28 installed above 300 ft-lbs	All bolts were 7/8 inch dia. A325. Approximately 63% were found to be installed overtorqued.

*The connections sampled are separate from the connections inspected in Table Table V-2 and V-3.

TABLE V-5

DRAWINGS USED FOR STRUCTURAL STEEL INSTALLATION INSPECTION

American Bridge Detail Drawings

Order No.	Sheet No.	Revision No.
K-7023	E12	B
	610AD	A
	610D	-
K-7024	E2	C
	E5	F
	E18	G
	E20	E
	E22	G
	E301	E
	E302	G
	123	B
	176	C
	506	A
	526	-
K-7025	E4	D
	E12	H
	E702	A
	718	-
K-7029	E17	C
	E22	C
	405	-
	413	-
	508	B
	516	C
K-7030	E1	-
	E2	-
	E6	B
	E7	A
	E9	D
	102	A
	106	A

TABLE V-5 (Continued)

DRAWINGS USED FOR STRUCTURAL STEEL INSTALLATION INSPECTION

Bechtel Design Drawings

Drawing No.	Rev.	Title
1C01-9-S-1532	4	Reactor Containment Building Steam Generator, R.C. Pump Vertical and Pressurizer Lateral Support
1C01-9-S-150	5	Reactor Containment Building Internal-Steel Framing Plan @ El. 68-0"
3A01-05-0001	12	Steel Structures Standards General Notes
3C01-9-S-1502	8	Reactor Containment Building Internal - Steel Framing Plan @ El. (-)2'-0"
3C01-9-S-1505	4	Reactor Containment Building Internal - Steel Framing Plan @ El. 37'-3"
3C01-9-S-1508	5	Reactor Containment Building Internal - Steel Framing Plan @ El. 52'-0'
3C01-9-S-1509	4	Reactor Containment Building Internal - Steel Framing Plan @ El. 68'-0"
3C01-9-S-1510	5	Reactor Containment Building Internal - Steel Framing Plan @ El. 68'-0"
3C01-9-S-1511	1	Reactor Containment Building Column Schedule and Details
3C01-9-S-1528	8	Reactor Containment Building Internal Sections and Details
3C01-9-S-1539	2	Reactor Containment Building Internal - Miscellaneous Plan Sections and Details
3C01-9-S-1619	6	Reactor Containment Building Internal - Steel Alterations @ El. (-)2'-0"
3C01-9-S-1621	5	Reactor Containment Building Internal - Steel Alterations @ El. 37'-3"
3C01-9-S-1622	3	Reactor Containment Building Internal - Steel Alterations @ El. 52'-0"
3C01-9-S-1623	3	Reactor Containment Building Internal - Steel Alterations @ El. 68'-0"
3C01-9-S-1624	6	Reactor Containment Building Internal - Steel Alterations Details and Tables
3C01-9-S-1625	2	Reactor Containment Building Internal - Steel Alterations Details and Tables
3C01-9-S-1629	6	Reactor Containment Interal - Steel Alterations Details and Tables
3F01-9-S-3003	3	Fuel Handling Building Roof Framing Plan (Plan - Roof Truss @ Top Chord and Roof Truss MK-T1)
3M01-9-S-4043	3	Mechanical and Electrical Auxiliary Building Framing in HVAC Areas El. 69'-6" U.N.
3M01-9-S-4060	4	Mechanical and Electrical Auxiliary Building Framing Plan @ Els. 21'-0" and 23'-0"

TABLE V-5 (Continued)

DRAWINGS USED FOR STRUCTURAL STEEL INSTALLATION INSPECTION

Bechtel Design Drawings

Drawing No.	Rev.	Title
3M01-9-S-4065	4	Mechanical and Electrical Auxiliary Building Framing Plan @ El. 35'-0"
3M01-9-S-4071	1	Mechanical and Electrical Auxiliary Building Framing Plan @ El. 60'-0"
3M01-9-S-4082	4	Mechanical and Electrical Auxiliary Building Framing Plan @ El. 72'-0", 74'-0" and 76'-0"
3M01-9-S-4090	4	Mechanical and Electrical Auxiliary Building Colunm Schedule and Standard Details

VI. MATERIAL TRACEABILITY AND CONTROL

A. Objective

This part of the inspection effort was to verify that the identification and marking of materials and equipment used in the fabrication and construction processes have been maintained, and that the documentation required to support traceability, to both the design drawings/specifications and to the material sources, was retrievable and met regulatory requirements, PSAR commitments, and applicable codes and standards.

B. Discussion

A total of 219 items were selected at random and identified as samples for the inspection. The items inspected were located in the storage yards, laydown areas, storage warehouses, outlying buildings, and various elevations and rooms in the reactor containment, auxiliary building, diesel building, and fuel handling building for both Unit 1 and Unit 2. Some items inspected were in storage and others were being installed. Some had been installed and were in a storage mode, and others had been installed and turned over to the operations group.

Tables VI-1 through VI-8 indicate the areas where material/equipment samples were selected, and adequacy of the identification, traceability and documentation. The applicable reference documents reviewed and used during the inspection included the following:

- Site Final Safety Analysis Report.
- Specification 4A010GS1009, Safety Related Non-ASME Bolting Materials, Rev. 1.
- Specification 5A010GS1007, Civil/Structural Construction Materials, Rev. 3.
- Specification 3E189ES1000, Conduct and Tray Supports, Rev. 6.
- Procedure SSP-13, Material Control, Rev. 0.
- Procedure ASP-5, Material Control, Rev. 8.
- Procedure WPP/QCI-12.4, Material Identification and Marking Requirements, Rev. 10.
- Procedure QCP-9.4, Verification of Weld Filler Material Control, Rev. 3.
- Procedure WPP/QCI-18.0, EE580 Cable and Raceway Tracking Procedure, Rev. 12.
- Procedure QCP-10.22, Receipt Inspection, Rev. 12.
- Engineer and Constructor ASME Procedure.

° American Society for Testing Materials standards.

Equipment and components were inspected in order to verify that required identification codes were maintained on items such as civil construction materials, electrical cable and equipment, welding supplies, vendor supplied equipment assemblies, structural and mechanical items.

1. Material Traceability

a. Inspection Scope

Two hundred nineteen samples were examined to determine if the identification and markings were traceable to the applicable specification, drawing, purchase order, code data package, mill test report or a combination thereof. The licensee's records management group retrieved the requested documentation which was analyzed and compared to site requirements and field notes by the NRC CAT inspector.

b. Inspection Findings

During the inspection it was determined that a program for identification of materials and retrievability and adequacy of documentation was generally in place and functioning.

(1) The following were found to be satisfactory:

(a) The records management group uses a computer assisted program for retrieval of most documents that are considered complete. In-process records are processed manually or by using sub-programs (i.e., electrical EE580 program for routing, terminations, cable type, etc.)

(b) Eighteen samples of different types of welding consumables as noted in Table VI-1 were examined for markings, retrievability of documentation and adequacy of the documentation.

(c) Fourteen samples of different types and sizes of electrical cables were inspected for identification, documentation and qualification requirements. These results were satisfactory as shown in Table VI-2.

(d) Civil/Construction materials were inspected for compliance to the specification requirements. Thirty-one items were sampled and were found to meet the specification requirements as shown in Table VI-3.

(e) Anchor bolts and embedded items were not a part of the traceability program due to the fact that a major program in this area was previously undertaken by the licensee and is awaiting review by the NRC. The NRC CAT inspector reviewed the structural bolting for an

Accumulator and Residual Heat Removal Heat Exchanger and noted that both were included in the licensee's report.

(f) Table VI-4 summarizes materials and equipment that was inspected and is used in the Heating, Ventilating and Air Conditioning (HVAC) discipline including fans, motors and dampers. Tracability was found to be satisfactory.

(2) Significant weaknesses in the program were found in the following areas:

(a) The action taken for the disposition of FCR BE-00088 on the clarification of bolting material requirements for cable tray and conduit supports was not effective in that it allowed the option of not imposing the manufactures marking requirements of the specified national bolting standard without appropriate consideration of the measures needed to maintain the traceability and control of unmarked fasteners throughout the plant.

(b) Verification of markings/traceability of bolting materials used in the fabrication of large vendor supplied skid mounted equipment and used by the construction crafts in the fabrication and installation of electrical equipment.

(3) The following observations were made by the NRC CAT inspector and found to be unsatisfactory:

(a) Code data packages for the Unit 1 Radwaste Holdup Tank 7R32IXTS101A and Reactor Internals Disconnecting Device Pressure Housing, Board #18288 could not be located. As a result of the NRC CAT finding, the licensee issued Nonconformance Report BN-03015 to document the deficiency of Board #18288 and provide for appropriate corrective action. No written corrective action was noted during the NRC CAT inspection concerning the Radwaste Holdup Tank.

The code data package for an ASME 8-inch check valve was incomplete and a corrected copy of the certificate of welding was generated. As a result of the NRC CAT finding, the licensee issued a Document Deficiency Notice QC-RN-150.1. The material type as indicated on a code data report for an ASME 8 inch Safety Injection Check Valve Bonnet (valve #V1423) was different than that indicated on the mill test report. As a result of the NRC CAT finding, the licensee initiated NCR BN-03013 to document this discrepancy for corrective action. These and other ASME code data packages inspected are indicated in Table VI-5.

(b) Some documents that were requested to confirm bolting traceability of certain selected equipment samples summarized in Table VI-6 were not located and furnished for review by the NRC CAT inspector prior to the end of the inspection. Licensee representatives stated that actions would be continued to locate applicable documentation and review bolting traceability.

(c) It was found by the NRC CAT inspectors that the specific requirement of the national standard ASTM A307 Grade B for marking of fasteners has been deleted by engineering from a specification for electrical raceway supports, without requiring adequate on-site material control during their installation (Reference FCR BE-00088 and Specification 3E189ES1000 for conduit and tray supports).

The deletion of marking/identification requirements for electrical equipment bolting has resulted in the uncontrolled distribution of bulk quantities of these items throughout the plant. This condition may have resulted in the indiscriminate use of the unmarked fasteners in other types of equipment installations because the bolting is readily available and presumed to be adequate.

Based on the above observations, the NRC inspector could not ascertain the appropriate use and traceability of the unmarked fasteners for the various electrical installations of the NRC CAT sample, and thus the quality of the fasteners is considered indeterminate.

(d) The bolting in 10 of 11 samples of electrical equipment was not found to be traceable when inspected for conformance to specifications or seismic reports. Bolting used in fabrication and/or installation of the ten samples were not marked or had mixed markings. The results are tabulated in Table VI-7.

(e) Two sections of 2 inch schedule 160 stainless piping in storage were found to be mismarked. As a result of the NRC CAT finding, QCI report G1649 was issued by the licensee to scrap the pieces.

(f) Mechanical material and equipment was inspected to the specification requirements. Regarding bolting, several items were found to be of the correct type, identified and traceable. However, traceability deficiencies were found in 14 of 20 samples of bolting for large mechanical installations listed in Table VI-8. The following are five examples of such deficiencies:

- Mounting bolts for the Essential Cooling Water Wash Screen (3R281NPA102A) Motor were unmarked. These are required to be ASTM A193-B7. As a result of the NRC CAT finding, the utility has issued NCR AM-03072 documenting the discrepancy for corrective action.

- Motor mounting bolts for the Auxiliary Feedwater Motor #13 were identified as ASTM A193-B7 and were required to be ASTM A307. The licensee, during the NRC CAT inspection, did not issue documentation to record this discrepancy for corrective action.

- Bolting for the Containment Spray, High Head Safety Injection and Low Head Safety Injection Pumps, motors and transition pieces Nos. 1A, 2A, 3A, 1B, 2B, 3B and 1C, 2C, 3C were observed to be either unmarked, A307, A325 or A449. The correct bolting for these units is ASTM A193-B7. As a result of the NRC CAT finding, the licensee issued NCR CM-03078 to document this discrepancy for corrective action.

- Auxiliary Feedwater Turbine (3S141MTU01) driver bolting to the base was not identified or marked. This material is required to be SA193-B7. As a result of the NRC CAT finding, NCR BM-03076 was issued to document this item for corrective action.

- Bolting on the Essential Cooling Water Strainer Flange (3R281NSP101A) by drawing was required to be cadmium plated. The specification allowed for cadmium or zinc plating, and the sample appeared to be zinc plated. As a result of the NRC CAT finding, the licensee issued Field Change Request BP-00891 to change the drawings to include zinc plating.

c. Conclusions

In general, the material traceability and control program was considered to be satisfactory. However, lack of traceability was found for fastener materials for certain large vendor supplied mechanical/electrical equipment assemblies mounted on skids and for certain electrical equipment and cable tray/conduit supports. Also, documentation to permit verification of traceability of fasteners for certain equipment was not located by the licensee during the inspection.

TABLE VI-1

WELDING CONSUMABLES

ITEM	LOCATION	COMPLIANCE
3/32 E7018	Test Shop	Satisfactory
.093 E6010	Test Shop	Satisfactory
3/32 E7018	Test Shop	Satisfactory
1/8 E6010	RCB II	Satisfactory
1/8 308L-16	RCB II	Satisfactory
3/32 308-16	RCB II	Satisfactory
1/8 316-16	RCB I	Satisfactory
.045 ERNICR-3	RCB I	Satisfactory
1/8 E12018-M	RCB I	Satisfactory
5/32 308-16	RECO	Satisfactory
5/32 308-16	RECO	Satisfactory
3/16 309-16	RECO	Satisfactory
3/32 E7018	DG Caddy	Satisfactory
3/32 E7018	MEAB Caddy	Satisfactory
5/32 E7018	MEAB I Caddy	Satisfactory
5/32 E7018	MEAB I Room	Satisfactory
.035 wire	MEAB I Room	Satisfactory
1/8 308-16	MEAB I Room	Satisfactory

TABLE VI-2

ELECTRICAL CABLE

ITEM	LOCATION	COMPLIANCE
3/c #12	Reel yard	Satisfactory
7/c #12	Reel yard	Satisfactory
3/c #12	ECW Structure	Satisfactory
2/c #16	Unit I laydown	Satisfactory
1/c 500MCM	Unit I laydown	Satisfactory
3/c #8	Unit I laydown	Satisfactory
5/c #12	Unit I RCB El 68	Satisfactory
9/c #12	Unit I RCB El 50	Satisfactory
3/c #8	Unit I RCB El 24	Satisfactory
3/c #10	Unit I FHB El 73	Satisfactory
2/c #12	Unit I MEAB El 65	Satisfactory
3/c #12	Unit I MEAB	Satisfactory
5/c #12	Unit I MEAB El 35	Satisfactory
7/c #12	Unit I MEAB El 10	Satisfactory

TABLE VI-3

CIVIL/CONSTRUCTION MATERIALS

Item	Identifier	Location	Compliance
#9 Rebar	T5-6275	Laydown	Satisfactory
#10 Rebar	S-16741	Laydown	Satisfactory
#11 Rebar	S-25074	Laydown	Satisfactory
Cadweld Powder	N-7178	Storage warehouse	Satisfactory
Cadweld Powder	D-24409	Storage warehouse	Satisfactory
Cadweld Sleeve	S-2068	Storage warehouse	Satisfactory
Cadweld Sleeve	S-1901	Storage warehouse	Satisfactory
W.R. Admixture	B-12120-09W	Batch plant	Satisfactory
A.R. Admixture	B-11293-09V	Batch plant	Satisfactory
Cement	Grind #13	Batch plant	Satisfactory
Paint	111488	Paint warehouse	Satisfactory
Paint Cure	108220B	Paint warehouse	Satisfactory
Paint Mix	112389	Paint warehouse	Satisfactory
Paint Powder	112260	Paint warehouse	Satisfactory
Cadweld Sleeve	S-1798	Unit II RCB springline	Satisfactory
Cadweld Sleeve	S-2082	Unit II RCB springline	Satisfactory
Structural Beam	J72499	Unit II El 72 RCB	Satisfactory
Wall Embed	70479	Unit II El 45 RCB	Satisfactory
Structural Nuts	2H	Unit II stairwell RCB	Satisfactory
Steel Column	K7029	Unit II RCB	Satisfactory
Floor Embed	2907	Unit II El 35 control Room	Satisfactory
Threaded Rod	NA	Unit II MEAB El 10	Satisfactory
Nuts	DH	Unit II MEAB El 10	Satisfactory
Stainless Plate	13721	Condensate Tank Unit I	Satisfactory
C.S. Plate	401C7601	Condensate Tank Unit I	Satisfactory
3" Shim	680015	Unit I FHB roof	Satisfactory
Wall Embed	52028	Unit I RCB El 60	Satisfactory
Liner Plate	2425	Unit 1 RCB El 57	Satisfactory
Anchor Bolts	NA	Unit I RCB El 2	Satisfactory
Anchor Bolts	NA	Unit I RCB El 32	Satisfactory
Floor Plate	3E1846	Unit 1 RCB Refuel Pool	Satisfactory

TABLE VI-4

HEATING, VENTILATING AND AIR CONDITIONING

Item	Identifier	Location	Compliance
Joy Fan	3V112VFN003	Warehouse C	Satisfactory
Bolts	TB	Unit II MEAB El 60	Satisfactory
Bolts	STB	Unit II MEAB El 60	Satisfactory
Hanger	2-6-0052-S056-RSI-28075	Unit II MEAB El 35	Satisfactory
Damper	8V141VDA-043	Unit I RCB El 5	Satisfactory
Ventilation Fan	8V141VFN-023	Unit I RCB El 6	Satisfactory
Cooling Coil	8V141VHX-004	Unit I RCB El 6	Satisfactory
Fire Damper	1-3-0073-VD-101	Unit I FHB El 47	Satisfactory

TABLE VI-5

ASME CODE DATA PACKAGES REVIEWED

Item	Location	Compliance
8" Check Valve	Warehouse D	Unsatisfactory
16" Gate Valve	Warehouse D	Satisfactory
Instrument Valve	Unit II RCB	Satisfactory
Component Support	Unit II RCB	Satisfactory
12" Pipe and Flange	Unit II FHB	Satisfactory
Spent Fuel Pool Heat Exchanger	Unit II FHB	Satisfactory
10" Gate Valve	Unit II FHB	Satisfactory
Ball Valve	Unit II MEAB El 10"	Satisfactory
6" Bronze Pipe	ECW Building	Satisfactory
24" Bronze Pipe	ECW Building	Satisfactory
2" Pipe and Elbow	Unit I FHB	Satisfactory
8" Containment Spray Ring Pipe	Unit I FHB	Satisfactory
2" Globe Valve	Unit I FHB	Satisfactory
Reactor Internal Disconnect Device Housing	Unit I RCB	Not Retrievable
30" Main Steam Pipe	Unit I RCB El 65	Satisfactory
30" Main Steam Pipe	Unit I RCB El 35	Satisfactory
Pipe Pentration	Unit I RCB	Satisfactory
RHR Heat Exchanger	Unit I RCB Rm 306	Satisfactory
Flexible Instrument Line	Unit I RCB El 35	Satisfactory
24" Gate Valve	Unit I RCB El 24	Satisfactory
31" Crossunder Pipe	Unit I RCB El 2	Satisfactory
8" Safety Injection Check Valve	Unit I RCB El 6	Unsatisfactory
Pressure Sensor	Unit I RCB El 32	Satisfactory
2" Solenoid Valve	Unit I DGB El 32	Satisfactory
Spent Fuel Pool Heat Exchanger	Unit I FHB El 4	Satisfactory
Spent Fuel Cooling Pump	Unit I FHB El 35	Satisfactory
14" Fabricated Pipe	Unit I FHB El 17	Satisfactory
3" Plug Valve	Unit I MEAB El 74	Satisfactory
Component Cooling Water Surge Tank	Unit I MEAB El 65	Satisfactory
Recycle Evaporator Condensate Tank	Unit I MEAB El 56	Satisfactory
Waste Evaporator Condensate Tank	Unit I MEAB El 56	Satisfactory
FTD Filter	Unit I MEAB El 65	Satisfactory
2" Valve	Unit I MEAB El 65	Satisfactory
Radwaste Holdup Tank	Unit I MEAB El 57	Not Retrievable
Chemical & Volume Control Tank	Unit I MEAB El 46	Satisfactory
Component Cooling Heat Exchanger	Unit I MEAB El 29	Satisfactory
Seal Water Heat Exchanger	Unit I MEAB El 10	Satisfactory

TABLE VI-6

TRACEABILITY DOCUMENTATION FOR BOLTING NOT FURNISHED

Item	Location	Compliance
Chilled Water Pumps	Unit II MEAB El 10	Not Retrieved
Centrifugal Charging Pump	Unit II MEAB El 10	Not Retrieved
Fire Pumps	Fire Pump house	Not Retrieved
Reactor Internals Disconnect Device*	Unit I RCB	Not Retrieved
Feedwater Booster Pump Motor	Unit I TGB	Not Retrieved
Feedwater Booster Pump	Unit I TGB	Not Retrieved
Steam Generator Feed Pump	Unit I TGB	Not Retrieved
Diesel Generator	Unit I DGB	Not Retrieved
Spent Fuel Pool Skimmer	Unit I FHB El 27	Not Retrieved
Load Center E1C-1	Unit I MEAB El 65	Not Retrieved
Chemical and Volume Control Monitor	Unit I MEAB El 35	Not Retrieved
Relay Cabinets	Unit I MEAB El 35	Not Retrieved
Pressurizer Heater Controller	Unit I MEAB El 35	Not Retrieved
2" Carbon Steel Pipe Spool*	Unit I MEAB El 46	Not Retrieved
Radwaste Holdup Tank*	Unit I MEAB El 57	Not Retrieved
Load Center Transformers	Unit I MEAB El 10	Not Retrieved
Liquid Waste Pumps	Unit I MEAB El 10	Not Retrieved
Essential Cooling Water Pump	Unit I MEAB El 10	Not Retrieved

*Except for those items indicated by an asterisk, the NRC CAT inspector requested documentation to determine bolting requirements. Since documentation was not provided, traceability was not verified.

TABLE VI-7

ELECTRICAL EQUIPMENT BOLTING

Item	Location	Compliance
Relay Rack Cabinets	Unit I MEAB El 35	Unsatisfactory
Computer	Unit I MEAB El 35	Satisfactory
Pressurizer Heater Controller	Unit I MEAB El 35	Unsatisfactory
Load Center Transformers	Unit I MEAB El 10	Unsatisfactory
Battery Racks	Unit I MEAB El 10	Unsatisfactory
Battery Racks	Unit I MEAB El 35	Unsatisfactory
Battery Racks	Unit I MEAB El 65	Unsatisfactory
C&VC Control Board Monitor	Unit I MEAB El 35	Unsatisfactory
Bi-Stable Status Control Board Monitor	Unit I MEAB El 35	Unsatisfactory
Load Center Transformers	Unit I MEAB El 65	Unsatisfactory
Diesel Generator Control Panels	Unit I DGB El 35	Unsatisfactory

TABLE VI-8

MECHANICAL BOLTING

Item	Location	Compliance
Chilled Water Pump	Unit II MEAB El 10	Unsatisfactory
Centrifugal Charging Pump	Unit II MEAB El 10	Satisfactory
Charging Pump Gearbox	Unit II MEAB El 10	Unsatisfactory
Positive Displacement Charging Pump	Unit II MEAB El 10	Satisfactory
Recycle Evaporator Feed Pump	Unit II MEAB El 10	Satisfactory
ECW Wash Screen Pump	ECW Building	Satisfactory
ECW Wash Screen Motor	ECW Building	Unsatisfactory
ECW Motor	ECW Building	Satisfactory
Fire Pumps	Fire Pump House	Unsatisfactory
RHR Pump Support	Unit 1 RCB El 3	Satisfactory
Feedwater Booster Pump	Unit 1 TBG	Unsatisfactory
Steam Generator Feed Pump	Unit 1 TGB	Unsatisfactory
Auxiliary Feedwater Pump	Unit I Valve Cubicle 1	Satisfactory
Auxiliary Feedwater Motor	Unit I Valve Cubicle 1	Unsatisfactory
Diesel Air Compressor	Unit I DGB	Unsatisfactory
Fire Protection Actuators	Unit I Deluge House #12	Unsatisfactory
Spent Fuel Cooling Pump	Unit I FHB El 35	Satisfactory
HHSI, LHSI & Containment Spray Pumps (9)	Unit I FHB El 15	Unsatisfactory
HHSI, LHSI & Containment Spray Motors (9)	Unit I FHB El 15	Unsatisfactory
Spent Fuel Pool Skimmer	Unit I FHB El 27	Unsatisfactory
Liquid Waste Pump	Unit I MEAB El 10	Unsatisfactory
ECW Turbine Driver	Unit I Valve Cubicle 4	Unsatisfactory

VII. DESIGN CHANGE CONTROL

A. Objective

The primary objective of the appraisal of design change control was to determine whether design change activities were conducted in compliance with regulatory requirements, Safety Analysis Report commitments and approved licensee, engineer, constructor and vendor procedures. An additional objective was to determine that the changes to structures and hardware prescribed in a sample of design change documents were accurately completed.

B. Discussion

10 CFR 50 Appendix B, Criterion III "Design Control" and Criterion VI "Document Control" establish the overall regulatory requirements for design change control. These requirements are elaborated in Regulatory Guide (RG) 1.64 Rev. 2, June 1976, "Quality Assurance Requirements for the Design of Nuclear Power Plants," which endorses American National Standards Institute (ANSI) Standard N45.2.11-1974 "Quality Assurance Requirements for the Design of Nuclear Power Plants." The licensee's commitments to comply with RG 1.64 is stated in Chapter 17 of the South Texas Project (STP) Final Safety Analysis Report (FSAR).

The areas of design change control evaluated by the NRC Construction Appraisal Team (CAT) inspectors were control of changes to design documents and control of design changes. In each of these areas, interviews were conducted with personnel responsible for the control of activities, procedures were reviewed, and a sample of the controlled documents was reviewed. In addition, a sample of the completed structures and hardware which had been inspected and accepted by on-site contractor quality control (QC) personnel was inspected by the NRC CAT inspectors. These evaluations were performed on an interdiscipline basis.

1. Control of Design Documents

The specific aspects of the control of design documents inspected were the availability to the users of the latest approved design documents and design change documents, and the methods of assuring that approved changes not yet incorporated into design documents are provided to the users prior to work being performed.

a. Inspection Scope

(1) The following general quality assurance (QA) program manuals and procedures primarily related to distribution and control of design documents and design change documents were reviewed to establish the acceptance criteria for this portion of the inspection:

- Houston Lighting and Power Company (HL&P) Project Quality Assurance Plan for South Texas Project, Rev. 7, dated August 7, 1985.

- Bechtel South Texas Project Quality Program Manual, Rev. 3, dated July 15, 1985.

- Ebasco Nuclear Quality Assurance Program Manual ETR-1001 for South Texas Project, Rev. 12, dated July 26, 1985.

- South Texas Project Procedure No. RMSP 1.02, "General Operating Description-RMS," Rev. 3, dated August 1, 1985.

- South Texas Project Procedure No. RMSP 2.03, "Design Drawing and Drawing Change Notice Control," Rev. 3, dated June 14, 1984.

- South Texas Project Procedure No. RMSP 2.05, "Specifications, Specification Change Notices and Procurement Document Control," Rev. 4, dated March 14, 1984.

- South Texas Project Procedure No. RMSP 3.16, "Quality Records," Rev. 6, dated May 20, 1985.

- Bechtel Procedure No. WPP 3.0, "Field Control of Design Documents," Rev. 17, dated November 13, 1985.

- Bechtel Procedure No. WPP 3.2, "Field Supplier Document Control," Rev. 3, dated March 29, 1983.

- Bechtel Procedure No. WPP-QCI 6.0, "Control, Review and Processing of Quality Records," Rev. 9, dated March 25, 1985.

- Bechtel Engineering Department Procedure (EDP) No. 4.46, "Project Drawings," Rev. 8 STP, dated March 6, 1985.

- Bechtel EDP 4.49, "Project Specifications," Rev. 6 STP, dated January 23, 1985.

- Ebasco Quality Assurance Instruction (QAI) No. 019, "Review, Processing and Turnover of Quality Records," Rev. 2, dated March 25, 1985.

- Ebasco Quality Control Procedure (QCP) No. 6.2, "Document Control," Rev. 1, dated January 21, 1985.

- Ebasco QCP No. 17.1, "Quality Assurance Records," Rev. 3, dated March 8, 1985.

- Ebasco Procedure No. ASP-6, "Document Control," Rev. 7, dated May 17, 1985.

(2) Bechtel, Ebasco and HL&P QA audit and surveillance reports concerning design document control were reviewed for findings, trends and corrective actions.

(3) Bechtel, Ebasco and HL&P document control, engineering, construction and QA personnel were interviewed concerning design document and design change document distribution and control.

b. Inspection Findings

(1) Design documents and design change documents are issued by Bechtel; issue at the site is through the Bechtel Field Document Control Center (FDCC) to various satellite document stations in accordance with a distribution matrix. The satellite stations are also controlled by Bechtel. A computerized Field Revision List (FRL) is the data base which gives the current design document revision and lists the unincorporated design changes; a "historical" version of the FRL showing each revision of design documents and the change documents written against each revision is also available. The unincorporated design changes are posted on the design documents in the reference stations to relieve the users of the need to review the FRL.

(2) The NRC CAT inspectors reviewed against the latest FRL a series of procedures, specifications and drawings at the Bechtel FDCC, at Bechtel Reference Station A02 (located in the Unit 1 construction office, Building 10), and at Bechtel Reference Station B49 (located in the Unit 2 construction office, Building 16). Tables VII-1A through 1E summarize the NRC CAT findings for this review, which was performed to check that documents were being distributed, posted and otherwise controlled in accordance with Bechtel Procedure WPP 3.0, "Field Control of Design Documents," and other applicable requirements.

The team reviewed eleven Bechtel and Ebasco procedures and five Bechtel specifications against the latest FRL at Reference Station A02. Four of the sixteen documents had deficiencies (i.e., did not accurately reflect all approved changes) as recorded in Table VII-1A.

Fifteen Bechtel large and small bore piping isometric drawings were reviewed at Reference Station A02. The active change documents listed in the field revision log for these drawings were posted on the drawings with minor exception, and only a few superseded change documents were found posted on the drawings (Table VII-1B).

A total of 49 Bechtel electrical drawings were reviewed against the latest FRL at Reference Stations A02 and B49 (Tables VII-1C-D). Four of the nineteen drawings reviewed at Reference Station B49 exhibited an unacceptably high rate of discrepancies (Bechtel drawings 3E359E58020, -029, -191 and -317, Table VII-1D). The NRC CAT inspectors are particularly concerned about the active change documents not posted on the drawings, since this information is lost to the users. These drawings were all cable tray support detail "cookbook"

drawings. The cable tray support "cookbook" drawings posted in the reference stations are maintained by reference station personnel for reference use only. However, FDCC maintains the master copies of these drawings, and issues bound sets of these detail drawings at five-day intervals to check-out-stations where their issuance for use by the construction craft is also controlled.

In order to determine if incorrect information was being issued to the construction crafts, the team reviewed 21 electrical drawings at the Bechtel FDCC against the latest field revision log, including 11 of the detail drawings reviewed at Reference Station B49. The team found these drawings to be properly controlled (Table VII-1E).

(3) The NRC CAT reviewed a sample of ten pipe support detail drawings for large and small bore safety class pipe. The latest issue of each pipe support drawing was checked to confirm that any change documents issued against the previous revision to the drawing had been properly incorporated. No discrepancies were observed.

(4) A Bechtel in-house study entitled "Overview of the Design Change Control Program" was prepared at the request of the NRC CAT inspectors and issued on November 11, 1985. This study describes the scope and trends of change documents issued for the South Texas Project, as well as compliance with respect to the number and time constraints detailed in existing site procedures; i.e., documents must be revised every "x" months or when "y" unincorporated design changes are outstanding. Attachment C, sheet 2 of the study indicates, for example, that a total of 25,320 Drawing Change Notices, 27,120 Field Change Requests, and 4,113 Field Change Notices have been issued for the South Texas Project through October, 1985. Attachments H, sheets 1, 2 and 5, indicate that approximately 90 percent of the change documents tracked since the beginning of 1985 have been processed in accordance with the governing number and time constraints.

c. Conclusions

The controls for posting unincorporated design changes on design documents were not adequately implemented at Station B49. However, for the sample inspected, the availability of design documents and approved design change documents for users is generally adequate.

2. Preparation of Document Packages

The use of design documents and design change documents in the preparation of work packages and inspection packages was inspected.

a. Inspection Scope

(1) The following procedures primarily related to the preparation and use of work packages and inspection packages and were reviewed to establish the inspection criteria for this portion of the inspection:

- South Texas Project Standard Site Procedure (SSP) No. 36, "Work Package Control," Rev. 0, dated September 16, 1985.
- Bechtel QCP-10.16, "Inspection of Electrical Raceways," Rev. 4, dated May 1, 1985.
- Bechtel PED-027, "Civil/Structural Directive for the Review of Pipe Support Drawings," Rev. 1, dated March 13, 1985.
- Bechtel Specification 3A010SS0012 for Category I Structural Steel, Rev. 2, dated January 21, 1984.
- Bechtel Specification 3A010SS0026 for Category I Miscellaneous Steel, Rev. 6, dated August 27, 1985.
- Ebasco QCP-9.5, "Weld Inspection (AWS)," Rev. 6, dated October 10, 1985.
- Ebasco QCP-10.5, "Inspection of Structural Steel Erection and Bolting," Rev. 5, dated July 19, 1985.
- Ebasco QCP-10.7, "Miscellaneous Metal Fabrication," Rev. 6, no rev. date.
- Ebasco QCP-10.12, "Component Support Fabrication and Installation Inspection," Rev. 4, dated June 17, 1985.
- Ebasco QCP-10.19, "Inspection of Anchoring Devices Installed Within Concrete Structures," Rev. 6, dated February 28, 1985.
- Ebasco QCP-10.31, "Inspection of Configuration Control Packages," Rev. 1, dated July 11, 1985.
- Ebasco Procedure Construction Site Procedure (CSP) 43, "Installation of Electrical and Associated Hangers," Rev. 5, dated September 30, 1985.

(2) Bechtel, Ebasco and HL&P document control, engineering, construction and QC personnel were interviewed concerning the use of design documents and design change documents.

b. Inspection Findings

(1) Ten samples of installed structural steel installation documents and QC inspection records provided by Ebasco civil/structural site engineering were reviewed. Table VII-2 summarizes the NRC CAT findings for this review, which was performed to confirm that Ebasco used the correct drawings, change documents, procedures and specifications to install and inspect the structural steel. Four of the ten samples were found to have deficiencies. The most significant finding from this review was that work done under a Field Change Request (FCR) dated September 14, 1984 had not been QC inspected. When a QC inspection was performed, a nonconformance was identified (Item 1, Table VII-2).

Structural steel is installed and inspected based on design drawings and approved design changes (i.e., there is no procedural requirement at STP for a structural steel work package) and the related QC inspection activities are performed on an area basis, with no easily auditable tracking of records for specific joints, members, etc. In a number of instances, the team encountered difficulty in identifying the specific installed steel that had been QC inspected. As a consequence, some installed or modified structural steel may not be QC inspected or inspected in a timely manner.

On September 20, 1985, HL&P notified NRC Region IV of a potentially reportable item concerning inspection of installed structural steel. The lack of an accurate detailed location description for structural steel is one of the identified deficiencies currently under review by NRC Region IV. The licensee is conducting an investigation to determine the extent of the documentation deficiencies in regard to structural steel erection. A thorough review of inspection documentation on structural steel erection is currently being performed. The licensee's review should also address the above identified NRC CAT finding.

(2) A sample of installation documents and QC inspection records for the ten electrical cable tray supports listed in Table VII-3A was reviewed to verify that Ebasco used the correct drawings, change documents, procedures and specifications to install and inspect the cable tray hangers. Table VII-3B summarizes the NRC CAT findings for this review. Minor documentation deficiencies were identified in seven of the ten samples.

There is no requirement at South Texas Project to provide an as-built record of an installed cable tray support. In addition, a given cable tray support detail drawing defines a design envelope rather than a unique hanger configuration. As a consequence, physical inspection is required to verify the specific configuration of an installed cable tray support. NRC CAT inspectors verified another sample of 14 cable tray supports, and concluded that the installed hanger configurations

conformed to the hanger detail drawings. NRC CAT review of this sample is documented in Section II, Electrical and Instrumentation Construction, of this report.

c. Conclusions

The use of design documents and design change documents in preparation of work packages and inspection packages appears generally adequate. However, during this review a deficiency in inspection of structural steel was identified. The licensee needs to determine whether this deficiency will be addressed in his overall evaluation of the inspection of structural steel pursuant to his notification to NRC Region IV of similar problems with the inspection and identification of structural steel.

3. Control of Design Changes

The specific aspects of the control of changes to design inspected by the NRC CAT were the change control systems for Field Change Notices (FCNs), Field Change Requests (FCRs) and Drawing Change Notices (DCNs) and implementation and verification of the changes.

a. Inspection Scope

(1) The following procedures relating primarily to the control of design changes were reviewed to establish the acceptance criteria for this portion of the inspection:

- South Texas Project Site Instruction 2.17, "Requests for Engineering Assistance," Rev. 2, dated July 31, 1985.
- Bechtel Procedure No. WPP-QCI 20.0, "Field Change Request," Rev. 15, dated August 20, 1985.
- Bechtel Procedure No. WPP 20.1, "Field Change Notice," Rev. 5, dated May 21, 1985.
- Bechtel Procedure No. WPP 22.0, "Configuration Control Package (CCP)/(Design Change Package - DCP)," Rev. 2, dated November 4, 1985.
- Bechtel Procedure No. WPP-QCI 34.0, "Organization and Responsibilities," Rev. 8, dated June 10, 1985.
- Bechtel EDP-2.13, "South Texas Project Engineering Team Organization and Responsibilities," Rev. 4 STP, dated June 1, 1984.
- Bechtel EDP-4.26, "Interdisciplinary Design Review," Rev. 0, dated December 2, 1977.
- Bechtel EDP-4.27, "Design Verification," Rev. 2 STP, dated July 31, 1984.

- Bechtel EDP-4.33, "On-Project Design Review," Rev. 3 STP, dated December 31, 1984.

- Bechtel EDP-4.34, "Off-Project Design Review (Design Control Check List and Design Review Notice)," Rev. 2 STP, dated December 15, 1983.

- Bechtel EDP-4.37, "Design Calculations," Rev. 4 STP, dated August 7, 1984.

- Bechtel EDP-4.47, "Drawing Change Notice," Rev. 4 STP, dated February 6, 1985.

- Bechtel EDP-4.62, "Field Change Request/Field Change Notice," Rev. 5 STP, dated March 26, 1985.

- Bechtel EDP-4.72, "Configuration Control Package," Rev. 3 STP, dated September 5, 1985.

- Bechtel EDP-4.73, "Design Change Management Procedure (Design Change Approval Request - DCAR - Process)," Rev. 2 STP, dated May 23, 1984.

- Ebasco Procedure No. ASP-7, "Field Change Notice Procedure," Rev. 4, dated August 1, 1985.

- Ebasco Procedure No. ASP-11, "Field Change Request," Rev. 4, dated July 29, 1985.

- Ebasco Procedure No. ASP-17, "Configuration Control Package (CCP)/Design Change Package (DCP)," Rev. 2, dated October 28, 1985.

(2) Bechtel and Ebasco QA audit and surveillance reports concerning design changes were reviewed for findings, trends and corrective actions.

(3) Interviews were conducted with personnel from Bechtel, Ebasco and HL&P concerning initiation (organization) review, approval and implementation of design changes.

b. Inspection Findings

(1) The Bechtel Site Engineering Organization (SEO) currently employs approximately 150 office personnel and 120 field personnel on site. The functions of Bechtel SEO are described in Bechtel procedure WPP-QCI 34.0, subsection 5.6. The functions of Bechtel project engineering personnel assigned to the site are described in Bechtel procedure EDP 2.13, subsection 5.6. Bechtel project engineering personnel assigned to the job-site take the lead in responding to field change requests, provide engineering dispositions on nonconformance reports, and monitor Ebasco field change notices for compliance to Ebasco and Bechtel requirements.

(2) The NRC CAT reviewed a sample of 55 Bechtel and Ebasco FCNs, FCRs and DCNs. These change documents were selected from the civil/structural and pipe support disciplines. Table VII-4 summarizes the NRC CAT findings derived from this review, which was performed to confirm that change documents had been correctly incorporated into the referenced drawings. NRC CAT review of an additional sample of design change documents is discussed in Section VII.B.3.b.(7), below.

Discrepancies were observed in the incorporation of 8 of the 55 change documents into the design documents. In seven cases, the team found that either the technical content or the scope of some change documents had been modified upon incorporation into the referenced design drawings. Six of these cases involved modification of FCRs or FCNs. Neither Bechtel procedure WPP-QCI 20.0, "Field Change Request," subsection 5.4.3, nor Ebasco procedure ASP-11, "Field Change Request," subsection 8.0.6, permits the modification of Field Change Requests. Bechtel procedure EDP 4.47, "Drawing Change Notice," subsection 3.6 permits the modification of a Drawing Change Notice upon incorporation into a design drawing, if notification is included in the drawing revision block. However, the change documents are not annotated to indicate the modified version of the technical content or scope that has been incorporated.

Change documents originally restricted to installation in either Unit 1 or Unit 2 have been modified upon incorporation into the referenced drawing for installation in both Units. Since many drawings are applicable to both Units 1 and 2 by default, and since the change documents are not reviewed to reflect the incorporated modification, it is not possible to determine if any error of omission has occurred or a conscious design decision has been made.

(3) The NRC CAT reviewed selected audits in the area of design control (Table VII-5) that had been conducted either by Bechtel or Ebasco, or by teams composed of Bechtel, Ebasco and HL&P personnel. The modification of some field change requests upon incorporation into the design drawings does not appear to have been an identified concern, although Bechtel explicitly audited this attribute in the latter part of 1984 (audit No. ESI-14-84, page 45, audit item 47).

The team also reviewed audit findings with respect to the Bechtel/Westinghouse interface. Audit M24-501 was conducted on March 11-25, 1984 to assess the programmatic adequacy and the proper procedural implementation of the Westinghouse NSSS program on site. The audit summary noted that the corporate Westinghouse program was being adequately implemented, but concluded that site specific procedures and instructions had not been developed to control activities affecting quality which were being performed by Westinghouse site personnel.

The audit summary considered this a significant deficiency which could have an impact on the overall South Texas Project quality program. Audits S15-501, D08-501, G42-501 and S23-501 also address aspects of the Bechtel/Westinghouse design interface. The deficiencies identified in Section II, Electrical and Instrumentation Construction, of this report with respect to the installation of Westinghouse motor operated valves indicate that the concerns identified in previous audit reports at the Bechtel/Westinghouse design interface require vigorous corrective action to assure a controlled A/E-NSSS design interface at South Texas Project.

(4) The NRC CAT documented conflicting definitions for configuration control package revisions in the governing Bechtel and Ebasco procedures: Bechtel EDP 4.72, subsections 7.3-4; Bechtel WPP-22.0, subsection 4.9.1, and Ebasco ASP-17, subsection 8.0.4. One definition notes that each revision of a configuration control package supersedes all previous revisions, and includes all previously issued design information. Another definition notes that each revision of a configuration control package supplements the previous revisions, and that all revisions are necessary to determine the intended final installed configuration. Design documents contained in a specific configuration control package may be revised upon completion of the physical work associated with that package. The team notes that the Bechtel field document control center has recently upgraded the field revision list to identify configuration control packages as a function of a given drawing. However, the NRC CAT is concerned that drawings incorporated into multiple configuration control packages prior to this upgrade may have been subject to conflicting modifications.

(5) The NRC CAT requested the Bechtel structural calculations for ten civil/structural change documents which added (or modified) equipment support steel to the Bechtel structural drawings. Table VII-6 summarizes the NRC CAT findings for this review, which was performed to confirm that appropriate calculations had been performed to substantiate design changes to project drawings. The team found seven of the ten Bechtel calculations acceptable.

Three of the changes reviewed were found to have inadequate calculational bases. A calculation for a nonsafety support in the seismically designed Fuel Handling Building had been performed, but not checked or signed off by a group leader (Table VII-6, item 1). Four bays of floor steel had not been verified by calculation, or by documented engineering judgment (Table VII-6, item 2), and some existing steel that was recently checked for the first time showed relatively high stress ratios (Table VII-6, item 3).

The NRC CAT is concerned that structural calculations or other adequate documentation of design bases may be lacking for some structural steel in safety related and nonsafety seismic structures. All structural steel should be explicitly or

generically qualified, and this analytical qualification should be documented. ANSI N45.2.11-1974 Section 4.2, Design Analyses, notes in part that "Analyses shall be sufficiently detailed as to purpose, method, assumptions, design input, references and units such that a person technically qualified in the subject can review and understand the analyses and verify the adequacy of the results without recourse to the originator."

(6) The NRC CAT reviewed three pipe support calculations to verify that supplementary steel had been properly modeled, and that calculated weld sizes had been noted on the pipe support drawings. Although no concerns were identified, the team had become concerned during the course of the inspection that pipe support supplementary steel and supporting steel was not always being evaluated for possible addition of beam stiffener plates. However, the NRC CAT was informed that a pipe support review team has already been established within the Bechtel pipe support group to review all ASME and seismic II/I supports for various pipe support design attributes. Both new as well as existing pipe support designs will be reviewed under this program, in accordance with Rev. 3 to Bechtel PED 023.

(7) Inspectors in each NRC CAT discipline checked the design control process at South Texas Project by evaluating compliance of a sample of installed and inspected hardware with respect to the applicable design drawings and their approved design change documents (Table VII-7A-C). In most instances, the installed hardware conformed to the design documentation. Of the 87 hardware samples reviewed for compliance with the governing design change documents, only 2 discrepancies were noted. However, because the NRC CAT is concerned that the design control process at South Texas Project may not be adequately controlled in some areas, i.e., motor-operated valves (Section II.B.3.b(8)), the licensee needs to assess the impact that these deficiencies may have on the associated hardware.

c. Conclusions

Control of the design change process is generally adequate for the sample inspected. However, additional management attention is needed to: (1) preclude further modification of design changes during incorporation into their referenced drawings, particularly unit-specific changes, (2) control the design interface between Bechtel and Westinghouse, (3) ensure that documented calculations exist to demonstrate both the bases and adequacy of design drawings and design changes, and (4) to ensure that the conflicting definitions for configuration control packages have not resulted in the improper use or as-building of these change documents.

TABLE VII-1A

REVIEW OF POSTING OF DESIGN CHANGES
PROCEDURES/SPECIFICATIONS SAMPLE

Reference Station A02

Document	Observation
Ebasco Procedure ASP-11	a) Table of contents does not list ICP (interim change to a procedure) No. 1;
	b) Procedure pages not correctly numbered
Ebasco Procedure QCP-10.7	Table of contents does not list PCR (procedure change report) No. 7
Bechtel Specification 5A010PS002	a) Table of contents and appendices misfiled;
	b) Total number of pages per appendix not tabulated.
Bechtel Specification 3A010SS0030	Total number of pages per appendix not tabulated

TABLE VII-1B

REVIEW OF POSTING OF DESIGN CHANGES
BECHTEL LARGE AND SMALL BORE PIPING ISOMETRIC SAMPLE

Reference Station A02

Drawing	Sheet No.	Rev. No.	Total Active Change Documents (CDs)	Active CDs Not Posted on dwg	Superseded CDs Posted On dwg
8M369PIA239	A08	4	5	-	-
8M369PIA239	A13	4	4	-	-
8M369PIA239	A17	4	4	-	-
8M369PIA239	A24	3	4	-	-
8M369PIA239	A29	4	3	-	-
3M369PCC207	2	4	17	-	-
5M369PCC207	5	3	5	-	-
5M369PCC207	7	4	14	1	-
4M369PCC207	9	5	14	-	-
5M369PCC207	10	4	18	-	-
3M369PEW229	18	0	40	1	-
5D369PEW329	5	1	18	-	2
3C019S1542	-	4	6	-	1
3C019S1600	-	5	2	-	-
3C019S1603	-	3	3	1	-
TOTAL			157	3	3

TABLE VII-1C

REVIEW OF POSTING OF DESIGN CHANGES
BECHTEL ELECTRICAL DRAWING SAMPLE

Reference Station A02

Drawing	Sheet No.	Rev. No.	Total Active Change Documents (CDs)	Active CDs Not Posted on dwg	Superseded CDs Posted On dwg
3E560E55127*	1	1	21	-	-
3E359E58001	1	11	7	-	3
3E359E58001	4	6	4	-	1
3E359E58001	5	7	4	-	1
3E359E58001	7	4	7	-	4
3E359E58001	2	9	2	-	1
3E359E58002	1	0	3	-	-
5E209E01638	2	9	5	-	-
5E209E1631	5	8	3	-	-
9E0VNAV	1	3	6	-	-
9EEW0101	1	2	5	-	1‡
9E0HE21	1	2	2	-	-
5E549EL5031	-	8	15	-	-
3E209E2825	-	8	16	-	-
3E209E56009	-	9	7	-	-
9E0AN03	2	2	1	-	-
6E100E02130	-	7	6	-	-
5E030E0100	3	14	4	-	-
9E0DAAB	1	5	1	-	-
5E030E0100	3A	3	4	-	-
9E0HC09	1	2	2	-	-
5E500E00103	3	22	9	2	-
9E0VCAB	1	3	5	-	-
9E0VCAG	1	2	3	1	-
9E0FP08	1	3	4	-	-
9E0PMAL	1	5	3	-	-
0E0SW10	1	1	2	-	-
3E209E56104	-	5	6	-	-
9E0PFCF	1	3	2	-	-
1EPFCC01	1	3	1	-	-
TOTAL			160	3	11

(*) There were approximately 35 not to be incorporated (N/I) CDs posted on this drawing that were subsequently tabulated on sheet 1A of the drawing and should have been deleted from sheet 1.

(‡) Incorrect CD No. posted.

TABLE VII-1D

REVIEW OF POSTING OF DESIGN CHANGES
BECHTEL ELECTRICAL DRAWING SAMPLE

Reference Station B49

Drawing	Sheet No.	Rev. No.	Total Active Change Documents (CDs)	Active CDs Not Posted on dwg	Superseded CDs Posted On dwg
3E359E58317	1	5	14	3	5
3E359E58191	1	3	4	1	6
3E359E58020	1	10	15	9	4
3E359E58029	1	6	7	2	5
3E359E58260	1	6	6	-	-
6E210E02564	2	4	6	-	1
3E359E58042	1	11	9	1	2
3E359E58140	1	4	7	-	-
9E560E50021	-	3	4	-	1
3E359E58901	1	1	5	-	1‡
3E359E58067	1	5	7	2	-
3E560E55127	1	1	21	-	-
3E560E55127	1A	2	3	-	-
3E359E58822	1	4	13	-	1
3E359E58072	1	6	5	-	-
3E359E58041	1	9	10	1	1
5L49T60002	-	16	44	1§	1
3E560E55045	-	12	15	-	-
3E560E55046	-	9	22	-	1
TOTAL			217	20	29

(‡) Incorrect CD posted

(§) 1 CD posted on drawing twice

TABLE VII-1E

REVIEW OF POSTING OF DESIGN CHANGES
BECHTEL ELECTRICAL DRAWING SAMPLE

Field Document Control Center (FDCC)

Drawing	Sheet No.	Rev. No.	Total Active Change Documents (CDs)	Active CDs Not Posted on dwg	Superseded CDs Posted On dwg
3E359E58317*	1	5	14	1‡	-
3E359E58191*	1	3	4	-	-
3E359E58020*	1	10	15	1	-
3E359E58029*	1	6	7	-	-
3E359E58041*	1	9	10	-	-
3E359E58140*	1	4	7	-	-
3E359E58148	1	6	3	-	-
3E359E58169	1	5	3	-	-
3E359E58238	1	3	3	-	-
3E359E58093	1	4	4	1	-
3E359E58260*	1	6	6	-	-
3E359E58268	1	2	3	-	-
3E359E58048	1	8	3	-	-
3E359E58057	1	4	3	-	1
3E359E58901	1	1	5	-	-
3E359E58831	1	1	2	-	-
3E359E58042*	1	11	9	-	-
3E359E58067*	1	5	7	-	-
3E359E58073	1A	5	4	-	-
3E359E58072*	1	6	5	-	-
3E359E58822*	1	4	13	-	1
TOTAL			130	3	2

(*) Drawings reviewed at Reference Station B49

(‡) 1 CD number transposed

TABLE VII-2

REVIEW OF WORK PACKAGES AND INSPECTION REPORTS
STRUCTURAL STEEL SAMPLE

ITEM	OBSERVATION
1	Field Change Request (FCR) No. CC-0414W was issued on September 14, 1984 against Bechtel drawings No. 3C01-9-S-1506, Rev. 5, 3C01-9-S-1508, Rev. 3, and 3C01-9-S-1510, Rev. 2. The FCR specified the coping of radial and circumferential steel at three different elevations in containment. Coping the beam flanges provides access to enable welding of the containment liner plate at the construction hatch opening. However, at the time of the CAT inspection, the steel rework had not been QC inspected. Subsequent Ebasco QC inspection is documented on miscellaneous metal fabrication inspection report 3461F1 dated October 28, 1985. Nonconformance Report Number CC-03133 was also issued on October 28, 1985 to document coping of beam flanges in excess of the dimensions specified in the FCR.
2	Drawing Change Notice (DCN) No. 3 was issued on January 25, 1985 against Bechtel drawing No. 3F01-9-S-3001, Rev. 1, in order to provide support details for Fuel Handling Building Sump Tank No. 1 Sump Pumps 9Q061/2NPA113A. Field Change Notice (FCN) 1-C-0329 provides the fabrication details for the new steel. However, there are discrepancies in the bolt hole diameters specified for the beam clip angles. The DCN and the drawing specify 15/16 in. diameter bolt holes for 3/4 in. diameter bolts, while the FCN specifies 13/16 in. diameter bolt holes. The Bechtel civil/structural site engineering organization issued DCN No. 5 on October 30, 1985 to correct DCN No. 3.
3	FCR BC-01544 was issued on December 24, 1984 against Bechtel drawing No. 3F01-9-S-3005, Rev. 1. The FCR detailed modifications to HVAC plenum No. 9V121VXV021 perimeter grating and support steel to provide an air-tight seal. However, Ebasco QC AWS D1.1 structural welding inspection report No. 1-00865, dated March 7, 1985, incorrectly references Rev. 1 of the Bechtel drawing. Rev. 2 of the drawing, dated December 18, 1984, was the correct drawing of record. The inspection report was corrected on October 30, 1985.
4	The not to be incorporated (N/I) amendment list for Bechtel drawing 3M01-9-S-4043, Rev. 3, dated July 15, 1985, incorrectly references FCN 1C-0265, dated February 21, 1985, as a FCR. Rev. 4 of the drawing, issued on November 5, 1985, correctly references the FCN.

TABLE VII-3A

LISTING OF ELECTRICAL CABLE TRAY SUPPORTS

Support No.	Location Drawing No.
H64	3-E-20-9-E-56004, Rev. 3
H117	3-E-20-1-E-56004, Rev. 5
H2	3-E-35-9-E-56008, Rev. 8
H153	3-E-20-9-E-56004, Rev. 3
H139	3-E-35-9-E-56008, Rev. 5
H115	3-E-20-9-E-56004, Rev. 3
H84	3-E-20-1-E-56004, Rev. 5
H136	3-E-35-9-E-56008, Rev. 3
H102	3-E-35-9-E-56008, Rev. 5
H100	3-E-35-9-E-56008, Rev. 8

TABLE VII-3B

REVIEW OF WORK PACKAGES AND INSPECTION REPORTS
ELECTRICAL CABLE TRAY SUPPORT SAMPLE

ITEM	OBSERVATION
1	Page 2 of the electrical raceway hanger inspection record/traveler for hanger No. 1-004-H64 does not reference Bechtel drawing No. 3-E-35-9-E-58140, sheet 1, Rev. 2 AWS D1.1 structural welding inspection report No. 02630 for hanger No. 1-004-H64 does not reference the cable tray hanger connection detail drawings, and references incorrect detail numbers 22 and 23 for the installed cable tray. The correct details are 42 and 70. The inspection report was corrected on November 11, 1985.
2	Bechtel drawing No. 3-E-20-1-E-56004, Rev. 5, is incorrectly referenced on page 3 of the electrical raceway hanger inspection record/traveler for hanger No. 1-004-H117. The inspection report was corrected on November 11, 1985.
3	Page 2 of the electrical raceway hanger inspection record/ traveler for hanger No. 1-004-H153 does not reference Bechtel drawing No. 3-E-35-9-E-58148, sheet 2, Rev. 4. AWS D1.1 structural welding inspection report No. 02407 for hanger No. 1-004-H153 references Rev. 2 of Bechtel drawing 3-E-20-9-E-56004. Rev. 3 of the drawing, dated September 16, 1983, was the drawing of record at the time of inspection on October 20, 1983. The inspection report was corrected on November 11, 1985. AWS D1.1 structural welding inspection report No. 02407 does not reference the cable tray hanger connection detail drawings.
4	Page 2 of the electrical raceway hanger inspection record/traveler for hanger No. 1-008-H139 does not reference Bechtel drawing No. 3-E-35-9-E-58029, sheet 4, Rev. 4.
5	The line diagram for the cable tray support shown on page 2 of the electrical raceway hanger inspection record/traveler for hanger No. 1-004-H115 shows one more G58HD12A tray support than the installed cable tray. Page 1 of the traveler (item 5) does not reference Bechtel drawing No. 3-E-35-9-E-58117, sheet 3, Rev. 5. The inspection report was corrected on November 11, 1985. Page 2 of the traveler (item 5) does not reference Bechtel drawing No. 3-E-35-9-E-58117, sheet 3, Rev. 3.

TABLE VII-3B - (Continued)

REVIEW OF WORK PACKAGES AND INSPECTION REPORTS
ELECTRICAL CABLE TRAY SUPPORT SAMPLE

ITEM	OBSERVATION
	AWS D1.1 structural welding inspection report No. 02630 for hanger No. 1-004-H115 does not reference the cable tray hanger connection detail drawings. The inspection report was corrected on November 11, 1985.
6	Page 2 of electrical raceway hanger inspection record/traveler 1-004-H84, prepared on December 19, 1983, was not updated to reference Field Change Request (FCR) CE-02312, dated April 24, 1984. The construction supervisor signed off on page 2 on June 23, 1985.
7	Page 2 of the electrical raceway hanger inspection record/traveler for hanger No. 1-008-H136 references Field Change Notice (FCN) CE-00831. The change document is actually a FCR. Ebasco voided this FCR on January 6, 1984. The construction supervisor signed off page 2 on August 4, 1984. FCR CE-00923 is referenced on the traveler (item 7). However, this FCR was superseded by FCR CE-01089 on November 4, 1983. FCR CE-01089 is referenced on page 2 of the traveler, but does not appear to be applicable to hanger 1-008-H136. FCR CE-00578 is referenced on the traveler (item 7), but this FCR was superseded by FCR CE-00828 on September 27, 1983, which is not referenced on the traveler. FCR CE-01133 is referenced on the traveler (item 7) but this FCR was superseded by FCR CE-01287 on December 6, 1983, which is not referenced on the traveler. Page 5 of electrical raceway hanger inspection record/traveler No. 1-008-H136 does not reference Bechtel drawing 3-E-35-9-E-58042, sheet 5, Rev. 0. The inspection report was corrected on November 11, 1985.

TABLE VII-4

REVIEW OF DESIGN CHANGE DOCUMENTS FOR INCORPORATION INTO DESIGN DOCUMENTS

ITEM	OBSERVATION
1	Field Change Request (FCR) BC-01202 was issued on June 13, 1984 against Rev. 2 of Bechtel drawing 3M01-9-C-4312. The FCR was issued to reduce an oversized HVAC opening. A modified version of the FCR (as noted in the drawing revision block) was incorporated into revision 3 of the Bechtel drawing, which was issued on October 4, 1984. As shown on the drawing, the detail is now applicable to both Units 1 and 2. It appears that the penetration was reworked in accordance with the FCR, so that the as-built configuration is not in agreement with the design drawing. The Bechtel civil/structural site engineering organization indicates that FCR BC-01202 was incorrectly incorporated into Rev. 3 of the Bechtel drawing, and issued Drawing Change Notice (DCN) No. 3 on November 16, 1985 to correct the drawing.
2	FCR CC-03426 was issued on June 23, 1984 against Rev. 7 of Bechtel drawing 3M35-9S-37417. The FCR was issued to shift a piece of supplementary steel in plan to provide support for a hanger for Unit 1 only. The FCR was incorporated into Rev. 8 of the Bechtel drawing, but this detail is now applicable to both Units 1 and 2. The drawing revision block does not indicate that the FCR was modified upon incorporation into the drawing. The Bechtel civil/ structural site engineering organization indicates that the decision was made to shift the steel for Unit 2 as well, at the time the FCR was incorporated into the drawing.
3	DCN No. 7 was issued on September 26, 1984 against Rev. 1 of Bechtel drawing 3C01-9-S-1600. The DCN was issued to provide support details for RHR pumps A, B and C in Unit 1 containment. The DCN was modified upon incorporation into Rev. 2 of the Bechtel drawing, as noted on the drawing revision block, to be applicable to both Units 1 and 2.
4	FCR CC-04949 was issued on December 22, 1984 against Rev. 3 of Bechtel drawing 7G-22-9-S-2002. The FCR revised support details for relay racks ERR126 (nonsafety) in Units 1 and 2. The FCR was modified upon incorporation into Rev. 3 of the Bechtel drawing, as noted in the drawing revision block, and as detailed on the drawing. However, the location of the revised steel in plan was not clouded, and the 13/16 in. bolt holes for the support channel were not transferred onto the drawing. The Bechtel civil/structural site engineering organization has verified that the support was installed as detailed on the drawing, and issued DCN No. 18 on November 18, 1985 to correct the drafting error.

TABLE VII-4 - (Continued)

REVIEW OF DESIGN CHANGE DOCUMENTS FOR INCORPORATION INTO DESIGN DOCUMENTS

ITEM	OBSERVATION
5	FCR BC-01279 was issued on July 24, 1984 against Rev. 1 of Bechtel drawing 7G22-9S-2010. The FCR adds a supplementary steel beam to provide support for exhaust fans 8V321(2)VFN013 and -4 (nonsafety) in the turbine generator building. The addition of the supplementary steel is required because of interference with a concrete block wall. FCR BC-01279 was superseded by FCR CC-04461, which restricted the identical support detail for installation in Unit 1 only. FCR-04461 was modified upon incorporation into Rev. 3 of the Bechtel drawing, as noted in the drawing revision block, for installation in Units 1 and 2. The Bechtel civil/structural site engineering organization issued DCN No. 4 on November 18, 1985 to restrict the application of FCR CC-04461 to Unit 1 only.
6	DCN No. 2 was issued on October 6, 1984 against Rev. 1 of Bechtel drawing 3C01-9-S-1603. The DCN provided construction details for the carbon unit A and B fan supports in containment for Units 1 and 2. The DCN was correctly incorporated into Rev. 3 of the Bechtel drawing, except for a minor drafting error involving failure to dimension a steel connection plate. The Bechtel civil/structural site engineering organization issued DCN No. 3 on November 15, 1985 to correct the drawing.
7	FCN BS-1-0194 was issued on July 9, 1984 against Bechtel drawing CV-9010-GU0006, Rev. 1. The FCN revised the bill of materials for a pipe support configuration to allow the installation of a rigid sway strut from bulk stock for Unit 1 only. The FCN also specified the center-to-center dimensions for the Unit 1 struts. However, the drawing did not properly specify the different center-to-center (C-C) dimensions required for the struts. The C-C dimensions for the Unit 2 struts were listed in the bill of materials (apparently past practice) while the C-C dimensions for the Unit 1 struts were dimensioned on the drawing. However, the drawing did not restrict the use of these strut C-C dimensions to the Unit 1 struts. The Bechtel pipe support group site engineering organization issued DCN No.1 on November 18, 1985 to correct the drawing.
8	FCN BS-1-0235 was issued on August 5, 1984 against Rev. 2 of Bechtel drawing CC-9215-RR0005. The FCN was incorporated into Rev. 3 of the Bechtel drawing on March 12, 1985. The team reviewed the drawing, which details separate pipe supports for Units 1 and 2. The supporting steel for these supports appeared to require stiffeners, and the team then reviewed the pipe support calculation. Rev. 1 of calculation JC-CC-92-15-RR0005, dated September 30, 1985, does require beam stiffeners for both the pipe support supplementary steel and the supporting framing

TABLE VII-4 - (Continued)

REVIEW OF DESIGN CHANGE DOCUMENTS FOR INCORPORATION INTO DESIGN DOCUMENTS

ITEM	OBSERVATION
	steel. Bechtel issued two separate configuration control packages on October 30, 1985 to add beam stiffeners to the pipe support steel, CCD-1-M-ST-0066-00 and 2-M-ST-0067-00; however, the beam stiffeners to be added to the supplementary steel for the Unit 2 pipe support were not clouded on the pipe support drawing. The Bechtel pipe support group site engineering organization issued FCR XEJ-00371 on November 18, 1985 to correct the configuration control package for Unit 2.

TABLE VII-5

SOUTH TEXAS PROJECT AUDIT SAMPLE

Audit No.	Audit Date	Audit Subject
EQA-123	12/07/84	Document Control/Instructions and Procedures, FCNs
ESI-14-84	11/26/84	Evaluation of Design Control Operations
BEC-6-84	05/24/84	Document Control - Field Control of Design Documents (Unscheduled Audit)
BEC-7-84	07/18/84	Evaluation of Quality Program for Procurement Document Control
BEC-8-84	08/14/84	Evaluation of Quality Program for QA Records
BEC-10-84	09/28/84	Evaluation of Compliance to Quality Program Requirements for Design Control and Project Engineering Design Interface Activities
BEC-11-84	10/31/84	Evaluation of Quality Program for Evaluation of Compliance to Quality Program Requirements for Preparation, Review, Approval and Control of Procedures
C14-501	02/06/85	Ebasco Structural Steel Installation Activities
G35-501	02/06/85	HL&P-RMS Site Records Retrieval
G39-501	03/13/85	HL&P/Bechtel/Ebasco-Quality Records
M24-501	04/18/85	Westinghouse - Site Activities
S15-501	04/15/85	Bechtel Control of Westinghouse Design Disclosure Documents
D08-501	04/23/85	Bechtel Design Control (Houston & Site)
G42-501	06/06/85	Bechtel/Ebasco Document Control
M16-501	07/25/85	Ebasco Valve & Pipe Installation
D08-502	10/22/85	Bechtel Design Control (Houston & Site)
S23-501	10/16/85	Bechtel Document Control of Ebasco and Westinghouse Documents

TABLE VII-6

REVIEW OF CALCULATIONS
STRUCTURAL SAMPLE

ITEM	OBSERVATION
1	Drawing Change Notice (DCN) No. 5 issued on August 9, 1983 against Bechtel drawing No. 3F01-9-S-3005, added support details for Fuel Handling Building heating coils 8V121VHX001 and -002 at two plan elevations. Bechtel had performed a calculation for the support steel for this non-safety equipment but the calculation had not been checked or signed by the group leader at the time of the inspection. Bechtel did not assign a number to this calculation, and does not plan to formalize this calculation.
2	Bechtel drawing No. 3M01-9-S-4043, issued on November 5, 1984, revised the structural steel floor plan in the Mechanical and Electrical Auxiliary Building between column lines 30 and 32, and column lines M8 and H, at plan elevation 69 ft.-6 in. Field Change Notice (FCN) 1-C-0265, issued on March 6, 1985, provides the fabrication details for the structural steel adjacent to a pair of HVAC openings located in the southeast corner of the floor plan. The CAT team requested the calculations for the structural steel detailed on the FCN. Bechtel indicates that engineering judgment was used to size the installed steel. However, this engineering judgment was not documented. The Bechtel civil/ structural site organization has verbally indicated that calculations could not be retrieved for any of the four above-referenced bays of structural steel in the Mechanical and Electrical Auxiliary Building.
3	DCN No. 5, issued on October 24, 1985 against Bechtel drawing No. 3M01-9-S-4069 Rev. 4, added a transverse stiffener beam between two existing parallel beams which support pipe hangers. The beam was added to increase the torsional stiffness of the existing beams. The added steel is located in the Mechanical and Electrical Auxiliary Building. The team requested the structural calculation for the added steel beam. Bechtel provided a recently completed calculation which verified the adequacy of the added beam (Rev. 1 to Bechtel calculation No. CC-6043, dated November 13, 1985). Each of the existing steel beams was also checked in this calculation. The stress in one of the beams is 86 percent of allowable load capacity. The stress in the other beam is 109 percent of allowable load capacity. These beams were subjected to generic dead and live distributed loads, a concentrated live load, and peak vertical and horizontal seismic spectra (i.e., the loads that would normally have been used to size this steel initially). It appears, however, that this is the first formal check of this steel.

TABLE VII-7A

ELECTRICAL AND INSTRUMENTATION CONSTRUCTION HARDWARE SAMPLE

Change Document
FCR DE-00274
FCR CE-04476
FCR CE-04475*
FCR CE-05252
FCR CE-05302
FCR BE-00536
FCR CE-05294
FCR CE-04881
DCN No. 8 (Dwg. 3D019-S-5002)
FCR CC-D5635
FCR XDE-00055
FCR CE-04284
FCR BE-00674
FCR BM-00225
FCN TGXM-10585, A, B, C*

(*) Refer to Section II, Electrical and Instrumentation Construction, for a discussion of the deficiencies noted with the implementation of these design change documents.

TABLE VII-7B

MECHANICAL CONSTRUCTION HARDWARE SAMPLE

	Change Document
A. Piping	FCR DP-451
	FCR DP-541
	FCR DP-57-1
	FCR DP-503
	FCR DP-690
	FCR DP-748
	FCR DP-662
	FCR DP-669
	FCN IP-1125
	FCN IP-1074
	FCN IP-1069
	FCN IP-1067
	FCR DP-269W
	FCR DP-614
	FCR DP-916
	FCR DP-14W
	DCN Nos. 14 & 15 (Dwg. 5M369PCC207, Sh. 10, R.1)
	FCN IP-1384
	FCR DP-939W
	FCR DP-918
	FCR DP-772
	FCR DP-751
	FCR DP-739
	FCR DP-718
	FCN IP-1081
	FCN IP-1106
	FCN IP-0836
B. Pipe Supports	FCN IP-0981
	FCR DJ-00248
	FCR XEJ-00185
	FCN J-0919
	FCR DJ-00368
	FCR DJ-00306
	FCR DJ-00374
	FCR DJ-00648
	FCR DJ-00440
	FCN J-0967
	FCN J-0968
	NCR BS-00212

TABLE VII-7B - (Continued)

MECHANICAL CONSTRUCTION HARDWARE SAMPLE

	Change Document
C. Concrete Expansion Anchors and Base Plates	FCR CM-02181W
	NCR CM-00587
	NCR CS-00802
	NCR CS-03103
	NCR CS-01014
	FCR DJ-00787
	FCR DJ-00994
	FCR DJ-00894
	FCR EJ-00289
	FCR J-0983
	DCN No. 1 (Dwg. CC9317-HL5006)
	FCR DJ-00763
D. HVAC	FCR BH-00827
	FCR CH-01546
	FCR BH-00559
	FCR CH-00845
	FCR CH-01800
	FCR DL-00152W
	FCR CH-02181W
	FCR EAB-314
	FCR BH-01844
	FCR BH-01142

TABLE VII-7C

CIVIL/STRUCTURAL CONSTRUCTION HARDWARE SAMPLE

Change Document
FCR EC-00318
FCN 2C-0450
FCR EC-00321
FCR EC-00098
FCR EC-00318
FCR CM-00194
FCR CC-02180
Dwg. No. 3C01-9-S-1633, Rev. 10

VIII. CORRECTIVE ACTION SYSTEMS

A. Objective

The objective of this portion of the NRC CAT inspection was to verify through selected samples, whether measures were established and implemented to assure that nonconformances and other conditions adverse to quality were promptly identified and corrected.

B. Discussion

An examination was made of the licensee's program for identification and control of nonconformances and corrective actions, including review of documents and inspection of some material/equipment for verification of actual corrective actions in the plant. Items such as the following were reviewed:

- Quality assurance programs
- Procedures and organizational interfaces
- Trend analyses
- Audits and surveillance reports
- Nonconformance reports
- Deviation reports
- Inspection reports
- Corrective action reports
- Control of actual material/equipment corrections in the plant
- Control of open nonconformances at turnover for testing or operation

Table VIII-1, "Corrective Action Samples," contains a list of samples that were randomly selected.

The following manuals and procedures of on-site organizations were found in place, and applicable portions pertaining to corrective action provide the background information and acceptance criteria for this inspection.

Houston Lighting and Power Company (HL&P)

- Quality Assurance Program Description for the Design and Construction Phases of the South Texas Project, Rev. 11

- Project Quality Assurance Plan, Rev. 7

- South Texas Project Quality Assurance Procedures, Rev. 46

- Standard Quality Assurance Procedures:

  SQAP-01 General Control of Standard QA Procedures, Rev. 1
  SQAP-02 Deficiency Reporting, Rev. 1
  SQAP-03 Project Audits, Rev. 1
  SQAP-04 Project Surveillances, Rev. 1

- PSQP-16.3 Trend Analysis, Rev. 3

- SSP-8 Nonconformance Reporting, Rev. 0

° OPGP03-ZM-0002 Preventive Maintenance Program, Rev. 0

Bechtel Power Corporation (Bechtel)

° Project Quality Program Manual, South Texas Project, Rev. 11

° WPF/QCI-4.0 Receiving Inspection, Rev. 11

° WPP/QCI-5.0 Nonconforming Materials, Parts and Components, Rev. 14

° WPP/QCI-28.0 Maintenance of Materials and Equipment, Rev. 11

° SQAP-04 Project Surveillances, Rev. 1

Ebasco Services Incorporated (Ebasco)

° ETR-1001 Nuclear Quality Assurance Program Manual, Rev. 11

° QAI-11 Corrective Action and Stop Work Authority, Rev. 7

° QCP-10.9 General Inspection (G series), Rev. 2

° QCP-10.30 Inspection of Installation and Fabrication of Electrical Cable Tray Hangers, Conduit Supports and Auxiliary Steel, Rev. 1

° QCP-10.11 Mechanical Equipment Installation Inspection, Rev. 5

Westinghouse Construction Services (Westinghouse)

° Quality Assurance Program Manual (QAPM) for ASME Code Section III, Division I

° QAPM Addenda for South Texas Project (yellow pages)

° QAPM Addenda, Section 15.0 Nonconformances, Rev. 9

° QAPM Addenda, Section 16.0 Corrective Action, Rev. 7

° STP Project Quality Plan, Rev. 4

Pittsburgh DesMoines Steel Company (PDM)

° Corporate Quality Assurance Manual (CQAM) ASME Section III, 1981 Edition, Rev. 8

° CQAM Appendix 202 (for STP), Section 12, Nonconformances and Corrective Action

Richmond Engineering Company (RECO)

° Quality Assurance Manual, South Texas Project, Rev. 3

Intermach Company (Intermach)

° Quality Assurance Manual (The Bahnson Co.), Rev. 9

° QFP-15.001 Nonconforming Items, Rev. 4

° QFP-16.001 Corrective Action, Rev. 1

° QFP-8.001 Identification and Control of Materials, Parts and Components, Rev. 3

° QFP-9.001 Control of Welding Processes, Rev. 3

° QCI-013 Control of Nonconforming Items, Rev. 2

Prescon Corp. (Prescon)

° Quality Assurance Program, Rev. 10

Champion, Inc. (Champion)

° Quality Assurance Manual, Rev. 26

Pittsburgh Testing Laboratory (PTL)

° Quality Assurance Manual, Rev. 8

1. Corrective Action Measures

a. Inspection Scope

A review was performed of applicable portions of the Quality Assurance (QA) program and procedures. In addition to QA manuals and procedures, a total of 439 samples of corrective action documents were reviewed. Also, 16 samples of closed nonconformances involving material/equipment were inspected for verification of corrective actions in the plant. In addition, 58 samples of open nonconformances were selected for verification of "HOLD" status.

b. Inspection Findings

In general, it was found that satisfactory procedures were in place for corrective action systems to identify and control the correction of conditions adverse to quality at the site. Except for concerns discussed below, the corrective action systems and implementing measures were found to be acceptable. The 16 material/equipment samples requiring rework in the plant were inspected, and corrective action control was verified.

(1) Fastener Materials

Numerous problems with fastener material discrepancies on large vendor-supplied ASME pump/motor assemblies and other vendor equipment were found by the NRC CAT inspectors for which effective corrective actions were not previously evident. See Section VI.B for details. These problems indicate a lack of attention by vendors to ensure that fasteners of required materials are specified and provided with delivered items, a lack of effective quality control at vendors'

plants, and also a lack of vendor surveillance by the licensee with attention to verification of proper fasteners prior to shipment.

(2) Preventive Maitenance (PM)

Review of the PM program revealed that numerous problems have been encountered, including overlubrication and contamination due to commingling of lubricants. Seven fan motors, after turnover to Startup, were later found to have been overlubricated.

Review of PM history of four Auxiliary Feedwater Pumps (three motor driven and one turbine driven) revealed repeated corrosion problems. One unit seized and could not be rotated. Rotating elements of the four units had to be returned to the vendor for repairs.

The NRC Resident Inspection Office has issued inspection reports (85-08 and 85-11) on PM deficiencies. Also, Ebasco issued a Management Corrective Action Report, MCAR-13 dated February 23, 1985 which contains a list of 106 deficiencies and resulted in a major review and reorgnization of the PM program.

Of particular concern is the current practice of the licensee accepting turnover packages and preparing operational maintenance programs assuming that the past PM history is good without assessing potential for damage to the equipment due to past PM deficiencies. The potential long term effects of the lack of proper maintenance has not been addressed and documented, and it does not appear that measures (reference: OPGP03-ZM-0002 Preventive Maintenance Program, Rev. 0, dated 5-15-85) were in place to provide for damage assessment and evaluation.

(3) Nondestructive Examination (NDE)/Radiographic Testing (RT) Audits; Records Retrieval

Review of the total of 21 prior audits of welding/NDE revealed only two audits that addressed RT records packages and retrievability (audits M11-301 and G35-502). These two audits included three weld joints for one audit and six weld joints for the other. The total of 9 weld joints (of approximately 25,000 field weld joints) is a very small sample to have been audited. NRC CAT examination of the radiographs for two of the three welds for audit M11-301 found them to have deficiencies, indicating that the audits were limited in scope and depth (see Section IV.B for details).

None of the 21 prior audits covered vendor NDE/RT records.

Requests for information to identify vendors that were required to supply radiographs were not readily answered. Some radiographs from vendors involving plant equipment were not made available to the NRC CAT inspectors, and in some

cases could not be located. A method for identifying vendors, equipment and related radiographs was not available at the start of the CAT inspection (see Section IV.B for details).

The required records retrieval for RT film was not evident during this inspection, and raises questions regarding the ability of the licensee to verify the required product quality, if records are not readily available.

(4) Significant Deficient Corrective Actions for Certain Electrical Items: Motor Operated Valves (MOVs) and Motor Control Centers MCC)

Corrective action deficiencies related to unauthorized electrical wiring of MOVs furnished by Westinghouse were noted by the NRC CAT inspectors (see Section II.B). Questionable QA and corrective action activities involving design change control, field modification and inspection were indicated. It was noted that no audits or surveillances of Westinghouse activities related to MOVs had been conducted. However, one HL&P audit report, S26-501 dated September 24, 1985 addressed field wiring changes by Westinghouse on other electrical equipment inspected and accepted at the site without prior written authorization for the changes. The response by Westinghouse noted a procedure change for accelerated Field Change Notice (FCN) work to require written authorization prior to the work. Also, a project team audit S15-501 dated April 15, 1985 referenced a prior HL&P audit M24-501 of Westinghouse which addressed deficiencies in the electrical area. It appears that the generic aspects of these audit results were not applied by Westinghouse to the MOV work.

Also, corrective action deficiencies related to faulty bus extensions of circuit breakers in MCCs procured by Bechtel were noted by the NRC CAT inspectors (see Section II.B).

(5) Open Nonconformances "HOLD" Status Control

Open Nonconformance Reports (NCRs) and related equipment requiring "HOLD" tags for 58 items were reviewed for verification. "HOLD" tags for 13 items (22%) were missing or improperly controlled.

Since "HOLD" tags are required to be used as a means of controlling quality, attention and action are required to assure proper application and maintenance of "HOLD" tags on nonconforming material and equipment. As a result of this NRC CAT finding, Bechtel issued General Surveillance Report SB 727 to document incorrect "HOLD" tag control.

c. Conclusions

The licensee's corrective action program was found to be generally acceptable, except for the following concerns:

(1) Failure to assure that fasteners of required materials were furnished with vendor supplied equipment.

(2) Failure for Operations to assess and evaluate damage to equipment due to past PM deficiencies and incorporate such considerations into operational maintenance programs.

(3) Failure to conduct a reasonable quantity of audits of actual radiographs of both field welds and vendor supplied welds. Also, failure to assure that vendors required to supply radiographs were readily identified and that the location of radiographs/records were known and readily retrievable as required.

(4) Failure to identify the need for effective corrective action activities for certain electrical items: MOVs and MCCs.

(5) Failure to properly apply and control "HOLD" tags on nonconforming material and equipment.

(6) There appears to be a need for more attention to generic and lessons-learned aspects of the corrective action program to help reduce deficiencies and avoid recurrence.

TABLE VIII-1

CORRECTIVE ACTION SAMPLES

Items/Reports	Quantity Examined								
	HLP	BEC	EBA	WES	PDM	REC	INT	PTL	TOTAL
Trend	3*	*	*	3	-	-		-	6
Audit	41*	*	*	6	3	-	1	-	51
Nonconformance	17	61	69	6	5	5	12	5	180
Deviation	-	-	-	10	8	-	15	-	33
Inspection	-	5	18	-	-	-	4	-	27
Surveillance	14	19	12	-	-	-	-	-	45
Corrective Action	9	18	12	-	-	-	-	-	39
Deficiency Eval.	10	10	-	-	-	-	-	-	20
Mgt. Corrective Action	-	-	4	-	-	-	-	-	4
Inspection Efficiency	9	-	-	-	-	-	-	-	9
Stop Work	3	-	1	-	-	-	-	-	4
Turnover Packages	20	-	-	-	-	-	-	-	20
TOTAL	126	113	116	25	16	5	32	5	438

HLP = Houston Lighting and Power Company
BEC = Bechtel Power Corporation
EBA = Ebasco Services Incorporated
WES = Westinghouse Construction Services
PDM = Pittsburgh DesMoines Steel Company
REC = Richmond Engineering Company
INT = Intermach Company
PTL = Pittsburgh Testing Laboratories

* Joint (HLP, BEC, and EBA) trend and audit program samples listed under HLP.

A. PERSONS CONTACTED

The following list identifies licensee representatives and NRC personnel present at the exit meeting, and licensee discipline coordinators and key individuals contacted during the inspection for each area.

1. Exit Meeting

Houston Lighting and Power Company

F. L. Alkov	G. Goldberg	T. H. McGriff
J. Bevins	S. Head	R. C. Munter
P. F. Boyle	R. Hernandez	A. G. Peterson
D. P. Bradley	S. R. Hubbard	G. B. Rogers
R. J. Daly	M. F. Hutcheson	M. T. Sweigart
S. Dew	T. J. Jordan	W. Trujillo
F. Dotson	D. R. Keating	J. Westermeier
J. E. Geiger	W. H. Kinsey, Jr.	W. R. Whitley
		M. R. Wisenburg

Bechtel Energy Corporation

R. D. Bryan	L. W. Hurst	R. L. Rogers
J. L. Hurley	D. R. Quattrochiocchi	R. Wilkerson

Ebasco Services, Incorporated

A. M. Cutrona	W. Taylor	R. W. Zaist
R. A. Harrington		

Westinghouse Electric Corporation

D. M. Bokesch	C. W. Rowland	F. J. Twogood
H. L. Hogarth	S. R. Spiegelman	R. J. Von Osinski

NRC and Consultants

S. Baron	D. Garrison	T. McLellan	W. Sperko
D. Carpenter	G. Georgiev	O. Mallon	S. Stein
L. Constable	R. Heishman	E. Martindale	R. Taylor
R. Compton	C. Johnson	J. Nemoto	R. Vollmer
A. DuBouchet	R. Kadambi	M. Peranich	
D. Ford	J. McCormack	H. Phillips	

2. Licensee Coordinators and Contacts

Area	Contact
Team Leader	R. Hernandez W. Trujillo
Electrical and Instrumentation	D. Bradley D. Richter J. Bagley
Mechanical	M. Hutchesan S. Hubbard J. Bagley C. Brewer A. Benyo
Welding and NDE	S. Hubbard R. Abel R. Lewis
Civil and Structural	T. McGriff J. Stevens
Material Traceability	F. Alkov J. Senecal R. Fish
Corrective Action Systems	E. Luder J. Hansen
Design Change Controls	K. McNeal

In addition to the above personnel, numerous other inspectors, engineers and supervisors were also contacted.

B. DOCUMENTS REVIEWED

The types of documents listed below were reviewed by the NRC CAT members to the extent necessary to satisfy the inspection objectives stated in Section I of this report. There are additional references within the body of the report to specific procedures, instructions, specifications and drawings.

1. Final Safety Analysis Report and Safety Evaluation Report

2. Quality assurance manual

3. Quality assurance procedures and instructions

4. Quality control procedures and instructions

5. Administrative procedures

6. General electrical installation procedures and specifications

7. General instrumentation installation procedures and specifications

8. General piping and pipe support installation procedures and specifications

9. General mechanical equipment installation procedures and specifications

10. General concrete specifications

11. As-built drawings

12. Welding and NDE procedures

13. Personnel qualification records

14. Material traceability procedures

15. Procedures for processing design changes

16. Procedures for document control

17. Procedures for controlling as-built drawings

18. Procedures for processing nonconformances

GLOSSARY OF ABBREVIATIONS

A/E	- Architect-engineer
AISC	- American Institute of Steel Construction
ANSI	- American National Standards Institute
ASME	- American Society of Mechanical Engineers
ASTM	- American Society for Testing and Materials
AWG	- American Wire Gage
AWS	- American Welding Society
ATWS	- Anticipated transient without scram
BBC	- Blount Brothers Company
BEC	- Bechtel Engineering Corporation
BR	- Brown & Root, Inc.
CAR	- Corrective Action Report
CAT	- Construction Appraisal Team (NRC)
CB&I	- Chicago Bridge and Iron Company
CCP	- Configuration Control Package
C of C	- Certificate of Conformance
CEA	- Concrete expansion anchor
CMTR	- Certified material test report
CPS	- Construction Process Sheet
CSP	- Construction Site Procedure
DCN	- Drawing Change Notice
DEF	- Deficiency Evaluation Form
DER	- Deficiency Evaluation Report
DR	- Deviation Report
ECN	- Engineering Change Notice
ECW	- Essential Cooling Water
EDP	- Engineering Department Procedure
ERSA	- Engineering Request for Site Action
FCN	- Field Change Notice
FCR	- Field Change Request
FDCC	- Field Document Control Center
FRL	- Field Revision List
FSAR	- Final Safety Analysis Report
HECo	- Hatfield Electric Company
HL&P	- Houston Lighting and Power Company
Hunter	- Hunter Corporation
HVAC	- Heating, ventilating and air conditioning
IE	- Office of Inspection and Enforcement (NRC)
IEEE	- Institute of Electrical and Electronic Engineers
IPCEA	- Insulated Power Cable Engineers Association
LP	- Liquid penetrant inspection
LOCA	- Loss-of-coolant accident
MCC	- Motor Control Center
MCM	- Thousand circular mils
MIC	- Midway Industrial Company
MOV	- Motor operated valve
NCR	- Nonconformance Report
NDE	- Nondestructive examination

NISCo	- Nuclear Installation Service Company
NPS	- Nuclear Power Service, Inc.
NRR	- Office of Nuclear Reactor Regulation (NRC)
NRC	- U.S. Nuclear Regulatory Commission
NSSS	- Nuclear steam system supplier
PAP	- Powers-Azco-Pope
PDM	- Pittsburgh Des Moines Corporation
PED	- Project Engineering Directive
PSAR	- Preliminary Safety Evaluation Report
PSI	- Preservice inspection
PTL	- Pittsburgh Testing Laboratories
QA	- Quality assurance
QAI	- Quality Assurance Instruction
QAM	- Quality Assurance Manual
QC	- Quality Control
QCP	- Quality Control Procedure
QR	- Quality Requirement
RG	- Regulatory Guide (NRC)
RHR	- Residual Heat Removal System
RSM	- Reliable Sheet Metal Works, Inc.
RTD	- Resistance Temperature Detector
SAR	- Safety Analysis Report
SDR	- Standard Deficiency Report
SEO	- Site Engineering Organization
SIP	- Site Implementation Procedure
SSP	- Standard Site Procedure
STP	- South Texas Project
SWI	- Site Work Instruction
SWR	- Startup Work Request
UT	- Ultrasonic inspection
V	- Volt
VT	- Visual inspection
W	- Westinghouse Electric Corporation

NRC Form 8–C
(4–79)
NRCM 0240

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