

U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report Nos. 50-456/85019(DRS); 50-457/85020(DRS)

Docket Nos. 50-456; 50-457

License Nos. CPPR-132; CPPR-133

Licensee: Commonwealth Edison Company  
Post Office Box 767  
Chicago, Illinois 60690

Facility Name: Braidwood Station, Units 1 & 2

Inspection At: Braidwood Site, Braidwood, Illinois  
Sargent & Lundy Engineers, Chicago, Illinois

Inspection Conducted: April 22, 23, May 31, June 14, 18,  
July 26, and August 12, 14, and 16, 1985

Inspector: *D. H. Danielson*  
J. W. Muffett

9/4/85  
Date

Approved By: *D. H. Danielson*  
D. H. Danielson, Chief  
Materials and Processes Section

9/4/85  
Date

Inspection Summary

Inspection on April 22 through August 16, 1985 (Report No. 50-456/85019(DRS); 50-457/85020(DRS))

Areas Inspected: Unannounced, special safety inspection of licensee actions concerning Braidwood Construction Assessment Program (BCAP). The inspection involved a total of 100 inspector-hours by one NRC inspector.

Results: No violations or deviations were identified.

## DETAILS

### 1. Persons Contacted

#### Commonwealth Edison Company (CECo)

- \*E. E. Fitzpatrick, Assistant Quality Assurance Manager
- \*N. N. Kaushal, BCAP Director
- \*N. P. Smith, General Supervisor of Quality Assurance
- \*G. M. Orlov, BCAP Assistant Director
- \*D. L. Ceechett, Licensing Engineer
- W. Vahle, Project Field Engineer

#### Sargent & Lundy Engineers (S&L)

- \*R. W. Hooks, Structural Engineering Division, Assistant Head
- \*D. DeMoss, Mechanical Project Engineer
- \*K. Fus, Mechanical Project Engineer
- \*R. Johnson, Site QA Coordinator
- \*S. R. Bertheau, Senior Structural Design Engineer
- \*A. Lunardini, Senior Structural Design Engineer
- K. Kostal, Project Director
- G. T. Kitz, Head of Engineering, Mechanical Division

The inspector also contacted and interviewed other licensee and contractor employees.

\*Denotes those attending the final exit interview at the Braidwood Station on August 16, 1985.

### 2. BCAP Discrepancy Evaluations

The implementation of Commonwealth Edison's BCAP (Braidwood Construction Assessment Program) found a number of discrepant items. These discrepancies were generally potential violations of the ASME Code, the AWS Code, or deviations from design drawings and specifications. In a number of these instances "Engineering Judgement" was used to determine the adequacy of the installation. In the remainder of these cases calculations were performed to demonstrate the adequacy of the installed component. The basic purpose of this report is to document the NRC review of these calculations and engineering judgements.

#### a. Review of Evaluations of the Structural Engineering Discrepancies

The following "structural" discrepancy evaluations and calculations were reviewed (they are listed by their BCAP identification number):

CSR I-S-2-XXX-149  
CSR I-S-2-XXX-150  
CSR I-S-2-XXX-151  
CSR I-S-2-XXX-158  
CSR I-S-2-XXX-164  
CSR I-S-2-XXX-166  
CSR I-S-2-XXX-174  
CSR I-S-2-XXX-188  
CSR I-S-002-001-01  
CSR I-S-002-002-01  
CSR I-S-002-002-02  
CSR I-S-002-002-04  
CSR I-S-002-003-01  
CSR I-S-002-004-01  
CSR I-S-002-004-02  
CSR I-S-002-005-01  
CSR I-S-002-005-02  
CSR I-S-002-005-03  
CSR I-S-002-005-04  
CSR I-S-002-009-01  
CSR I-S-002-009-02  
CSR I-S-002-012-01  
CSR I-S-002-013-01  
CSR I-S-002-015-01  
CSR I-S-002-015-04  
CSR I-S-002-015-07  
CSR I-S-002-016-01  
CSR I-S-002-018-01  
CSR I-S-002-021-01  
CSR I-S-002-021-02

These calculations were reviewed for technical methodology, completeness and proper references. During the initial review of these calculations, a number of observations were made. The observations were as follows:

- (1) Three of the discrepancies reviewed (CSR I-S-002-005-03, CSR I-S-002-009-02 and CSR I-S-002-018-01) dealt with under torqued bolts in structural connections. Although the calculations demonstrated that the connections were adequate for the design loads, the calculation of the "R" value (strength reduction factor) appeared to be inaccurate.
- (2) The calculations concerning the evaluation of discrepancy CSR I-S-002-002-04 were not present during the initial review. These calculations were misfiled and were made available during the subsequent inspection.
- (3) The inspector inquired as to the procedure used in evaluating welded connections which contained a discrepancy and also contained additional unspecified

welds (particularly extra length). During the initial review it appeared that the method used had the potential for being non-conservative. (This relates the technique of using weld areas rather than moments of inertia in the initial decision to make a detailed engineering analysis.)

All of these issues contained in these observations were resolved prior to the conclusion of the inspection. None of the structural discrepancies reviewed were safety significant. In addition, the procedures dealing with the dispositioning of the discrepancies were found to be functioning properly.

b. Review of Evaluations of the Mechanical Engineering Discrepancies

The following "mechanical" discrepancies were reviewed (they are listed by their BCAP identification number):

CSR I-M-001-015-01  
CSR I-M-001-069-01  
CSR I-M-002-003-02  
CSR I-M-002-077-02  
CSR I-M-002-083-02  
CSR I-M-002-XXX-78  
CSR I-M-003-023-02  
CSR I-M-003-032-02  
CSR I-M-003-044-01  
CSR I-M-003-063-01  
CSR I-M-003-064-02  
CSR I-M-003-068-01  
CSR I-M-003-070-03  
CSR I-M-003-071-01  
CSR I-M-003-XXX-58  
CSR I-M-003-XXX-59  
CSR I-M-004-021-02  
CSR I-M-004-037-03  
CSR I-M-004-039-02  
CSR I-M-004-055-02  
CSR I-M-005-012-01  
CSR I-M-006-022-02  
CSR I-M-006-035-02  
CSR I-M-006-037-01  
CSR I-M-006-049-01  
CSR I-M-006-051-03  
CSR I-M-006-053-01  
CSR I-M-006-056-03  
CSR I-M-006-067-01  
CSR I-M-006-070-01  
CSR I-M-006-077-01

These calculations were reviewed for technical methodology, completeness and proper references. During the initial review of these calculations a number of observations were made. These observations were as follows:

- (1) Two of the discrepancy evaluations reviewed (CSR I-M-003-044-01 and CSR I-M-003-023-02) concerned improper setting of spring hangers. The QC inspector identified that both the setting of the hanger and the range (difference between the hot and cold settings) were incorrect. The evaluation performed by S&L in both these cases only addressed the setting and did not address the error in the range.
- (2) The evaluation of discrepancy CSR I-M-003-032-02 did not contain a sketch of the hanger of sufficient detail for the NRC inspector to review this discrepancy. This sketch was provided after this issue was brought to S&L attention and the evaluation was found to be adequate.
- (3) Two of the discrepancy evaluations reviewed (CSR I-M-003-068-01 and CSR I-M-003-XXX-58) concerned the threaded portion of bolts loaded in shear. ASME Code, Section III, Subsection NF (NF-4722) specifically does not allow threaded portion of bolt to be loaded in shear.

A review of the actual installation and of correspondence from the manufacturer confirmed that the bolts would not fail. The NRC review for Code compliance and of the detailed stress analysis for this item require further review. This item is considered open (456/85019-01; 457/85020-01).

- (4) The ASME Code, Section III, Subsection NF calls for locking devices on threaded connections on component supports. BCAP discrepancy CSR I-M-003-071-01 identifies loose lock nuts on a snubber. This is a potential deviation from Code requirements.
- (5) BCAP discrepancy CSR I-M-005-012-01 identified a piping elbow with ovality in excess of 8% (8% is the standard limit on ovality). The ASME Code, Section III allows evaluation of ovality in excess of 8%. This evaluation has been performed and was adequate.
- (6) BCAP discrepancy CSR I-M-006-077-01 concerns a "U bolt" type pipe support which had loose jam nuts and loose primary nuts. No engineering analysis of this condition was performed to determine the effect of this discrepancy.

Observations (1), (4) and (6) above have been determined not to be safety significant since the Braidwood QA program requires that a "final walkdown" of piping systems be performed to identify and correct discrepant conditions on piping supports and

restraints. The NRC review of the procedure for the "final walkdown" has not been completed. This is considered to be an open item (456/85019-02; 457/85020-02).

All of the issues contained in these observations (except the open items noted above) were resolved prior to the conclusion of the inspection. Excluding the open items, all the discrepancies reviewed were determined not to be safety significant. In addition, the procedures dealing with the dispositioning of the discrepancies were found to be functioning properly.

On August 14, 1985, an additional sample of the evaluations of "Mechanical" discrepancies were reviewed. These evaluations concern the effect of the discrepancies on the piping itself rather than the supports and the restraints. The discrepancy evaluations which were reviewed were as follows, and the sample selected was based on Large Strength Reductions:

- CSR I-M-002-040-01
- CSR I-M-002-095-01
- CSR I-M-005-048-01
- CSR I-M-009-076-01
- CSR I-M-009-080-01
- CSR I-M-009-114-02
- CSR I-M-009-019-02

The following samples were randomly selected:

- CSR I-M-001-029-01
- CSR I-M-003-024-01
- CSR I-M-009-071-01
- CSR I-M-012-092-01

In addition, the following calculations which analyze the effects of arc strikes on piping were also reviewed:

- BCAP-SU-0255
- BCAP-SU-0246
- BCAP-SU-0333 (stress level 96% of allowable)
- BCAP-SU-0350
- BCAP-SU-0335
- BCAP-SU-0337
- BCAP-SU-0325

The largest strength reduction found in the review was determined to be 54%. This reduction in strength was related to discrepancy CSR I-M-009-076-01. Due to the conservatism of the original design this discrepancy is not safety significant. None of the discrepancies in the second sample of "Mechanical"



discrepancies were determined to be safety significant. In addition, the procedures dealing with the dispositioning of the discrepancies in this area were also found to be functioning properly.

c. Review of Evaluations of Discrepancies in Conduit Hangers and Cable Tray Hangers

The following conduit hanger discrepancy evaluations were reviewed. They are listed by their BCAP discrepancy number and the S&L calculation which evaluated the discrepancy:

<u>BCAP No.</u>	<u>Calculation No.</u>
CSR I-E-COH-005-02	19.3.1.9.2
CSR I-E-COH-012-01	19.3.1.9.2
CSR I-E-COH-019-01	19.3.1.9.2.19
CSR I-E-COH-024-01	19.3.1.9.2.24
CSR I-E-COH-031-01	19.3.1.9.2.31
CSR I-E-COH-035-02	19.3.1.9.2.35
CSR I-E-COH-052-01	19.3.1.9.2.52
CSR I-E-COH-055-08	19.3.1.9.2.55
CSR I-E-COH-056-01	19.3.1.9.2.56
CSR I-E-COH-057-03	19.3.1.9.2.57
CSR I-E-COH-062-01	19.3.1.9.2.62
CSR I-E-COH-066-02	19.3.1.9.2.66
CSR I-E-COH-067-03	19.3.1.9.2.67
CSR I-E-COH-069-02	19.3.1.9.2.69
CSR I-E-COH-072-02	19.3.1.9.2.72

The following cable tray hanger discrepancy evaluations were reviewed. They are listed by their BCAP discrepancy number and the S&L calculation which evaluated the discrepancy.

<u>BCAP No.</u>	<u>Calculation No.</u>
CSR I-E-CPH-125-05	19.3.1.11.2.125, Revision 3
CSR I-E-CPH-129-04	19.3.1.11.2.129, Revision 2
CSR I-E-CPH-131-06	19.3.1.11.2.131, Revision 2
CSR I-E-CPH-134-06	19.3.1.11.2.134, Revision 2
CSR I-E-CPH-137-06	19.3.1.11.2.137, Revision 2
CSR I-E-CPH-142-03	19.3.1.11.2.142, Revision 2
CSR I-E-CPH-147-04	19.3.1.11.2.147, Revision 2
CSR I-E-CPH-155-03	19.3.1.11.2.155, Revision 2
CSR I-E-CPH-157-03	19.3.1.11.2.157, Revision 3
CSR I-E-CPH-164-02	19.3.1.11.2.164, Revision 2
CSR I-E-CPH-170-01	19.3.1.11.2.170, Revision 4

These discrepancy evaluations were reviewed for technical methodology, completeness and proper references. During the initial review of the calculations a number of observations were made. The observations were as follows:

- (1) The books containing the cable tray hanger discrepancy evaluations did not have titles or file numbers.
- (2) The BCAP discrepancy evaluations for CSR I-E-CPH-157-03 did not reference the correct calculation.
- (3) In the original discrepancy report for CSR I-E-CPH-157-03, the QC inspector initially determined that a crack existed in a weld. The same QC inspector subsequently changed the discrepancy report eliminating the mention of a crack in the weld. This weld will be inspected by the NRC to determine its condition. This is considered an open item (456/85019-03; 457/85020-03).

All of the issues contained in these observations (except the open item) were resolved prior to the conclusion of the inspection. Excluding the open item all the discrepancies reviewed were determined not to be safety significant. In addition, the procedures dealing with the dispositioning of the discrepancies were found to be functioning properly.

### 3. Open Items

Open items are matter which have been discussed with the licensee, which will be reviewed further by the inspector and which involves some action on the part of the NRC or licensee or both. Open items disclosed during this inspection are discussed in Paragraphs 2.b, 2.b.(3), 2.c.(3).

### 4. Exit Interview

The NRC inspector met with the licensee representatives (denoted under Paragraph 1) at the conclusion of the inspection on August 14, 1985. The inspector summarized the purpose and findings of the inspection. The licensee acknowledged this information. The inspector also discussed the likely informational content of the inspection report with regard to documents or processes reviewed during the inspection. The licensee did not identify any such documents/processes as proprietary.