JUN 19 1985

MEMORANDUM FOR: C. E. Norelius, Director
Division of Reactor Projects, Region III

FROM: J. G. Partlow, Director
Division of Inspection Programs
Office of Inspection and Enforcement

SUBJECT: ASSESSMENT OF IMPLEMENTATION OF THE NRC INSPECTION PROGRAM BY REGION III AT BRAIDWOOD STATION

The Office of Inspection and Enforcement described to the Commission in SECY-82-150A the assessment of the implementation of the NRC inspection program in conjunction with Construction Appraisal Team (CAT) inspections. Accordingly, we have examined Region III's implementation of the construction inspection program based on the December 1984-January 1985 CAT inspection at Braidwood. The results of the inspection were documented in Inspection Report 50-456/84-44, 50-457/84-40 dated February 20, 1985. The enclosure to this memorandum documents the results of our assessment of the construction inspection program implementation.

J. G. Partlow, Director
Division of Inspection Programs
Office of Inspection and Enforcement

Enclosure: Assessment

cc: J. Taylor, IE

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REGIONAL CONSTRUCTION INSPECTION PROGRAM
ASSESSMENT - BRAIDWOOD (R-III)

I. OBJECTIVE

The Construction Appraisal Team (CAT) of the Division of Inspection Programs conducted an announced construction inspection at the Braidwood Station of the Commonwealth Edison Company (CECo) during the period of December 10-20, 1984 and January 7-18, 1985. While the predominant effort of the inspection team was devoted to hardware inspection, the team also evaluated project management, the control of design changes and corrective action. At the specific request of regional management an effort was also made to evaluate the ongoing Braidwood Construction Assessment Program (BCAP).

BCAP is a comprehensive assessment program instituted by CECo to verify the quality of construction at the site. The program elements of the assessment plan are to implement a construction sample reinspection, a reverification of procedures to specification requirements and a review of significant corrective action programs.

The objective of this assessment was to evaluate Region III's implementation of the Construction Inspection Program, and to make an overall assessment of the adequacy of Region III's oversight of construction activities at the Braidwood site.

II. Assessment Activities

A review was made of Braidwood's inspection reports, SALP reports and construction deficiency reports to identify those deficiencies that were previously identified by Region III inspectors or the licensee. The inspection reports of 1979-1984, the 1983 and 1984 SALP reports, open items and violations were reviewed.

To determine inspection effort at the Braidwood site the inspection reports for 1979-1984 and the 766 inspection data were analyzed. It was determined that Region III performed approximately 3600 manhours in 1983 and 5300 manhours in 1984 of direct inspection effort at the Braidwood site. The inspection hours for 1983 and 1984 were compared to two unit sites in a similar state of construction and the manhours were found comparable thus indicating a satisfactory level of inspection effort at the site. The analysis of the inspection reports and 766 computer data indicated that the construction inspection program was approximately 90 percent complete at the start of the CAT inspection.

The Executive Summary and Potential Enforcement Actions of the Braidwood CAT inspection report (50-456/84-44, 50-457/84-40) is provided as Appendix A and Appendix B, respectively.

To determine the adequacy of the BCAP, a review was made of the written program, the organization, the implementing procedures and the periodic progress reports issued by BCAP and the Region. Only a limited BCAP sample of hardware was available for overinspection by the CAT and these samples were inspected and a limited assessment made.

III. ASSESSMENT FINDINGS

A. Electrical and Instrumentation Construction

1. CAT Findings

The CAT inspectors found that electrical separation criteria established in quality control procedures were not sufficient to identify installations of raceway and cables violating design requirements for separation.

2. Assessment

The cable raceway separation deficiencies were previously identified by Regional Inspectors in Braidwood Report No. 50-456/82-06. During this inspection the inspectors identified two areas of separation deficiencies.

These were:

a. Inadequate separation between Class 1E and non-Class 1E cable trays.

b. Inadequate separation distance in four areas where Class 1E cables travel in free air. As a result of the separation deficiencies identified during this inspection a Level IV and Level V notice of violation were initiated against Commonwealth Edison Company.

3. Recommendation

Region III has satisfactorily implemented the Construction Inspection Procedures in the areas of Electrical Construction. However, a number of electrical separation problems have been identified at plants in other regions and an Information Notice has been prepared and issued so that resident and regional inspectors will be aware of the problem. In addition, a memorandum has been transmitted to NRR requesting clarification on different interpretations of IEEE-384.

B. Mechanical Construction

1. CAT Findings

The CAT inspectors determined that the licensee's inspection programs have failed to identify areas where seismic category I pipe supports/restraints and other seismic pipe supports/ restraints have not been constructed in accordance with design requirements.

2. Assessment

- The region has implemented a significant portion of the inspection module relative to pipe supports. In Inspection Report No. 84-14 a number of supports/restraints were inspected and no major problems were identified. In Inspection Report No. 84-09 inspectors identified missing hardware and inadequate documentation in their examination of pipe whip restraints.

- In addition to the inspections, Regional Management has encouraged the licensee to conduct a reinspection of a sample of pipe supports/restraints to determine the adequacy of construction. Subsequent to the licensee's inspection the results of the reinspection will be analyzed and and further corrective action, if required, will be recommended by the Region.

3. Recommendation

The Construction Inspection Procedures for this area are evaluated to be adequate to have identified the problem found by the CAT inspectors.

C. Welding - NDE

1. CAT Findings

The CAT inspectors found that vendor procured tanks and heat exchangers were accepted and installed with deficient welds. In addition, various vendors have supplied radiographs which did not have the required weld and film quality.

2. Assessment

- Past CAT inspections have also identified welding deficiencies in vendor provided equipment. This problem has been brought to the attention of the Vendor Program Branch and they are modifying their inspection approach in an attempt to reduce the number of deficiencies that are being found in the field.

- Problems similar to the vendor supplied radiographs which did not have the required weld and film quality were previously identified by the Mobile VAN (NDE) during their inspection at Braidwood on March 26-April 6 and April 9-20, 1984 (Inspection Report No. 84-05). The inspection was conducted of safety-related piping, structural and support weldments fabricated to ASME Code, Section III, Classes 1, 2 and 3 and AWS D1.1. As a result of this inspection four violations were identified concerning unacceptable radiographs, obsolete drawings, failure to identify nonconforming conditions and failure to identify weld defects.

- The findings of the Mobile NDE van were compared to CAT findings in the welding and design change control area and were found to be in general agreement.

3. Recommendation

The Construction Inspection Procedures for this area are determined to be adequate. An IE Information Notice has been issued relating to the tank and heat exchanger weld problems.

D. Material Traceability and Control

1. CAT Findings

- 10,500 feet of General Electric "Vulkene" switchboard wire was received at Braidwood. Some of this wire has been installed without appropriate qualification to IEEE 383-1974.

- Bolting material for Class 1E seismic cable tray hangers and for Class 1E storage battery racks were found that did not meet the requirements of ASTM A307 that was specified.

2. Assessment

- In Braidwood Inspection Report No. 84-13, the Region III inspectors checked electrical discipline procurement documents for technical adequacy, Quality Assurance program requirements, 10 CFR 21 provisions, identification of items, and if the supplier was on the approved bidders list. The sample of procurement documents totaled 14 items which included ASTM A36 plate, structural steel, tube steel, and heat shrink tubing. Problems were not identified with the procurement documents except for the failure of one vendor to specify the application of 10 CFR Part 21 to the procurement item.

- Regional inspectors inspected 6 cable raceway supports for configuration, dimensions, elevation, welding detail, bolting, and correct material type in October, 1984 as documented in Inspection Report No. 84-31. There was no documentation that there were problems identified with improper bolting material. In October, 1984 Regional inspectors inspected the battery racks as documented in Inspection Report No. 84-29 but there was no identification of improper bolting material.

3. Recommendation

The Construction Inspection procedure for the area of procurement appears to be adequate. The procedures for the inspection of cable tray supports and battery racks to assure that material installed is as specified also appears to be adequate. However, even though the inspection procedures appear to be adequate, in the last seven of 10 CAT inspections, problems have

been identified with traceability for fasteners. The Reactor Construction Programs Branch will conduct a review of the fastener traceability problem and if justified issue an Information Notice identifying traceability as a potential problem area.

E. Corrective Action Systems

1. CAT Findings

- NCR 39 identified weld deficiencies in electrical struts and hangers. The supporting documentation attached to the NCR identified that 90 percent of the welds were unacceptable. The corrective action block on the NCR was marked "N/A" and contained a statement identifying the welds as acceptable. There was no documentation supporting this corrective action statement on the NCR.

- NCR 293 identified weld deficiencies on back-to-back B-line strut and spaced back-to-back strut. The corrective action was to rework the deficient welds on the back-to-back strut and return the spaced back-to-back strut to the vendor. Inspection of installed spaced back-to-back struts identified numerous weld deficiencies. Based on the weld deficiencies noted in the installed strut, the corrective action for this NCR was ineffective.

2. Assessment

Region III management has recognized the inadequacy of the licensee's corrective action program. In a meeting between Region III management and Commonwealth Edison management on February 17, 1983, it was brought to the licensee's attention that the corrective action may be narrowly limited to the precise finding instead of broad applicability. It was further emphasized that there was a need to review construction events to determine root causes and take positive corrective actions. Followup meetings were held in July, September and October of 1983 in order to improve licensee construction performance. As a result of these concerns Commonwealth Edison Company initiated the BCAP. One element of BCAP is to determine that corrective actions have been adequately implemented and documented for past construction problems that have been identified and resulted in significant corrective action. Those significant corrective action programs that are included under BCAP are:

- Reinspection of safety-related mechanical equipment
- Quality control reinspection
- Piping heat number traceability
- Quality control structural steel review
- Electrical installation document review
- Safety-related pipe supports
- HVAC welding
- HVAC configuration

- HVAC duct stiffener and fitting detail
- Instrumentation installation verification
- NSSS component support verification

3. Recommendation

The Construction Inspection Procedures for these areas are evaluated to be adequate for their intended scope. Regional efforts to improve licensee performance for adequate corrective actions are being accomplished through the management meetings and the BCAP.

F. Braidwood Construction Assessment Program

1. CAT Findings

- The CAT inspectors found that three of six supports/restraints that had been inspected by BCAP inspectors had deficiencies that were not identified by the BCAP inspectors.

- The CAT inspectors found that of four piping runs inspected, that 2 runs had different inspection results between the BCAP and CAT inspectors. One run had a significant dimensional error that was not identified by BCAP and on one run BCAP had identified a dimensional error when in fact the dimension was correct.

2. Assessment

- The program elements of BCAP consist of a construction sample reinspection, a reverification of procedures to specification requirements and a review of significant corrective action programs. The status of the BCAP was such that it was not possible to do any of the three elements except a limited hardware overinspection. It was possible to overinspect a very small sample of hardware in the areas of supports/restraints, piping runs, HVAC supports and ducts for welding, HVAC ducts for configuration and conduit runs. In four of the six areas that were overinspected, there was general agreement between BCAP and CAT findings; in two areas, supports/restraints and piping runs deficiencies were identified by the CAT that were not identified by the BCAP.

3. Recommendation

On the basis of the limited sample overinspected, it appears that BCAP inspection effort needs to be improved in the areas of supports/restraints and piping runs. The status of the other program elements of BCAP did not permit the CAT to make a meaningful assessment.

IV. REVIEW OF BRAIDWOOD CONSTRUCTION INSPECTION REPORTS

1. Scope

The inspection procedures itemized in IE MC 2512 were reviewed as to which were applicable to the Braidwood construction site. A 766 computer printout was obtained for the entire construction period that identified report numbers, inspection procedures, inspection dates, staff hours, percent complete and status. This information was tabulated as indicated in Attachment I for Unit No. 1. A review was then conducted for which procedures were implemented against procedure requirements.

The inspection reports prepared by the regional inspectors were evaluated to determine if they included the required information, if they were sufficiently comprehensive, if the report was issued in a timely fashion and if the report was prepared in accordance with IE Manual Chapter 0610.

2. Assessment

The review of the MC 2512 inspection procedures required to be implemented as compared to those actually implemented indicated basically full implementation except for a few where plant construction was still in progress. However, it was determined that one required procedure was not fully implemented. Inspection Procedure 35020B, "Audit of Applicant's Surveillance of Contractors QA/QC Activities" is required to be performed five months before docketing and subsequently as necessary. There is no record in the 766 data bank to indicate that this procedure was performed initially or in a subsequent time frame. At Braidwood, Commonwealth Edison is performing the duties of construction manager and is overseeing as many as ten contractors at a time performing safety-related work. For this kind of construction organization it is essential that the licensee conduct periodic surveillances and audits of the contractor's QA/QC activities. In consideration of the major problems identified in the electrical, mechanical, and HVAC areas, this procedure should have been implemented more than once over the past few years.

A random sample of nine inspection reports indicated that they were essentially being prepared in conformance with IE MC 0610. The reports included pertinent information such as report number, Docket No., Inspectors, inspection summary, results, details of inspection, persons interviewed, and individuals present at entrance and exit meetings.

Two areas for improvement were identified in the inspection reports. One involved identifying the Inspection Procedures implemented during the inspection and including them in the paragraph of inspection summary. This format is shown in Exhibit III in IE MC 0610.

Another area for improvement involves the issuance of inspection reports. The procedure suggests that inspection reports be issued 20 days after the last day of inspection or 20 days after the

inspection period ends as in the case of monthly resident's reports. The following lists the reports reviewed and the total time elapsed from the end of inspection to report issuance:

Report No.	Last Day of Inspection or Period	Date of Report	Elapsed Time Date
84-07	May 31	July 20	50
84-13	July 6	Aug. 6	30
84-17	Aug. 31	Oct. 1	30
84-19	July 12	Aug. 14	32
84-20/19	July 25	Oct. 18	83
84-22/21	Aug. 16	Aug. 28	12
84-28/27	Nov. 23	Nov. 28	5
84-31/29	Nov. 9	Nov. 26	17

The time required to issue reports is much longer than recommended in MC 0610 and a concerted effort should be made to reduce the report time.

3. Recommendation

Overall the region has performed satisfactorily in the implementation of the construction procedures. Procedure 35020B should be implemented as indicated in the assessment and regional management should make a concerted effort to have inspection reports issued in a timely interval.

V. 1983 AND 1984 SALP REPORTS

An analysis was made of the two most recent SALP reports for those areas that were common to both SALP and the CAT inspection. For the 1984 SALP report the two areas that were rated Category 3 were Piping Systems and Supports and Safety-Related Components.

In the area of Piping Systems and Supports where there was similar inspection effort, the CAT findings were similar to the regional findings. In one area there was a variance between CAT findings and Regional findings. In Inspection Report No. 84-13 a number of supports/restraints were inspected for weld defects, configuration and other attributes and no problems were identified. The specific supports/restraints inspected were different from the CAT sample but the CAT inspection identified an inordinate number of deficiencies. It will be necessary for the Region to evaluate the results of the BCAP inspection in this area to determine if additional licensee effort is necessary. In the area of Safety-Related Components the CAT was not able to reach a qualitative appraisal because of the ongoing reinspection and corrective action programs being implemented. The CAT did find that there still was not adequate protection of safety-related equipment even though this problem had been previously identified in the two most recent SALP reports. The CAT specifically found the improper support of scaffolding on small diameter piping, damage to instrument tubing from scaffolding, unauthorized removal of supports, and poor housekeeping in safety-related trays in containment. The other

areas rated by SALP; Containment and other Safety-Related Structures, Support Systems, Electrical Power Supply and Distribution, and Instrument and Control Systems were generally similar to the CAT findings.

VI. REGIONAL HANDLING OF ALLEGATIONS AT CONSTRUCTION SITES

1. Scope

To evaluate regional effort in the handling of allegations. To accomplish the foregoing a random sample of two items was selected from inspection reports and reviewed for proper closure.

2. Assessment

Allegations

- On March 30, 1984, an individual contacted the NRC Region III office and provided information with respect to deficiencies with the installation of the Heating, Ventilation, and Air Conditioning (HVAC) systems at the Braidwood Station. The individual made nine specific allegations that encompassed poor workmanship because of productivity pressures, inadequate QC inspectors, failure to follow requirements, by-passing of the NCR system to correct deficiencies, improper certification of welders, failure to remove galvanized coating prior to welding and distortion of hangers because of excessive heat. An experienced Regional Inspector conducted an unannounced safety inspection on June 12-15, 20 and 21, 1984 to address those allegations. The inspector spent a total of 68 hours at the site and the result of the inspection is documented in Inspection Report 84-14.

  To evaluate the allegations, the inspector reviewed the contractor's past and present QA Programs, construction procedures, installation documentation, drawings, inspector training and certification program, and the current inspection and repair program. In addition, the inspector conducted interviews with personnel and observed the training and testing of welders. As a result of the inspector's review seven of the nine allegations were either substantiated or partially substantiated. However, the inspector concluded that a work stoppage and a 100 percent reinspection program by the contractor, a reorganization of site management, a new QA and craft training program and revision of installation procedures would correct the alleged deficiencies.

  The Region's timely and comprehensive response to this specific allegation is evaluated to be adequate.

- The electrical contractor at Braidwood has a policy to interview all employees terminating their employment. On March 9, 1984 a QC inspector who was terminating his employment provided a list of ten concerns relative to electrical construction work at Braidwood. This list of concerns was provided to the NRC's Senior Resident Inspector. As a result of these concerns a Regional inspector conducted an unannounced inspection at the site on August 20-31, 1984. The concerns identified by the QC inspector involved improper handling of inspection reports, corrosion of electrical equipment, mislabeled hangers and improperly installed conduits, trash in cable pans and trays, poor weld rod control, poor control of in-process welding, poor control of stud welding, poor control of voided drawings and field change reports, cracks in concrete floors and walls and numerous cases of welders and electricians on drugs and/or alcohol.

  The inspector by reviews of licensee actions, training records, inspection check lists, procedures, construction drawings, inspection reports and by interviews and plant inspection determined that seven of the ten concerns were substantiated. The seven substantiated concerns were found to be previously identified by the contractor or licensee or there was a program in place to repair. (Inspection Report No. 84-23)

  The Region's response to the concerns are evaluated to be timely and comprehensive and were adequate.

3. Recommendation

   The Region's handling of allegations relative to construction progress was evaluated to be satisfactory.

VII. OVERALL ASSESSMENT CONCLUSIONS

A review of Braidwood reports for 1979-1984 indicated that construction inspection modules appeared to be adequately implemented and that the reports were written to the appropriate scope and depth. The Braidwood inspectors and Regional inspectors did identify a significant number of licensee deficiencies that resulted in notices of violation. The Regional followup and corrective action review of the violations appeared to be satisfactory.

Regional management involvement with the Braidwood construction activities was evident from the Section Chief through the Regional Administrator. Management was knowledgeable about site construction problems and had been instrumental in causing the licensee to improve and enlarge the Quality Assurance organizations at the site. In addition, the management competence of a number of the site contractors was improved by changes and additions of personnel. Regional management had a number of meetings with licensee management in 1983 and 1984 to encourage the licensee to improve its performance at the Braidwood site and to take more comprehensive action in the implementation of corrective action for identified

problems. Regional management was also instrumental in causing the licensee to institute a comprehensive construction assessment program (BCAP) to assure the quality of construction at the site.

Regional management attention will continue to be needed on Braidwood activities as a result of the BCAP findings and the large number of major ongoing corrective action programs that still have not been satisfactorily concluded. In addition, the CAT inspection identified two areas of concern in that the licensee is placing excessive reliance on final walkdown inspections late in the construction program to identify and resolve problems and whether the site project management can manage the large number of ongoing corrective action programs and still ensure that current construction work is correctly performed.

Overall, the Regional effort to oversee the construction activities at the Braidwood site appears to be satisfactory. The implementation of the Construction Program Inspection Procedures was adequate. Regional management attention to site construction activities is strong and will need to be maintained at the current level until some of the existing site problems are corrected. As indicated in Section IV, Inspection Procedure 35020B needs to be implemented and regional management should make a concerted effort to have inspection reports issued in a more timely fashion.

APPENDIX A

EXECUTIVE SUMMARY

An announced NRC Construction Appraisal Team (CAT) inspection was conducted at Commonwealth Edison Company's (CECo) Braidwood Station during the period December 10-20, 1984 and January 7-18, 1985.

Overall Conclusions

Hardware, Project Management and documentation for construction activities were generally in accordance with requirements and licensee commitments. However, the NRC CAT did identify a number of construction program weaknesses that require increased management attention. These are:

1. The effectiveness of first level quality control (QC) inspection activities needs to be improved, particularly in the pipe support/restraint and welding areas.

2. A large number of final inspection activities are being included in a final walkdown, when greater difficulty will be encountered in identifying deficiencies because of interferences, accessibility and the pressure of schedule.

3. The identification and resolution of cable tray and conduit electrical separation deficiencies is inadequate.

4. An excessive number of incidents of damage to installed equipment has been caused by current construction activities.

The foregoing identified weaknesses require additional management attention to assure that completed installations meet design requirements.

An effort was made by the NRC CAT to evaluate the ongoing Braidwood Construction Assessment Program (BCAP). The schedule for the BCAP inspection program was such that only limited hardware samples were available for NRC CAT overinspection. It was possible to overinspect a very small sample of hardware in the areas of supports/restraints, piping runs, HVAC supports and ducts for welding, HVAC ducts for configuration and conduit runs. In four of the six areas that were overinspected, there was general agreement between BCAP and NRC CAT findings; in two areas, supports/restraints and piping runs, deficiencies were identified by the NRC CAT that were not identified by the BCAP inspectors. On the basis of the limited sample overinspected, it appears that BCAP inspection effort needs to be improved in the areas of supports/restraints and piping runs.

AREAS INSPECTED AND RESULTS

Electrical and Instrumentation Construction

The electrical and instrumentation samples inspected generally met the applicable design and construction requirements. However, construction and inspection deficiencies were identified in several areas including several items which will require additional NRC review and analysis.

Site implementation of electrical separation criteria is not consistent with the FSAR commitment which, with several exceptions, endorses IEEE Standard 384-1974. Several items regarding the interpretation of separation criteria will require additional NRR review. The electrical contractor's quality control program was found deficient in that the inspection criteria was not sufficient to identify separation deficiencies. As a result, a number of installations of non-Class 1E to Class 1E raceway and cable were found that did not meet the IEEE requirements and the FSAR commitments for minimum separation.

The majority of bolts used with raceway supports are of indeterminate material as they do not contain the manufacturer's identification required by the ASTM standard.

Although the instrumentation sample was not sufficiently large because of an ongoing reinspection program to draw an overall conclusion, a number of instances were identified of items damaged during the erection of scaffolding.

Mechanical Construction

Contractor QC inspections and site QA programs have not been effective in assuring that installed pipe supports/restaints meet design requirements. The inspection and acceptance criteria provided for activities such as QC inspection and document review and control need to be strengthened and clarified.

Numerous examples of generally poor construction practices were observed. The need to protect and maintain installed and accepted hardware needs to be reemphasized.

Piping, HVAC, concrete expansion anchors and mechanical equipment were generally found to be installed in accordance with requirements or with deficiencies that had previously been identified. However, because of ongoing re-evaluations and reinspections, it was not possible to establish a complete and conclusive assessment of these areas.

The NRC CAT inspectors do not consider that the previously identified NRC concern regarding pipe to pipe and interdisciplinary clearances has been responded to in a timely or effective manner. System and area walkdown inspections performed late in the construction program must be recognized as only an additional level of assurance of proper installation and not a substitute for detailed, item specific first line QC inspections.

Welding and Nondestructive Examination

Welding and nondestructive examination activities were generally found to be conducted in accordance with the governing codes and specifications. However, a number of examples were identified where completed structural welds in pipe supports/restraints did not have the weld sizes specified by the design drawings. These undersized welds should have been identified during the weld inspection by QC. The licensee has performed an engineering evaluation concerning this problem and concluded that most of these welds are adequate for the intended application. In the area of vendor supplied ASME tanks and heat exchangers a number of tanks were found to have undersized weld reinforcement in nozzle to shell and manway to shell welded joints.

The NRC CAT inspectors also found radiographs which did not meet the specified acceptance criteria. The licensee's quality assurance procedures do not require that an independent interpretation of radiographs be performed prior to final storage in the vault. The NRC CAT believes that this lack of independent radiographic interpretation may have contributed to the Project's inability to detect deficient radiographs.

Civil and Structural Construction

Concrete quality was acceptable. Requirements for rebar around three of four inspected construction openings and cadweld testing frequency were not met.

Structural steel member sizes, configurations and connections had no major concerns identified. A few high strength steel bolts were found to be installed at below specified torque values.

In the area of masonry wall construction, a concern was identified regarding the need to assure proper rebar anchorage prior to replacement of masonry in the removed sections of masonry walls.

Material Traceability and Control

The measures presently established for material traceability and control for ongoing work appear to be adequate except for one area. During this inspection, it was determined that 10,500 feet of switchboard wire not qualified to IEEE 383-1974 was installed at Braidwood Station.

Corrective Action

The corrective action programs generally are being implemented in accordance with requirements. However, based on the results of this inspection, the controls for nonconformance reports issued by site contractors previous to 1983 need additional review. These include:

1. Some nonconformance reports were voided without documented justification.

2. Nonconformances dispositioned "Use-As-Is" or "Repair" were not routinely reviewed by the appropriate engineering personnel.

3. The specified corrective actions did not in some cases adequately resolve the nonconformances.

Design Change Control

Design change control was determined to be generally in conformance with applicable requirements. In the area of the most significant finding was the failure to annotate unincorporated design changes on controlled design documents. The most significant finding in the area of design change control was design change documents written against superseded revisions of the approved design drawings. In at least one instance, this deficiency resulted in a pipe support being installed and inspected to other than the latest approved design.

Project Management

The overall project management effort is evaluated to be satisfactory to construct the project in conformance with quality standards. Additional management attention is required to improve contractor performance in the areas of contractor deficiency trending, and craft and quality control inspector training.

APPENDIX B

POTENTIAL ENFORCEMENT ACTIONS

As a result of the NRC CAT inspection of December 10-20, 1984 and January 7-18, 1985 at the Braidwood site, the following items are being referred to Region III as Potential Enforcement Actions (section references are to the detailed portion of the inspection report).

1. Contrary to 10 CFR 50, Appendix B, Criterion VII and CECo Quality Assurance Manual, Quality Requirement No. 7.0, the measures to assure that equipment and services conform to the procurement documents were found to be ineffective in that vendor procured tanks and heat exchangers were accepted and installed with deficient welds. In addition, various vendors have supplied radiographs which did not have the required weld and film quality. (Section IV.B.1, 10)

2. Contrary to 10 CFR 50, Appendix B, Criterion VIII and CECo Quality Assurance Manual, Quality Requirement No. 8.0, the licensee failed to implement measures to prevent the following incidents:

   a. 10,500 feet of General Electric "VULKENE" switchboard wire was received at Braidwood. Some of this wire has been installed without appropriate qualification to IEEE 383-1974. (Section VI.B.1)

   b. Sargent & Lundy standard EB115.0 required the use of ASTM A307 bolting material for Class 1E seismic cable tray hangers. Hangers in the lower cable spreading room did not utilize ASTM 307 fasteners in some cases. Also, the generic qualification document for the Class 1E storage batteries specified ASTM A307 bolts for the battery racks. The battery racks were inspected and found to have bolting material that did not meet the requirements of ASTM A307. (Section VI.B.1)

3. Contrary to 10 CFR 50, Appendix B, Criterion X and CECo Quality Assurance Manual, Quality Requirements No. 10.0, the licensee's inspection programs have failed to identify areas where seismic category I pipe supports/restaints and other seismic pipe supports/restraints have not been constructed in accordance with design requirements. (Section III.B.2)

4. Contrary to 10 CFR 50, Appendix B, Criterion X, and CECo Quality Assurance Manual, Quality Requirement No. 10.0, the licensee failed to provide an adequate inspection program in that electrical separation criteria established in quality control procedures were not sufficient to identify installations of raceway and cables violating design requirements for separation. (Section II.B.1)

5. Contrary to 10 CFR 50, Appendix B, Criterion X and the CECo Quality Assurance Manual, Quality Requirement No. 10.0, the program for inspection of activities affecting quality was not effectively implemented in that the inspection programs have not identified that the specified weld sizes in structural pipe support/restraints have the required weld configuration. (Section IV.B.1)

6. Contrary to 10 CFR 50, Appendix B, Criterion XVI and CECo Quality Assurance Manual, Quality Requirement 16.0, the licensee's electrical contractor's corrective actions for the following NCRs were found to be inadequate:

   a. NCR 39, issued in April 1979, identified weld deficiencies in electrical struts and hangers. The supporting documentation attached to the NCR identified that 90 percent of the welds were unacceptable. The corrective action block on the NCR was marked "N/A" and contained a statement identifying the welds as acceptable. There was no documentation supporting this corrective action statement on the NCR. (Section VIII.B.1)

   b. NCR 293, issued in May 1981, identified weld deficiencies on back to back B-line strut and spaced back to back strut. The corrective action was to rework the deficient welds on the back to back strut and return the spaced back to back strut to the vendor. Inspection of installed spaced back to back strut identified numerous weld deficiencies. Based on the weld deficiencies noted in the installed strut, the corrective action for this NCR was ineffective. (Section VIII.B.1)

ATTACHMENT I

INSPECTION PROGRAM HISTORY FOR BRAIDWOOD

A. Civil and Structural Procedures

1. Program Requirements

a. IP-45061B, 45063B, 45065B - Lakes, Dams & Canals - Procedures to be done before start of work and observation of work and review of quality records before work is 50% complete.

b. IP-46051B, 46055B - Foundations - Procedures to be done before work is 10% complete and review of quality records before work is 60% complete.

c. IP-46153B - Site Preparation and Foundations - To be done before work is 60% complete.

d. IP-47051B, 47053B, 47054B, 47055B, 47056B - Containment (Structural Concrete) - Procedure review before start of work, observation of work after 10% and 50% and review of records after 10% and 50%.

e. IP-47061B, 47063B, 47065B - Containment (Prestressing) - Procedures review before start of work, observation of work after 10% and records review after 20%.

f. IP-48051B, 48053B, 48055B - Containment (Steel Structures and Supports) - Procedure review before start of work, observation of work and record review before work is 50% complete.

g. IP-48061B, 48063B, 48064B, 48065B, 48066B - Safety-Related Structures (Structural Steel and Supports) - Procedure review before start of work, observation of work at 10% and 50%, and record review at 20% and 50%.

2. Inspections Conducted at Braidwood

Mod. No.	Report Numbers	From Date	To Date	Staff Hours	Percent Complete	Status
a. IP-45061B, 45063B, 45065B - Lakes, Dams & Canals						
45061B	78-03	031578	031778	4	100	C
45063B	78-03	031578	031778		100	C
45065B	78-07	070678	081078	5	100	C

b. IP-46051B, 46055B - Foundation

46051B	77-08	112177	112377		100	C
46053B	77-08	112177	112377		100	C
46055B	77-08	112177	112177		100	C

c. IP-46153B - Site Preparation and Foundations - Module not in effect of time of activity. Earlier site preparation and foundations modules completed.

d. IP-47051B, 47053B, 47054B, 47055B, 47056B - Containment Structural Concrete)

47051B	77-04	080377	080577	17	100	C
47053B	77-07	080377	080577	31	100	C
47054B	78-10	112878	121978	18	100	C
47055B	77-05	090777	090977	11	100	C
47056B	77-08	090777	090977	3	100	C

e. IP-47061B, 47063B, 47065B - Containment (Prestressing)

47061B	81-12	090981	092281	16	100	C
47063B	81-14	111881	112081	37	100	C
47065B	81-14	111881	112081	33	100	C

f. IP-48051B, 48053B, 48055B - Containment (Steel Structures and Supports)

48051B	79-09	080779	080979	8	100	C
48053B	79-02	020779	020979	6	100	C
48055B	79-02	020779	020979	3	100	C

g. IP-48061B, 48063B, 48064B, 48065B, 48066B - Safety-Related Structures (Structural Steel and Supports)

48061B	81-07	060381	060581	1	100	C
48063B	83-11	071183	072783	5	100	C
48064B	81-10	090181	090381	1	100	C
48065B	83-11	071183	072783	4	100	C
48066B	84-17	070784	083184	67	100	C

B. Mechanical Construction Procedures

1. Program Requirements

a. IP-49051B, 49053B, 49054B, 49055B, 49056B - Reactor Coolant Pressure Boundary Piping - Procedure review before start of work, observation of work at 20% and 60% and record review after 20% and 60%.

b. IP-49061B, 49063B, 49065B - Safety-Related Piping - Procedure review before start of work, observation of work at 40% and record review at 50%.

c. IP-50051B, 50053B, 50055B - Reactor Vessel Installation - Procedure review before start of work, observation of work at installation and record review of completion.

d. IP-50061B, 50063B, 50065 - Reactor Vessel Internals - Procedure review before start of work, observation of work during installation and record review after installation.

e. IP-50071B, 50073B, 50074B, 50075B, 50076B - Safety-Related Components - Procedure review before start of work, observation of work at 10% and 50% and record review after 20% and 50% work completion.

f. IP-50090B - Safety-Related Pipe Support and Restraint Systems. To be implemented before work is 20% complete.

g. IP-50095B - Spent Fuel Storage Racks. - Observation of work before work is 50% complete

2. Inspections Conducted at Braidwood

Mod. No.	Report Numbers	From Date	To Date	Staff Hours	Percent Complete	Status
a. IP-49051B, 49053B, 49054B, 49055B, 49056B - Reactor Coolant Pressure Boundary Piping						
49051B	79-01	010979	011179	3	100	C
49053B	81-04	040381	040881	3	100	C
49054B	81-04	040381	040881	2	80	
49055B	81-07	060381	060581	3	100	C
49056B	84-01	020884	021084	3	100	C
b. IP-49061B, 49063B, 49065B - Safety-Related Piping						
49061B	84-06	020184	033184	38	50	C
49063B	81-04	040381	040881	19	100	C
49065B	81-10	090181	090381	36	100	C
c. IP-50051B, 50053B, 50055B - Reactor Vessel Installation						
50051B	79-05	041979	042779	21	100	C
50053B	79-09	080779	080979	10	100	C
50055B	79-09	080779	080979	2	100	C
d. IP-50061B, 50063B, 50065 - Reactor Vessel Internals						
50061B	80-11	090980	091080	5	100	C
50063B	81-04	040381	040881	13	100	C
50065B	81-04	040381	040881	2	100	C

e. IP-50071B, 50073B, 50074B, 50075B, 50076B - Safety-Related Components

50071B	83-11	071183	070283	15	100	C
50073B	82-08	091082	123182	84	100	C
50074B	83-11	071183	072783	67	100	C
50075B	84-13	060584	070684	66	100	C
50076B	83-11	071183	072783	63	100	P

f. IP-50090B - Pipe Support and Restraint Systems

50090B	84-13	060584	070684	34	50

g. IP-50095B - Spent Fuel Storage Racks

50095B	84-13	060584	070684	8	80

C. Electrical and Instrumentation Construction Procedures

1. Program Requirements

a. IP-51051B, 51053B, 51054B, 51055B, 51056B - Electrical Components and Systems - Procedure review before start of work, observation of work at 30% and 60% complete and record review before 70%.

b. IP-51061B, 51063B, 51064B, 51065B, 51066B - Electrical Cables and Terminations - Procedure review before start of work, work observation at 10% and 50% completion and record review at 20% and 50%.

c. IP-52051B, 52053B, 52054B, 52055B, 52056B - Instrumentation - Components and Systems - Procedure review before start of work, work observation at 10% and 50% and record review at 20% and 50%.

d. IP-52061B, 52063B, 52064B, 52065B, 52066B - Instrumentation - Cables and Terminations - Procedure review before start of work, work observation of 10% and 50% and record review at 20% and 50%.

2. Inspection Conducted at Braidwood

Mod. No.	Report Numbers	From Date	To Date	Staff Hours	Percent Complete	Status

a. IP-51051B, 51053B, 51054B, 51055B, 51056B - Electrical Components and Systems

51051B	83-18	103183	011384	31	100	C
51053B	83-18	081583	081883	60	80	
51054B	84-04	030584	030984	8	30	
51055B	84-13	060584	070684	30	60	
51056B	84-06	020184	033184	10	35	

b. IP-51061B, 51063B, 51064B, 51065B, 51066B - Electrical Cables and Terminations

51061B	83-18	103183	011384	24	100	C
51063B	84-23	082084	083184	40	100	C
51064B	84-23	082084	083184	50	40	
51065B	84-23	082084	083184	10	100	C
51066B	84-23	082084	083184	22	40	

c. IP-52051B, 52053B, 52054B, 52055, 52056B - Instrumentation - Components and Systems

52051B	83-18	103183	111384	6	100	C
52053B	84-17	070784	083184	29	70	
52054B	83-13	081583	081883	8	10	
52055B	84-17	070784	083184	14	70	
52056B	83-13	081583	081883	3	10	

d. IP-52061B, 52063B, 52064B, 52065B, 52066B - Instrumentation - Cables and Terminations

52061B	84-23	082084	083184	1	100	C
52063B	84-04	030584	030984	12	40	
52064B	84-23	082084	083184	34	50	
52065B		Work in Progress				
52066B		Work in Progress				

e. IP-53051B, 53055B, 53055B - Containment Penetrations

53051B	81-07	060381	060581	1	100	C
53053B	81-07	060381	060581	1	100	C
53055B	81-10	090181	090381	6	100	C

D. Welding and NDE Procedures

1. Program Requirements

a. IP-55051B, 55053B, 55055B - Containment - Structural Steel Welding - Procedure review before start of work, work observation after 20% and record review after 30%.

b. IP-55061B, 55063B, 55064B, 55065B, 55066B - Safety-Related Structures - Welding - Procedure review before start of work, work observation at 10% and 50% and record review at 20% and 50%.

c. IP-55071B, 55073B, 55074B, 55075B, 55076B - Reactor Coolant Pressure Boundary Piping Welding - Procedures review, before start of work, work observation at 10% and 40% and record review at 20% and 50%.

d. IP-55081B, 55083B, 55085B - Safety-Related Piping Welding - Procedure review before start of work, work observation at 20% and record review at 30%.

e. IP-55093B - Reactor Vessel Internals Welding - Observation of work during installation.

f. IP-55151B, 55152B, 55153B, 55154B, 55156B, 55157B, 55158B, - Steel Structures and Supports - Welding during various stages of construction.

g. IP-55171B, 55172B, 55173B, 55175B, 55176B, 55177B, 55178B - Reactor Coolant Loop Piping - Welding Activities: To be performed at various stages of construction.

h. IP-55181B, 55182B, 55183B, 55185B, 55186B, 55187B, 55188B - Other Safety-Related Piping - Welding Activities: To be performed at various stages of construction.

2. Inspections Conducted at Braidwood

Mod. No.	Report Numbers	From Date	To Date	Staff Hours	Percent Complete	Status
a. IP-55051B, 55053B, 55055B - Containment Structural Steel Welding						
55051B	77-07	102677	102777	4	100	C
55053B	79-02	020779	020979	6	100	C
55055B	79-02	020779	020979	3	100	C
b. IP-55061B, 55063B, 55064B, 55065B, 55066B - Safety-Related Structures - Welding						
55061B	81-10	090181	090381	2	100	C
55063B	78-04	041778	042078	4	100	C
55064B	83-11	071183	072783	33	100	C
55065B	78-04	041778	042078	3	100	C
55066B	83-11	071183	072783	12	100	P
c. IP-55071B, 55073B, 55074B, 55075B, 55076B - Reactor Coolant Pressure Boundary Piping - Welding						
These modules were consolidated into IP-55050 by Change Notice 83-06.						
55050	84-05	032684	042084	40	70	
d. IP-55081B, 55083B, 55085B - Safety-Related Piping - Welding						
55081B	77-04	041977	042277	2	100	C
55083B	81-10	090181	090381	7	100	C
55085B	84-01	020884	021084	3	100	C
e. IP-55093B - Reactor Vessel Internals - Welding						
55093B	84-01	020884	021084	3	100	C

f. IP-55151B, 55152B, 55153B, 55154B, 55156B, 55157B, 55158B - Steel Structures and Supports - Welding Activities

These modules were incorporated into new inspection procedure 55100 by Change Notice 83-06.

55100	84-05	032684	042084	17	80	

g. IP-55171B, 55172B, 55173B, 55175B, 55176B, 55177B, 55178B, - Reactor Coolant Loop Piping - Welding activities

55171B	83-11	071183	072783	4	100	C
55172B	82-03	052482	060482	13	100	C
55173B	83-11	071183	072783	11	100	C
55175B	81-09	071581	072081	1	100	C
55176B	80-80	072480	081480	2	100	C
55177B	81-09	071581	072081	3	100	C
55178B	83-11	071183	072783	2	100	C

h. IP-55181B, 55182B, 55183B, 55185B, 55186B, 55187B, 55188B - Other Safety-Related Piping - Welding Activities

55181B	81-09	071581	072081	1	100	C
55182B	80-08	072480	081480	7	100	C
55183B	84-01	020884	021084	6	100	C
55185B	83-11	071183	072783	2	100	C
55186B	84-01	020884	021084	2	100	C
55187B	80-08	072484	081480	8	100	C
55188B	84-01	020884	021084	2	100	C

E. Miscellaneous Inspection Procedures

1. Program Requirements

a. IP-30051B, 30702B, 30703B, 35020B, 35060B, 35061B, 35065B, 36100B, 37051B, 37055B, 64051B, 64053B, 73051B, 73052B, 73053B, 73055B, 80220B, 92800B, 92701B, 92702B, 92703B, 92715B, 92716B - Various inspections during construction phase.

2. Inspection Conducted at Braidwood

Mod. No.	Report Numbers	From Date	To Date	Staff Hours	Percent Complete	Status
30051B	80-14	112580	112580	4	100	C
30702B	Ten performed from 1980 to 1983					
30703B	Performed as procedures require					
35020B						
35060B	82-03	052482	060482	18	90	C
35061B	82-03	052482	060482	15	100	C
35065B	82-07	121582	121782	9	10	
37051B	83-17	100383	121683	22	90	
37055B	84-09	050184	060484	6	100	C
64051B	82-05	041982	111982	14	100	C

64053B	82-05	041982	111982			C
73051B	84-01	020884	021084	1	100	C
73052B	84-01	020884	021084	1	100	C

Mod. No.	Report Numbers	From Date	To Date	Staff Hours	Percent Complete	Status
73053B	84-01	020884	021084	2	100	C
73055B	84-01	020884	021084	2	100	C
80220B	80-09	[illegible]1780	092380	10	100	C
92700B	Performed as procedures require					
92701B	Performed as procedures require					
92702B	Performed as procedures require					
92703B	Performed as procedures require					