UNITED STATES NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

DIVISION OF INSPECTION PROGRAMS
REACTOR CONSTRUCTION PROGRAMS BRANCH

Report No.: 50-461/85-30

Docket No.: 50-461

Licensee: Illinois Power Company

Facility Name: Clinton Power Station

Inspection At: Clinton, Illinois

Inspection Conducted: May 20-31 and June 10-21, 1985

Inspectors:

M. W. Peranich, Chief, Construction Programs/ CAT Section, Team Leader — Date Signed 8/6/85

T. L. Chan, Reactor Construction Engineer — Date Signed 8/6/85

G. B. Georgiev, Sr. Reactor Construction Engineer — Date Signed 8/6/85

T. K. McLellan, Reactor Construction Engineer — Date Signed 8/6/85

J. I. Nemoto, Reactor Construction Engineer — Date Signed 8/6/85

for R. J. Smeenge, Reactor Inspector (Region III) — Date Signed 8/6/85

for S. R. Stein, Reactor Construction Engineer — Date Signed 8/6/85

Consultants: A. V. DuBouchet, D. C. Ford, J. B. McCormack, O. P. Mallon, W. S. Marini, E. Y. Martindale, R. E. Serb and W. J. Sperko, Jr.

Approved By:

Robert F. Heishman, Chief
Reactor Construction Programs Branch — Date Signed 8/6/85

TABLE OF CONTENTS

I. INSPECTION SCOPE AND OBJECTIVES

The objective of this inspection was to evaluate the adequacy of construction at the Clinton Power Station 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. In addition, a sample of the results of the licensee's Overinspection Program were compared with the NRC CAT inspection findings in applicable areas inspected.

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 reflected 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 piping and components. Additionally, a review was made of a selected number of documents associated with design change control and nonconformance reporting.

A number of inspection samples in several areas coincided with either Baldwin Associates' Field Verification (BAFV) Program or Illinois Power Company's Overinspection (IPOI) Program. These are identified in the following sections along with an assessment of the programs' findings compared to the observations of this inspection. Refer to Section VII, Design Change Control, of this report for further discussion of the IPOI Program.

1. Electrical Raceway Installation

a. Inspection Scope

Seventy segments of installed Class 1E cable tray, representing a total length of about 1,200 feet, were selected from various plant areas for detailed examination by the NRC Construction Appraisal Team (CAT). These segments were inspected for compliance to requirements relative to routing, location, separation, identification, protection, physical loading, support spacing and support configuration. Additionally, 31 runs of installed conduit, with an aggregate length of about 1,000 feet, were inspected for compliance to specified requirements such as routing, location, separation, bend radii, support spacing and associated fittings. The BAFV records for a number of the conduit runs inspected were also reviewed.

Thirteen 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 the cable tray, conduit and raceway support samples.

The following documents provided the basic acceptance for the inspection:

- Sargent & Lundy Clinton Power Station Unit 1 Specification K-2999, "Electrical Installation," Amd. 10
- Baldwin Associates Project Procedure BAP 3.3.1, "Exposed Conduit Installation and Traveler Processing," Rev. 18
- BAP 3.3.6, "Electrical Raceway Support Installation," Rev. 9
- BAP 3.3.10, "Cable Tray Installation and Traveler Processing," Rev. 6
- BAP 3.3.11, "Cable Tray Attachment Installation," Rev. 6
- BAP 3.3.14, "Conduit Support Installation," Rev. 1 Change B
- Baldwin Associates Quality Assurance Instruction BQAI-190-8, "Electrical Raceway Hanger/Supports Field Verification," Rev. 4
- BQAI-190-9, "Electrical Raceway Field Verification," Rev. 4.

b. Inspection Findings

The NRC CAT inspectors observed that, in general, Class 1E raceway installations were in accordance with applicable design criteria. Important quality attributes such as material type, location, identification and installed configuration were found to be as shown on approved construction drawings. However, several construction deficiencies were identified and are discussed in the following sections.

(1) Raceway Separation

The requirement to establish physically independent and redundant cable raceway systems is specified in the Clinton Power Station (CPS) Final Safety Analysis Report (FSAR). Section 8.3.1.4, entitled "Independence of Redundant Systems," describes requirements for physical arrangement of raceways in order to comply with the requirements of Regulatory Guide (RG) 1.75.

The CPS raceway design includes four safety-related divisions to serve the Engineered Safety Features systems and two nonsafety-related divisions which serve the balance of plant systems. Minimum spatial separation between raceways comprising each of these divisions has been established in accordance with the guidelines specified in the Institute of Electrical and Electronic Engineers (IEEE) Standard 384-1974.

NRC CAT inspectors reviewed documents which explained the CPS electrical separation design philosophy. In summary, Sargent & Lundy Engineers (S&L) as the Architect Engineer controls electrical separation through their design process. Location dimensions on electrical raceway installation drawings are used for maintaining proper separation. Consequently, specific separation criteria is purposely not included in the specifications and instructions issued to the electrical contractor for installation and inspection. This has resulted in an inspection program which verifies the correct location of raceway components but does not include attributes for inspection of electrical separation.

To verify the adequacy of controls established through the design process, NRC CAT inspectors selected a sample of completed raceway installations for review. During the examination the inspectors identified numerous installations which did not maintain spatial separation as described in the FSAR. Several deficiencies existed between components of redundant safety divisions, but deficiencies primarily occurred between safety and nonsafety-related components. Specific cable tray deficiencies were then compared to design drawings to determine if required fire barriers (i.e., tray covers) had been detailed for installations which exhibited less than the required spatial separation. It was noted that in many cases barriers had not been specified on the applicable drawing. Reference Table II-2 for a listing of raceway separation deficiencies identified by the NRC CAT inspectors.

Discussions with the licensee indicate that they had become aware of the need to perform specific walkdowns for electrical separation because field installation tolerances could not be controlled by design drawings. As such, field walkdowns of raceway for seismic interaction were incorporated into S&L's Clinton Project Instruction PI-CP-034, Interaction Analysis Procedure, early in 1983. However, incorporation of specific electrical raceway separation criteria was not accomplished until mid 1985.

In order to evaluate this program, NRC CAT inspectors reviewed the walkdown procedure, examined the plant area previously inspected by the separation walkdown team, and interviewed the engineers responsible for performing the walkdown. The following concerns were identified as a result of this evaluation:

- Separation criteria detailed in the walkdown procedure is not complete in that spatial separation between raceway and exposed electrical cable has not been addressed.

- Personnel performing separation walkdowns have not received training adequate to assure that they are knowledgeable of all accept/reject criteria.

- The program represents the final inspection and acceptance of raceway for the attribute of electrical separation. As such, it lacks appropriate involvement from the quality assurance (QA) organization.

In connection with this issue, review of Sargent & Lundy Electrical Department Standard ESI-180 indicates that analysis has been used to justify many of the installations which exhibit less than the required spatial separation. NRC CAT inspectors noted that this does not satisfy the requirement of section 8.1.6.14 position C.6 of the CPS FSAR which states, "The analysis 'out' given in paragraphs 4.5(3), 4.6.2 and 5.1.1.2 has not been used."

An S&L calculation, No. 19-BD-13, was cited as justification for the examples of lessor separation identified by the NRC CAT between non-Class 1E raceway run above Class 1E cable tray. A review of the analysis indicates that it does not meet the requirements of IEEE-384 paragraph 5.1.1.2 in that it is not based on tests of proposed installations and does not consider actual raceway arrangements. The analysis only addresses non-Class 1E raceway which crosses over Class 1E cable tray and states that covers are not required for the Class 1E tray as the heat from a fire or fault in the upper raceway will rise.

Discussions with the licensee revealed that an amendment to the CPS FSAR has been prepared which would allow the use of analysis to establish adequate electrical separation. As a result, further evaluation of this issue will be required by NRC personnel.

In summary, the review of design, construction, and inspection activities indicates that existing design and quality verification programs have not been adequate to assure that commitments relative to electrical separation have been met. As a result of this observation, the licensee has indicated that a program evaluation will be performed. Additionally, based upon results of the evaluation and concerns addressed in this report, program requirements may be revised.

(2) Raceway Supporting Scaffolding

BAP 3.3.10 permits the use of installed cable tray to support temporary scaffolding with notification of BA quality control (QC) by the area electrical supervisor, and the procedure provides inspection criteria following removal of the scaffolding. The NRC CAT inspectors questioned the procedure controls that would alert BA QC whenever Class 1E cable trays were used to support scaffolding and assure inspection of the trays after removal of the scaffolding.

Since the controls were not well documented, BA's Deputy Project Manager subsequently issued letter EPR-160-85 June 4, 1985. The letter only permits placing scaffolds on Class 1E cable tray on an exception basis requiring Superintendent

approval. The letter also requires documentation in a departmental log and written notification to BA QC.

Section III, Mechanical Construction, of this report, also discusses support of temporary scaffolding.

(3) Electrical Conduit

In general, the installation of conduit conforms to design requirements. A number of separation violations were noted between conduits, and between conduits and cable tray and are included in the discussion in Section II.B.1.b(1), above.

In what the NRC CAT inspectors consider an isolated case, conduits C9822, C9823, and C9824 are not attached to support E29-1000-02C-122 as required by drawing E29-1000-02C-EIH. The licensee subsequently issued Nonconformance Report (NCR) 31717 to document the condition.

(4) Raceway Supports

The examination of seismic raceway supports was accomplished for both cable tray and conduit installations. In general, attributes such as location, material type and size, anchor spacing, welds (location, size and general quality) and installed configuration were found to be in accordance with design requirements.

c. Conclusions

The use of engineering analysis to establish adequate electrical separation is not consistent with current FSAR commitments, and an analysis to justify separation between Class 1E and non-Class 1E raceway was found to be technically inadequate.

The licensee's existing programs of design and quality verification activities have not been adequate to assure that raceway installations conform to FSAR commitments for electrical separation.

With the exception of compliance with electrical separation criteria, conduit and support installations appear to be in conformance with requirements.

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 BA QC inspectors. The sample included medium and low voltage power, control, and instrumentation cables. 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. In addition,

IPOI records for installation and termination of those cables marked with an *, below, were reviewed.

The NRC CAT inspectors selected approximately 270 cable ends for examination. 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 cables, totaling about 1,650 feet, were selected from different systems, electrical trains and locations:

Cable	Type
1HP03C-P3E	3 Conductor 750 MCM
*1HP08A-P3E	3 Conductor 500 MCM
1RH02A-P2E	3 Conductor 1/0 AWG
*1RH27A-P1E	3 Conductor 19/22 AWG
*1CC08A-P2E	3 Conductor 19/22 AWG
1DC01B-P1E	3 Conductor 4/0 AWG
*1LP01A-P1E	3 Conductor 500 MCM
1LP03A-P1E	3 Conductor 19/22 AWG

The following control cables totaling approximately 1,020 feet were selected from different systems, electrical trains and locations:

Cable	Type
1HP08E-C3E	2 Conductor 19/22 AWG
1DG01C-C1E	15 Conductor 19/25 AWG
1DC01E-C1E	4 Conductor 19/25 AWG
*1IA02B-C1E	12 Conductor 19/25 AWG

The following instrument cables totaling approximately 560 feet were selected from different systems, electrical trains and locations:

Cable	Type
1LD41F-K2E	1 Pair 16 AWG Twisted Wire Shielded
1SC76A-K1E	1 Pair 16 AWG Twisted Wire Shielded
1DC06G-K4E	1 Pair 16 AWG Twisted Wire Shielded
*1NR75B-K1N	1 Pair 16 AWG Twisted Wire Shielded

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

- S&L Clinton Power Station Specification K-2999, "Electrical Installation," Amd. 10
- BAP 3.3.2, "Cable Installation," Rev. 14

- BAP 3.3.3, "Cable Terminations," Rev. 6
- BAP 3.3.9, "Cable Protection," Rev. 6
- BQAI-190-12, "Electrical Cable Installation Field Verification"
- BQAI-190-7, "Electrical Cable Termination Field Verification."

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 applicable computer generated Cable Pull Ticket.

One instance of improper routing was identified in the Power Generation Control Complex (PGCC). NRC CAT inspectors noted that nonsafety-related cable C11A-XX-030 had been looped into a Division 2 safety-related floor section near panel H13-P652. Investigation indicated that this condition was the result of improper distribution of excessive slack in the cable. A review of the applicable design document, Panel Module Wirelist 287A5660, Rev. 11 showed a correct routing of this cable through nonsafety-related floor sections.

As a result of this observation, the licensee has issued Nonconforming Material Report (NCMR) 2-0304 and Construction Work Request (CWR) 6271 to document and correct this condition.

(2) Separation

During the inspection of Class 1E cables NRC CAT inspectors identified a number of cable and wiring installations which did not conform to specified requirements for electrical separation. Examples identified include wiring deficiencies which were located inside of control room operator panels. In this area, examination revealed that vendor installed wiring had been routed through flexible metalic conduit. In several areas conduits which contained redundant Class 1E wiring had been installed in physical contact with one another. Examples of this condition were observed in the following panels:

P800-62, 63, 64, 65
P870-55, 57, 58, 59, 61
P601-19, 22

Additionally, inadequate spatial separation was observed between exposed Class 1E wiring in several of the control panel sections.

NRC CAT inspectors examined the documents which control the design and installation of equipment in the control room area. The General Electric Company (GE) Topical Report NEDO-10466-A provides design criteria and safety evaluation for components comprising the PGCC. In accordance with the definition provided by this document, the PGCC consists of 1) a set of steel floor sections, 2) a set of termination cabinets, and 3) a set of interpanel cables.

Other control room panels, such as operator and signal conditioning panels, are not considered part of the PGCC and were designed by Sargent & Lundy Engineers. However, internal separation for all control room panels was to be in accordance with the requirements of GE document 22A7472 "Electrical Equipment, Independence For Nuclear Safety-Related Systems."

In reviewing these documents NRC CAT inspectors raised questions concerning the use of flexible conduit as a fire rated barrier within control room panels. Discussions with licensee personnel indicate that the use of flexible conduit in the PGCC panels and floor sections has been justified by test and analysis as stated in Section 8.3.1.4.5.5 of the FSAR and that this analysis provides justification for use of flexible conduit in other control room panels as well. However, based upon subsequent discussions with the NRR staff, NRC CAT inspectors concluded that analysis of components outside the scope of the PGCC has not been provided. As such, the wiring configurations described above do not comply with FSAR requirements.

Additionally, the use of flexible conduit as a fire rated barrier and the fire protection adequacy of control room panels outside the scope of the PGCC installation are issues requiring further evaluation by the NRC.

In connection with this issue a program weakness was identified concerning the review of vendor issued specifications. GE specification 22A7472 was issued in April of 1981 and, as previously indicated, provides requirements for separation within electrical equipment. However, the S&L review of this specification did not occur until January of 1985. The S&L approval of this specification stipulates that "contractor may proceed in accordance with specification based on making the revisions noted and resubmit." NRC CAT inspectors expressed concerns regarding the timeliness of this review in light of the fact that S&L revisions and comments to the specification were extensive and that much of the equipment affected by the requirements of the specification had previously been installed and, in some cases, turned over to operations. The licensee should determine whether S&L's specification changes are being incorporated into the installed equipment.

Separation deficiencies were also identified in 4160V switchgear E22-S004. However, this deficiency and the adequacy of the installation are addressed in Potential Deficiency Report 81-05. Construction activity in connection with resolution of this report has not been completed.

Separation ceficiencies also exist between exposed electrical cable and raceway components. As discussed in Section II.B.1.b(1) above, these deficiencies had not been identified by the licensee due to inadequate incorporation of accept/reject criteria into separation walkdown procedures.

(3) Power Cable Spacing and Derating

CPS power cable installations have been designed in accordance with Insulated Power Cable Engineers Association (IPCEA) publications P-46-426 "Power Cable Ampacities - Volume I - Copper Conductors" and P-54-440 "Ampacities - Cables in Open Top Cable Trays." The power cables have been derated in accordance with the IPCEA standards such that cables sharing raceways may be in contact. Additionally, ampacities for power cables are based on a 2-inch average depth of fill in cable tray. As a result, cables in solid metal trays could be installed without maintained spacing.

The project's power cable ampacities calculation, S&L No. 19-G-1, was reviewed and compared to the FSAR commitments. The calculation takes the appropriate values from tables in IPCEA P-54-440, adjusts the values for actual cable diameters and applys a five percent general derating factor for tray covers. The ampacities are derated an additional 10 percent as required by IPCEA P-54-440 for a 50°C ambient temperature and it is these values that are listed in the FSAR Section 8.3.

No deficiencies were identified in this area.

(4) Cable Damage

With the exception of the Class 1E cables damaged as a result of the watt transducer fire in 4160V switchgear 1E22-S004 discussed in Section II.B.3, below, no deficiencies were identified in this area.

(5) Cable Identification

In general, the identification of Class 1E cable installations was found to be in accordance with applicable design criteria. No construction deficiencies were identified.

(6) Terminations

In general, cable termination activities performed by construction personnel conformed to requirements. However, two types of deficiencies were observed and are discussed below.

(a) The NRC CAT examined four 5kV terminations in switchgear and found three which were not insulated as required by specification. These were the "from" ends of cables 1LP01A-P1E, 1HP08A-P3E and 1HP03D-P3E. Section 1004.1C2 of S&L Specification K-2999 and paragraph 4.12.1a of BAP 3.3.3 require all 5kV terminations in switchgear to be insulated with termination kits or insulating boots. The BA QC Inspection Checklists for the three terminations and IPOI's checklist for 1LP01A accepted the installations indicating that insulation was not required.

The terminations for 1HP08A and 1HP03D in switchgear 1E22-S004 were subsequently documented on NCR 32232 and Field Change Request (FCR) 38981 and dispositioned use-as-is. This was based on S&L's determination that the busses for this particular switchgear were not required to be insulated and, therefore, the cable terminations need not be. IP startup had identified uninsulated bus to breaker connections in the switchgear containing cable 1LP01A, but had not identified the uninsulated cable terminations.

Although discussions with the licensee indicate there may be technical justifications for certain uninsulated 5kV terminations, the installations identified by the NRC CAT inspectors do not conform to current specification requirements.

(b) A field-installed jumper wire in the remote shutdown panel was found by the NRC CAT to be a type which is not qualified for Class 1E service. This jumper wire is located on terminal strip GG, between terminal points 18 and 26, and is depicted on drawing E03-1C61-P001, sheet 6, Rev. K. Further investigation of this finding revealed the following:

- Startup discovered, during system checkout, that the required jumper between these points was missing and initiated Maintenance Work Request (MWR) B02288 in order to have plant operating staff personnel install the missing jumper wire.

- The MWR form was improperly reviewed, thus the MWR was processed as a nonsafety-related work order.

- Due to the error in the processing of the MWR form, non-Class 1E qualified jumper wire was obtained from the operations warehouse and installed by plant operating staff personnel, and QC inspection of this installation was not performed.

Subsequently, the licensee has issued MWR-B11255 and Condition Report 1-85-06-007 to document this NRC CAT finding. However, the condition report inaccurately indicates that use of unqualified wire does not involve nonconforming material and, therefore, does not indicate

the appropriate safety classification for the condition being reported.

It should be noted that, due to a similar finding by the NRC CAT at another facility, the licensee had previously instituted a program to assure that all field-installed wiring was accomplished using Class 1E qualified wire. This included the removal of all unqualified wire from the construction warehouses to preclude its inadvertent use. However, this purge of unqualified wire did not extend into IP's operations warehouse.

The NRC CAT inspectors then selected an additional 10 safety-related MWRs which involved termination activities requested by startup and performed by plant staff. The MWRs selected are: B04831, B1000, B10039, A13589, B10038, A16980, A14412, A17116, A17112, and B10159. These were reviewed for proper processing of the form and evidence of the application of adequate QA program requirements to the work performed. In addition, the NRC CAT inspectors physically inspected the completed hardware pertaining to each MWR.

The results of this review are as follows:

- Two additional instances of unqualified jumper wire were discovered. These were related to MWRs A16980 and A17116 and involved internal wiring in safety-related motor operated valves 1SX004C and 1SX006C.

- The form for MWR A14412 indicated that no QC inspection was required. The work associated with this MWR is the splicing of internal motor leads to field cable in safety-related motor operated valve 1SX004C. Sargent & Lundy Standard EA-209 requires these splices to be insulated, either with Class 1E qualified insulating and jacketing tapes, or with Class 1E qualified heat-shrinkable tubing. The completed configurations of either of these methods renders it impossible to determine whether or not qualified materials were used and were properly installed. Therefore, in order to assure the adequacy of these splices, an in-process witnessing inspection by QC was necessary.

- MWR B1000 involves the swapping of two motor leads at the Residual Heat Removal pump 1C motor in order to achieve proper phase rotation of the motor. Review of the MWR form and associated QC inspection documentation indicates that the work was properly accomplished and inspected. However, no documentation was generated which would inform the designer of the change in motor phasing. Therefore, the currently approved design document (wiring diagram E03-1RH00, SH.9, Rev. D) is in

conflict with the as-installed configuration of the installation. The licensee stated that the disposition of FCR 24896 allows motor terminations to be changed without initiating a design change document and that the designer need not be notified of such changes in motor phasing. A review of this FCR reveals that, although it does state "connections may be modified as required to obtain proper motor rotation", it does not indicate that approved design drawings (wiring diagrams) do not have to depict the as-installed wiring configurations. In addition, on page 2 of 5 of the "Clinton Power Station As-built Program" dated May 2, 1985, the licensee has committed to maintain wiring diagrams in an as-built condition.

In summary, of 11 maintenance work orders reviewed, 6 instances of either unqualified material, improperly documented or missed inspections, and conflict between as-built configuration and approved drawing were observed. This indicates that the Maintenance Work Request Program is ineffective in identifying safety-related work and prescribing the appropriate QA requirements for the work.

c. Conclusions

Wiring installations in a number of control panels are not in accordance with applicable electrical separation requirements. Additionally, the use of flexible conduit as a fire rated barrier and the fire protection adequacy of certain control room panels are issues requiring further evaluation by the NRC. A number of Class 1E 4160V cable terminations have not been completed in accordance with applicable design requirements.

The hardware and QA program deficiencies identified in the area of the Maintenance Work Request program indicate a need for additional management attention in order to assure that safety-related wiring remains in conformance with applicable requirements subsequent to turnover from construction.

3. Electrical Equipment Installation

a. Inspection Scope

Over 30 pieces of installed or partially installed electrical equipment and associated hardware items were inspected. Samples were based on system function and safety classification.

The following specific electrical components were inspected in detail:

(1) Motors

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

Residual Heat Removal Pump Motor	1AP07EG-1A
Residual Heat Removal Pump Motor	1AP09ED-1B
Low Pressure Core Spray Pump Motor	1AP07EE
High Pressure Core Spray Pump Motor	1E22-S001

(2) Electrical Penetration Assemblies

The following containment penetration assemblies were inspected:

1EE10E-1P2E	Power
1EE22E-1C3E	Control
1EE33E-1K2E	Neutron Monitoring
1EE18E-1C1E	Control

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

(3) Circuit Breakers

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

Low Pressure Core Spray
High Pressure Core Spray
Residual Heat Removal Pump 1A

(4) Switchgear and Motor Control Centers

The following switchgear and motor control centers were inspected:

Motor Control Center	1AP30E-1B
Motor Control Center	1AP60E-1A
Motor Control Center	1AP73E-1A
4160V Switchgear	1AP07E-1A1
4160V Switchgear	1AP09E-1B1
4160V Switchgear	1E22-S004-1C1

(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.

125V DC Battery	1DC06E-1A
125V DC Battery	1DC01E-1B

(6) 125V DC System Equipment

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

Battery Charger	1DC06E-1A
Battery Charger	1DC07E-1A
125V DC Motor Control Center	1DC14E-1B
125V DC Distribution Panel	1DC14E-4A
Static Inverter	1C71-S001A
Static Inverter	1C71-S001B

(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:

Remote Shutdown Panel	1C61-P001
Diesel Generator Control Panel	1PL12JA
Diesel Generator Control Panel	1PL12JB
Operator Main Control Panels	

(8) Motor Operated Valves

Four motor operated valves were examined in detail.

1E12-F004A
1E12-F027B
1E12-F024B
1E12-F047A

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

- S&L Clinton Power Station Specification K-2999, "Electrical Installation," Amd. 10
- BAP 2.10, "Equipment Installation," Rev. 6
- BQAI-190-6, "Electrical Equipment Field Verification," Rev. 4.

b. Inspection Findings

(1) Motors

Motors examined were found to have been installed in accordance with applicable design criteria. Nameplate data such as operating voltage, horsepower and speed were compared with FSAR requirements and found to be acceptable. Maintenance records for the High Pressure Core Spray pump motor were reviewed and also found to be acceptable.

During the examination of the Low Pressure Core Spray pump motor NRC CAT inspectors raised questions concerning the adequacy of materials used to mount the motor to its pedestal. This issue is discussed further in Section VI, Material Traceability and Control, of this report.

(2) Electrical Penetrations

Penetrations examined were found to be in accordance with design documents. Installation and inspection procedures were thorough, and associated inspection and maintenance records were detailed and complete.

During the examination of the electrical penetration assemblies it was noted that a pipe restraint had been welded to the nozzle of penetration 1EE27E. Discussion with the licensee regarding this issue disclosed that nonconformance reports (NCR 28725 and NCMR 1-0971) had previously been issued to document this condition and had been dispositioned use-as-is by engineering. Based upon the information available, NRC CAT inspectors could not determine whether this activity had adversely affected the penetration gas boundary or components within the penetration sleeve, or whether the disposition of the nonconformance reports is adequate.

Further evaluation by the licensee is required.

(3) Circuit Breakers

The examination of the selected circuit breakers indicated that they had been installed and maintained in accordance with applicable design documents. Important installation attributes such as proper alignment and main contact penetration were verified by physical inspection of the equipment and review of construction and startup test records.

(4) Switchgear and Motor Control Centers

Several construction deficiencies were identified in Class 1E switchgear installations. The examination of switchgear 1AP09E disclosed that the switchgear unit had been floor mounted using American Society for Testing and Materials (ASTM) A-307 bolting materials corresponding to Society of Automotive Engineers (SAE) Grade 2. In reviewing the vendor (Westinghouse) manual NRC CAT inspectors noted that SAE Grade 5 bolting material had been specified for this installation. Additionally, the review of the seismic qualification report for this equipment indicates that Grade 5 bolting materials had been used to mount the test unit to the shake table for qualification.

This item was discussed with licensee personnel who produced NCR 24174 which had been issued in December of 1984 to document this condition. Subsequently, this item was transferred to and dispositioned on CPS NCMR 1-0413 in accordance with site procedures for items turned over to operations. The disposi-

tion of the NCMR requires that all of the existing bolting material be replaced with the specified SAE Grade 5 material. NRC CAT inspectors noted that the switchgear unit is energized and provides the Class 1E power feed for many of the plant systems currently under test. Consequently, although this deficiency had been properly identified by the licensee, the delay in initiating the specified corrective action could adversely affect other plant systems.

During the examination of switchgear 1E22-S004 NRC CAT inspectors noted that watt transducer 1JY-AP778 located inside of cubicle 1 of the switchgear had burned. Additionally, the transducer associated wiring and Class 1E field cables located above the device had also been damaged as a result of the transducer fire.

Discussions with licensee personnel revealed that MWR B08649 had been issued to document and correct this condition. A review of this document indicates that the disposition, "Procure, calibrate and install new transducer and associated wiring as necessary," is inadequate in that it fails to consider damage done to the Class 1E field cables located in proximity to the device.

Wiring separation deficiencies were also identified inside of various cubicles of switchgear 1E22-S004. This item is identified as part of Potential Reportable Deficiency 81-05 dated February 5, 1982 and specified rework is scheduled to be accomplished in accordance with the resolution of this document.

The examination of switchgear 1AP07E and the motor control centers selected indicate that they have been installed in accordance with applicable requirements.

(5) Station Batteries and Racks

The condition of the 125V battery rooms was found to be clean, free of debris and in good order. Although permanent ventilation systems had not been installed, temporary systems were in place and provided adequate ventilation for the areas examined. Access to these areas was controlled by keyed entry.

The 125V batteries were examined in detail and found to be in good condition. Maintenance activities were reviewed and in general had been performed in accordance with requirements.

(6) 125V DC System

Inspection of components comprising the 125V dc system disclosed a deficiency in the installation of battery chargers 1DC07E and 1DC06E. Design documents which specify installation details for this equipment show mounting pad dimensions which differ from the actual field configuration.

1DC07E - Design Dimensions 48 inches W x 40 inches D
Actual Dimensions 47 inches W x 36 inches D

1DC06E - Design Dimensions 48 inches W x 40 inches D
Actual Dimensions 47 inches W x 38 inches D

The review of applicable records indicates that the appropriate design change document had been initiated for the conditions noted on charger 1DC-06E. However, technical justification for the discrepancies identified on charger 1DC-07E was not provided.

As a result of this observation the licensee has issued NCR 32598 to document and correct this condition.

Other 125V dc system components examined were found to have been installed in accordance with requirements.

(7) Control Panels

In general, the installation of Class 1E control panels was found to be in accordance with applicable requirements. Six panels were identified which had been mounted using bolts of indeterminate material type. The following panels exhibited this condition:

Switchgear HVAC Control Panel	1PL65JC
Switchgear HVAC Control Panel	1PL65JB
Diesel Generator HVAC Panel	1PL54JA
Shutdown Service Water Panel	1PL53JA
Shutdown Service Water Panel	1PL53JB
Shutdown Service Water Panel	1PL53JC

The use of indeterminate bolting materials in safety-related applications is discussed in detail in Section VI, Material Traceability and Control, of this report.

During the examination of the Divisions 1 and 2 Class 1E Diesel Generator Control panels, NRC CAT inspectors noted that physical identification of the panels was not in compliance with FSAR requirements for identification of Class 1E equipment. Nameplates supplied by the vendor (Stewart & Stevenson) are not of the color coding required for safety-related Divisions 1 and 2 electrical equipment.

Discussions with the licensee indicate that the requirements of Specification K-2861, to which these panels were purchased, may have been implemented prior to the FSAR commitment for color coding of equipment. Consequently, these panels had not been properly identified. As a result of this observation the licensee has issued Field Engineering Change Notice (FECN) 10305 to document and correct this condition.

In addition, the NRC CAT inspectors reviewed a licensee surveillance of vendor panels. Based on an NRC inspection at another site, the licensee's QA organization initiated a special surveillance of vendor panels concentrating on those turned over to IP startup and initially tested. The surveillance findings indicated a number of problems and resulted in IP QC performing a broader scope inspection program. However, the scope of the IP QC inspection program does not include panels manufactured by MCC Powers and a number of GE panels.

The NRC CAT specifically inspected a number of panels excluded from the IP QC program and identified a number of discrepancies:

1PL54JA (MCC Powers)	Separation between non-Class 1E field installed lighting circuit and Class 1E vendor wires; minimum bend radius of Class 1E vendor wires (subsequently documented on NCMR 2-0350); mounting bolts of indeterminate material.
1PL53JA (MCC Powers)	Separation between non-Class 1E field cable 1VH79A and Class 1E vendor wires; mounting bolts of indeterminate material.
1PL53JB and JC (MCC Powers)	Mounting bolts of indeterminate material.
H22-P028 (GE)	Misidentification of Class 1E associated vendor wiring as non-Class 1E; separation between Class 1E vendor wiring and non-Class 1E lighting and utility circuits; isolation or analysis of the interface between Class 1E associated vendor wiring and non-Class 1E field wiring. Subsequently addressed on Field Deviation Disposition Request, LH1-3027 Rev. 0.

The NRC CAT findings indicate that the scope of the IP QC inspection program for vendor supplied control panels needs to be enlarged. The discrepancies found in the MCC Powers equipment and the GE panel indicate that the 63 panels manufactured by these two companies originally omitted from the inspection program should be included. Inspection attributes, such as the interface between field wiring and vendor wiring, mounting details, and minimum bend radius should be added to the QC inspection program.

(8) Motor Operated Valves

Motor operated valves examined were installed and maintained in accordance with applicable design documents.

c. Conclusions

In general, the installation of electrical equipment has been accomplished in accordance with requirements. However, of concern were the examples of hardware deficiencies which exist in equipment which has been turned over for operation.

Items such as internal panel separation and the mounting of seismically qualified equipment are concerns which will require additional attention by the licensee.

4. Instrumentation Installation

a. Inspection Scope

The NRC CAT inspectors selected a sample of 15 completed runs of instrument piping, comprising about 930 feet, for a detailed examination in accordance with specification requirements and isometric drawings.

Four instrument racks and ten piping supports were examined for conformance with requirements including installed configuration, mounting details, material conformance, identification, and location.

Eleven instruments were examined for conformance with requirements for location, mounting details, and instrument type and range.

See Table II-4 for a listing of piping runs, supports, racks, and instruments included in the sample, and identification of those items previously inspected by BAFV or IPOI programs.

The following documents provided the acceptance criteria for the inspections:

- S&L Clinton Power Station Specification K-2883, "Erection of Phase I Piping Systems and Equipment," Amd. 13
- BAP 2.6, "Instrumentation," Rev. 7 Change F
- Applicable design drawings and change documents.

b. Inspection Findings

In general, the installation of instruments, racks, piping runs, and supports conformed to the appropriate requirements. However, a number of deficiencies were identified and are discussed below:

(1) The weld symbol for weld number 1 of support 1AB35011G on drawing M-1AB35011G, Rev. B does not indicate the required fillet weld size. The licensee subsequently issued NCR 32421 to document this condition. It should be noted that this support had undergone reinspection under the BAFV program, and this drawing deficiency was not identified.

(2) Instrument line RH-919-7C was found bent in two locations (due to construction traffic in the area) near support 1AB01034G. The licensee subsequently issued NCMR 2-0338 to document this condition.

(3) The support clamp for piping run 1E12-N015A "LO" on support 1AB02204G was found to be missing. Further review revealed that this condition had been previously discovered by the BAFV program and documented on NCR 80367 and NCMR 1-1005.

(4) Instruments 1E12-N015C, 1E12-N055C, and 1E12-N056C are mounted on instrument rack 1E22-P005 using bolts containing no identification markings on their bolt heads. The NRC CAT inspectors observed that all other bolts used to mount instruments to this and other instrument racks contain markings which identify them as ASTM A-307 (SAE Class 2) bolts. The licensee has subsequently issued NCMR 2-0335 to document this condition. This NCMR states that Rosemont Instruction Manual 4302, Rev. B, Model 1153 requires these bolts to be ASTM A-193, Grade B8, which would indicate that all bolts used to mount instruments to racks are nonconforming. Further review by the licensee is necessary to accurately define the material requirements for these bolts.

(5) Three instances were observed of installed instrument piping in physical contact with other items. These are:

- Instrument line 1MS31AB-3/4 is in contact with 6-inch diameter pipe 1HG05BA
- Instrument line 1MS31JB-3/4 is in contact with 3-inch diameter pipe 1SC02DA
- Instrument line 1NB05BB-3/4 is in contact with heating, ventilating and air conditioning duct support P-4010.

In the first two cases, the licensee's Interaction Analysis Group had previously documented these points of contact on Potential Interference Reports (PIRs) C-2007 and C-2008, which have been dispositioned use-as-is by S&L. Further discussions with the Interaction Analysis Group reveals that the analysis supporting the use-as-is dispositions only addresses possible seismic interaction and may not consider thermal expansion or movement of either the instrument lines or the pipe involved.

In the third case, discussions with the Interaction Analysis Group indicates that interactions of this type are considered to be a generic exclusion to their criteria and, as such, they are not required to document this on a PIR. However, following further discussion with the licensee, NCMR 2-0334 was issued to document this condition as a construction deficiency instead of a seismic interaction. The NRC CAT questions the prudence of the generic exclusion for such an item. Identified construction deficiencies in completed and QC accepted installations need to be recorded and evaluated in accordance with existing QA requirements.

Refer to Section III, Mechanical Construction, of this report for a further discussion of the licensee's Interaction Analysis Program.

c. Conclusions

The NRC CAT inspectors determined that, in general, instrumentation, tubing, and support installations conform to applicable requirements. The activities of the Interaction Analysis Group and subsequent dispositioning of identified PIRs by S&L require further review by the licensee.

TABLE II-1

RACEWAY INSPECTION SAMPLE

Cable Tray:

189A(P2E)	188A(P2E)	187A(P2E)	186A(P2E)	185A(P2E)
184A(P2E)	183E(P2E)	182A(P2E)	181A(P2E)	18R9(P2E)
1892G(P2E)	1893G(P2E)	16297G(P2E)	1894G(P2E)	1895G(P2E)
16296G(P2E)	16295G(P2E)	16294G(P2E)	16293G(P2E)	16292G(P2E)
16291G(P2E)	16260G(P2E)	16259G(P2E)	16257G(P2E)	1071D(P2E)
1072D(P2E)	1070D(P2E)	1069D(P2E)	1068D(P2E)	1067D(P2E)
1063D(P2E)	1064D(P2E)	1065D(P2E)	1066D(P2E)	169D(P2E)
168D(P2E)	167D(P2E)	166D(P2E)	165D(P2E)	164D(P2E)
163D(P2E)	162D(P2E)	161D(P2E)	16R1(P2E)	16413K(C4E)
16412K(C4E)	16411K(C4E)	16410K(C4E)	10510K(C1E)	16R9(C1E)
1614B(C1E)	17R12(K1E)	17111C(K1E)	17112C(K1E)	17115C(K1E)
17116C(K1E)	17117C(K1E)	17R55(K1E)	17220C(K1E)	17222C(K1E)
17223C(K1E)	17224C(K1E)	17R80(K1E)	19120D(P3E)	19121D(P3E)
19122D(P3E)				19123D(P3E)

Cable Tray Supports:

Support Number	Drawing Number
1000-01B0H3	E26-1000-01B-H3
	E26-1000-01B-CPH
1001-03A-H24	E26-1001-03A-H24
	E26-1001-03A-CPH
1003-01A-H57	E26-1003-01A-H57
	E26-1003-01A-CPH
1005-04A-H44	E30-1005-04A-H44
	E30-1005-04A-CPH
1004-04A-H2	E30-1004-04A-H2
	E30-1004-04A-CPH
1002-01A-H1	E27-1002-01A-H1
	E27-1002-01A-CPH
1003-01C-H9	E27-1003-01C-H9
	E27-1002-01C-CPH

TABLE II-1 (Continued)

RACEWAY INSPECTION SAMPLE

Conduit Supports:

E26-1003-03A-TCC-2

E26-1003-01A-CC-CP-2

E26-1002-04A-CC-17

E26-1002-04A-JS-1

E26-1003-01A-CC-57

E26-1003-01A-WH-3

Conduits:

Conduit No.	Length (feet)	Conduit No.	Length (feet)
C2301	8	C61490	36
*C2305	10	*C61545	29
C2318	19	*C62867	31
*C2319	10	C71191	37
C2341	8	C71192	39
C629	48	*C72183	45
C633	48	*C71365	110
C6404	33	*C71543	46
C6438	23	C71855	50
C6141	52	C9822	43
C61039	17	C9823	43
C61066	27	C9824	43
C61069	28	*C91230	23
C61371	25	C91523	21
C61386	16	C91527	20
C61394	27		

NOTE: The (*) indicates conduits inspected under the Baldwin Associates Field Verification Program.

TABLE II-2

SEPARATION FINDINGS

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

Column A		Column B
C9713(K1E)	*	1PB999(P2E)
C92709(C1B)	*	C92757(P1E)
C92709(C1B)	*	C92758(C1E)
C73991(C2B)	*	C71191(C2E)
C73991(C2B)	*	C71192(P2E)
C71365(C2E)	*	C73639(K1B)
C71365(C2E)	*	C7894 (C1E)
C71365(C2E)	*	C71991(K3N)
C71365(C2E)	*	C73218(C2B)
C71365(C2E)	*	C72235(K1B)
C71991(K3N)	*	C72030(K2B)
C72717(C2E)	*	C72812(K1E)
C7891 (C2E)	*	C73287(K1B)
C62367(K4E)	*	C61069(C2E)
C62367(K4E)	*	C62084(P2E)
C62367(K4E)	*	C61068(P2E)
C62367(K4E)	*	C62100(K1B)
C6141 (C1E)	*	1PB695(P1B)
16300K(C4E)		C61039(C2E)
16300K(C4E)		C61037(C2E)
16300K(C4E)		C61038(C2E)
16300K(C4E)		C62876(C2E)
C6947 (P1B)	*	C6949 (P1E)
C61066(P2E)	*	C61364(K1E)
C61371(C2E)	*	C6934 (P2B)
C73255(C1E)	*	1PB7107(DIV.2)
C71855(K3E)	*	17128C(K1B)
C6917(B)		16279G(P2E)
C61364(1E)	*	C61066(2E)
C61374(1E)		16257B(C2E)
C61373(1E)		16257A(C2E)
C61258(P2B)	*	C61373(1E)
C6249(B)		161D(P2E)
C6303(B)	*	167E(C2E)
C6207(B)		167D(P2E)
C659(B)	*	168D(P2E)
C0357(B)		1065E(C2E)
C02522(B)		1065E(C2E)
C8926(B)		187A(P2E)
C8133(B)		187A(P2E)
C8578(B)		184A(P2E)
C8579(B)		184B(C2E)
C8137(B)		184A(P2E)
C8300(B)		183A(P2E)
C8538(B)	*	C81649(2E)
C8699(C3E)		1875D(P2B)
C81775(2E)		1833D(P3E)
C81777(2E)		1833D(P3E)
C81776(2E)		1833D(P3E)
C81778(2E)		1833D(P3E)
C81257(B)		18926(P2E)
C0224(B)		1061D(P2E)
C0223(B)		1061D(P2E)
1068D(P2E)		C0372(B)
1068C(C2E)		C0372(B)
C72997(1E)	*	C72514(4E)
C72296(1E)	*	C72514(4E)
C72297(1E)	*	C71570(3E)
C71570(3E)	*	C72296(1E)
C72888(1E)	*	C71541(2E)
C73160(B)	*	C73666(1E)
1H13-P70GA(1E)		10360A(C1B)
1H13-P701A(1E)		10347A(C1B)
1H13-P731F(1E)		10344A(C1B)
C62382(B)	*	16390E(C3E)
C62381(B)	*	16390E(C3E)
10602(C1B)		10603K(P2E)
10602B(C1B)		10631A(P1E)

TABLE II-2 (Continued)

SEPARATION FINDINGS

Column A		Column B
10632B(C1E)		10603K(P2E)
10603K(P2E)		10632A(P1E)
10611D(P2B)		10615K(P2E)
10611E(C2B)		10615L(C2E)
10600E(C2B)	*	10632B(C1E)
C1079(B)	*	10632B(C1E)
10600K-P2E		10632A(P1E)
C6901(P2B)		16257G(P2E)
C6901(P2B)		16258A(C2E)
C6901(P2B)		16258G(P2E)
C6901(P2B)		16259G(P2E)[1]
C0409(B)		C9866(1E)[1]
10358B(C1B)		1H13-P706F(1E)[1]
C0409(B)		1992B(C1E)
C9866(B)	*	C9831(C1E)
C0410(B)		1989B(C1E)
C9713(K1E)	*	1PB999(P2E)
C9804(B)		1992A(P1E)
C9657(2E)	*	C9617(B)
C9657(2E)	*	C9615(B)
C74311(B)	*	C72514(4E)

NOTE: [1]These separation deficiencies also involve raceway to cable.

TABLE II-3

CABLE TERMINATION INSPECTION SAMPLE

PGCC Termination Cabinet 1H13-P743

Cables: 1VD03B, 1VD18E, 1VD11F, 1VD03D, 1VD06B, 1VD03C, 1VD06C, 1VH09E, 1VH09B, 1VH09D, 1VX21B, 1VX18B, 1VX09B, 1VX12B, 1VY09B, 1VY08B, 1DO03C, 1HP21P, 1HP75A, 1HP75B, 1HP75C, 1HP75D, 1DO79B, 1DO79A, 1SX75D, 1SX75C, 1SX55A, 1SX08C, 1SX03D, 1SX03B.

PGCC Termination Cabinet 1H13-P742

Cables: 1VC06B, 1VC08B, 1VD05C, 1VD02D, 1VD02B, 1VD10F, 1VD18C, 1VD02C, 1VF07J, 1VC40L, 1VG35K, 1VC02C, 1VC45H, 1VC14B, 1VC45F, 1AP23G, 1DG31G, 1AP23B, 1DG21F, 1AP29D, 1AP21G, 1AP23F, 1AP21M, 1DG31L, 1AP60D, 1AP29C, 1AP29K, 1CC08C, 1CC09C.

PGCC Termination Cabinet 1H13-P741

Cables: 1AP22D, 1DG11G, 1AP28E, 1AP22B, 1DG01D, 1AP20G, 1AP22G, 1AP20M, 1CC11F, 1CC14G, 1DG11L, 1AP28K, 1CC14C, 1CC11C, 1CC17L, 1CY05C, 1RP11E, 1CY09C.

Diesel Generator 1A Control Panel 1PL12JA

Cables: 1DG02A, 1DG02D, 1DG11F, 1DG11S, 1DG02B, 1DG11C, 1DG11T, 1DG11E, 1DG11D, 1DG01D, 1DG02F, 1DG04A, 1DG06A, 1DG09B, 1DG09C, 1DG10C, 1DG10B, 1DG05A, 1DG07A, 1DG02C, 1DG02E, 1DG02G, 1DG75E, 1DG11R, 1DG75C, 1AP20K, 1AP22J, 1DG08A, 1DG01E, 1DG01Q, 1AP20M, 1AP22K, 1DG01S, 1DG01Q, 1DG01R.

Division 3 Optical Isolator Cabinet 1PL49J

Cables: 1MI05A, 1HP11D, 1HP17J, 1SX03E.

Remote Shutdown Panel 1C61-P001

Cables: 1RH55F, 1RH55E, 1RH40D, 1RH40C, 1RH31D, 1RH31C, 1RH27D, 1RH27C, 1RH07D, 1RH07C, 1RH12D, 1RH12E, 1RH12C, 1RH01G, 1RH01H, 1RH01C, 1RS02A, 1RH22E, 1RH09F, 1RH09D, 1RH09C, 1RH18D, 1RH18C, 1RH16D, 1RH16C, 1RH61F, 1RH61E, 1RH38D, 1RH38C, 1RH63F, 1RH63E, 1SX20C, 1SX20N, 1RH22D, 1RH22C, 1RI13E, 1RI13C, 1RI10D, 1RI10C, 1RI03D, 1RI03C, 1RI06D, 1RI06C, 1RI26D, 1RI26C, 1RI05D, 1RI05C, 1RI08D, 1RI08C, 1RI25C, 1RI25B, 1RI24B, 1RI24A, 1RI27F, 1RI27G, 1NB38D, 1RH73L, 1RI12E, 1RI12C, 1RI09G, 1RI09C, 1RI24J, 1RI24H, 1RI24G, 1RI24K, 1RS04A, 1RS06A, 1RS82A, 1RI11D, 1RI11C, 1RI07D, 1RI07C, 1RI04D, 1RI04C, 1RS05C, 1RH13D, 1RH13C, 1RH13E, 1RH17F, 1RH17E, 1RS05B, 1RH10E, 1RH23D, 1RI02F, 1RI15F, 1RI27J, 1RI27H, 1RI15E, 1RI17D, 1RI17C, 1RH37C, 1RH37D, 1NB39D, 1RS05A, 1NB35A, 1NB35C,

TABLE II-3 (Continued)

CABLE TERMINATION INSPECTION SAMPLE

Remote Shutdown Panel 1C61-P001 (Continued)

Cables: 1RI76D, 1RI76G, 1RI76E, 1RI76C, 1RI85C, 1RS75A,
1RS76B, 1RS76D, 1RI85B, 1RI85A, 1RS03A, 1SX59D,
1SX59C, 1RH24D, 1RH24C, 1RH33D, 1RH33C, 1RH36D,
1RH36C, 1RH50D, 1RH50C, 1SX14K, 1SX14L, 1SX14M,
1SX30E, 1SX17D, 1SX33D, 1SX37E, 1SX10F, 1SX20Q,
1SX14C, 1SX14F, 1SX14J, 1SX30C, 1SX17C, 1SX33C,
1SX37C, 1SX10C, 1SX11C, 1SX25J, 1SX25Q, 1SX50F,
1SX20J, 1SX50K, 1SX25X, 1SX25V, 1SX11D, 1RS80A,
1RS79B, 1RS79D, 1NB35M, 1NB35B, 1RI02G, 1RI02F.

4160 V Power Cables in Switchgear

Cables: 1RH02A, 1LP01A, 1HP08A, 1RH27A, 1LP03A, 1HP03D.

TABLE II-4

INSTRUMENTATION INSPECTION SAMPLE

Instrument Racks:	1H22-P005	BA	OI
	1H22-P026	BA	OI
	1H22-P027	BA	OI
	1H22-P042	BA	
Instrument Pipe Supports:	1SPS-CM096A		
	1AB35004G	BA	
	1AB35003G	BA	
	1AB35002G	BA	
	1AB35011G	BA	
	1RB31511R	BA	
	1RB32518G	BA	
	1RB22538G	BA	
	1RB21572R	BA	
	1RB21576X		
Instrument Piping Runs:	1PT-CM034/1PT-CM256	BA	
	1E31-N088C "HI"		
	1E31-N088C "LO"	BA	
	1E31-N088B "HI"	BA	
	1E31-N088B "LO"	BA	
	1E12-N015C "HI"	BA	OI
	1E12-N015C "LO"		
	1E12-N015B "HI"		OI
	1E12-N015B "LO"	BA	
	1E12-N015A "HI"		
	1E12-N015A "LO"	BA	
	1B21-N078A	BA	
	1B21-N081A "HI"		
	1B21-N078B	BA	
	1B21-N081B "HI"		
Instruments:	1E31-N088C		
	1E31-N088B		
	1B21-N081B		
	1E12-N015A		
	1E12-N015B		
	1E12-N015C		
	1PT-CM034		
	1PT-CM256		
	1B21-N078A		
	1B21-N078B		
	1B21-N081A		

NOTE: BA indicates inclusion in Baldwin Associates Field Verification.
OI indicates inclusion in Illinois Power Company Overinspection.

III. MECHANICAL CONSTRUCTION

A. Objective

The objective of the appraisal of mechanical construction was to determine if 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.

The inspection samples in a number of these areas included items covered by the Illinois Power Company (IP) Overinspection Program. Section VII, Design Change Control, of this report provides further discussion of the IP Overinspection Program.

1. Piping

a. Inspection Scope

Piping depicted on the 11 Baldwin Associates (BA) and 3 Reactor Controls, Inc. (RCI) drawings listed in Tables III-1a and b was inspected by the NRC Construction Appraisal Team (CAT). In all cases, piping inspected by the NRC CAT had been previously inspected and accepted by the responsible QC organizations. The piping samples included portions of the High Pressure Core Spray (HPCS), Low Pressure Core Spray, Reactor Core Isolation Cooling (RCIC), Reactor Water Clean-Up, Shutdown Service Water, Main Steam Isolation Valve Leakage Control, Nuclear Boiler, and Control Rod Drive (CRD) systems. In addition, some of the NRC CAT samples included piping covered by the IP Overinspection Program. Attributes inspected included configuration (i.e., component orientation and dimensions), component locations and types, and valve operator orientations. Pipe support locations and types were inspected against hanger design drawings to the extent indicated in Table III-1. Site construction practice as it affected installed components was observed and component material specifications were compared to drawing bills of material on a random basis.

The sample of BA piping selected for inspection included all American Society of Mechanical Engineers (ASME) pipe classes and ranged in size from 1 to 20 inches. The sample included approximately 600 feet of large bore (greater than 2-inch diameter) and approximately 275 feet of small bore (less than or equal to 2-inch diameter) piping located in the containment, auxiliary, fuel and diesel generator buildings. QC verified isometric drawings were used to

perform the inspection. Subsequently, field data compiled by the NRC CAT was also compared to walkdown record copies (NRC IE Bulletin 79-14) of piping design drawings to the extent indicated in Table III-1. Observations associated with the inspected piping are listed in Tables III-1a and b. A sample of approximately 125 feet of RCI piping associated with the insert and withdraw of the CRD was inspected by the NRC CAT. The inspection utilized walkdown record copies of the RCI drawings listed in Table III-1b.

Thirteen piping samples representing approximately 200 feet of pipe were selected to determine whether ASME requirements for pipe wall thickness were met. The measured pipe wall thicknesses were compared against the minimum wall thickness requirement specified by ASME (12.5 percent below nominal thickness). Pipe wall thickness was measured using ultrasonic methods, with personnel and equipment provided by the licensee. Circumferential measurements were taken at the ends and the center of the samples; other measurements along the length of the pipe were also obtained for those samples in which a potential for violating minimum wall thickness requirements appeared likely. See Table III-2 for the inspection sample and observations.

The following documents provided the acceptance criteria and background information:

- BA Project Procedure (BAP) 2.14, "Fabrication/Installation of Items, Systems, and Components," Rev. 10, Change F
- BAP 3.2.9, "Piping 'As-Builts'," Rev. 0, Change A
- BAP 3.6.6, "Control of Welded Temporary Attachments," Rev. 0
- Sargent & Lundy Engineers (S&L) Project Instruction PI-CP-028, "Field Installation Data Required to Permit Confirmation of Piping Subsystem Analysis," Rev. 2
- S&L Drawing M09-1001N, "Component Support Installation Tolerances ...," Sheet 1, Rev. N and Sheet 12, Rev. N
- S&L Specification K-2882, "Nuclear Safety Related and Non-Nuclear Safety Related Specifications for Phase II Piping, Miscellaneous Equipment, and Equipment Erection," through Amendment 11
- S&L Nuclear Station Engineering Instructions (NSEI) ME-2, "Interaction Analysis Program," Rev. 0
- S&L Project Instruction PI-CP-034, "Interaction Analysis," Rev. 4
- RCI Quality Assurance Instruction QAI-10-1, "Instruction for Quality Control Inspection," Rev. 6

- RCI QAI-8-4, "Instruction for As-Built Inspection/Verification Walkdown," Rev. 5

- RCI Document No. RCI-FPC-4, "Friction Clamp for 1" Withdraw CRD Pipe," Rev. 6

- RCI Document No. CLN-TOL-1, "Clinton Field Tolerances," through Rev. 3

- RCI Document No. CLN-TOL-2, "Clinton Interface Tolerances," Rev. 1.

b. Inspection Findings

In general, the NRC CAT inspected piping conformed to installation requirements and tolerances. However, the following observations and discrepancies warrant additional attention.

(1) Baldwin Associates

- Pipe spool 1-NB-751-4 depicted on Drawing NB-751 is routed through and is in contact with the tube steel support for electrical box 1JB729. This configuration is in accordance with the support design drawing, No. E27-1602-03B-EIT and the piping design drawing, No. M27-1602-03B-03BK except that the current pipe to support steel contact is not identified by either drawing. According to BAP 2.14 (Form JV-734) and BA QC personnel, this contact is regarded as an interference to be identified during the QC walkdown inspection. Also, according to the BA Resident Engineer, such contact must be identified during preparation of the as-built drawings.

  There was no evidence presented to the NRC CAT inspector that this pipe to electrical support steel contact was identified by either the QC inspection or the as-built walkdown for evaluation by the piping design organization. Since no similar instances of obvious interference with piping were encountered by the NRC CAT, this finding is considered an isolated case which requires appropriate engineering disposition.

- At pipe spool pieces 1-RI-758-3 and 1-RI-758-5A, a temporary pipe support was not removed at the time of the NRC CAT inspection. Procedure BAP 2.14 specifically noted that removal of temporary supports need not be verified for QC acceptance of the piping. BA QC personnel noted that removal of each temporary support was controlled by the discipline superintendent and the dismantling was performed in accordance with BAP 3.6.6. As discussed with BA QC however, neither that procedure nor any other presented to the NRC CAT inspector provided assurance that all temporary supports would be removed. The NRC CAT is

concerned that the QC inspection and acceptance of piping prior to the removal of temporary supports may result in undetected unacceptable conditions once the temporary supports are removed, or that if the supports are not removed, that unanalyzed constraints may be imposed on the piping.

- Various dimensional discrepancies were also noted among the inspected piping. Two instances were observed where the three inch tolerance for fitting to fitting dimensions, as specified by the piping specification K-2882, had been exceeded. As a result of the NRC CAT observations, the licensee has prepared Nonconforming Material Reports (NCMRs) addressing the discrepant dimensions.

  In related inspection observations, three instances were noted where dimensions between components, or components and supports were found to differ from the as-built dimensions by one inch or more. Procedure BAP 3.2.9 required that as-built dimensions be checked and recorded to the closest inch.

  The maximum out of tolerance conditions and maximum difference between as-built and measured dimensions were two inches for both cases. The magnitude of these discrepancies when considered with regard to the pipe sizes involved, are not large. The NRC CAT did not identify a large number of discrepancies of this nature, and thus, does not consider the occurrences of the discrepant conditions to be of significant concern.

(2) Reactor Controls, Inc.

With respect to RCI installed piping, no discrepant conditions were found by the NRC CAT during the inspection. However, the following observations are provided.

- During inspection of the CRD piping, the RCI document which specified the design of friction clamps used for axial restraint of withdraw piping was reviewed. Based on this review and discussions with RCI engineering and QC personnel, it was determined that no inspection tolerance or minimum clearance was specified for the gap between the clamp halves (ears). To function as designed, the clamp must develop bearing between the clamp and pipe by the controlled application of torque to the clamp bolts. Contact between the clamp ears would result in reduced clamp to pipe bearing, and therefore reduced capacity of clamp restraint in the axial (pipe) direction. Although not a QC inspection attribute, RCI stated that the need to maintain a minimum gap was known and that in all cases, such a gap was maintained by construction.

Random inspection of RCI supports by the NRC CAT included an inspection for a minimum clearance between clamp ears on approximately 60 axial clamps associated with the CRD "withdraw" piping. No cases of contact between the clamp ears were observed, but several clamp ears exhibited clearances of only one to two mils indicating that this attribute may warrant QC inspection.

- In conjunction with the inspection of RCI installed piping, their as-building and stress reconciliation effort was also reviewed. As a result, it was observed that portions of piping associated with the Hydraulic Control Units (HCU) to which RCI piping interfaced, had not been walked-down for as-built reconciliation of the RCI piping since the HCUs had been installed by BA. Subsequent clarification provided by RCI stated that RCI would incorporate the piping associated with the HCUs into their walkdown. Because the previously completed walkdowns did not include the HCU piping, the need exists for the licensee to assure that the additional piping is incorporated into the as-building effort, and to recognize the potential for deficiencies arising from construction interfaces.

(3) Piping Minimum Wall Verification

With regard to the 13 piping samples selected for minimum wall thickness verification, none of the samples were found to be below the specified minimum values. Only one sample was within seven mils of the minimum wall thickness limit. The various samples ranged in diameter from ½ inch to 24 inches, and were specified to meet the ASME Boiler and Pressure Vessel Code, Section III, Class 1, 2 and MC requirements (as appropriate).

(4) Interaction Analysis Program

In conjunction with the review of piping systems, the NRC CAT reviewed the licensee's Interaction Analysis Program as it related to Unresolved Safety Issue (USI) A-17, "Systems Interaction in Nuclear Power Plants," discussed in the Clinton Power Station (CPS) Safety Evaluation Report (NUREG-0853). NSEI ME-2 and Project Instruction PI-CP-034 were the guidance documents used for the interactions inspection program.

The scope of the program originally considered only the seismic displacement of components (e.g., piping, supports, cable trays). The allowable clearance criteria stated in the above identified instructions included a built-in incremental clearance for thermal displacement. Conditions which violated the acceptable clearance criteria (under categories identified in the procedures) were identified on Potential Interaction Reports (PIRs). These PIRs were then evaluated for their acceptability.

During the initial implementation of the program approximately 4000 PIRs were generated of which only 2 required rework; the remainder were dispositioned use-as-is. Based on these results (Report No. EMD-050518, "Generic Evaluation of Interaction Between Seismically Designed Components"), the licensee developed exclusions for which certain categories of potential interactions need not be considered or documented.

In future revisions to the Interaction Analysis Program, the scope of the program will be expanded to address the thermal effects of piping with respect to the overheating of electrical components due to proximate hot piping, interferences with installation of piping insulation, and interferences with pipe expansion resulting in piping overstress or interferences with components. (The Interaction Analysis Program as it relates to electrical and instrumentation components, cables and conduits is discussed in Section II, Electrical and Instrumentation Construction, of this report).

The NRC CAT considers the guidance procedures to be difficult to understand due to their apparent piecemeal compilation and fragmented incorporation of information. Further, although the NRC CAT did not identify any deviations regarding the application of the current procedures, observations of hardware indicate that the program revision will need to ensure the appropriate identification of thermal clearance violations for the certain categories of interactions previously excluded.

c. Conclusions

Piping was found to generally conform to design requirements and specifications. Site inspection and engineering personnel were knowledgeable of requirements and responsibilities. No significant problems regarding construction practice as it affected installed piping hardware were observed by the NRC CAT. However, the lack of control regarding the removal of temporary supports, and the piecemeal formulation of the program for identification and evaluation of potential interferences and interactions warrants additional attention.

2. Pipe Supports/Restraints

a. Inspection Scope

Twenty-six ASME Class 1, 2 and 3, and ten Class D pipe supports/restraints which represented a variety of types, sizes, systems and locations were selected for detailed inspection. These supports/restraints were inspected for proper configuration, clearances, member size, location, weld size, fasteners, and damage. All but two supports had been QC inspected and accepted. Included in the ASME supports sample were two supports/restraints reviewed under the IP Independent Design Review which was performed by Bechtel Power Corporation and six supports/restraints reviewed under the IP

Overinspection Program. See Table III-3 for a listing of the inspection sample.

In addition, approximately 70 other supports/restraints were observed at random in the field for obvious deficiencies such as loose or missing fasteners, improper clearances or angularity, improper locking devices, disassembled items, damage and improper concrete expansion anchor spacing.

Installation traveler packages for the supports were examined and compared with drawings and change notices to verify that the required attributes were inspected and that inspections were performed to the latest design documents. BA Field Verification and IP Overinspection reports were also reviewed to assess the effectiveness of the program in this area.

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

- S&L Specification K-2882, "Phase II Piping, Miscellaneous Equipment, and Equipment Erection," through Amendment 11
- S&L Specification K-2884, "Component Supports," through Amendment 8
- S&L Specification K-2884-001, "Basic Engineers Load Capacity Data Sheet Manual"
- S&L Drawing No. M09-1001N, "Component Support Installation Tolerances ...," Rev. N
- S&L Drawing No. M09-1003N, "Component Support Installation Tolerances ...," Rev. M
- IP QAI-710.15, "Component Support Overinspection Checklist," Rev. 4
- "IP Nuclear Power Construction QA Manual," Appendix A, Rev. 10
- BAP 3.2.5, "Piping Component Supports," Rev. 7, Change B
- BA Quality Assurance Instruction BQAI-190-5, "Component Support Field Verification," Rev. 4
- Applicable design drawings and change documents.

b. Inspection Findings

Approximately 94 percent of the nearly 11,300 component supports (large bore and small bore safety related, and fire protection related) had been installed and QC accepted. Approximately 65 percent of the 545 Class D (quality inspectable) supports had been installed and QC accepted.

The inspection activities for pipe support/restraint installation was controlled by BAP 3.2.5 which included a three phase inspection program that required the preparation of travelers for each inspectable support/restraint.

- Phase I inspection covers the installation of the support's primary attachment to the building, and verification of its location and orientation to the building.

- Phase II inspection covers the inspection and verification of the installed support per the design drawings.

- Phase III inspection includes restroking of snubbers, load stamping of constant spring supports, and setting of variable spring supports.

In general, pipe supports/restraints were in conformance with the specified requirements. The inspection checklists for attributes used by QC personnel were found to be comprehensive and detailed. Several discrepancies were identified and are discussed below. These discrepancies included incorrect modelling and analysis of certain Class 1 supports, pipe shear lugs not in contact with the riser clamp as required by the design drawing, thread length mismatch between a snubber body and its extension piece, incorrect substitution of material, and scaffold in contact with or supported by pipe support/restraint components. See Table III-4 for a listing of inspection observations. Welding deficiencies are discussed in Section IV, Welding and Nondestructive Examination, of this report.

- The lower pipe shear lugs on support M-1SX01028S were not in contact with the riser clamp as required by the design drawing. Gaps between the clamp and lugs ranged from 1/32 inch to 3/16 inch. In addition, one shear lug was observed to be 1-1/4 inches wide when the specified width was 2-1/2 inches. Engineering documentation authorizing the variation of shear lug sizes were not provided to the NRC CAT. NCMR 2-0327 was generated for this condition. While this support was inspected during the IP Independent Design Review performed by Bechtel Power Corporation, these deficiencies were not identified during that review.

- Two Pacific Scientific Arrestor PSA 35 snubbers, for supports M-1MS31002S and M-1RH08092S, were identified by the NRC CAT inspector as exhibiting a 1/4 inch thread length mismatch between the extension piece and the snubber body. The extension piece was provided by Basic Engineering (BE); the snubber was provided by Pacific Scientific Company. This mismatch was a result of the male threads of the extension piece being longer than the female threads of the snubber. Upon disassembly, it was discovered that the extension piece was fully seated against the internal dust cover. The NRC CAT is concerned that the extension piece could be tighten beyond the 1-1/4 inch depth of the female threads of the snubber body and push the dust cover into the inertia mass, thus causing the

malfunction of the snubber. We are also concerned with the potential generic implications of this condition on other supports which use Basic Engineering supplied extension pieces. The licensee is currently evaluating the extent and significance of this condition.

The licensee did not have a construction or QC procedure that included inspection attributes which would prevent the overtightening of these components. However, as a result of these observations, the licensee is in the process of incorporating the necessary changes into their inspection program to ensure that such conditions are identified.

- Two ASME Class 1 snubber supports were found to have been modelled and analyzed in a manner contrary to Final Safety Analysis Report (FSAR) commitments. According to S&L, supports M-1NB01003S and M-1NB01002S of the Nuclear Boiler System were modelled as rigid supports. The FSAR states that the Nuclear Steam Supply System (of which the Nuclear Boiler System is included) shall be modelled as flexible supports. The NRC CAT is concerned that this deviation could affect the adequacy of the design of the supports, and considers that this deviation in design warrants additional attention by the licensee.

- The NRC CAT observed that the rear bracket (Part No. BE-410-5) on support M-1SX01028S did not have an "N" suffix as part of the part number. The "N" suffix was observed on all of the ASME support components in our sample. The NRC CAT was concerned about the material traceability aspects of the component and the significance of the "N" suffix. According to the licensee, traceability is determined by a Receiving Inspection Report (RIR) number which is etched on each part or assembly. From the RIR, the part or assembly can be traced to the purchase order, packing slip, and Certificate of Compliance (C of C). Part number BE-410-5 was obtained from the BE parts catalog which did not list the "N" suffix. BE-410-5 and BE-410N-5 were identical parts, thus no specific distinctions were made between the two. Safety-related supports/restraints are required to have C of Cs and RIRs. These documents are verified by BE QC, BA vendor surveillance and receiving QC personnel. The licensee indicated that these supports will be reinspected for material compliance under Corrective Action Request 222 reinspection and verification program. Based on this program, adequate traceability appears to be provided.

- Evidence of a lack of attention to detail by QC personnel during their inspections of Class D pipe supports/restraints was observed by the NRC CAT during the inspection of Class D seismic supports, even though the inspection checklist for attributes was thorough in content. The NRC CAT identified discrepancies in four of the ten supports selected for detailed review, such as the unauthorized substitution of shaped steel with one of a similar shape but smaller size, binding contact between a pipe clamp and eye nut, and various weld quality

irregularities. The NRC CAT reviewed the traveler packages for these supports and in general, found them to be accurate and acceptable. However, the above discrepancies were not identified in the traveler packages associated with the supports.

- Numerous instances of wooden scaffold in contact with or supported by permanent support components were observed. In one case, scaffold was supported by a spring can and its support rod. In each case, there was no apparent damage to the support components when the scaffolding was removed.

  The licensee did not have a formalized program which controlled the erection of temporary scaffold on permanent supports as was evidenced by the numerous observations. The NRC CAT is concerned about the lack of control on the erection of scaffold and its effects on the hardware, since physical damage is not restricted to that which is readily visible. Further, damage to previously QC accepted supports could result in undetected unacceptable conditions. As a result of the NRC CAT observation, the licensee has issued a project memorandum addressing the erection of scaffolding. Section II, Electrical and Instrumentation Construction, of this report also discusses the support of temporary scaffolding.

During the review of piping (Section III.B.1, above), three box type restraints were found not to exhibit the minimum gap requirement between the pipe and the support frame steel. The S&L M09 series drawings specify minimum pipe to support steel clearances based on system temperatures. For the Shutdown Service Water piping of Drawing SX-27, a minimum clearance of 0.015 inches is required. Furthermore, for any system regardless of temperature, an "air gap" must be maintained. For the three supports listed in Table III-1a against Drawing SX-27, the required clearance was found not to exist. For two of these (supports 1SX11014R and 1SX11016R), support frame steel was found to be in contact with the top and bottom of the pipe such that the requirement to maintain an air gap was also violated. As a result of the NRC CAT observations, BA has reviewed the supports in question and other similar Shutdown Service Water supports. Two Nonconformance Reports (NCRs) addressing a total of six cases, including the three addressed here, of less than required pipe to steel clearances were written following this review. The NRC CAT considers these discrepancies to be isolated occurrences.

The installation and inspection travelers of six ASME and ten Class D supports/restraints were reviewed, and were found to exhibit proper chronological inspection verification and acceptance of handling, installation processes and sequences. In addition, six BA Field Verification packages and IP Overinspection reports were reviewed and were found to accurately reflect the condition of the hardware.

c. Conclusions

ASME Class 1, 2, and 3 pipe supports/restraints were found to be in general conformance to design requirements. Site engineering and inspection personnel were knowledgeable of procedures, requirements and responsibilities. Procedures and inspection checklists were thorough and detailed. However, the NRC CAT is concerned with the potential damage and generic implications regarding the thread length mismatch between snubber assembly components, and concludes that additional attention is warranted. We are also concerned that certain Class 1 supports may not be properly modelled and analyzed.

Class D pipe supports/restraints were generally found to be in conformance with design requirements. However, additional attention to detail by QC personnel during their inspections is warranted.

Observations regarding scaffolding in contact with permanent supports indicates a deficiency in the control of the erection of scaffold.

3. Concrete Expansion Anchors

a. Inspection Scope

Seventy-one concrete expansion anchors on 12 pipe supports/ restraints and 61 anchors on 8 HVAC restraints were inspected for proper diameter, length stamp, embedment, edge distance, damage, washers and residual torque (an indication of anchor preload). In addition, the length of the expansion anchors were verified by ultrasonic testing. The anchors inspected were selected at random on a variety of systems and ranged in diameter from one-half to one inch. Anchors were torqued to the BA or Zack Company (Zack) specified post installation test torque. Table III-5 provides a listing of the anchors inspected.

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

- BAP 2.16, "Concrete Expansion Anchors Work," (sic) Rev. 12-5
- Zack Procedure FQCP-12, "Inspection of Concrete Expansion Anchors," Rev. 5-3

b. Inspection Findings

Pipe support/restraint expansion anchors were installed by BA, and HVAC restraint anchors were installed by the HVAC subcontractor, Zack Company. Expansion anchor installations were inspected by the respective subcontractor QC personnel. The BA and Zack procedures were nearly identical in substance. However, two fundamental differences existed with respect to inspections. BA QC inspected and witnessed 100 percent of the anchor bolts installed. Zack QC inspected a minimum of one concrete expansion anchor of each diameter on each anchor plate assembly, or a minimum of one concrete

expansion anchor in every ten of each diameter, whichever was greater.

For the NRC CAT inspection the anchor nuts were torqued to the specified retightening (BA) or testing (Zack) torque. Fourteen anchors for pipe supports out of seventy-one tested exhibited insignificant nut rotation at less than the retightening torque with a maximum of 1/8 turn (which was within the BAP 2.16 acceptance criteria). Seven anchors for HVAC supports out of sixty-one tested exhibited insignificant nut rotation at less than the testing torque with a maximum of 1/16 turn. Since Zack procedures did not specify any allowable nut rotation, job plans to retorque each of the affected anchor nuts were issued for the associated anchor plate assemblies.

All other features inspected by the NRC CAT for both BA and Zack installed anchors were in conformance with requirements.

c. Conclusions

Concrete expansion anchors inspected by the NRC CAT were installed in accordance with design and procedural requirements. The results of the torque tests are typical of normal wedge type expansion anchor installations and do not indicate installation deficiencies.

4. Heating, Ventilating and Air Conditioning

a. Inspection Scope

Six HVAC seismic restraints were selected at random and inspected for location, configuration, member size, weld size and connection details. Approximately 150 feet of duct adjacent to the restraints and others selected at random were examined for proper attachment to anchors, companion angle size and joint makeup. Thirteen fire dampers were inspected for proper installation, operability and condition. IP Overinspection documents were also reviewed to assess the effectiveness of the program in this area. HVAC concrete expansion anchor installation was inspected and is discussed in Section III.B.3, above. See Table III-6 for a listing of inspected items.

The following documents provided the acceptance criteria for the inspection of HVAC hardware installations:

- Zack Procedure FQCP-5, "Fabrication and Installation Inspection," Rev. 8-1
- Zack Procedure FQCP-10.7, "System Walkdown for Turnover," Rev. 2-1
- IP QAI-710.20, "HVAC Overinspection Checklist," Rev. 4
- S&L Specification K-2910, "General HVAC Specification"

- S&L PI-CP-024, "Non-Category I Verification Program," Rev. 2
- S&L Design Criteria DC-ME-17-CP, "Design Criteria for Interaction Analysis in Category I Buildings," Rev. 1
- Applicable design drawings, duct standards and change documents.

b. Inspection Findings

HVAC systems were designed by S&L and detailed on the Zack layout drawings. Hardware for fabrication and installation were detailed on duct fabrication details and hanger details.

The installation and inspection of HVAC seismic supports/restraints are controlled through the use of "job plans." A job plan is essentially a traveler which details the activities to be performed and the required inspection activities. Installation and inspection criteria are delineated on the job plans. The inspections are documented on hanger inspection checklists, which then become part of the job plan package.

In general, the inspected HVAC seismic restraints conformed to design documents and specification requirements. One minor brace angle discrepancy (four degrees out of tolerance) and one minor dimensional discrepancy were noted. The duct assemblies exhibited proper weld stitches to supports and companion angles, placement of reinforcements, proper fasteners, and in general, conformed to specified requirements. However, two documentation related anomolies were noted for support R-7037.

NCR 911376 recorded stiffener plates missing from its vertical channel members, and was dispositioned use-as-is. The NRC CAT requested the calculations for the support which formed the basis for the disposition, and upon review noticed that the configuration used to disposition the NCR differed significantly from that depicted on the current design drawing. Subsequent calculations utilizing as-built information reconfirmed that the use-as-is disposition was still acceptable. This same support also had a Field Engineering Change Notice (FECN) posted against it (FECN 7718) when in fact a nonconformance report should have been generated. The FECN changed a weld symbol to match a field configuration which had been erroneously QC accepted. Support R-7037 had undergone IP Overinspection, and the inspection results were documented on Inspection Report No. H2030 prior to the inspection by the NRC CAT. These two anomolies are not significant in the engineering context and are considered to be isolated occurrences.

With respect to the licensee's inspection program of Class D (nonsafety-related) seismic supports and duct, Zack Procedure FQCP-5 required that the Class D seismic assemblies receive the same level of inspection as the safety-related seismic Category I assemblies. The job plan packages of the Class D seismic supports

which were reviewed by the NRC CAT contained the appropriate inspection reports. The concerns of Position C.2 of Regulatory Guide 1.29, "Seismic Design Classification," have been adequately considered and implemented by the licensee through the documents PI-CP-024 and DC-ME-17-CP.

With regard to the 13 fire dampers which were subjected to a release test, all of the dampers released as designed and provided the required isolation. It should be noted however, that Zack and S&L are currently evaluating the impact of defects in certain fire dampers described in a 10 CFR 21 notification by the manufacturer of the fire dampers (Ruskin Manufacturing Company). This notification, in part, stated that certain models of fire dampers were found not to close properly under air flow conditions, and recommended that the affected dampers be tested under the appropriate flow conditions.

S&L intends to evaluate the functionality of the dampers through the use of test models. Test criteria have been developed; modelled configurations included horizontal and vertical duct runs, the use of balancing dampers, and multiple damper configurations. The ducting ranged in size from 24x24 inches to 60x50 inches. The tests were conducted at the vendor's facilities with the use of an S&L approved test procedure (XHV-85-41), which was originally developed by Ruskin Manufacturing Company (41585DY-NIBD-23).

At the time of the NRC CAT inspection, S&L was reviewing the results of the tests.

c. Conclusions

The inspected HVAC hardware generally conforms to design requirements and specifications, and the 10 CFR 21 notification regarding fire dampers is receiving adequate licensee attention and followup.

5. Mechanical Equipment

a. Inspection Scope

Twenty-four pieces of equipment for seven systems were inspected for proper configuration, location, condition and bolt size. Installation documentation for these components were reviewed for content, clarity, consistency and thoroughness. IP Overinspection and BA Field Verification documents were also reviewed in order to assess the effectiveness of these programs in this area. Equipment examined included the Emergency Diesel Generators, Diesel Generator Day Tanks, and the Standby Liquid Control Pumps. The NRC CAT inspector examined documentation for components which were considered to be completely installed, and those which were still in-process. Equipment which had received final alignment or whose foundation anchor bolts had been tensioned or torqued were considered to have been completely installed. Table III-7 provides a listing of inspected items.

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

- BAP-2.10, "Equipment Installation," Rev. 10-D
- BQAI-190-3, "Mechanical Equipment Field Verification," Rev. 3
- IP QAI-710.3, "Mechanical Equipment Overinspection Checklist," Rev. 1
- Applicable equipment details and foundations drawings.

b. Inspection Findings

Installation inspection reports generally exhibited the desired sequencing of installation activities and inspections. However, BAP 2.10 which governed the preparation of equipment installation travelers, did not require work to be performed in the sequence in which they appear in the traveler unless specifically noted. As such, any designated QC holdpoint did not disallow the initiation or completion of work activities (which may fall sequentially later in the traveler) prior to the sign-off of the QC holdpoint. Rather, only a QC verification need be performed for that particular operation or activity at its completion.

Of the 24 components for which installation documentation was reviewed, all had been inspected and found acceptable by QC for those attributes examined by the NRC CAT inspector. Of these components, the NRC CAT identified only one discrepancy between installation requirements and as-installed conditions. Diesel Fuel Oil Storage Tank D001TC was found to be missing washers at the foundation anchor attachment. Further, this was the only discrepancy identified between the sampled as-installed hardware and the associated BA Field Verification or IP Overinspection reports. It was noted however, that five components manufactured by Goulds Pumps Inc. (HPCS Water Leg Pump, Residual Heat Removal Water Leg Pump, RCIC Water Leg Pump and the Control Room Chilled Water Pumps) appeared to have been improperly fastened to the foundation anchor bolts in that the foundation anchor nuts were tightened to a "snug tight plus ¼ turn" condition rather than the torque value specified by the vendor drawings. For each water leg pump, this potential discrepancy was originally documented by licensee QC personnel on NCR 6639. This NCR was dispositioned use-as-is by the invocation of Field Change Request (FCR) 3477 which specified the snug tight condition "unless otherwise specified." Due to the ambiguous and imprecise language in both FCR 3477 and NCR 6639, the NCR appeared to have been improperly dispositioned. A review of NCR 6571, which dispositioned a similar discrepancy (for the Spent Fuel Cooling Pumps) in the same manner, revealed that the licensee's position was that S&L's requirements prevailed over vendor recommendations as the component installations were governed by S&L drawings and documents. The NRC CAT thus considers NCR 6639 to have been appropriately dis-

positioned and the equipment to have been properly installed. The licensee has agreed to provide clarification regarding the tightening of foundation anchor bolts.

The NRC CAT inspector also reviewed the seismic analyses for the HPCS, RCIC and Residual Heat Removal Water Leg Pumps, RCIC Pump, Turbine and Gland Seal Compressor, and the Diesel Generator Day Tanks for consistency between the foundation anchor bolt material type assumed in the analyses, and the as-installed material. No discrepancies were identified.

During the review of equipment installation travelers, the traveler package covering the modification of the lube oil system for the HPCS diesel generator was examined. Documentation showed a history of queries by licensee personnel regarding the appropriateness of the safety classification of the materials to be used during the modification; nonsafety-related material and components were purchased for the modification. These questions arose as a result of a disparity between a vendor generated Field Deviation Disposition Request (FDDR LH1-482) which categorized the lube oil system to have been safety-related, and a General Electric Quickletter dated March 4, 1985 which stated that the material to be used in the modification need not be safety-related.

Ultimately, the use of nonsafety-related materials was approved by the supplier of the HPCS diesel generator in FCR 37073. The NRC CAT inspector reviewed documents germaine to this concern and concludes that the specified use of nonsafety-related materials and components as described in FCR 37073 is consistent with licensee commitments as evaluated in Section 9.5.7 of the CPS Safety Evaluation Report (NUREG-0853).

c. Conclusions

Mechanical equipment installations generally conformed to design and installation requirements. Equipment travelers adequately documented work activities.

TABLE III-1a

PIPING INSPECTION SAMPLE - LARGE BORE

Baldwin Associates Piping

Drawing Number	Pipe Class	Diameter (inches)	No. of Support Locations Inspected		Notes	Observations
			Design	As-Built		
HP-2 Rev. 10L	2	20, 16	15	15	1	10'0" design dwg. dimension measures 9'7"
LP-1 Rev. 8G	1	10	5	5	2	
RI-7 Rev. 10M	2	6	12	12		
RI-14 Rev. 8J	1	4	-	-	3	
RT-47 Rev. 5K	3	4, 3	14	14		
SX-25 Rev. 8J	3	8	18	18	4	6'10" as-built dimension from Support 1SX13003X to upstream elbow measures 6'8"
SX-27 Rev. 7P	3	8	15	15		4'0" as-built dimension from Support 1SX11016R to Support 1SX11015X measures 4'1" Pipe to support steel minimum gap does not exist at Supports 1SX11012R, 1SX11014R and 1SX110016R

TABLE III-1b

PIPING INSPECTION SAMPLE - SMALL BORE

Baldwin Associates Piping

Drawing Number	Pipe Class	Diameter (inches)	No. of Support Locations Inspected		Notes	Observations
			Design	As-Built		
HP-753 Rev. 15	2	2, 1	10	5	5	2'6" as-built dimension measures 2'7"
IS-754 Rev. 12	1, 2	1½, 2	23	0	6	3'9" design dwg. dimension measures 3'5½"
NB-751 Rev. 6	1, 3	2	-	-	3	Interference between pipe and support for electric box 1JB729 not documented for piping design incorporation
RI-758 Rev. 17	2	2	0	0	7	Temporary pipe support not dismantled at two locations

Reactor Controls, Inc. Piping

Drawing Number	Pipe Class	Diameter (inches)	No. of Support Locations Inspected		Notes	Observations
			Design	As-Built		
SA-489 Rev. 3	2	1	-	4	8	
SA-490 Rev. 5	2	1	-	5	8	
SA-501 Rev. 3	2	1¼	-	4	8	

TABLES III-1a and b (Continued)

PIPING INSPECTION SAMPLE

NOTES

1. Piping dimensions inside containment wall not inspected.

2. Piping dimensions outside containment wall not inspected.

3. Selected piping components inspected by NRC CAT - Piping layout not inspected.

4. Piping between floor at elevation 737'0" and support M-1SX13004R not inspected by NRC CAT.

5. As-built walkdown is not required for all piping shown.

6. As-built data not inspected.

7. As-built walkdown not required for piping shown.

8. Walkdown design data recorded (March 29, 1985) on listed mathematical model revision inspected by NRC CAT.

TABLE III-2

PIPE WALL THICKNESS SAMPLE AND OBSERVATIONS

Manufacturer[1]/ (Heat No.)	Pipe Size/ Schedule	ASME Class	Specified Nominal/ Minimum Wall Thickness (Inches)	Minimum Wall Thickness Measured (Inches)
B&W (59768)	2½/xxs	2	0.552/0.483	0.501
C-W (14-390)	12/40s	1	0.375/0.328	0.434
C-W (13-419)	12/80s	1	0.688/0.602	0.715
J&L (631675)	12/40	2	0.406/0.355	0.377
J&L (364557)	4/80	2	0.337/0.295	0.316
S (466139)	1/80s	2	0.179/0.157	0.170
S (465835)	½/40s	2	0.109/0.095	0.106
S (462337)	6/40s	2	0.280/0.245	0.267
PSC (60834)	8/80	2	0.500/0.438	0.473
TCS (93563)	3/4/40s	2	0.113/0.099	0.109
USS (L-24722)	6/40	2	0.280/0.245	0.279
SF (1-RI-14-5)	4/120	1	0.438/0.383	0.390
(1E51-D306)	24/	MC	1.000/0.875	1.096

NOTES:

[1]B&W - Babcock & Wilcox Tubular Products Division
C-W - Curtiss-Wright Corporation
J&L - Jones & Laughlin Steel Corporation
S - Sandvik, Inc.
SF - Southwest Fabricating & Welding Company, Inc.
PSC - Phoenix Steel Corporation
TCS - Teledyne Columbia - Summerill
USS - U.S. Steel Corporation

TABLE III-3

PIPE SUPPORT/RESTRAINT INSPECTION SAMPLE

S/R Number[1]	Type	Pipe[2] Class	Size (Inches)	Location[3]	Comments[4]
M-1MS32002S Rev. C	Snubber	C	12	Cont.	
M-1MS31002S Rev. C	Snubber	C	12	Cont.	BA
M-1MS33009S Rev. D	Snubber	C	12	Cont.	BA
M-1MS31009C Rev. F	Spring	C	12	Cont.	
M-1NB01003S Rev. A	Snubber	A	2	Cont.	
M-1NB01002S Rev. B	Snubber	A	2	Cont.	
M-1NB01008S Rev. C	Snubber	A	2	Cont.	
M-1NB01027X Rev. A	Box	A	2	Cont.	
H-1RH-780-4 Rev. 0	U-bolt	B	3/4	Aux.	IP
M-1RH47013G Rev. A	Box	B	1-1/2	Aux.	IP
M-1RH71016G Rev. C	Box	C	1-1/2	Cont.	IP
M-1RH34010X Rev. A	Strut	A	18	Cont.	IP
M-1RH14009S Rev. D	Snubber	B	8	Aux.	
M-1RH14006S Rev. C	Snubber	B	8	Aux.	TVL
M-1RI14025G Rev. B	Box	B	1	Aux.	
M-1RI14018G Rev. D	Box	B	2	Aux.	BA, TVL
M-1RI14002G Rev. D	Box	B	2	Aux.	BA, TVL
M-1RI14015G Rev. E	Box	B	2	Aux.	BA, TVL
M-1RI14001G Rev. G	Box	B	2	Aux.	BA, TVL
M-1SX42021R Rev. F	Strut	C	2-1/2	Aux.	IP, TVL
M-1SX42019R Rev. C	Strut	C	1-1/2	Aux.	IP
M-1SX01048X Rev. F	Strut	C	30	Screen	
M-1SX01017R Rev. H	Riser Clamp	C	30	Screen	
M-1SX01050X Rev. E	Strut	C	30	Screen	
M-1SX01028R Rev. J	Riser Clamp	C	30	Screen	
M-1SX21002G Rev. B	Box	C	2	Aux.	
M-1CC06042G Rev. B	Box	D	14	Fuel	TVL*
M-1CC06016X Rev. B	Strut	D	14	Fuel	TVL*
M-1CC12007C Rev. D	Spring	D	3	Cont.	TVL
M-1CC07014R Rev. D	Rod	D	14	Fuel	TVL
M-1CC06035X Rev. A	Strut	D	14	Fuel	TVL
M-1CC07050X Rev. C	Strut	D	14	Fuel	TVL
M-1CY23002G Rev. C	Box	D	3	Aux.	TVL
M-1FW03014S Rev. C	Snubber	D	20	Turbine	TVL
M-1HP03024R Rev. C	Rod	D	10	Fuel	TVL
M-1VQ03003R Rev. E	Strut	D	10	Cont.	TVL

TABLE III-3 (Continued)

PIPE SUPPORT/RESTRAINT INSPECTION SAMPLE

NOTES:

[1]CC - Component Cooling Water
CY - Cycled Condensate
FW - Feedwater
HP - High Pressure Core Spray
MS - Main Steam
NB - Nuclear Boiler
RH - Residual Heat Removal
RI - Reactor Core Insolation Cooling
SX - Shutdown Service Water
VQ - Drywell Purge

[2]A - ASME Class 1
B - ASME Class 2
C - Asme Class 3

[3]Cont. - Containment Building
Aux. - Auxiliary Building
Screen - Screen House
Fuel - Fuel Building
Turbine - Turbine Building

[4]BA - BA Field Verification Records Reviewed by NRC CAT
IP - IP Overinspection Records Reviewed by NRC CAT
TVL - Traveler Package Reviewed by NRC CAT
* - Not QC Inspected at Time of NRC CAT Inspection

TABLE III-4

PIPE SUPPORT/RESTRAINT INSPECTION OBSERVATIONS

From Support Sample

Support/Restraint	Observations
M-1MS31002S Rev. C	Mismatch of thread engagement of BE extension piece and PSA 35 snubber. Extension piece male threads measured 1-1/2 inches and snubber body threads were 1-1/4 inches. Extension piece was in contact with internal dust cover. 1/4 inch of threading exposed on extension piece when assembled with snubber body.
M-1MS31009C Rev. F	Scaffold contacting against riser clamp.
M-1MS33009S Rev. D	Exessive debris in W-beam blocks drainage of water.
M-1NB01003S Rev. A	Incorrect lock wiring. Not modelled per FSAR commitment.
M-1NB01002S Rev. B	Not modelled per FSAR commitment.
M-1NB01008S Rev. C	Weld of item 2 to item 3 not welded as shown on design drawing.
M-1NB01027X Rev. A	Elevation of 2-1/2 x 2-1/2-inch angle is 2-7/8 inches above drawing location. Thickness of 2-1/2 x 2-1/2-inch angle is not listed as 3/8 inch on FCR 33320.
M-1RH14006S Rev. C	Zero inch gap on top between telescoping cylinder and support cylinder of snubber. 1/8 inch gap on bottom between telescoping cylinder and support cylinder of snubber.
M-1RH14009S Rev. D	Cotter pin not spread. Loose locknut on extension piece. Zero inch gap on top between telescoping cylinder and support cylinder of snubber. 1/8 inch gap on bottom between telescoping cylinder and support cylinder of snubber.

TABLE III-4 (Continued)

PIPE SUPPORT/RESTRAINT INSPECTION OBSERVATIONS

From Support Sample

Support/Restraint	Observations
M-1RI14002G Rev. D	Zero inch clearance between top horizontal member and pipe. Pipe not supported by bottom horizontal member; 0.046 inch clearance between bottom member and pipe.
M-1SX01048X Rev. F (Ref. Dwg. No. M-1SX01017R)	Sheet 1, item 6 calls for rear bracket BE-410-5, no "N" suffix. Extra rear bracket of a BE strut was incorrectly listed on NCR 26414.
M-1SX01017R Rev. H	Support was not listed on NCR 26414 with reference to the extra rear bracket shown on Drawing M-1SX01048X.
M-1SX01028R Rev. J	Bottom lugs were not in contact with riser clamp. Gaps measured 1/32 inch through 3/16 inch. Bottom lug width of 1-1/4 inch did not meet the design requirements of 2-1/2 inches.
M-1CY23002G Rev. C	1/8 inch grind depth at weld tie-in on east vert member.
M-1CC07014R Rev. D	Pipe clamp ears binding against eye nut. Cotter pin not spread.
M-1CC07050X Rev. C	Undercut on main structural member (Item 6) greater than 1/16 inch. Members not welded as shown on design drawing (Item 6 to Item 7). Hole in weld of west rear bracket.
M-1CC06042G Rev. B	Debris between pipe and south vertical support steel. Support was not QC inspected.
M-1CC12007C Rev. D	Structural steel shape M4 x 13 was substituted for a W4 x 13 shape. 3/16" x 3" x 6-1/4" plate was substituted for two 3" x 3" washer plates without proper documentation.

TABLE III-4 (Continued)

PIPE SUPPORT/RESTRAINT INSPECTION OBSERVATIONS

From Random Sample

Support/Restraint	Observations
M-1FC02003R	Scaffold interfering with support.
M-1FP46005	Sway strut in contact with conduit C6513.
M-1HP03024R	Scaffold resting on pipe support.
M-1MS23006C	Scaffold platform resting on riser clamp.
M-1RH14010S	Scaffold in contact with snubber.
M-1RH13036S	Cotter pin not spread on rear bracket.
M-1RH09049X	Loose locknut on pipe clamp.
M-1RH16031X	Nail substituted for cotter pin in rear bracket of sway strut.
M-1RH07053X	Auxiliary steel for conduit support E-26-1001-02B-CP-13 is in contact with rear bracket pin on sway strut.
M-1RH08092S	Mismatch of thread engagement of BE extension piece and PSA 35 snubber. Extension piece male threads measures 1-1/2 inches and snubber body threads were 1-1/4 inches. Extension piece was in contact with internal dust cover. 1/4 inch of threads exposed on extension piece when assembled with snubber.
M-1SX18022V	Scaffold in contact with spring can.
M-1SX17028X	Rear bracket binding eye bolt of sway strut. Pipe clamp was 2 inches lower than design elevation.
WS00520G	U-bolt damaged (nonsafety).
M-1VC02003R	Scaffold interfering with support.
Valve No. 2SX017A	Scaffold interfering with valve.

TABLE III-5

CONCRETE EXPANSION ANCHOR SAMPLE AND OBSERVATIONS

Pipe Support Drawing (BA)	Number of Bolts - Diameter	Number of Bolts Turned Prior to Achieving Retightening or Testing Torque	Number of Turns to Achieve Retightening or Testing Torque
M-1VC04017X	15-3/4	6	1/12, 1/12, 1/12 1/8, 1/12, 1/32
M-1VC04001V	4-1/2	0	-
M-1CC06042G	6-1	1	1/16
M-1RI27003G	3-3/4	1	1/8
M-1RI03017R	8-3/4	0	-
M-1SX75015G	4-1	1	1/16
M-1SX78008R	8-3/4	2	1/32, 1/16
M-1SX77020X	4-3/4	1	1/32
M-1SX21002G	4-1	0	-
M-1SX23008V	4-3/4	1	1/32
M-1RI14001G	2-3/4, 1-1	1	1/32
M-1RI14019R	8-1	0	-

HVAC Support Drawing (Zack)	Number of Bolts - Diameter	Number of Bolts Turned Prior to Achieving Retightening or Testing Torque	Number of Turns to Achieve Retightening or Testing Torque
C-3163	6-3/4	3	1/16, 1/64, 1/64
C-3162	6-3/4	0	-
D-4308	15-3/4	1	1/64
C-3211	8-3/4*	1	1/16
C-3151	8-3/4	1	1/64
D-0121	6-3/4	0	-
C-1109-3	4-1	0	-
C-4103	8-3/4	1	1/64

*One anchor bolt is recessed into the nut and one thread of the nut is visible. NCR No. 912167 issued.

TABLE III-6

HVAC INSPECTION SAMPLE AND OBSERVATIONS

Supports/Restraints

Support I.D.	Location	Observations
R5008	Containment	Acceptable.
R7022	Containment	"E" and "X" dimensions were 15/16 inches longer than that shown on dwg.
R7033	Containment	Brace angle exceeded dwg. requirements by 4 degrees. NCR 911376 was dispositioned using wrong configuration.
C3163	Control Building	Acceptable.
C6335	Control Building	Acceptable.
D4324	Diesel Generator Building	Acceptable.

Fire Dampers

Damper I.D.	Quantity	HVAC System
OVC42YF	4	Control Building
OVC103Y	1	Control Building
OVC104Y	1	Control Building
OVL68Y	1	Laboratory HVAC
OVL70Y	1	Laboratory HVAC
1VX08YC	1	Switchgear Heat Removal
1VX82Y	2	Switchgear Heat Removal
1VX86Y	2	Switchgear Heat Removal

TABLE III-7

MECHANICAL EQUIPMENT SAMPLE

Diesel Generator Air Start Skid	1DG06SA
Diesel Generator Day Tanks	1DG01TA,B,C
Diesel Generators	1DG01KA,B
Diesel Generator Oil Transfer Pumps	1D001PA,C
Diesel Generator Fuel Oil Storage Tanks	1D001TA,C
HPCS Diesel Engine	1E11-S001
HPCS Water Leg Pump	1E22-C003
RHR Water Leg Pump	1E12-C003
RCIC Pump and Turbines	1E51-C001, C002
RCIC Gland Seal Compressor	1E51-C002
RCIC Water Leg Pump	1E51-C003
Standby Liquid Control Pumps	1C41-C001A,B
Control Room Chilled Water Pumps	0VC08PA,B
Switchgear Heat Removal Coolers	1VX01SA,B
RHR Room Coolers	1VY06S,07S

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/restraints, field and shop fabricated tanks and heat exchangers, structural steel installations, heating, ventilating and air conditioning (HVAC) installations, electrical supports, and instrumentation and control tubing were inspected. The inspected welds were selected to provide a representative sample of the licensee'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.

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.

During the inspection of welds on pipe supports/restraints, the NRC Construction Appraisal Team (CAT) identified welds which did not have the weld size specified by the Architect Engineer, Sargent & Lundy Engineers (S&L). Undersized welds were found in both skewed and non-skewed connections on pipe supports. S&L has evaluated most of the undersized welds and determined that the welds are adequate for the intended application. 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 in Sections IV.B.1 and 11, below.

The licensee has instituted an Illinois Power Company (IP) Overinspection Program. The program provides for additional inspections to be performed by the Baldwin Associates Field Verification (BAFV) Group and the IP Overinspection Group. Section VII, Design Change Control, of this report provides additional discussion of the IP Overinspection Program.

The IP Overinspection Program was set up to include inspections of welds in all of the major areas of plant construction such as electrical, piping, instrumentation, HVAC and structural steel. The NRC CAT inspectors inspected eleven pipe supports/restraints which were inspected under the scope of the program. In addition two supports in the electrical, two supports in the instrumentation, two supports in

the HVAC and two supports in the structural steel areas were inspected to assess the adequacy of the welding overinspections.

In the area of NDE, the NRC CAT inspectors reviewed radiographs supplied by various contractors and vendors. The NRC CAT inspectors found radiographs which showed that some welds did not have the required weld quality or the NDE documentation did not accurately reflect the current status of the hardware. A detailed discussion concerning the welds and their associated deficiencies are provided in Sections IV.B.1., 9, 10 and 11, below.

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. Sargent & Lundy Engineers: Architect Engineer.

2. Baldwin Associates: piping installation and piping supports/ restraints, instrumentation installation and instrumentation supports, fire protection fabrication and installation, electrical installation and supports, drywell wall field installation and structural steel erection and modification.

3. Chicago Bridge and Iron Company (CB&I): containment liner and containment penetration fabrication and installation, tank fabricator.

4. Bristol Steel Company: reactor pool and spent fuel pool liner fabrication and installation, structural steel supplier.

5. Zack Company (Zack): heating, ventilating and air conditioning.

6. General Electric Company: reactor internals field modification and installation.

7. Reactor Controls Inc.: control drive mechanism piping installation.

Shop Fabrication

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

2. Harnischfeger Corporation: crane manufacturer.

3. General Electric Company: nuclear steam supply system.

4. Anchor/Darling Valve Company: valve manufacturer.

5. Progressive Fabricating Inc.: pipe sleeve and cylinders supplier.

6. Carrier Corporation: chillers and coolers manufacturer.
7. Pathway: expansicn bellows supplier.
8. RECO Industries Inc.: tank fabricator.
9. Posi Seal: valve bodies supplier.
10. Fisher Controls Inc.: valve manufacturer.
11. Rockwell: flow diverters supplier.
12. Lakeside Bridge and Steel: miscellaneous steel supplier.
13. La Barge: pipe supplier.
14. Hub: tube supplier.
15. Yuba Heat Transfer Corporation: high pressure heater manufacturer.
16. Southern Boiler: small tanks supplier.
17. Tube Turns: penetration manufacturer.
18. Spencer Turbine Co.: blow casing supplier.
19. Chicago Tube and Iron: tee tubes supplier.
20. Nooter: water storage tank supplier.
21. Guyon Alloys: tube and fittings supplier.
22. Gould: valve supplier.
23. Metal Bellows: bellows manufacturer.
24. Atomic International: hydrogen recombiner manufacturer.
25. Steward and Stevenson: air receiver tank supplier.
26. W.J. Woolley Company: containment vessel hatches fabricator and supplier.
27. G.W. Taylor: material supplier.
28. Trent Tube: material supplier.
29. Bingham-Willamette: pump manufacturer.

The results of the inspection activities involving each of these areas and contractors are documented in the following sections.

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 BA. Southwest Fabricating and Welding supplied the shop fabricated piping spools.

The NRC CAT inspected 56 pipe supports/restraints involving approximately 550 welds in order to verify conformance of welding to drawing requirements and confirm the visual acceptability of the welds. The inspection included 11 supports consisting of 68 welds, which had been checked under the IP Overinspection program in order to evaluate the effectiveness of that program. See Table IV-1 for a listing of supports subjected to detailed inspection. Additionally, another 16 supports/restraints involving 400 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 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 44 piping spools involving 1400 American Society of Mechanical Engineers (ASME) Class 1, 2 and 3 welds were inspected. Twenty-four of those piping spools were subjected to detailed inspection which included the review of pertinent QC documentation while the remaining 20 spools were only visually inspected. Both field and shop welds were inspected in order to assure compliance with the requirements of the ASME Code. Some of the inspected socket welds were fabricated by Reactor Controls, Inc. (RCI) in conjunction with the Control Drive Mechanism piping installation contract. See Tables IV-3 and IV-4 for listings of piping spools inspected. In addition, 75 welding filler metal test reports, 22 welder qualification test records and 4 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 for the pipe fabrication area included the review of 62 shop and 75 field fabricated welds which involved 1815 film. The field welds were fabricated by BA and the shop fabricated pipe spools were supplied by Southwest Fabricating and Welding. Three welds involving 28 film supplied by RCI were also reviewed as a part

of this inspection. In addition, 6 NDE procedures and 11 NDE personnel qualification records were reviewed in order to verify compliance with the governing codes and specifications. Six 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 quality assurance NDE procedure was reviewed for adequacy.

b. Inspection Findings

(1) Welding Activities

In general, the inspected pipe and pipe support/restraint welding activities were found to comply with the governing codes and specifications. However, discrepancies were identified involving undersized welds in both skewed and nonskewed welded connections. Forty-six of 950 structural welds inspected, involving 56 pipe supports/restraints, were found to be deficient with respect to the specified acceptance criteria. Forty-four of the welds were undersized, one weld had overlap and lack of fusion, and another weld had undercut and was also welded across the beam flange which violated the specification requirements. Nineteen of the undersized welds were found on hanger 1RH051R which had a total of 79 welds. As a result of this finding the BA personnel identified and reinspected the remaining 20 hangers of similar design. A relatively high percentage of undersized welds were also found on those hangers. Investigation revealed that the hangers were predominately shop fabricated by BA and the shop fabricated portion was not inspected as closely as those welds which were made during installation. See Table IV-1 for details. As a result of this finding the applicant issued Nonconformance Reports (NCRs) and the welds were determined to be adequate for the intended application.

Two of the 1400 pipe welds inspected were found to deviate from the specified acceptance criteria. The two welds and their associated deficiencies are listed as follows:

(a) An undersized reinforcing fillet weld between a small-diameter coupling and spool piece 1RH-8-7 was found. NCR 32441 was written as a result of this finding.

(b) Undersized welds were found on socket welds on the 3/4-inch Schedule 160 piping connections on RCI work. NCR CRD-185-48 was written as a result of this finding. In addition, all pipe of this size and schedule was reinspected and accepted by the Architect Engineer without repair. Ten percent of the remaining RCI fillet welds were also inspected, and these were found to be of the correct size since the connecting piping was Schedule 80 or lighter.

(2) Nondestructive Examination Activities

In general, the inspected NDE activities were found to comply with the applicable codes and specifications. However, during the review of the radiographic film some irregularities were identified which involved the following two welds:

- Field Weld IVQ-B-1

  The radiographs for this weld covering view 2-3 were originally rejected for base metal gouging. The repair film did not adequately cover the repaired area. As a result of this finding the applicant issued NCR 31598.

- Shop Weld IFC-2-13

  This weld was reradiographed by BA. The weld traveler FC-2-B misidentified weld IFC-2-13 as being weld IFC-2-13-W-3. A visual examination of weld IFC-2-13 confirmed that the radiographed weld is IFC-2-13. As a result of this finding the applicant issued NCR 31513.

c. Conclusions

(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. The welds for these supports were evaluated by the Architect Engineer and determined to be structurally adequate for the intended application.

(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 welds which were misidentified and the repair areas did not have adequate radiographic coverage.

2. Reactor Internals Modification and Installation

a. Inspection Scope

Approximately 20 feet of welded seam of the outer bank hood replacement of the steam dryer and 6 new tie bar installation welds were inspected. In addition, one welding procedure and the qualification test records for two welders were also reviewed for adequacy. The modification work was performed by General Electric Installation and Services Engineering Division.

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. Electrical Installation and Electrical Supports

a. Inspection Scope

The NRC CAT inspected approximately 100 field and 60 shop welds in the area of electrical installation. Two welding procedures and the qualification test records for six welders were reviewed. In addition, the personnel qualification test records for four welding inspectors were also reviewed and four inspectors were observed and evaluated for their ability to follow the visual inspection procedures. The welding activities in the electrical area were performed by BA.

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.

4. Instrumentation Tubing Installation and Instrumentation Supports

a. Inspection Scope

Approximately 110 welds involving 18 instrumentation supports, 2 panels, and 80 tubing welds were visually inspected to ascertain compliance with the specified acceptance criteria. Two welding procedures and qualification test records for six welders were reviewed. NDE procedures and qualification records for four NDE inspectors were also reviewed. Two visual welding inspectors and two liquid penetrant inspectors were observed and evaluated for their ability to follow the applicable inspection procedures. The welding in the instrumentation area was performed by BA.

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 applicable construction codes and specifications.

5. Heating, Ventilating and Air Conditioning Installation and Supports

a. Inspection Scope

Approximately 140 welds involving 20 supports were inspected for compliance with the specified acceptance criteria. Six welding procedures and the qualification test records for six welders were reviewed. In addition, four welding inspector 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, one air filter and four dampers were also included in this inspection. The welding in the HVAC area was performed by Zack Company.

b. Inspection Findings

During the inspection of Hanger A-0082 a burn through the duct was observed in the welded joint between the duct and the duct companion flange. As a result of this finding, Zack Company issued NCR 912085 and the duct will be repaired as required.

c. Conclusions

In general, the inspected welded activities were found to comply with the requirements specified by the Architect Engineer. With the exception of the minor finding (burn through duct in one isolated case) the inspected welding activities were found to comply with the applicable codes and specifications.

6. Structural Steel Fabrication, Erection and Modification

a. Inspection Scope

Approximately 150 welds comprising 80 field and 70 shop welds involving 22 structural beams were visually inspected in order to ascertain compliance with the specified acceptance criteria.

Five welding procedures and the qualification test records for six welders were reviewed. Visual inspection procedures and the qualification test records for five inspectors were also reviewed. Three welding inspectors were observed and evaluated for their ability to follow the visual inspection procedures. The structural steel field welding was performed by BA. Rockwell Engineering and Bristol Steel supplied structural steel to the project.

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. Fuel Storage Pool and Refueling Cavity Liner Fabrication

a. Inspection Scope

The NRC CAT visually inspected approximately 120 feet of welded seam on the Fuel Storage Pool and the Refueling Cavity Liner. The attachment welds for two gusset hooks and two pad plates were also inspected in order to ascertain compliance with the specified acceptance criteria. In the area of NDE the NRC CAT reviewed the radiographs for 100 feet of welded seam involving 234 film. The Fuel Storage Pool and Refueling Cavity Liner fabrication was completed by Bristol Steel.

b. Inspection Findings and Conclusions

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.

8. Fire Protection System Fabrication and Installation

a. Inspection Scope

Approximately 80 welds involving 10 pipe supports, and 15 pipe welds involving 2 pipe spools were visually inspected. One welding procedure and the qualification test records for two welders were also reviewed for adequacy. The fire protection installation was completed by BA.

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 governing construction codes and specifications.

9. Containment Liner and Containment Penetration Installation

a. Inspection Scope

The NRC CAT visually inspected approximately 50 feet of liner seam, the welds on one pad plate, the attachment weld for one personnel hatch, and the attachment welds for two mechanical and two electrical penetrations. In the area of NDE, the NRC CAT reviewed the radiographs for 150 feet of liner seam which involved 450 film. One radiographic examination procedure was also reviewed as a part of this inspection. The containment liner and penetrations were installed by CB&I.

b. Inspection Findings

No problems were identified in the area of inspected welding activities. However, during the review of radiographs the NRC CAT inspectors identified 14 spot radiographs which did not meet the required weld quality. As a result of this finding, the applicant performed an evaluation of the affected liner welds and concluded that the welds are acceptable "as is" because every weld was subjected to and had passed magnetic particle and vacuum box inspections. In addition, in 1984, the applicant had reviewed 25 percent of the fabrication and erection documentation for the containment liner. The review was conducted by the Authorized Nuclear Inspector employed by the Hartford Steam Boiler Inspection and Insurance Company. Twenty-six minor nonconforming conditions were identified and no major discrepancies were found. Based upon these reviews the applicant has concluded that the overall liner weld quality is acceptable to maintain the structural and leak tightness integrity of the containment liner.

The NRC CAT identified welded seams and their associated deficiencies are listed as follows:

° Purchase Order (P.O.) 409.27	7-8A-7C	139 porosity
	7-8A	146 porosity
	7-8B	144 porosity
	7-8B-7L	145 Incomplete Fusion
	513-A-5	142 porosity
° P.O. 409.29	9-10B	176 linear indication
	9-10B	173 alligned indication
° P.O. 409.35	11-12B-12L	194 crack-like indication
° P.O. 409.35	17D	219 porosity
	16A	10A crack-like indication
	16A	4-5 crack-like indication
° P.^ 409.40	517-11-7	28D incomplete fusion
	51-B-7	275 aligned indication
° P.O. 409.44	CO Vert.	4-5 I.F. porosity

c. Conclusions

In general, the inspected welding and NDE activities were found to comply with the requirements of the governing codes and specifications. However, the NRC CAT found spot radiographs which did not meet the specified weld quality. The welds were evaluated by the applicant and determined to be adequate for the intended application because every weld had passed magnetic particle and vacuum box testing.

10. Drywell Wall and Penetrations

a. Inspection Scope

The NRC CAT visually inspected approximately 40 feet of drywell wall seam and the attachment welds for one penetration. In the area of NDE, the NRC CAT reviewed the radiographs for 220 feet of welded seam which involved 340 film. One radiographic examination procedure was also reviewed as a part of the inspection. The drywell wall was fabricated by Mississippi Valley Steel Company and the field installation of the prefabricated assemblies was done by BA. The drywell locks and hatches were installed by CB&I.

b. Inspection Findings

No problems were identified in the inspected welding activities. However, during the review of radiographs, the NRC CAT inspectors identified three welds which did not have the specified weld quality. The three welds and their associated deficiencies are identified as follows:

- Seam weld No. 16, station 12 located at elevation 707' to 737', column 173° contained an unacceptable linear indication. The weld was fabricated by BA. NCR 32686 was generated as a result of this finding.

- Seam weld No. 30, film A-8, view F-G contained an unacceptable insufficient fusion indication. The weld was fabricated by Mississippi Valley Steel Company. NCR 32294 was generated as a result of this finding.

- One weld for P.O. 9993.1 on drywell locks and hatches assembly 1A, weld seam 1-5-4 to 1-5-1, view 0-1 R1 contained an unacceptable crack-like indication near station mark 1. The original film was rejected for a linear indication near station mark 0 which indicated that the repair film was reversed from the original film position. This reversal had prevented the interpreter from detecting the crack-like indication because he was looking at the wrong area. NCR 32597 was generated as a result of this finding. The radiographs were supplied by CB&I.

c. Conclusions

In general, the inspected welding and NDE activities were found to comply with the governing codes and specifications. However, three welds were found to contain unacceptable indications. As a result of this finding, the applicant has issued NCRs and the welds will be evaluated and repaired as needed.

11. Vendors and Shop Fabricators Other Than Those Previously Addressed

a. Inspection Scope

The NRC CAT visually inspected six 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 28 vendors which have supplied various equipments and hardware to the Clinton Power Station project. A total of 347 feet of welded seam involving 472 radiographs and 91 welds involving 771 film were reviewed. The radiographs for 19 valves involving 408 film, and the radiographs for 15 spot welds involving 33 film were also reviewed for compliance with the governing codes and specifications.

b. Inspection Findings

During the inspection of tanks and heat exchangers 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 six tanks and heat exchangers were found to deviate from the required drawing sizes. As a result of these findings, the applicant issued NCRs and this item will be reviewed and dispositioned by S&L. See Table IV-5 for details. The NRC has issued Information Notice No. 85-33 on the subject of undersized weld

reinforcement in ASME Code nozzle to shell joints. As a result of this notice, prior to the NRC CAT arrival, the licensee had inspected the nozzle welds on ten pressure vessels and tanks. Nine of the items were found to have undersized weld reinforcements around the nozzles. By the end of the NRC CAT inspection of this area, the licensee had initiated a complete reinspection of tanks and pressure vessels supplied by CBI and RECO industries.

In the area of NDE, the NRC CAT inspectors identified irregularities relating to NDE documentation and radiographs supplied by two vendors. See Table IV-6 for details.

c. Conclusions

In general, the inspected welding and NDE activities were found to comply with the requirements of the governing codes and specifications. However, six tanks and heat exchangers were found to deviate from the requirements stated in the applicable drawings and specifications. In addition, the radiographs and NDE documentation supplied by two vendors were found to be deficient with respect to the required quality.

TABLE IV-1

LIST OF SUPPORTS WHICH WERE INSPECTED
AGAINST DRAWING REQUIREMENTS

1MS28009S (1)	1MS28012C	1RB21572R
1MS86001S	1HP08009X (2)	1SX45003X (3)
1FC03091X (4)	1FC03002R (5)	1HP04019R
1HP04005R (6)	1HP03042S	1RH20007X
1RH19002X	1RH07004X (7)	1RH07003S
1RH16036X	1RH09089S	1LP03016S
1FB15018G*	1LP04003R	1R114019R
1RH09011R (8)	1MS07002G (10)	1RH04051R (9)
1RH04035X	1RH04042X (11)	1IA16002G
1SC01020R	1RT03032R	1RT11047X
1RB13542G (12)	1MS27012S (Partial)	1MS63001G
1FW01008G	1MS86001S	1MS86010S
1SX30003V	1HP03042S (13)	1RH09087S (14)
1MS86007V	1MS86010X	CLN-021-SP11 (17)
CLN-021-SP16	1SX-01028R	1SX-01017R
1SX-01050X	1RH47013G*	H-1RH-780-4* (15)
1SX42021R* (16)	1SX42019R*	1RH34010X*
1RH71018G*	1RH71016G*	1SX52022X*
1SC01020R*	1RB22056G*	

NOTES:

1. One fillet 1/32" undersized for full length due to member size. NCR 31498.
2. Two fillet welds undersized by 1/16". NCR 31499.
3. Two skewed fillet welds undersized by 1/16" for full length. NCR 31497.

TABLE IV-1 (Continued)

LIST OF SUPPORTS WHICH WERE INSPECTED
AGAINST DRAWING REQUIREMENTS

4. Two fillet welds 1/32" undersized. NCR 31493.

5. One fillet weld 3/4" undersized for full length. NCR 31496.

6. Two 1/4" fillet welds 3/32" undersized due to fit-up gap. NCR 31495.

7. One fillet weld 1/16" undersized. NCR 31494.

8. Four obtuse angle skewed welds and one right fillet weld undersized for full length 1/16". NCR 31542.

9. Nineteen of 79 fillet welds 1/32" undersized. NCR 31572.

10. One fillet weld undersized by 1/16". NCR 31541.

11. Obtuse angle fillet weld 3/32" undersized. NCR 31574.

12. Obtuse angle fillet weld 1/8" undersized due to too small attaching plate. NCR 31573.

13. Three fillet welds 1/16" undersized.

14. Two obtuse angle fillet welds 1/8" undersized. NCR 31611.

15. Weld surface has overlap and lack of fusion. NCR 31604 and NCR 31615.

16. Undercut in excess of 1/32" in two places, unspecified welding across flange. NCR 31599.

17. Obtuse angle fillet weld undersized. NCR CRD-186-48 (RCI work)

*These items were subjected to Overinspection by Illinois Power QA.

TABLE IV-2

LIST OF SUPPORTS WHICH WERE SUBJECTED TO VISUAL INSPECTION ONLY

1RB22144G	1CC50041G	1RB22111G
1FW03011S	1RB22106G	1IA16002G
1RI10009S	1RB22056G	1RF07001G
1LP09005G	1RH40011X	1RH40013G
1FB15015G	1FB15006G	1FB15008G
1FB15018		

TABLE IV-3

LIST OF PIPING WHICH WAS SUBJECTED TO VISUAL INSPECTION ONLY

Item	Description	Pipe Size (in.)	Material
G003-A-1	Main Steam	24	Carbon Steel
1CC-21-1	Component Cooling	10, 12	Carbon Steel
1RH-16-1	Residual Heat Removal	12	Carbon Steel
1SX-15-3	Shutdown Service Water	18	Carbon Steel
1FC-12-8	Fuel Pool Cooling	14	Stainless Steel
1FC-30-5	Fuel Pool Cooling	8	Stainless Steel
1FC-30-14	Fuel Pool Cooling	14	Stainless Steel
1RH-8-7 (1)	Residual Heat Removal	24	Carbon Steel
1RH-8-8	Residual Heat Removal	24	Carbon Steel
1RH-8-9	Residual Heat Removal	24	Carbon Steel
1RH-26-8	Residual Heat Removal	4	Carbon Steel
1RH-26-5	Residual Heat Removal	18	Carbon Steel
1SX-17-11	Shutdown Service Water	18, 24	Carbon Steel
1SX-2-2	Shutdown Service Water	12	Carbon Steel
1RI-13-3ZA	Reactor Isolation	4	Carbon Steel
1RI-13-3ZB	Reactor Isolation	4	Carbon Steel
1RI-13-5R	Reactor Isolation	4	Carbon Steel
1RI-13-6	Reactor Isolation	4	Carbon Steel
1RI-13-7	Reactor Isolation	4	Carbon Steel
1RI-13-8	Reactor Isolation	4	Carbon Steel

TABLE IV-4

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

Item	Description	Pipe Size (in.)	Material
G003-A-1	Main Steam	24	Carbon Steel
G004-A-1	Main Steam	24	Carbon Steel
G005-A-1	Main Steam	24	Carbon Steel
1RI-13-9	Reactor Isolation	4	Carbon Steel
1RI-13-7A	Reactor Isolation	4	Carbon Steel
1RI-13-4ZA	Reactor Isolation	4	Carbon Steel
1RI-13-4ZB	Reactor Isolation	4	Carbon Steel
1RI-13-5AA	Reactor Isolation	4	Carbon Steel
1RI-13-4A	Reactor Isolation	4	Carbon Steel
1RI-13-6B	Reactor Isolation	4	Carbon Steel
1FW-1-1	Feedwater	20	Carbon Steel
1FW-1-2	Feedwater	18	Carbon Steel
1FW-1-3	Feedwater	12	Carbon Steel
1FW-1-4	Feedwater	12	Carbon Steel
1FW-1-5	Feedwater	12	Carbon Steel
1FW-1-6	Feedwater	12	Carbon Steel
1FW-1-7	Feedwater	12	Carbon Steel
1FW-1-8Z	Feedwater	20	Carbon Steel
1FW-1-1A	Feedwater	Lugs	Carbon Steel
1FW-1-1B	Feedwater	Lugs	Carbon Steel
1FW-1-7J	Feedwater	Lugs	Carbon Steel
1FW-1-7K	Feedwater	Lugs	Carbon Steel
1FW-1-7L	Feedwater	Lugs	Carbon Steel
1FW-1-7M	Feedwater	Lugs	Carbon Steel

TABLE IV-5

VENDOR SUPPLIED TANKS AND HEAT EXCHANGERS
WHICH WERE VISUALLY INSPECTED

ITEM	MANUFACTURER
Standby Liquid Control Tank 1C41-A001 (1)	Boeing Corporation
Fuel Oil Storage Tank 1D001TC (2)	RECO Industries, Inc.
Fuel Oil Day Tank 1DG01TC (3)	RECO Industries, Inc.
Accumulator Tank 1B21-A003E (4)	RECO Industries, Inc.
Fuel Pool Cooling Heat Exchanger 1FC01AA (5)	Yuba Heat Exchanger Corp.
Fuel Oil Storage Tank 1D001TA (6)	CB&I Corporation

NOTES:

(1) Five nozzle reinforcing fillet welds undersized. NCR 32365.

(2) One nozzle reinforcing fillet weld and support fillet welds undersized. NCR 32364.

(3) Undersized fillet welds on supports. NCR 32363

(4) Two nozzle reinforcing fillet welds and support welds undersized. NCR 32361.

(5) One nozzle reinforcing fillet weld undersized due to overgrinding, and support fillet welds undersized. NCR 32362.

(6) Nine nozzle reinforcing fillet welds undersized, manway reinforcing fillet welds undersized, support fillet welds undersized, head-to-shell mismatch in excess of that permitted by the Code and weld surface quality unacceptable. NCR 32573.

TABLE IV-6

VENDOR RADIOGRAPHS REVIEWED

Contractor	Welds	Valve Pumps	Spot Welds	Feet of Welds	Film	Notes
General Electric	20				450	
Yuba Heat Transfer				30	60	
Progressive Fabricating				40	105	
RECO Industries	26				32	
Pathway				36	52	
Harnischfeger				16	12	
Anchor/Darling		5			160	(1)
Rockwell	2				14	
Lakeside Bridge & Steel				22	54	(2)
Carrier				6	9	
La Barge				45	37	
Southern Boiler				15	10	
Tube Turns	6				12	
Fisher Controls		2			44	
Spencer Turbine Co.				13	22	
Chicago Tube and Iron	4				32	
Nooter			15		33	
Guyon Alloys	6				9	
HUB	1				2	
Gould		2			53	
Atomic International	6				63	
Metal Bellows	10				68	
Steward and Stevenson				40	32	

TABLE IV-6 (Continued)

VENDOR RADIOGRAPHS REVIEWED

Contractor	Welds	Valve Pumps	Spot Welds	Feet of Welds	Film	Notes
Posi Seal		7			106	
W. J. Wooley				12	19	
G. W. Taylor				52	40	
Bingham-Willamette		3			45	
Trent Tube				30	20	

NOTES:

(1) Film stuck together indicating that film was improperly packaged.

(2) Reader sheet for piece mark 2-1-1 showed rejections for cracks and other indications. The original film also showed rejections. The final acceptable film was not identifiable as being of the same area. Further investigation indicated that a slot in the area of interest was welded, ground smooth and re-radiographed. The final radiographs were identified and determined to be acceptable.

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 were concrete, reinforcing steel configuration, cadwelds, structural steel installation, high strength bolting, structural fill, and diesel generator exhaust silencer supports. A major part of the installed structural steel inspection sample was previously inspected by the Illinois Power Overinspection (IPOI) Program.

For concrete, reinforcing steel configuration, structural steel installation, high strength bolting, and diesel generator exhaust silencers, a physical or hardware inspection and a QC documentation and field procedures review were conducted. For cadwelds, concrete pours, and structural fill, a review of QC documentation and field procedures was performed.

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 a concrete placement, and general concrete surface quality. These areas were checked for conformance with Sargent and Lundy Engineers (S&L) design drawings and specifications. General concrete quality was examined from surrounding areas of completed concrete construction for conformance to site specifications.

For the reinforcing steel configuration inspection, the upper layers of exposed rebar projecting from the east face of the base mat along plant wall lines 200 and 202 and between the D wall line and the south exterior wall line of the Diesel Generator Building wall were reviewed for conformance to applicable drawings and specifications.

One in-process concrete placement for the personnel access hatch door to the drywell was observed by the NRC CAT. These observations occured from the time of mixing of the concrete at the site batch plant to completion of the placement of the concrete in the steel formwork. Observations were made for slump tests, length of time required for concrete placement, and preparation of concrete cylinder test specimens.

QC documentation and appropriate field procedures were reviewed for six concrete pour travelers and three cadweld travelers.

The QC documentation reviewed for six concrete pour travelers and associated concrete pour package numbers are given in Table V-1. Records reviewed and associated with the concrete placements included concrete pour pre-placement checklist, concrete pour placement and testing checklist, and report of concrete cylinders. The reviews checked the forms for adequate completion by the QC inspectors, the existence of senior QC inspectors' signature for evaluation of completed forms, and acceptable coverage of attributes by the documentation.

For the cadweld QC documentation and field procedures review, the following cadweld travelers were covered: CCW No. 1, CCW No. 2 and CCW No. 3. Records were reviewed to identify whether the cadweld work was properly inspected before and after each cadweld was performed and whether each cadwelder was adequately tested. In addition, the qualification records for 10 cadwelders (operator ID Nos. 6, 15, 16, 17, 19, 20, 27, 30, 46, 48) in cadweld traveler CCW No. 1 were reviewed to determine if they were properly qualified to perform cadwelds of each splice position, bar size and grade.

The requirements and acceptance criteria for reinforced concrete construction were obtained from the drawings listed in Table V-2 and the following specifications and procedures:

- S&L Specification K-2938, "Concrete Mix Design," Rev. 3, dated April 14, 1981
- S&L Specification K-2944, "Concrete and Grout Work," Rev. 26, dated July 13, 1984
- Baldwin Associates Project Procedure BAP 3.1.1, "Concrete," Rev. 13, dated October 3, 1984
- BAP 3.1.5, "Embedments/Reinforcing Steel/Cadwelding," Rev. 10, October 3, 1984

b. Inspection Findings

Two areas were identified by the NRC CAT where the concrete placements did not meet site criteria in the AD wall line at elevation 724'. Debris and rags were found embedded in the wall. It was also identified that the 2-inch shake space between the containment and the adjacent structures had been violated. Two areas were identified by the NRC CAT inspectors where concrete had encroached into the 2-inch shake space between the containment and the adjacent structures. The licensee reinspected the rest of the shake space and identified 26 additional locations where the 2-inch shake space clearance requirements had not been met. Nonconformance Report (NCR) 31579 was issued on this deficiency.

The six concrete pour travelers were found to meet procedure requirements and demonstrate proper QC inspection.

In the top steel reinforcement of the concrete base mat on the 200 line and 202 line, one area was identified where the number and spacing of the rebar were not in accordance with the design drawing, but were in accordance with the shop drawings approved by S&L. NCR 31949 was written and the condition was evaluated and accepted by S&L.

Visual inspection requirements before and after the cadwelds were performed were met. The 10 cadwelders reviewed for qualification requirements were found to be properly qualified for cadwelding the appropriate bar size and grade and splice positions.

Two discrepancies were found in the cadweld traveler packages reviewed. One discrepancy was a noncompliance with the cadweld tensile testing requirements in the Final Safety Analysis Report (FSAR) and specifications. Appendix B, paragraph B.2.3.4 of the FSAR states "Separate sampling and testing cycles were established for cadweld splices in horizontal, vertical, and diagonal bars, for each bar grade and size, and for each splicing operator." However, the cadweld records showed that separate sampling and test cycles were established for cadweld splices in each position, bar size and grade for each shift (instead of for each cadweld operator).

This discrepancy was previously identified by Baldwin Associates (BA) in NCR 31282 written on May 18, 1985. The S&L disposition for NCR 31282 was to use-as-is because the specification requirements had been met. However, the NRC CAT does not consider that the requirements of Paragraph 4.4.1(a) of the mechanical splice specification were met. The same sampling plan is provided in the FSAR. It appeared that S&L's resolution was based on a general observation of the records and not a complete review of the records. Therefore, the disposition of NCR 31282 is considered inadequate.

The concern of the NRC CAT with this discrepancy is that one or more operators may have been tested at less than the required frequency. Since the cadweld tensile test sampling schedule was based on each shift, rather than individual cadwelders, there could be deviations from the required testing frequency stated in the FSAR. The FSAR requirements in Appendix B, paragraph B.2.3.4 for tensile testing frequency for each operator states:

> Separate sampling and testing cycles were established... for each splicing operator as follows:
>
> a. one production splice out of the first ten splices
>
> b. one production and three sister splices for the next 90 production splices, and
>
> c. one splice, either production or sister splices for the next subsequent units of 33 splices. At least 1/4 of the tested number of splices tested were production splices.

The cadweld records do not easily permit a reconstruction of the testing information to determine if the testing requirements were met. However, a tabulation was made of the tensile testing frequency for production splices of the three cadweld travelers reviewed by the NRC CAT. Results of the tabulation are shown in Table V-3a and V-3b.

Table V-3a shows four operators (I.D. Nos. 6, 16, 20, 30) whose sampling did not meet the requirements of one production splice out of the first ten splices. Table V-3b shows 13 additional operators (I.D. Nos. 28, 35, 38, 45, 48, 49, 50, 51, 61, 62, 67, 68, 72) whose sampling did not meet the testing requirements.

The other discrepancy was found in the Cadweld Test Cycle Log. The Cadweld Test Cycle Log was to record the sequential order in which the cadwelds were performed. However, numerous instances were found where cadwelds were not in sequential order. Table V-4 shows numerous cadweld sequential discrepancies based on the dates obtained from the cadweld inspection check-off sheets for 17 Cadweld Test Cycle Log sheets. The remaining Cadweld Test Cycle Log sheets contain over 20 other instances of improper ordering of cadweld production splices.

c. Conclusion

The general concrete construction quality seems adequate. QC documentation in the completed concrete pour travelers appeared adequate. Procedures followed by site craft for the single in-process concrete pour work observed by the NRC CAT appeared to be proper. The rags found in a completed concrete placement and the 28 locations with concrete in the shake space between the containment and adjacent structures will require appropriate management attention.

Records reviewed for cadweld work performed indicated that the frequency of tensile test sampling for many cadweld operators was not satisfied. S&L's corrective action was not adequate.

2. Structural Steel Installation

a. Inspection Scope

Installed and QC accepted structural steel were inspected by the NRC CAT. A major part of the NRC CAT inspection sample was covered by the IPOI Program. Attributes inspected by the NRC CAT were member size, configuration, and high strength bolted connection configuration. High strength bolt friction and sliding connections were tested by using a calibrated torque wrench to determine whether the bolts were properly installed. Most of the friction bolt connections and all of the bolted sliding connections had been inspected by the IPOI Program.

The samples used in the structural steel verification for correct member size and configuration are described in Table V-5. A total of 59 structural steel members and 27 connections were inspected by the

NRC CAT. Samples were taken from areas previously covered by IPOI except for the framing to the Hydraulic Control Unit in Area 3 of the Containment Building.

Section VII, Design Change Control, of this report discusses deficiencies identified with the IPOI documentation for structural steel beams. Four of the beams refered to in that section with documentation deficiencies were inspected by the NRC CAT to determine if the hardware quality had been affected. This sample was part of the inspection sample in Table V-5.

The location, size, and number of the three different kinds of high strength bolts for friction connections that were checked for installation torque are shown in Table V-6. A total of 287 bolts were tested for minimum installation torque. Test torque values of IPOI were used for the NRC CAT inspection.

The sample of sliding connections tested is described in Table V-7. A total of 15 bolts spread over five connections were tested for maximum installation torque.

The requirements and acceptance criteria for structural steel installation are included in the drawings listed in Table V-8 and in the following specifications and procedures:

- S&L Specification K-2947, "Furnish Structural Steel," Rev. 3, dated June 22, 1983
- S&L Specification K-2948, "Erect Structural Steel," Rev. 9, dated March 9, 1984
- BAP 3.13, "Structural Steel Erection," Rev. 11, dated October 22, 1984.

b. Inspection Findings

Detailed findings of the erected structural steel member and connection inspection are provided in Tables V-5, V-6 and V-7. The comments portion of the tables contain an explanation of whether the inspection sample had been covered by IPOI.

Of the 59 members reviewed, there was one discrepancy found during the structural member size and configuration inspection. Modification 1AC for Detail 27-615 on Drawing S27-1458 requires a 7/8-inch A36 side plate, continuous between the centerlines of Beams 2D and 2E, which had not been installed. The beam had previously been inspected and accepted by IPOI. This seemed to be an isolated case rather than a program deficiency. The licensee indicated a complete reinspection of the beam would be performed, followed by an NCR.

No hardware deficiencies were identified for the sample of four beams associated with the IPOI documentation discrepancies discussed in Section VII.B.3.

Of the 251 friction connection bolts tested by the NRC CAT and previously by IPOI for minimum installation torque, only 2 bolts were found to be under-torqued. Of the 36 fixed connection bolts tested by the NRC CAT, but not within the inspection sample of IP OI, seven bolts were found under minimum acceptable installation torque including one just hand-tight.

Installation torque for the bolts of the sliding connections was defined as snug-tight. Procedures provided to the craft to ensure the bolts were installed in a manner which may prevent the sliding connections to perform as intended were insufficient. A sample of the bolting for two of the five sliding connections checked by the NRC CAT were found to be over-tight. S&L was asked to evaluate this condition. The subsequent response was considered inadequate by the NRC CAT and requires further evaluation.

The floor grating inside the Containment Building was observed to not be fastened to the structural steel. The NRC CAT is concerned that the grating could become a missile under high energy pipe break conditions. The licensee responded that the grating will be fastened to the structural steel with clips, but that the grating could still become a missile if subjected to the forces of high energy break conditions. This matter was discussed with and will be referred to the NRR Auxiliary Systems Branch for review.

Another observation by the NRC CAT was that the structural steel within the Containment Building was coated with inorganic zinc which could generate hydrogen gas during a loss of coolant accident. The licensee stated that the amount of zinc in the Containment Building is being calculated and systems are being sized in consideration of the hydrogen gas that could be generated. Therefore, the NRC review of the calculations and system sizing criteria may be performed at a later date.

c. Conclusion

The IPOI Program on the structural steel installation appears to be satisfactory with two exceptions. The inadequate implementation of the IPOI Program criteria resulted in not including the Hydraulic Control Unit (HCU) framing in the scope of the IPOI Program. Furthermore, the installed torque of some of the high strength bolts of the friction connections of the HCU structural steel not included in the IPOI Program was found inadequate. The evaluation by S&L of the identified condition of the sliding connections did not address the NRC CAT finding and the technical concern of additional loads due to over-tightened bolts.

3. Structural Fill

a. Inspection Scope

The NRC CAT inspectors reviewed daily earthwork logs between June 3, 1976 and June 13, 1976 for the safety-related Class B structural fill for the main power block structures. Also, the following NCRs were reviewed: NCR S-S-S-0006, NCR 174, and NCR 1650.

The requirements and acceptance criteria were included in the following documents:

- S&L Specification K-2942, "Earthwork," Amendment 9, dated July 13, 1984
- U.S. Testing Company Procedure QCP-10 "Testing Procedures for Earthwork," Rev. 0, dated February 9, 1977 and Rev. 9, dated January 2, 1985
- Fruin-Colnon "Compaction Test Section Report," dated April 1976.

b. Inspection Findings

The daily earthwork logs were reviewed by the NRC CAT inspectors. A discrepancy was identified with the lift thickness requirements in the structural fill records. Of the 15 compaction placement records reviewed, 7 did not record the lift thickness used in placing the fill. Section 2.5.4.5.1.5 of the FSAR states "Type B material used as structural fill to support foundation loads was placed in near horizontal lifts not exceeding 12 inches in loose thickness." Further, the applicable compaction test report also recommends that the fill be placed in 12 inch lifts. The NRC CAT review of the structural fill records do not indicate that the FSAR commitment was satisfied. Approximately one-half of the records reviewed did not indicate any lift thickness measurement. In other records the lift thickness was listed as 12 to 14 inches.

The dispositions for the three NCRs were questioned by the NRC CAT. Nuclear density test data was used to accept fill placements where the sand cone test data had failed. This was contrary to the project specification. Also, structural fill was placed over areas that had not been QC accepted. Some of these areas were not accepted for as long as two years; thus indicating untimely corrective action.

The following is a brief review of the three NCRs referenced above.

- NCR S-S-S-0006 was written by BA on June 11, 1976 to cover apparent errors in the correlation factor between sand cone tests and nuclear density tests for covered fills placed between May 29,1976 and June 10, 1976.

  As part of S&L's resolution of this NCR, S&L found that the perceived reduction in the correlation factor had been calculated incorrectly and that the 73 test locations in question were in accordance with the design requirements. The S&L disposition also indicated that all soil tests reports in question were checked by BA QC and spot checked by S&L. This check supposedly included all sand cone test data (approximately 367) up to May 24, 1976, correlation factors and all nuclear density test data.

- NCR 174 was written by BA on January 21, 1977 to cover failed sand cone tests between May 17, 1976 and August 19, 1976 and represented 45 zones (100x100x1 feet) in the structural fill. These areas of structural fill were accepted based on the results of the nuclear density tests. However, three of the failed sand cone tests were performed prior to May 24, 1976 and should have been evaluated as part of NCR S-S-S-0006. Sand cone test SC 320 performed on May 17,1976 was voided because the results were "unreliable." A second sand cone test, SC 364 performed on May 24, 1976, had a relative density of 65.3 percent. This was 20 percent below the acceptance criteria.

- On November 1, 1978 NCR 1650 was issued and stated that 16 zones placed between April 29, 1976 and May 17, 1976 did not meet the specification requirements for frequency of testing before additional fill was placed. This deficiency should have been identified by the prior review of all soil test reports accomplished under NCR S-S-S-0006 and NCR 174.

  The 16 zones were accepted by S&L on the following basis:

  - Deviation in portions of the documentation does not necessarily dictate nonconforming physical properties in the fill.

  - Zones in question were constructed with procedures similar to procedures used to construct the rest of the fill.

  - Average density of the fill is greater than that required by specification.

  - Small isolated confined pockets low in the fill will not influence the overall performance of the fill.

The daily earthwork logs and the basis for the disposition of the NCRs reviewed by the NRC CAT inspectors are not considered adequate for the following reasons:

- The applicable specifications and procedures were changed four times during the placement of the fill. These revisions may not have been sufficiently addressed by S&L's resolution of the NCRs.

- Some of the records did not show lift thicknesses used. In some cases incorrect lift thicknesses were used.

- The evaluation performed for the NCRs did not adequately address the discrepancies found by the NRC CAT with the apparent omissions in data for evaluations performed of soil test data.

- The acceptance of failed sand cone test data based on nuclear density test data was inconsistent with the specifications. The intent was to have the less reliable nuclear density test data supported with direct, sound sand cone test data and not vice versa.

- Based on our limited review, there was no indication of the size of unacceptable fill pockets.

c. Conclusion

The licensee's program of corrective actions did not result in a timely, comprehensive evaluation and appropriate disposition of known deficiencies in the testing and placement of structural fill for the period reviewed by the NRC CAT. The deficiencies found in the lift thickness of structural fill were also not identified or addressed by the corrective action taken. Therefore, current corrective action to ensure the adequacy of the structural fill requires additional management attention.

4. Diesel Generator Exhaust Silencer Supports

a. Inspection Scope

Installed torque values were checked for the sliding connections of the support pedestals of the diesel generator exhaust silencers. Installation procedures required the nuts to be hand tight.

b. Inspection Findings

From the testing of the exhaust silencer support sliding connection bolts, only one of the bolts were hand tight. Installed torque values found by the NRC CAT are shown in Table V-9.

c. Conclusion

An evaluation should be made concerning the over-tightened condition of the bolts. These bolts should not prevent the exhaust silencers from sliding as designed for thermal growth.

VI. MATERIAL TRACEABILITY AND CONTROL

A. Objective

The objective of this portion of the inspection was to examine traceability and control of material and equipment and to determine the adequacy of the licensee's program relative to these activities.

B. Discussion

The approach to perform the inspection was to identify and select samples of various types of installed material and equipment for examination. Some samples of installed material that were not accessible, such as rebar, were selected from records. The samples also included uninstalled material that had been QC inspected, such as protective coating materials, located in warehouses or shops. A total of 293 samples were examined.

The following Baldwin Associates Project Procedures (BAP) provided the acceptance criteria for this inspection:

- BAP 1.5, "Material Identification," Rev. 11, dated December 18, 1984; Change D, dated May 23, 1985
- BAP 2.3, "Receiving and Issuance," Rev. 12, dated July 26, 1984; Change F, dated April 25, 1985
- BAP 2.3.2, "Transfer of Material IP to BA," Rev. 0, dated April 19, 1985
- BAP 2.8, "Material Upgrading," Rev. 8, dated October 26, 1984; Change A, dated March 28, 1985
- BAP 2.19, "Welding Filler Material Procurement, Storage and Control," Rev. 3, dated June 19, 1984; Change B, dated December 18, 1984; Change C, dated May 31, 1985.

An inspection of installed material and equipment was conducted in the plant to select and verify markings on various samples such as equipment (mechanical, electrical and instrumentation), pipe, supports/restraints and weld joints. Other samples were inspected in warehouses or shops. Table VI-1, Summary of Samples, indicates the types and quantities of materials examined. Table VI-2, Weld Filler Material Compliance, contains a list of the 17 weld filler material samples selected.

1. Material Traceability and Control

a. Inspection Scope

A total of 293 samples were selected and examined for traceability to applicable drawings, specification, procurement, records, certified material test reports, certificates of compliance, heat numbers or other required documentation.

b. Inspection Findings

In general, it was found that the traceability and control of material at the site was satisfactory, with the exception of a lack of traceability for certain fastener materials. The following observations were made by the NRC Construction Appraisal Team (CAT) inspector:

(1) Manual and computerized records were used to control the identification and status of material and equipment at the site.

(2) Seventeen samples of weld filler materials listed in Table VI-2 examined for traceability and compliance with specifications and codes were found to be acceptable. Twenty-three weld filler material holding ovens in two issue stations were examined and found to meet requirements for temperature control and the thermometer calibration records. The holding temperature of 18 loaded portable ovens in the issue stations was measured using a pyrometer, and were found to be within the established temperature range. Approximately 100 portable ovens in use were examined, and only two were found to be not operating satisfactorily. The heater indicator lights on these two ovens were not lit, and rods were warm to the touch but lower than 125°F, the specified temperature. The light of one unit lit when the power plug was moved in the outlet. The other oven was checked at the issue station and found to be operating properly. The problem was identified as a loss of power at the work station.

(3) Indeterminate American Society for Testing and Materials (ASTM) A-36 steel plate material, which had been reported to the NRC as a potential 10 CFR 50.55(e) deficiency (55-84-18), is being stored in a segregated outside storage area. The area is roped off and clearly marked to show that this material is on HOLD.

(4) The inspector observed subdividing of stock materials by warehouse personnel. Prior to making the cut in steel plate and structural steel, the identification marking was transferred to each piece cut from the stock.

(5) Material and equipment listed in Table VI-1 were examined for traceability and control. Most items examined were found to have the required material traceability; however, some deficiencies were found regarding the traceability and control for large motor mounting bolts and other fastener materials as follows:

- Mounting bolts used in the transition piece between certain large pump-motor units as listed below are not traceable and do not have required washers. Documentation identifies that American Society of Mechanical Engineers (ASME) SA-193, Grade B7 bolts are to be used between the transi-

tion piece and the pumps. Documentation does not identify the grade of bolts to be used between the transition piece and the motors. ASME SA-193, Grade B7 bolts were installed between the transition piece and the pumps. Society of Automotive Engineers (SAE), Grade 5 bolts were installed between the transition piece and the motors. The supplier, General Electric Company, stated in a telephone conversation to the licensee (to be followed up by a letter) that SAE, Grade 5 bolts were adequate for this application. Additional investigation is required to confirm the proper bolts required for this application. However, no Nonconforming Material Report (NCMR) was issued by the licensee during the NRC CAT inspection regarding the use and disposition of SAE, Grade 5 bolts. The pump motor units inspected and the NCMRs issued for the omission of washers only, are as follows:

Low Pressure Core Spray Pump:	1E21-C001 - NCMR 2-0330
High Pressure Core Spray Pump:	1E22-C001 - NCMR 2-0331
Residual Heat Removal Pump:	1E12-C002

- Bolts installed to hold the Fuel Pool Cooling Pump motors 1FC02PA and 1FC02PB to the skids are unmarked or inconsistently marked and of indeterminate material. ASTM A325 bolts are required. As a result of this NRC CAT finding, the licensee issued NCMR 02-0340 to initiate corrective action.

- Bolts installed to hold the Reactor Core Isolation Cooling Pump 1E51-C001 to the skid are marked SAE, Grade 5 where ASME SA-193, Grade B7 is specified. The turbine (1E51-C002) hold down bolts are unmarked and indeterminate. The coupling end requires American Iron and Steel Institute (AISI) GR 4037-4140, and the governor end requires ASTM A108-G1170. As a result of these NRC CAT findings, the licensee issued NCMR 02-0347 to initiate corrective action.

- Nuts on clamp bolts at the lower end of a number of spring can hangers in the recirculation piping are not properly traceable. As a result of this NRC CAT finding the licensee issued Nonconformance Report (NCR) 71314 to initiate corrective action.

- The load pin on hanger 1LP02004V is an ASME Section III, Class 2 pin used in a Class 1 application. As a result of this NRC CAT finding the licensee issued NCR 32360 to initiate corrective action.

- Mounting bolts for HVAC control panel cabinets were unmarked and of indeterminate material. Refer to Section II.B.3.b(7), of this report, for details.

(6) ASME piping, tubing and welded joints inspected were marked with the necessary traceability markings, except for a

1/2 x 3/8 inch pipe-to-tube weld adapter in an instrument tubing run. The travelers for installation of this adapter identified an incorrect Receiving Inspection Report (RIR 886) which should have been RIR 6886. The licensee issued NCR 32336 to correct documentation associated with this adapter.

(7) While inspecting the Control Rod Drive Mechanism, the inspector noted that direction control valve No. 123 had an arc strike which burned a hole through the solenoid housing. The licensee issued NCMR 2-0246 to initiate the necessary corrective action.

(8) Unmarked bolting materials, without manufacturer's identification, for non-ASME applications are purchased safety, commercial grade, with certificates of conformance. This material and documentation are receipt inspected by Illinois Power Company's Quality Control before releasing for construction.

c. Conclusions

In general, except for certain fastener hardware, the material traceability and control program was considered to be satisfactory.

Lack of traceability was found for fastener materials, particularly for some vendor supplied pump-motor and pump-turbine assemblies mounted on skids. Also, deficiencies were found in traceability for fasteners on certain hangers and HVAC control panel cabinets.

TABLE VI-1

SUMMARY OF SAMPLES

Item	No. of Samples*
Equipment	14
Pipe	22 (L)
Tubing (Weld Joints)	19 (L)
Steel-Structural	18 (L)
Steel-Rebar	3 (L)
Steel-Tube	19 (L)
Hangers/Supports/Restraints	4 (L)
Embedments	16
Valves	7
Mounting Bolts & Nuts	40
Weld Filler Material	17 (L)
Weld Joints	17
Electrical Cable (Reels)	24 (L)
Fasteners (Sets)	36
Coatings	9 (L)
Unistrut	5 (L)
Raceway	6 (L)
Shims	1 (L)
TOTAL	293

*(L) = Lots

TABLE VI-2

WELD FILLER MATERIAL COMPLIANCE

Material Designation	Heat No./ Material ID	Compliance Comments
E70S2	065094	Acceptable
E70S2	32470	Acceptable
E70S2	065162/065163	Acceptable
E308-16 3/32	616385	Acceptable
E308-16 5/32	6M5B Mix 12	Acceptable
E308-16 3/32	49986	Acceptable
E308-16 1/8	0A0369	Acceptable
E309-16 3/32	0A10742	Acceptable
E316L-16 3/32	01353	Acceptable
E316L-16 1/8	02754	Acceptable
E502-16 1/8	432L0491	Acceptable
E502-16 3/32	421P4461	Acceptable
E7018XLM 3/32	402A9061	Acceptable
E7018XLM 1/8	22340	Acceptable
E7018 1/8	40461	Acceptable
E7018 3/32	LOT 28112	Acceptable
E7018 3/32	28296	Acceptable

VII. DESIGN CHANGE CONTROL

A. Objective

The primary objective of the appraisal of design change control was to determine whether the design and other related documents and activities which defined the installation and inspection of the as-built configuration, were controlled in accordance with regulatory requirements, Safety Analysis Report commitments and approved licensee, engineer, constructor and vendor procedures.

B. Discussion

The governing regulatory requirements for this appraisal are detailed in 10 CFR 50, Appendix B, Criterion III, "Design Control," and Criterion VI, "Document Control." These requirements are elaborated in Regulatory Guide (RG) 1.64, "Quality Assurance Requirements for the Design of Nuclear Power Plants," Rev. 2, dated June 1976, and American National Standards Institute (ANSI) Standard N45.2.11-1974, "Quality Assurance Requirements for the Design of Nuclear Power Plants." The licensee's commitment to comply with RG 1.64 is stated in Chapter 17 of the Clinton Power Station (CPS) Nuclear Power Plant Final Safety Analysis Report (FSAR).

In the area of design change control, the NRC Construction Appraisal Team (CAT) inspectors reviewed controlled documents which defined the installation and inspection of completed structures and hardware, and which defined or referenced design changes to in-process or completed structures and hardware. The NRC CAT inspection also reviewed the Baldwin Associates (BA) installation and inspection program and the Illinois Power (IP) Overinspection program. For each of these areas, NRC CAT inspectors conducted interviews with responsible personnel, reviewed drawings, procedures, specifications, change documents and reports, and reviewed installed and inspected structures and hardware.

IP provided responses for the majority of the NRC CAT findings documented in this section of the report. Where the IP response was not considered sufficient to resolve the NRC CAT finding, this is specifically noted.

1. Control of Design Documents

a. Inspection Scope

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

- Sargent & Lundy Engineers (S&L) General Quality Assurance (QA) Procedure GQ-3.07, "Sargent & Lundy Drawings," Rev. 6, dated October 21, 1981
- S&L General QA Procedure GQ-3.12, "Project Status Reports," Rev. 4, dated August 24, 1984

- S&L General Quality Assurance Program Topical Report SL-TR-1A, Rev. 6, dated April 22, 1983
- BA Quality Assurance Manual, Rev. 15, dated April 5, 1985
- BA Project Procedure BAP 2.0, "Document Control," Rev. 13, Change B, dated April 5, 1985
- BAP 2.0.1, "Instructions for Maintaining Project Procedures/ Specifications/Drawings," Rev. 2, Change B, dated January 31, 1985
- IP Nuclear Power Construction Quality Assurance Manual, Rev. 12, dated March 12, 1985
- IP Nuclear Power ASME Quality Assurance Manual, Rev. 5, dated March 5, 1985
- IP Records Management System Standards No. 2.05, "Standard for the Maintenance of Distributed Documents," Rev. 1, dated March 7, 1985
- IP Nuclear Planning and Support Department (NP&S) Procedure No. 2.51, "Document Control Procedure," Rev. 0, dated June 11, 1985.

NRC CAT inspectors interviewed engineering and construction personnel engaged in the distribution and control of S&L design drawings and specifications, BA design installation drawings, BA installation and inspection procedures, and vendor drawings.

b. Inspection Findings

The primary intent of this review was to assess the adequacy of the design document control program implemented by the constructor, Baldwin Associates, for ensuring that correct S&L or BA design documents were utilized for installation. This review was conducted at the BA Document Control Center (DCC), the BA resident engineering (RE) offices in the civil and structural, piping and pipe support, and electrical disciplines, and at the BA Field Document Center (FDC).

(1) The DCC distributes procedures, specifications, design drawings and associated change documents which are controlled in accordance with the BA QA Manual, BAP 2.0, "Document Control," and BAP 2.0.1, "Instructions for Maintaining Project Procedures/Specifications/Drawings."

Section 5.3 of BAP 2.0.1 requires that recipients of amendments and addenda to specifications check all transmitted documents for accuracy against the DCC transmittal, update the specification in accordance with the transmittal instructions, replace superseded pages, verify that all change documents identified on the transmittal as outstanding are filed in front

of the specification, and sign, date and return a copy of the transmittal to the DCC.

Section 5.4 of BAP 2.0.1 requires that recipients of change documents issued against specifications check the documents for accuracy against the DCC transmittal, revise the specification in accordance with transmittal instructions, remove affected specification sheets or forms and destroy or return to DCC as directed, file the change documents in the front of the specification, and sign, date and return a copy of the transmittal to the DCC.

Section 5.5 of BAP 2.0.1 requires that recipients of change documents [Field Change Requests (FCRs), Nonconformance Reports (NCRs), Engineering Change Notices (ECNs), and Field Engineering Change Notice (FECNs)] issued against a drawing, check the documents for accuracy against the DCC transmittal, update the change documents block to reflect the change document numbers, maintain a file of open change documents, and sign, date and return a copy of the transmittal to the DCC.

Section 5.7 of BAP 2.0.1 requires that recipients of revisions to procedures check the documents for accuracy against the DCC transmittal, remove superseded forms or procedures and insert new or revised procedures or forms in accordance with transmittal instructions, and sign, date and return a copy of the transmittal to the DCC.

While BAP 2.0.1 controls the transmittal, distribution and receipt of changes to specifications, procedures and drawings, the overall status of all change documents outstanding against a given specification or drawing is provided by the Document Management System (DMS), a computer data base which is updated by DCC as required by Section 5.1.4 of BAP 2.0.

Sections 6.4.2 and 6.4.3 of the BA QA Manual mandate a computer data base which maintains accountability and current status of all documents received or issued at the site including design, fabrication and installation drawings, design specifications, change documents and work packages and travelers. There are currently two computer data bases in use at the CPS which address this requirement: DMS, which lists active change documents issued at the site against the corresponding specifications and design drawings, and Construction Management Information (CMI), which lists all design change documents and the affected design drawings and specifications. A Traveler Tracking System (TTS), which is a subset of CMI, lists the status and location of traveler documents, and can optionally reference the associated design and change documents. IP is now in the process of developing a computer data base system to provide for better tracking and integration of data in these computer data basis systems.

(2) Tables VII-1 and VII-2 list the drawings, specifications and procedures selected for review, as well as the BA locations where copies of these controlled documents were accessed. For this documentation sample, the following information was accessed: the S&L transmittal letters, the DCC transmittal documents, the DMS computer data base lists of the active change documents posted against each drawing and specification, and the index to the latest revisions of the BA installation and inspection procedures.

Controlled copies of the drawings, specifications and procedures listed in Tables VII-1 and VII-2 were reviewed in the RE offices and the FDC to check that specifications were properly amended and that no superseded materials were present, and that the change documents posted with the specifications were consistent with the DMS computer data base listings of active change documents for those specifications. Drawings were checked to confirm that the latest revisions of the drawings were with the stick file and that the active change documents listed in the change documents blocks by authorized BA personnel were consistent with the change documents listed in the DMS computer data base. The BA installation and inspection procedures were checked to confirm that the latest revisions to the procedures were posted, and that no superseded materials were present.

The NRC CAT inspectors identified three categories of deficiencies during the course of this review: the presence of superseded or voided portions of specifications and procedures, or inconsistencies between procedures; discrepancies between the active change documents listed in the DMS computer data base for a given specification and the change document included with that specification; and discrepancies between the active change documents listed in the DMS computer data base for a given drawing and the change documents included on the change documents block.

(3) The NRC CAT inspectors documented the following discrepancies relative to superseded or voided portions of specifications and procedures, inconsistencies between procedures, and of one instance of drawing illegibility:

- A superseded copy (dated March 4, 1985) of the S&L Document Index System Foreign Document Report was on file at BA civil/structural (C/S) RE. This document is distributed by BA DCC as received on site from S&L. Distribution of this document is not controlled in accordance with BAP 2.0 and its presence without stamping as an uncontrolled item could result in the RE's inappropriate use in preparation of work packages.

- The BA C/S RE-12 controlled copy of the BA Project Procedures Manual contained superseded copies of BAP 1.1 and BAP 2.0.1. BAP 2.11 contained an Attachment A that was not

formally listed as an attachment in the procedure. BAP 2.41 was incorrectly filed under tab number 2.40, but BAP 2.40 was not on the distribution list for that controlled copy. A superseded copy of BAP 3.1.8 was incorrectly filed under tab number 3.1.4; however, the current revision of BAP 3.1.8 was correctly filed.

- FDC files CL-series drawings on aperture cards. The five CL-series drawings listed in Table VII-2 were requested for review. The aperture cards identified the correct revision numbers for the drawings, but were stamped "ORIGINAL DRWG. NOT LEGIBLE FOR MICROFILM." Blowbacks of the cards confirmed drawing illegibility. An examination of the full-size sepias at DCC indicated that one of the five sepias could not be legibly reproduced. Whether the illegible sepia was used in producing drawings included with a traveler needs to be verified and the affect of its use on construction determined.

- Amendment 5 to the FDC copy of S&L specification K-2947 and Amendment 11 to the FDC copy of S&L specification K-2948 had not been incorporated into the specifications Voided pages were not removed.

- The BA Traveler Preparation Review Group (TPRG) copy V-530 of S&L specification K-2882 contained a superseded copy of seven page Attachment 322.

- BAP 2.1.6 was filed with the TPRG copy of the BA Procedures Manual, although shown deleted in the table of contents.

- BA QA Manual, subsection 6.5.3.1, requires that design change documents be "posted and distributed by the Document Control Center to the affected drawings or work controlling documents as noted on the design change document." BAP 2.0.1, subsection 5.5, requires the recipient of a change document to maintain a file of open change documents. However, BAP 2.0, subsection 5.1.3 was revised on April 5, 1985 to note that stamp affixed change documents will no longer be distributed directly to the holders of the affected documents. This revision of BAP 2.0 is inconsistant with the current requirement of the BA QA Manual. The interim IP response provided during the NRC CAT inspection does not adequately address this finding.

(4) The following discrepancies were documented between the active change documents posted in the DMS data base for a given specification and the change documents posted with that specification.

- FCR 35687 was not filed with the FDC copy of S&L specification K-2947, but was listed in DMS. IP indicated that FCR 35687 is stamp-affixed. IP will correct DMS to list this change document as stamp-affixed.

- The following change documents were listed in DMS but were not filed with the TPRG, V-530 copy of S&L specification K-2882: ECNs 4511, 4822, 4832, 4853 and 5234; FCRs 1847, 26283, 26754, 28060, 30783 and 37478, and NCR 29249. IP indicated that the DMS listing of the ECNs is correct, and that copies will be posted with the specification; FCR 1847 is a stamp-affixed change document. IP will correct DMS to list FCR 1847 as stamp-affixed. DMS correctly lists the remaining FCRs and the NCR as outstanding against the specification, and copies of these change documents will be posted in the specification.

- The following change documents were filed with the TPRG, V-530 copy of S&L specification K-2882, but were not listed in DMS: ECNs 3634, 3929, 3954, 3960, 3996, 4017, 4061, 4265, 4281 and 4291; FCRs 17682, 19020, 20351, 20605, 20667, 20687, 20742, 21243, 21404, 21770, 21899, 22227, 22578, 22607, 22666, 22677, 22678, 22867, 23129, 23193, 23360, 23640, 24317, 24407, 24559, 24654, 24682, 24655, 24940, 25431, 28071, 30185, 30328, 31502 and 36345; FCR 24416 was filed with the specification, and is not stamp-affixed, but is listed in DMS as a stamp-affixed change document. IP indicated that the ECNs and FCRs listed above had all been superseded or incorporated, and have been removed from the specification. IP will correct DMS to list FCR 24416 as not stamp-affixed.

- The following change documents were listed in DMS but were not filed with the TPRG, V-460, (P/DRFT) copy of S&L specification K-2882: ECNs 4832, 4853, 4858, and 4943; FCRs 1847 and 34643, and NCR 29249. IP indicated that DMS correctly lists the ECNs as active against the specification, and copies of these change documents will be included with the specification. IP will correct DMS to list FCR 1847 as a stamp-affixed change document. IP indicated that DMS correctly lists FCR 34643 and NCR 29249 as active against the specification, and copies of these change documents will be posted with the specification.

- The following change documents were filed with the TPRG, V-460 (P/DRFT) copy of S&L specification K-2882, but were not listed in DMS: ECNs 4380, 4469 and 4895; FCRs 22867, 24317, 28071, 30328 and 36345; FECNs 6639, 7529 # (stamp-affixed) and 9478. FCR 24416 which was filed with the specification and was not stamp-affixed, was listed as stamp-affixed in DMS. IP indicated that the ECNs, FCRs and FECNs listed above were all superseded change documents, and will be removed from the specification. IP will correct DMS to list FCR 24416 as not stamp-affixed.

- The following change documents were listed in DMS, but were not filed with the FDC, V-300 (FDC/R) copy of S&L specification K-2882: FCRs 1847, 6480 and 22962, and FECN 8778. FECN 6639 and FCR 1874 were filed with the speci-

fication but were not listed in DMS. IP will correct DMS to list FCR 1847 as a stamp-affixed change document. IP indicated that DMS correctly lists FCRs 6480 and 22962, and FECN 8778 as outstanding against the specification, and copies of these change documents will be posted with the specification; FECN 6639 is a superseded change document; and FCR 1874 is incorrectly posted with the specification.

- Due to the results of the review of TPGR, V-460 and TPGR, V-530 copies of specification K-2882, a followup review of a third copy of the five controlled copies of this specification was performed.

  A new DMS printout was accessed and the 104 active design change documents listed (all nonstamp-affixed) were checked against the change documents filed with the TPRG, V-460, (D-6) copy of specification K-2882. All change documents were on file, with one exception: NCR-0114 (one of seven active NCRs). Approximately 200 pages associated with Amendment 11 to the specification were also audited, using the S&L transmittal listing the pages to be voided or inserted. There were no deficiencies identified.

  IP's response to NRC CAT findings for the initial two copies (V-460 and V-530) of specification K-2882 reviewed noted that these copies have been permanently returned to Document Control and the third copy (D6/V-460) will now be used as the sole reference of the Piping Department. Further, the licensee indicated that a full time Document Control clerk has been assigned the responsibility for maintaining the controlled documents of the Piping Department.

- The following change documents were listed in DMS but were not filed with the TPRG, V-460, (D-6) copy of S&L specification K-2884: ECNs 4683; FCRs 29144 and 32822, and NCR 70021. FCR 24317 was filed with the specification, but was not listed in DMS. IP indicated that DMS correctly lists the ECNs, FCRs and the NCR as outstanding against the specification, and copies of these change documents will be posted with the specification; FCR 24317 is a superseded change document and will be removed from the specification.

- FCRs 27508 and 27545 were listed in DMS but were not filed with the FDC copy of S&L specification K-2999. NCR 51358 was listed in DMS but was not filed with the specification. FCR 7113 had been removed from the file of change documents posted with the specification. IP did not provide an interim response during the NRC CAT inspection.

- FECN 5081 was filed with the V-465, E/McGUIRE copy of S&L specification K-2999, but was not listed in DMS. IP did not provide an interim response during the NRC CAT inspection.

(5) The following discrepancies were documented between the active change documents posted in the DMS data base for a given drawing, the change documents posted with the drawing, and the change documents listed on the change documents block:

- FCR 32933 is listed on the change documents blocks of the C/S RE copies of BA drawing CL1-27-S-136 and S&L drawing S27-1001-03B, but is not listed in DMS. IP indicated that FCR 32933 was superseded by FCR 37573 and removed from DMS on May 22, 1985. The transmittal receipt returned to DCC is dated May 24, 1985. The change documents blocks were therefore not updated in a timely manner.

- FCR 35968 is listed on the change documents block of the C/S RE copy of S&L drawing S27-1003-03A, but is not listed in DMS. IP indicated that FCR 35968 was superseded by FCR 37971 and was removed from DMS on May 25, 1985. The transmittal receipt returned to BA DCC is dated May 28, 1985. The change documents block was therefore not updated in a timely manner.

- NCR 29699 is listed on the change documents block of the C/S RE copy of S&L drawing S28-1002-02A. DMS lists NCR 29699 as stamp-affixed. IP indicated that DMS correctly lists NCR 29699 as stamp-affixed. The change document should not be posted on the change documents block.

- FCR 25139 is not filed with the FDC copy of S&L drawing S29-1422, but is listed in DMS. IP indicated that: DMS correctly lists FCR 25139 as outstanding against the drawing, and that a copy of the change document will be posted with the drawing, the FCR is incorporated in both travelers (S3369 and S3370), and there is no impact on hardware.

- FCR 32686 is not filed with the FDC copy of S&L drawing M09-1001N, but is listed in DMS. IP did not provide an interim response for FCR 32686 during the NRC CAT inspection.

- ECN 3332 and NCR 5351 R/3 were listed in DMS but were not listed on the change documents block of the BA Start-Up Field (SU-F) office copies of S&L drawings M-1SX01017R, sheets 1 and 2. It appears that ECN 3332 has already been incorporated into the drawings. IP indicated that ECN 3332 should not be outstanding against the drawing, and DMS will be corrected. IP did not provide an interm response on NCR 5351 R/3.
- FCR 27389 is listed in DMS but was not listed on the change documents block of the BA SU-F copy of S&L drawing M-1SX01048X. IP indicated that DMS correctly lists FCR 27389 as outstanding against the drawing. The transmittal receipt returned to BA DCC is dated August 29, 1984. The change documents block was therefore not properly updated.

- ECN 3332 is listed in DMS but was not listed on the change documents block of the SU-F copy of S&L drawings M-2SX01028R, sheets 1 and 2. It appears that ECN 3332 has already been incorporated into the drawings. IP indicated that ECN 332 should not be outstanding against the drawing, and DMS will be corrected.

(6) NRC CAT inspectors reviewed the IP audit program to determine whether the discrepancies identified in the construction design change control area had previously been addressed by IP audit personnel.

Sections 18 of the IP Nuclear Power American Society of Mechanical Engineers (ASME) QA manual and the IP Nuclear Power Construction QA manual define the requirements for a planned system of periodic audits to verify compliance with the quality assurance program at CPS.

The IP audit program is also discussed on page IV-30 of IP report, Results of Quality Programs for Construction of Clinton Power Station, with Appendices, NRC Docket No. 50-461, dated February 1985. Appendix B of that report summarizes each of the IP QA audits of the BA and IP organizations that were scheduled and performed for the period 1982-1984.

Table VII-3 lists the sample of IP audits of activities reviewed by the NRC CAT inspectors. The activities reviewed by IP, as well as audit findings, indicate that a number of the NRC CAT inspection design document control findings in this report were similar to those previously identified by IP. For example, IP audit report Q31-83-8, dated July 28, 1983, audit finding PD-1, noted that BA procedures did not describe the activities associated with the use and updating of the DMS, CMI or Aquarius (a historical file) computer programs. IP audit personnel also documented discrepancies between these computer programs, and documented additional discrepancies when these computer programs were compared to the specific design documents and the Document Review and Record cards. This audit finding was closed by IP on May 23, 1985. In another example, IP audit report Q31-85-02, dated April 4, 1985, audit finding ID-1 noted seven procedure updating discrepancies in nine copies of BAP QC piping and mechanical field office manuals.

Therefore, IP has implemented an audit program to verify compliance with the design document control provisions of the quality assurance program at CPS. However, based on NRC CAT findings, IP audit program corrective actions were not effective since the action taken did not provide for the prevention of the excessive deficiencies identified by the NRC CAT.

c. Conclusions

Design document control is generally acceptable for the overall scope of items sampled with the exception of the high rate of discrepancies identified in certain areas. These included the updating of procedures for the one sampled copy of a project procedures manual, and the discrepancies between the active change documents listed in the DMS computer data bases against two controlled copies of piping design specification K-2882 and the change documents physically posted with each copy of the specification. In addition, examples of other discrepancies were identified such as: the timeliness of updating change document blocks or design change documents to be listed in DMS, the presence of an illegible sepia drawing at DCC, and the inconsistency of the revision of BAP 2.0 with the BA QA Manual.

The examples of discrepancies identified by the NRC CAT - as currently present in the controlled project procedures and in the listing of design change documents for controlled specifications, drawings and their DMS computer data bases - are similar to the deficiencies previously identified in those areas by IP QA audits and, in part, by NRC Region III and Resident inspectors. Therefore, the effectiveness of IP corrective action was apparently inadequate .

IP interim responses to NRC CAT findings in this area generally indicated that the causes of the individual discrepancies in design change or procedure document control will be determined and that corrective action would be taken. IP needs to address the generic implications of NRC CAT findings for the types of discrepancies identified in the the project procedures manual and specification K-2882.

2. Control of Design Change Documents

a. Inspection Scope

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

- IP Corporate Nuclear Procedure (CNP) 3.03, "Nonconforming Material Report," Rev. 4, dated July 18, 1984
- IP Nuclear Station Engineering Department (NSED) Procedure D.8, "Handling Clinton Power Station Field Change Requests," Rev. 4, dated September 27, 1984
- IP NSED Procedure D.9, "Handling Clinton Power Station Field Problem Reports," Rev. 3, dated July 17, 1984
- IP NSED Procedure D.12, "Preparation and Control of Field Engineering Change Notices," Rev. 1, dated November 19, 1984

- IP CPS Procedure D.7, "Handling Clinton Power Station Nonconformance Reports," Rev. 6, dated February 28, 1985
- IP Nuclear Power Construction Quality Assurance Manual, Rev. 12, dated March 12, 1985
- IP Nuclear Power ASME Quality Assurance Manual, Rev. 5, dated March 5, 1985
- IP Records Management System Standards No. 2.05, "Standard for the Maintenance of Distributed Documents," Rev. 1, dated March 7, 1985
- IP NP&S Procedure No. 2.51, "Document Control Procedure," Rev. 0, dated June 11, 1985
- S&L General QA Procedure GQ-3.07, "Sargent & Lundy Drawings," Rev. 6, dated October 21, 1981
- S&L General QA Procedure GQ-3.13, "Engineering Change Notices," Rev. 6, dated October 21, 1981
- S&L General QA Procedure GQ-3.15, "Approved Procedural Deviations," Rev. 1, dated January 26, 1981
- S&L General QA Procedure GQ-4.01, "Procurement Specifications," Rev. 10, dated August 15, 1983
- S&L Project Instruction PI-CP-003, "Processing a Baldwin Associates Field Change Request or Nonconformance Report," Rev. 13, dated May 31, 1984
- S&L PI-CP-004, "Control of Clinton Engineering Change Notice (ECN)," Rev. 10, dated November 7, 1984
- S&L PI-CP-021, "Processing an Illinois Power Company Field Problem Report," Rev. 5, dated November 7, 1984
- S&L PI-CP-022, "Control of Clinton Field Engineering Change Notices (FECN)," Rev. 5, dated October 5, 1984
- S&L PI-CP-046, "Processing an Illinois Power Company Nonconforming Material Report (NCMR)," Rev. 2, dated October 10, 1984
- BA QA Manual, Rev. 15, dated April 5, 1985
- BAP 1.0, "Nonconformances," Rev. 16, dated March 28, 1985
- BAP 1.2, "Field Change Requests," Rev. 12, Change C, dated November 19, 1984
- BAP 2.0, "Document Control," Rev. 13, Change B, dated April 5, 1985

- BAP 2.0.1, "Instructions for Maintaining Project Procedures/Specifications/Drawings," Rev. 2, Change B, dated January 31, 1985.

NRC CAT inspectors interviewed engineering and construction personnel engaged in the distribution and control of design change documents.

b. Inspection Findings

Site issued design change documents are processed through the DCC and distributed, with the recent exception of stamp-affixed change documents, to all locations which maintain controlled copies of the affected drawings and specifications, and to all affected travelers. DCC updates the DMS computer data base to indicate that a given change document has become active against a drawing or specification, and copies of all active change documents are maintained with drawings and specifications. New travelers are issued, or supplements to existing travelers are issued, to incorporate newly-issued change documents which impact in-progress or completed structures and hardware. Change documents must be referenced on, and physically attached to, these work packages. As previously noted, TTS, the computer data base which lists the status and location of traveler documents, does not currently mandate that active change documents be listed in TTS. As a consequence, travelers affected by a given design change document could not always be readily identified. This is not consistent with the requirements of Section 17.4 of the BA QA manual, which commits BA to an index system for records to be maintained in the Documents Record Center which will ensure the rapid and orderly identification and retrieval of records.

NRC CAT inspectors selected the 24 design change documents listed in Table VII-4. In majority, the sample was selected from the change document discrepancies the NRC CAT inspection had documented in Section VII.B.1.b.(4) above, for a number of the controlled specifications available to REs for use in the preparation of work packages. The review was primarily performed to assess the extent design change documents not properly included with the specification may not have been implemented in work packages prepared by REs utilizing those specifications. IP was requested to provide the NRC CAT with an example of documentation which substantiated the intended disposition of each of the 24 selected change notices. The NRC CAT review of the documentation provided by IP assessed the actual disposition of each design change document for its incorporation in a work package, i.e., either an amendment to a specification, procedure or a purchase order, or supplement to a traveler. The NRC CAT review identified the following discrepancies:

- BA equipment installation traveler RH-024 does not appear to have been revised to incorporate FCR 27508. The change document is dated August 25, 1984, and waives the provisions of American Welding Society (AWS) D1.1, paragraph 8.2.3 for qualification for weldability of American Iron and Steel Institute (AISI) C1010 to C1025 sheet steel. The change

document requires that specification K-2999 be amended to incorporate this waiver. DMS still lists FCR 27508 as outstanding against the specification.

- ECN 5282, dated June 3, 1985, allows the use of ASME Code Case N-413, Minimum Size of Fillet Welds for Linear Type Supports, Section III, Division 1, Subsection NF. Box 7 of the change document was marked in error as it indicates that an FSAR revision is not required. However, the IP letter S-5454 dated May 22, 1985, which is referenced in the ECN, indicates that IP will draft an amendment to the CPS FSAR for the use of this code case. NRC's letter of April 30, 1985 to IP indicates that the referenced code case may be used at the CPS.

- FCR 27545 documents HVAC and electrical attachments welded to structural steel that were fireproofed without prior application of a galvanox coat. The FCR requires that specifications K-2910 and K-2999 be revised to permit a direct application of CAFCOTE H fireproofing directly over welds which are clean and free from slag and debris. The original nonconforming welds should have been documented on an NCR for an evaluation as to their acceptability.

This review resulted in identifying only one instance where the change document (FCR 27508) was not referenced on the appropriate traveler revision, and two other apparent discrepancies in documentation. However, the sample of change documents listed in Table VII-4 is not considered sufficiently large to confirm the actual implementation of all design change control discrepancies identified by the NRC CAT. The NRC CAT also could not confirm that the sample of work packages provided for review were prepared through the RE use of the TPRG V-530 and V-460 copies of the K-2882 controlled specification found to contain an excessive number of deficiencies in omitted design change documents. Further, the NRC CAT followup review of a third copy of the five controlled copies of Specification K-2882, found only one such deficiency. This indicates that travelers prepared by use of this third specification most likely would implement the design change documents not included with the V-530 and V-460 copies of the K-2882 specification. Therefore, the results of the verifications of the sample of work packages provided for NRC CAT review may not be representative of the disposition of the excessive change notice discrepancies identified in two of the five K-2882 specifications initially examined by the NRC CAT inspector.

c. Conclusions

The program for control of design change documents was generally determined to be in accordance with site procedures, with one exception. The exception pertains to an inconsistency between the program instructions for TTS and the Index System of records. TTS instructions allow that active design change documents need not be

listed in TTS for a given traveler. This option for TTS does not allow for the ready identification of travelers affected by a given change notice. On the otherhand, the Index System for Records is required to be maintained in a manner which will ensure the rapid and orderly identification and retrieval of records. It is noted that IP's current effort to integrate data in DMS and CMI into one data system should resolve this inconsistency in procedural requirements.

For the sample of 24 change documents and related implementing documents examined by the NRC CAT inspectors, all but one of the change documents was verified to be implemented as intended in a work package, i.e., either an amendment to a specification, procedure, or purchase order or supplement to a traveler. However, the NRC CAT findings also indicated that IP corrective action, as discussed in Section VII.B.1.c above, is warranted.

3. Illinois Power Company Overinspection Program

A consideration of the NRC CAT's selective examinations discussed in most sections of this report was to include examination of a sample of installed hardware that had been subject to the IP Overinspection Program.

The IP Overinspection Program was implemented in response to a series of stop work actions imposed in 1981 and 1982 due to identified deficiencies in the implementation of the BA QA Program for construction of various areas of CPS. The IP Overinspection Program provides two levels of additional inspection in the functional work areas subject to the prior stop work actions. The two additional levels of inspection of work previously inspected by BA QC include a sample inspection conducted by the BA Field Verification (BAFV) Group and a subsequent sample inspection by the IP Overinspection (OI) Group. The intent and scope of the IP Overinspection Program is summarized on pages V-1 and V-2 of IP Report "Results of Quality Programs for Construction of Clinton Power Station", with Appendices, NRC Docket No. 50-461, dated February 1985. As noted therein:

> The purposes of the Overinspection Program are to verify that the structures, systems, and components within the scope of the program are properly installed and to provide IP with assurance that BA is performing installation and inspection work that satisfies the applicable requirements of codes, standards, drawings, and specifications. These objectives are accomplished by performing additional inspections of completed and inspected work, whether performed before issuance of stop work actions in 1982 (old work) or after the stop work actions were lifted (new work). The inspections conducted under the Overinspection Program are in addition to those normally performed as part of the QA Program for CPS. Therefore, the Overinspection Program is a supplement to the QA Program and not a substitute for it.

Inspections in the IP Overinspection Program focus on installation of safety-related, augmented class D (radioactive waste), and fire protection items in the following areas: large and small bore piping, mechanical equipment, structural steel, heating, ventilating and air conditioning, electrical hangers, electrical conduit and raceways, electrical terminations, electrical equipment, and electrical and mechanical instrumentation.

Since the IP Overinspection Program supplements the BA QC program and is not a substitute for that program, the NRC CAT inspectors in the area of design change control reviewed the BA installation and QC inspection work packages in addition to the IP Overinspection Reports for the hardware sample listed in Tables VII-5 through VII-7. Other NRC CAT examinations of hardware previously inspected by the IP Overinspection Program are discussed in the other sections of this report.

a. Inspection Scope

The following documents provide the basic acceptance for the inspection:

- BA Quality Assurance Manual, Rev. 15, dated April 5, 1985
- BA Quality and Technical Services Organization Chart, dated March 8, 1985
- BA Quality Control Training and Qualification Manual, Rev. 9, dated September 26, 1984
- BAP 3.1.3, "Structural Steel Erection," Rev. 11, Change B, dated May 17, 1985
- BAP 3.2.5, "Piping Component Supports," Rev. 7, Change D, dated May 13, 1985
- BAP 3.3.6, "Electrical Raceway Support Installation," Rev. 10, dated May 17, 1985
- BAP 3.3.10, "Cable Tray Installation and Traveler Processing," Rev. 6, Change E, dated May 21, 1985
- BAP 3.6.3, "Repair of Welds, Material and Items," Rev. 0, Change C, dated April 17, 1985
- BAP 3.6.5, "Visual Inspections of Weldments," Rev. 0, Change B, dated March 26, 1985
- IP Nuclear Power Construction Quality Assurance Manual, Rev. 12, dated March 12, 1985
- IP Nuclear ASME Quality Assurance Manual, Rev. 5, dated March 5, 1985

- IP Nuclear Power Program Organizational Chart, dated January 15, 1985
- IP Quality Assurance Instructions QAI-710.01, "Overinspection Program," Rev. 5, dated March 20, 1985
- IP QAI-710-08, "Overinspection Sample Plan," Rev. 3, dated April 26, 1985
- IP QAI-710.12, "Structural/Auxiliary Steel Overinspection Checklist," Rev. 7, dated February 22, 1985
- IP QAI-710.13, "Mechanical Equipment Overinspection Checklist," Rev. 1, dated January 13, 1984
- IP QAI-710.14, "Piping/Valves/Instrumentation Overinspection Checklist," Rev. 4, dated November 15, 1984
- IP QAI-710.15, "Component Support Overinspection Checklist," Rev. 4, dated August 27, 1984
- IP QAI-710.18, "Electrical Raceway Support Overinspection Checklist," Rev. 2, dated February 21, 1985
- IP QAI-710.19, "Electrical Raceway Support Overinspection Checklist," Rev. 2, dated February 21, 1985

NRC CAT inspectors interviewed engineering and construction personnel engaged in the preparation and control of BA installation and inspection work packages and IPOI reports.

b. Inspection Findings

Inspection findings for this review are categorized as discrepancies in computer data bases, BA installation and inspection work packages, or in IPOI reports.

(1) As described in Section VII B.1.(b).(1) above, there are currently two basic computer data bases in use at CPS: DMS, which lists active change documents issued at the site against the corresponding design drawings, and CMI, which lists all design change documents and the affected design drawings and specifications. TTS, which is a subset of CMI, lists the status and location of traveler documents, and can optionally reference the associated design and change documents.

The NRC CAT inspectors documented several discrepancies in these computer data bases during the course of this review of the use and relationship of the computer data with the work packages prepared for BA installation and inspection and IP Overinspection activities. These include:

- TTS lists the incorrect design drawing revision numbers for the design drawing referenced in IPOI reports M-3330 and M-3338.

- A systematic weakness in DMS is it does not reference the work packages and travelers associated with the S&L structural steel design drawings.

- A systematic weakness in TTS is it does not reference the design drawings associated with electrical cable tray support travelers.

(2) There is no uniform relationship between the hardware detailed on a design drawing and the number of BA work packages and travelers prepared by each construction discipline to document the installation and inspection of that hardware. As an example, there is generally one-to-one correspondence between the design drawing and the traveler for pipe and cable tray supports, while for structural steel there are numerous work packages and travelers associated with each structural steel design drawing. Structural steel inspections were documented on either inspection forms, vendor drawings or welding travelers depending on whether the steel was vendor fabricated, field fabricated, bolted or welded.

The NRC CAT inspectors note that the current computer data bases program does not readily relate the associated design, fabrication, installation and inspection documents. Since there is no current correlation in DMS between the structural steel design drawings and the associated work packages and travelers, some documentation proved difficult to access and audit. For example, BA required approximately one week to access the welding travelers associated with the steel beams listed in Table VII-5. Other NRC CAT inspectors indicated that documentation proved difficult to access in their areas as well. However, the requested work packages and travelers were eventually accessed and, in general, were properly documented.

The NRC CAT inspectors noted a number of documentation discrepancies in the BA installation and inspection work packages. These included an incorrect Receiving Inspection Report number for a steel beam listed in a support traveler (E26-1003-01A-H48, Rev. 11), an incorrect inspection attribute indicated on two of three pre-inspection checklists filed with a hanger traveler (E27-10002-01B-H33), BA QC inspection forms for several steel beams do not reference the correct revisions of the S&L design drawings, a steel plate listed on the bill of materials but not used on the hanger drawing, and inconsistancy in documentation relative to the use of the surveyors' reports for verification of pipe support locations and Form JV-718 for verification of electrical hanger locations in containment.

(3) Illinois Power performed overinspection activities in accordance with a series of overinspection checklists which defined the attributes to be inspected for a specific piece of hardware. This list of attributes was generally a subset of the attributes that had been BA QC inspected for that piece of hardware.

The NRC CAT noted a number of generally minor documentation discrepancies in the IPOI reports reviewed. These included reports (S-0399, S-1490, M-3351, M-3329, E-3920) which referenced an incorrect drawing number, or drawing or revision number, an incorrect building elevation, or an incorrect FECN; two reports (M-3349, E-3762) which did not document an inspection attribute or included the wrong form; and one report (E-3623) which documents an incorrect drawing revision as being used for the inspection.

In addition an inconsistency similar to that discussed in Section VII.B.3.b.(2), above, relative to surveyors' reports was found. QAI-710.18 requires location of electrical hangers be verified to design drawings and Form JV-718 is used as the documentation of the verification, while QAI-710.15 does not require independent verification of pipe support locations in containment, but does require that the surveyors' report to be attached to the verification checklist.

As noted in Section III, Mechanical Construction, and Section V, Civil and Structural Construction, of this report, the NRC CAT physically inspected a sample of hardware associated with the IPOI report work packages reviewed. This included four of the steel beams listed in Table V-5 and six of the pipe restraints listed in Table III-3. The purpose of the field inspection was to substantiate the technical content of the IPOI reports, including the affect of a number of the apparent documentation discrepancies on the installation. No deficiencies in the installed hardware were identified.

c. Conclusions

For the overall scope of documentation items sampled during this NRC CAT review, the documentation of BA installation and inspection work packages and of IPOI reports, except for discrepancies noted, is generally adequate.

The majority of the discrepancies documented for this review are considered minor in nature. The two systematic weaknesses in the computer basis (DMS and TTS) are considered to contribute to the difficulty IP was having with the timely access of documentation.

The NRC CAT review of the approximately 400 documentation attributes for the 25 IPOI reports examined found that the reports were generally well documented relative to the overinspection conducted, with some exceptions. In majority, the exceptions related to documentation discrepancies which apparently had a minor effect on

the overinspection conducted. However, these errors in documentation indicate that a more critical management review of the information recorded on the IPOI reports should be performed.

TABLE VII-1

SPECIFICATIONS AND PROCEDURES REVIEWED

Document ID	Location(s)
S&L Spec. K-2882, Rev. 11	BA Traveler Preparation Review Group (TPRG) (3 copies) BA Field Document Center (FDC) S&L Field Design Office (to confirm filing of ECN 4832)
S&L Spec. K-2884, Rev. 8	BA TPRG BA FDC
S&L Spec. K-2944, Rev. 27	BA Civil/Struc. (C/S) Res. Eng. (RE) BA FDC
S&L Spec. K-2947, Rev. 5	BA C/S RE BA FDC
S&L Spec. K-2948, Rev. 11	BA C/S RE BA FDC
S&L Spec. K-2999 Rev. 11	BA Electrical RE (2 copies) BA FDC
Baldwin Project Procedures (various revisions.)	BA C/S RE BA TPRG

TABLE VII-2

DRAWINGS REVIEWED

Document ID	Location(s)
S&L Dwg. S26-1705, Rev. E	BA C/S RE & BA FDC
S&L Dwg. S26-1710, Rev. N	BA C/S RE & BA FDC
S&L Dwg. S26-1407, Rev. Y	BA C/S RE & BA FDC
S&L Dwg. S27-1001-03B, Rev. AH	BA C/S RE & BA FDC
S&L Dwg. S27-1002-01A, Rev. AY	BA C/S RE & BA FDC
S&L Dwg. S27-1003-03A, Rev. AM	BA C/S RE & BA FDC
S&L Dwg. S27-1004-04A, Rev. AB	BA C/S RE & BA FDC
S&L Dwg. S27-1005-04A, Rev. AD	BA C/S RE & BA FDC
S&L Dwg. S28-1002-02A, Rev. S	BA C/S RE & BA FDC
S&L Dwg. S28-1003-05A, Rev. T	BA C/S RE & BA FDC
S&L Dwg. S28-1100-07C, Rev. K	BA C/S RE & BA FDC
BA Dwg. CL1-27-S-132, Rev. 4	BA C/S RE &
BA Dwg. CL1-27-S-136, Sheet 12, Rev. 2	BA FDC (aperture cards) &
BA Dwg. CL1-27-S-136, Sheet 25, Rev. 2	BA DCC
BA DWG. CL1-27-S-136, Sheet 37, Rev. 1	
BA Dwg. CL1-27-S-141, Sheet 18, Rev. 1	
S&L Dwg. M09-1001N, Sheet 1, Rev. N	BA TPRG &
S&L Dwg. M09-1003N, Sheet 1, Rev. M	BA FDC
S&L Dwg. M09-1004N, Sheet 1, Rev. L	
S&L Dwg. M-1SX01048X, Rev. F	
S&L Dwg. M-1SX01017R, Rev. H, Sheets 1&2	
S&L Dwg. M-1NB01003S, Rev. A	
S&L Dwg. M-1NB01027X, Rev. A	
S&L Dwg. M-1CC06042C, Rev. B	
S&L Dwg. M-1RB24010G, Rev. C	
S&L Dwg. M-1SX01050X, Rev. E	
S&L Dwg. M-1SX01028R, Rev. J. Sheets 1&2	

TABLE VII-3

IP AUDIT SAMPLE

IP Audit Report No.	Organization Audited
Q31-83-8	Baldwin Associates (BA) Quality Assurance
Q31-84-01	BA Quality & Technical Services
Q31-84-02	BA Procurement
Q31-84-03	BA Piping/Mechanical
Q31-84-04	BA Document Review Group
Q31-84-05	BA Electrical Department
Q31-84-07	BA Field Verification
Q31-84-09	BA Document Control Center (DCC) and Nonconformance Review Group
Q31-84-10	BA Systems Release and Completion
Q31-85-01	BA Electrical Reinspection Program
Q31-85-02	BA Quality Control & Technical Services
Q31-85-04	BA Quality Engineering Systems, Quality Engineering Procedures and DCC
Q31-85-05	BA Procurement, Receiving and Audits Sections

TABLE VII-4

CHANGE DOCUMENT SAMPLE

Change Document	Description	Required Disposition	Implementing Document
ECN 3332	Add Note to two support drawings	Revise support drawings to incorporate note	Traveler Nos. H-SX-2-C, H-SX-3-D
ECN 4291	Modification to ECN 4061	Revise Paragraphs 326.7c, d of Specification K-2882, Revise Dwg. M06-1000, Sheet 12	Generic
ECN 4683	Correct typographical error in ECN 524	Revise Paragraph 302.4a of Specification K-2884	Generic
ECN 4822	Clarifications to Spec. BA-K-2882-29	Revise Attachment 311.3 of Specification K-2882	Clow Painting Procedure EPS 30-69-721
ECN 4832	Response Spectra Data for valves and actuators	Revise Article 305.4 in Attachment 311.3 of Specification K-2882.	Generic
ECN 4853	Clarification of shop painting requirements for valves installed in containment bldg.	Revise Attachment 311.3 of Specification K-2882	Clow Painting Procedure EPS 30-69-721
ECN 4943	Purchase and installation of nuclear safety-related heat tracing for CM and PR systems	Revise Attachment 311.2, add Sections 327 and Attachment 327 to Specification K-2882	IP PO X-19490, dated dated April 3, 1985
ECN 5263	Update list of Class D support listed in Attachment 302.50	Revise Attachment 302.50 of Specification K-2882	Traveler No. 1WOL06303
ECN 5282	Allow use of Code Case N-413 for component supports	Revise Attachment 110.1 of Specification K-2884	Generic
NCR 29249	Use as-is disposition of pipe minimum	S&L Concurrence	Traveler No. DG-2 Supp. 15
NCR 51358	Use as-is disposition of control cable mechanical connection	Revise Specification K-2999	Traveler No. 1VH25B

TABLE VII-4 (Continued)

CHANGE DOCUMENT SAMPLE

Change Document	Description	Required Disposition	Implementing Document
NCR 7002	Superseded by DR 5935; DR 5935 superseded by 10283; NCR 10283 documents use as-is disposition for anchor bolt which does not project beyond nut	S&L Concurrence	N/A
FCR 21404	Incorporate '81 Addenda to ASME Code for Minor Attach-	Revise Paragraph 118 of Specification K-2882	Traveler No. RR-759-A
FCR 21899	Revision of purchase requirements for copper refrigeration tubing	Revise Article 319.2 of Specification K-2882	BA PO C49800
FCR 27389	Snubber substitution for two supports	Incorporate design change drawings	Traveler No. H-SX-2-C
FCR 27508	Material clarification and weld qualification information	Revise Specification K-2999	Traveler No. RH-024 has not reference to FCR 27389.
FCR 27545	Use as-is disposition of fire proofed HVAC and electrical attachment weld to structural steel without galvanex	Revise Specification K-2910 and K-2999	Generic
FCR 28060	Material substitution for SA 307 GR A bolts and nuts	Revise Paragraph 118 of Specification K-2882	Baldwin Purchase Order No. C48811
FCR 29144	Clarification of safety-related requirements for exempt items per NF-2121(b) from basic engineers	Revise Specification K-2884	Generic
FCR 30783	Material substitution for primer and finish for interior of diesel oil storage tanks	Revise Specification K-2882	Midway Industrial Contractors Form
FCR 32822	Clarification of hanger support ID	Revise Specification K-2884	Generic

TABLE VII-4 (Continued)

CHANGE DOCUMENT SAMPLE

Change Document	Description	Required Disposition	Implementing Document
FCR 38578	Installation modifications to beam connections due to field interference	S&L Concurrence	Traveler No. CS1655
FCR 36538	Clarification of installation and inspection requirements for Class 0 penetration assemblies	Revise Paragraph 313.5 of Specification K-2882	Traveler No. VG-3-B
FCR 36245	Hanger stiffener cannot be installed due to interference	Revise Hanger Drawing 1RB13521G	Traveler No. H-RR-995-F

TABLE VII-5

STRUCTURAL STEEL IPOI SAMPLE

OI Report No.	Bldg.	Elev. (Ft.)	S&L Drawing	Bristol Drawing	Bristol Piece Mark
S-0826	Aux.	800	S26-1004-01A, Rev. F	F-0271D, Sheet 5-8, Rev. 0	5-8B6
S-0399	Fuel	800	S26-1004-02A, Rev. F	Baldwin Detail*	S2520A
S-0825	Aux.	800	S26-1004-01A, Rev. F	F-0271D, Sheet 5-6, Rev. 0	5-6B3
S-0862	Aux.	800	S26-1004-02A, Rev. H	F-0271D, Sheet 5-9, Rev. 1	5-9B5
S-1460	Contain.	778	S27-1003-03A, Rev. AH	F-0271A, Sheet 3-14, Rev. 1	3-14B3
S-1462	Contain.	778	S27-1003-03A, Rev. AH	F-0271A, Sheet F3-11, Rev. 2	F3-11B1
S-1464	Contain.	778	S27-1003-03A, Rev. AH	F-0271A, Sheet F3-5, Rev. 2	F3-5B8
S-1472	Contain.	778	S27-1003-03A, Rev. AH	Fab. Detail Per FCR 11690*	--
S-1486	Contain.	778	S27-1004-01A, Rev. AA	F-0271A, Sheet F5-16, Rev. 1	F5-16BA
S-1490	Contain.	803	S27-1004-01A, Rev. AB	F-0271A, Sheet F5-13, Rev. 1	F5-13B1

*Site Fabricated

TABLE VII-6

PIPE SUPPORT IPOI SAMPLE

OI Report No.	Bldg.	Elev. (Ft.)	Cl	S&L Drawing (Support No.)	Traveler No.
M-2590	Contain.	737	A	M-1RH34010X, Rev. A	H-RH-20I, Rev. 3*
M-3155	Control	737	C	M-1SX52022X, Rev. A	H-SX-22K, Rev. 1FR*
M-3328	Contain.	755	B	M-1RH71016G, Rev. C	H-RH-767-U, Rev. 1*
M-3329	Aux.	737	B	BA Dwg. H-1-RH-780-4, Rev. 0	H-RH-780-D, Rev. 1FR
M-3330	Contain.	755/762	B	M-1RH71018S, Rev. E	H-RH-767-CC, Rev. 4
M-3338	Contain.	755	C	M-1RB22056G, Rev. B	H-RH-947H, Rev. 1
M-3349	Contain.	828	B	M-1RH22035X, Rev. F	H-RH-29F, Rev. 2
M-3351	Fuel	712	C	M-1SX42019R, Rev. C	H-SX-13B, Rev. 15
M-3354	Aux.	708	B	M-1RH47013G, Rev. A	H-RH-764-L, Rev. 1*
M-3421	Fuel	712	C	M1SX42021R, Rev. F	H-SX-13P, Rev. 7*

*Traveler Not Reviewed

TABLE VII-7

ELECTRICAL CABLE TRAY HANGER IPOI SAMPLE

OI Report No.	Bldg.	Elev. (Ft.)	BA Drawing (Hanger No.)	Traveler No.
E-3762	Contain.	755	1002-01B-H24, Rev. 04	E27-1002-01B-H24, Rev. 5
E-3920	Aux.	781	1003-01A-H47, Rev. 04	E26-1003-01A-H47, Rev. 8
E-3921	Aux.	781	1003-01A-H48, Rev. 02	E26-1003-01A-H48, Rev. 12
E-4010	Contain.	768	1002-01B-H33, Rev. 04	E27-1002-01B-H33, Rev. 5
E-4541	Control	800	1004-04A-H10, Sheet 1, Rev. 03 & Sheet 2, Rev. 01	E30-1004-04A-H10, Rev. 23

OI Report No.	Bldg.	Elev. (Ft.)	S&L Drawing	Traveler No.
E-3623	Control	800	1004-00A-CPR, Rev. E	RT425, Rev. 6
			1942, Rev. Y (Items 10510K, M, N)	

* SCI - Seismic Category I

VIII. CORRECTIVE ACTION SYSTEMS

A. Objective

The corrective action systems and related activities were examined to determine 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 corrective actions, including review of sample documents and inspection of some material and equipment for verification of actual corrective actions in the plant.

The following procedures by Baldwin Associates (BA) and Illinois Power Company (IP) provided the acceptance criteria for this inspection:

- BA Project Procedure (BAP) 1.0, "Nonconformance Report (NCR)," Rev. 17, dated May 24, 1985
- IP Nuclear Station Engineering Instructions (NSEI) ME-2, "Interaction Analysis Program," Rev. 0, dated March 4, 1985
- IP Quality Assurance Procedure QAP-115.02, "Nonconforming Material Report (NCMR)," Rev. 4, dated February 8, 1985
- QAP-116.04, "Reporting of Deficiencies per 10 CFR 50.55(e)," Rev. 4, dated February 14, 1985
- QAP-116.05, "Evaluation and Reporting of Defects and Nonconformances per 10 CFR 21," Rev. 2, dated June 20, 1983
- QAP-116.06, "Project Trend Analysis Program," Rev. 7, dated May 15, 1985
- QAP-116.07, "Management Corrective Action Requests (MCAR)," Rev. 7, dated February 14, 1985
- QAP-116.08, "CPS Condition Report (CR)," Rev. 5, dated July 27, 1984
- IP Startup Administrative Instruction SAI-7, "Control of Conditions Adverse to Quality," Rev. 5, dated February 25, 1985
- IP Startup Administrative Procedure SAP-1, "System Subsystem Turnover," Rev. 12, dated July 18, 1984
- SAP-2, "Construction Work Requests," Rev. 13, dated December 20, 1984
- SAP-6, "System Release and Return," Rev. 5, dated December 7, 1984

° SAP-9, "Maintenance Work Requests-Startup Group," Rev. 5 dated August 24, 1984

° SAP-20, "Preventative Maintenance," Rev. 0, dated March 30, 1984.

1. Corrective Action Measures Inspection

a. Inspection Scope

A review was performed of applicable portions of the Quality Assurance (QA) program and procedures. A total of 231 samples of corrective action documents including Nonconformance Reports (NCRs), Nonconforming Material Reports (NCMRs) and Condition Reports (CRs) were reviewed. Five material and equipment samples were inspected for verification of corrective actions in the plant. Three samples of risk releases were selected for field verification of control and status of work on material and equipment to correct the deficient condition involved. Also, 26 samples of corrective action documents which identified documentation revisions to show as-built conditions for their disposition, were reviewed to verify that the required documentation revision had been completed.

Samples were selected to cover various disciplines and activities. The activities included the normal program activities of BA, Zack Company, IP and the additional activities of BA Field Verification and IP Overinspection.

Open items requiring corrective action after turnover from BA to IP were also reviewed.

Corrective actions dispositioned use-as-is were evaluated to determine if sound engineering was used for the disposition.

b. Inspection Findings

In general, it was found that satisfactory procedures were in place for corrective action systems to identify and correct conditions adverse to quality at the site. Except for a high rate of errors found in a limited sample of open items identified in the IP Startup Punch List, the corrective action measures were found to be acceptable. The following details the NRC CAT inspector's findings:

(1) With approximately 80 percent of the systems turned over to IP, more than 6000 open items are identified on the IP Startup Punch List Tracking System. The document packages for four open items were selected for a detailed review by the NRC CAT. The criteria used for the sample selection was that the item was identified as an open item and corrective action was required. Discrepancies were found in the posting of documents against two of the open items which prevented the open items from being closed although the work had been accomplished. Because of the high percentage of problems identified in this small sample, two additional sample packages were selected for review. Problems were identified in both of these additional packages. The high

percentage of open item packages with problems identified by the NRC CAT inspector indicates that additional management attention to this matter is required.

The packages examined are as follows:

- ISA0069 Install Permanent Cable Between E21-N049 and JB BA #61 -- Satisfactory
- ISA0009 Change Wiring of NSIV-LC Valves -- Satisfactory
- DGA0349 Division II Overhaul, Rust on Cylinder Liner, NCR 17583 -- Unsatisfactory, See Table VIII-1
- LPA0109 Water Leg Pump Seal Piping Discrepancies ILP-1P2 -- Unsatisfactory, See Table VIII-2
- DGA0153 Lube Oil Strainer Element Opening -- Unsatisfactory, See Table VIII-3
- ISA0074 1E32-F008 Torque Switch Not Working in the Closed Position -- Unsatisfactory, See Table VIII-4

(2) Manual and computerized records were used to track the status and to trend nonconformances.

(3) Work had been completed and inspected for five samples selected which required rework to correct a nonconformance.

(4) Three samples of the nonconformance documents reviewed permited work to continue on a conditional release before a final disposition could be made. The corrective action documents were still open and were controlled through the project's nonconformance program.

(5) The appropriate revisions to design documents for a sample of 26 corrective action reports which identified document revisions to show as-built conditions for their disposition, were found to be posted or incorporated into the design documents. The only exception was three documents identified on an NCR which had not been completed at the time of the NRC CAT inspection.

(6) Sections II.B.3.b(2), V.B.1.b and V.B.3.b of this report identify NCRs dispositioned use-as-is without providing sufficient documentation to substantiate compliance with requirements. Section III.B.4.b of this report identifies the use of an FECN when an NCR was required by project procedures.

(7) Section VII.B.1.b(7) of this report identifies ineffective corrective actions for IP QA audit program findings for the area of design document control. The NRC CAT inspectors found similar deficiencies in the same area previously identified by IP QA audits.

(8) Documentation reviewed for NCRs written due to BA Field Verification and IP Overinspection findings, was found to be satisfactory.

c. Conclusion

The corrective action system was found to be generally acceptable except for the following:

- Lack of control of entries into the IP Startup Punch List after turnover of systems for startup testing. The number of problems found with the limited NRC CAT sample of open items reviewed indicates that this matter requires additional management attention.

- Failure to apply effective corrective actions in the area of document control for IP QA audit findings.

- Disposition of nonconformances use-as-is without providing a basis to substantiate this disposition.

TABLE VIII-1

REVIEW OF OPEN PUNCH LIST ITEM DGA0349
DIVISION II OVERHAUL, RUST ON CYLINDER LINER, NCR 17583

Documents Issued/Date	Comments
NCR 17583 (5/2/84)	Identified light rust bloom on number 6 cylinder liner of 16 cylinder diesel, 1DG01KB. This NCR was superseded by NCMR 1-0809 (4/15/85) which is not identified on the punchlist. IP NSED investigated rust problem on all DGs (memo Y-72291) under NCR 17583, recommendation was to "rework" and the position taken, "the rust will be removed, after turnover, during disassembly of the engine to replace power assembly lower seal by mechanical maintenance."
MWR B02134 (4/1/85)*	Work request to inspect engine turbocharger via the inspection ports, for 16 cylinder engine. General maintenance and inspection, visual inspection performed.
MWR B02133 (4/1/85)*	Work request to remove power assembly and perform work as per instruction provided, for 16 cylinder engine. General maintenance and inspection activities.
MWR B02135 (4/1/85)*	Work request to replace viscous damper as per instructions provided, for 16 cylinder engine. Maintenance work.
MWR B02138 (4/1/85)*	Same as MWR B02133, except for 12 cylinder engine.
MWR B02139 (4/1/85)*	Same as MWR B02134, except for 12 cylinder engine.
MWR B02140 (4/1/85)*	Same as MWR B02135, except for 12 cylinder engine.
NCMR Q-01-08290 (4/19/85)	Written as the result of Condition Report, CR 1-85-04-054 which identified what the inspector believed to be a flaw in the weld area of the upper water jacket for cylinders 8 and 9 of the 12 cylinder engine. Engineering investigation and evaluation found this condition to be normal.
NCMR Q-02-018900 (4/26/85)	Written to identify scoring of connecting rod bearing surface, cylinders 1-9 of 16 cylinder engine, found while performing MWR B02135.
MWR B17342 (5/2/85)	Work request for pressure test of 12 cylinder engine cooling water system per instructions provided.

* Written 10/29/84, and, while not applicable to this subject item, were entered 4/1/85.

TABLE VIII-1 (Continued)

REVIEW OF OPEN PUNCH LIST ITEM DGA0349
DIVISION II OVERHAUL, RUST ON CYLINDER LINER, NCR 17583

Documents Issued/Date	Comments
MWR B17351 (5/22/85)	Same as MWR B17342, except for 16 cylinder engine.
MWR B17364 (5/28/85)	Work request to replace 12 cylinder engine AMOT valve element housing bolts per disposition of NCMR 2-0216.
Problem:	Of the twelve corrective action documents identified for punch list item DGA0349, only NCR 17583 appears to be related to the item description. NCMR 1-0809 which should have been identified, is missing. The initially identified open item has not been closed out.

TABLE VIII-2

REVIEW OF OPEN PUNCH LIST ITEM LPA0109
WATER LEG PUMP SEAL PIPING DISCREPANCIES 1LP-1P2

Documents Issued/Date	Comments
NCMR Q-00-02400 (12/16/83)	Unrelated NCMR entered in error and not removed from punch list. Related NCMR is Q-01-02400.
FPR 3288 (8/27/84)	Identified that pump 1E21-C002 was different from the other pumps in that seal injection piping was missing.
CR 1-84-09-00400 (9/6/84)	Identified seal bypass piping on LPCS pump 1E21-C0002 was missing.
NCR 021710 (9/6/84)	Identified the nonconformance.
NCMR Q-01-02400 (10/2/84)	Replaced NCR 021710 for corrective action control after turnover.
CWR 11334 (11/3/84)	Work request to install seal by-pass piping. NCR 021710, not NCMR Q-01-02400, identified the nonconformance. This work request was closed out 1/14/85.
Problem:	Work has been completed, NCR 021710 has been closed out. NCMR Q-01-02400 has not been closed out and is preventing this open item from being closed out.

TABLE VIII-3

REVIEW OF OPEN PUNCH LIST ITEM DGA0153
LUBE OIL STAINER ELEMENT OPENING

Documents Issued/Date	Comments
MWR B00183 (9/18/84)	Identified provisions for the diesel generator lube oil flush.
CR 1-84-10-540 (10/19/84)	Identified lube oil strainer had manufacturer's defect.
NCMR Q-01-052100 (1/9/85)	Identified the nonconformance with disposition to scrap defective strainer and replace with a new strainer.
FDDR LH1-5151 (1/15/85)	Provided GE's disposition for NCMR Q-01-052100.
MWR B03584 (3/5/85)	Prepared to replace strainer. Note: This work had been performed under MWR B00183 which was never closed out. MWR B03584 was closed out because the work had been previously completed.
Problem:	MWR B00183 is still identified as an open item of the punch list, preventing this item from being closed out.

TABLE VIII-4

REVIEW OF OPEN PUNCH LIST ITEM ISA0074
1E32-F008 TORQUE SWITCH NOT WORKING IN THE CLOSED POSITION

Documents Issued/Date	Comments
MWR B07829	Repair of identified problem with new Torque switch. Switch was replaced 4/17/85 and documentation closed out 4/19/85.
NCR 07082900 (3/2/85)	Nonconformance, spectacle flange, 1E32-D307, paper work indicated that an ASME Class NF flange was being used where a Class NC flange is required.
CWR C013430 (3/28/85)	Was prepared to replace the flange with an ASME NC flange as required.
Problem:	The NCR and CWR were initially entered into the punch list tracking system under ISA0074. The operator deleted the problem description but did not delete the NCR and CWR. ISA0074 was then reused for MWR B07829 with the NCR and CWR identified as documentation related to the open item. All the work for the MWR has been completed. The licensee had made the necessary corrections and removed this item from the open punch list prior to the NRC CAT inspection exit meeting.

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

a. Licensee and Contractors

G. Bell	D. Hall	M. Pacy
W. Connell	R. Heider	D. Selva
H. Daniels	S. Johnson	D. Shelton
G. Gandsey	W. Kelley	H. Victor
W. Gerstner	A. King	J. Wilson
J. Green	L. Osborne	S. Zabel

b. State of Illinois

R. Hubbard	A. Samelson	S. Swartz

c. NRC and Consultants

T. Chan	J. McCormack	R. Serb
A. DuBouchet	T. McLellan	B. Siegel
G. Georgiev	O. Mallon	R. Smeenge
T. Gwynn	W. Marini	W. Sperko
J. Harrison	E. Martindale	S. Stein
R. Heishman	J. Nemoto	J. Taylor
D. Johnson*	M. Peranich	R. Warnick
H. Livermore		

2. Licensee Coordinators and Contacts

Area	Name	
Team Leader	G. Bell	D. Shelton
	D. Hall	
Electrical and Instrumentation	E. Bailey	R. Kennedy
	D. Gilbert	L. Ratliff
	B. Johnson	
Mechanical	D. Adams	K. Danner
	B. Buffie	R. Kennedy
	L. Clark	A. Sherwood
	L. Combs	B. Taylor

*Institute of Nuclear Power Operations observer

Welding and NDE	J. Carson	T. Wilmoth
Civil and Structural	T. Parrent	K. Smith
Material Traceability	J. Gruber	
Design Change Control	G. Buffington R. Collins W. Connell	J. Greene S. Lyons
Corrective Action Systems	T. Warnick	

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. References to specific procedures, specifications, and drawings are contained within the body of the report.

1. Final Safety Analysis Report
2. Quality assurance manual
3. Quality assurance procedures and instructions
4. Quality control procedures
5. Administrative procedures
6. General electrical installation procedures and specifications
7. General instrumentation installation procedures
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

AISC - American Institute of Steel Construction
AISI - American Iron and Steel Institute
ANSI - American National Standards Institute
ASME - American Society of Mechanical engineers
ASTM - American Society for Testing and Materials
AWG - American Wire Gauge
AWS - American Welding Society
BA - Baldwin Associates
BAFV - Baldwin Associates Field Verification
BAP - Baldwin Associates Project Procedure
BE - Basic Engineering
BOM - Bill of Materials
BQAI - Baldwin Associates Quality Assurance Instruction
°C - Degree Celsius
CAT - Construction Appraisal Team (NRC)
CB&I - Chicago Bridge and Iron Company
CEA - Concrete Expansion Anchor
CMI - Construction Management Information
CPS - Clinton Power Station
CR - Condition Report
C/S - Civil/Structural
CRD - Control Rod Drive
CWR - Construction Work Request
dc - Direct Current
DCC - Document Control Center
DMS - Document Management System
ECN - Engineering Change Notice
°F - Degree Fahrenheit
FCR - Field Change Request
FDC - Field Document Center
FECN - Field Engineering Change Notice
FSAR - Final Safety Analysis Report
GE - General Electric Company
HCU - Hydraulic Control Unit
HPCS - High Pressure Core Spray
HVAC - Heating, Ventilating and Air Conditioning
IE - Office of Inspection and Enforcement (NRC)
IEEE - Institute of Electrical and Electronic Engineers
IP - Illinois Power Company
IPCEA - Insulated Power Cable Engineers Association
IPOI - Illinois Power Company Overinspection
k - One Thousand
LPCS - Low Pressure Core Spray
MCM - One Thousand Circular Mils
MWR - Maintenance Work Request
NCMR - Nonconforming Material Report
NCR - Nonconformance Report
NDE - Nondestructive Examination
NP&S - Nuclear Planning and Support
NRC - United States Nuclear Regulatory Commission
NSED - Nuclear Station Engineering Department

NSEI - Nuclear Station Engineering Instructions
PGCC - Power Generation Control Complex
PI - Project Instruction
PIR - Potential Interaction Report
PSA - Pacific Scientific Arrestor
PSAR - Preliminary Safety Evaluation Report
QA - Quality Assurance
QAI - Quality Assurance Instructions
QAP - Quality Assurance Procedure
QC - Quality Control
RCI - Reactor Controls, Inc.
RCIC - Reactor Core Isolation Cooling
RE - Resident Engineer
RHR - Residual Heat Removal
RG - Regulatory Guide (NRC)
RIR - Receiving Inspection Report
SAE - Society of Automotive Engineers
S&L - Sargent & Lundy Engineers
SSW - Shutdown Service Water
SU-F - Startup Field Office
TPRG - Traveler Preparation Review Group
TS - Technical Services
TTS - Traveler Tracking System
USI - Unresolved Safety Issue (NRC)
V - Volt(s)

NRC Form 8–C
(4–79)
NRCM 0240

COVER SHEET FOR CORRESPONDENCE

Use this Cover Sheet to Protect Originals of Multi-Page Correspondence.