

U. S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-456/84-14(DRS); 50-457/84-14(DRS)

Docket No. 50-456; 50-457

License No. CPPR-132; CPPR-133

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

Facility Name: Braidwood Station, Units 1 & 2

Inspection At: Braidwood Site, Braidwood, IL

Inspection Conducted: June 12-15, 20, and 21, 1984

Inspector: *W. J. Key*
W. J. Key

7/17/84
Date

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

7/17/84
Date

Inspection Summary

Inspection on June 12-15, 20, and 21, 1984 (Report No. 50-456/84-14(DRS); 50-457/84-14(DRS))

Areas Inspected: Special unannounced safety inspection to address allegations regarding deficiencies in the design and installation of the Braidwood HVAC systems. The inspection involved a total of 68 inspector-hours by one NRC inspector.

Results: No items of noncompliance or deviations were identified.

DETAILS

1. Persons Contacted

Commonwealth Edison Company(CECo)

- *G. E. Groth, Assistant Construction Superintendent
- *C. W. Schroder, Licensing & Compliance Superintendent
- *M. J. Wallace, Project Manager
- *R. J. Farr, Project Mechanical Supervisor
- *T. E. Quaka, Q.A. Superintendent
- *R. C. Bedford, Q.A. Engineer
- *S. J. Reutcke, Q.A. Engineer
- *J. Hawkinson, Mechanical Engineer
- *P. L. Barnes, Engineer

Pullman Sheet Metal Works (Pullman)

- *R. Lawler, Project Manager
- *T. Brooks, Corporate Q.A.
- *D. W. Grant, Q.A. Manager
- *R. W. Waterfield, Q.A. Engineer
- B. Ewald, Welding Engineer
- J. Lauden, Welding Engineer (S&L)

*Denotes those attending either the entrance or exit meetings or both.

2. Allegation

a. Background

On March 30, 1984, Individual A contacted the NRC Region III office and provided information regarding deficiencies with the installation of Heating, Ventilation, and Air Conditioning (HVAC) systems at Braidwood Station. Individual A stated that he had been an employee of Pullman, the HVAC contractor. The allegations listed below were provided by Individual A.

- . Employees were pushed to install metal without care for quality.
- . Craft personnel were not following Sargent and Lundy (S&L) requirements.
- . Pullman had only 3 or 4 QC inspectors, which were insufficient to properly cover the work.
- . Nonconforming conditions identified during final inspections were documented on Field Change Request (FCR) rather than on Nonconformance Reports (NR) and submitted to S&L requesting disposition of the as-built condition.

- . Some inspectors would tell craftsman to fix a nonconforming condition without documenting the inspection finding.
- . Certification of welders was improperly conducted. Welders were allowed to use excessive grinding on test coupons.
- . Some hanger welds were made without removing the galvanized coating.
- . Poor workmanship is indicated by the rework and repair work currently being performed.
- . A lot of hangers are distorted due to excessive heat.

b. NRC Review

In an effort to evaluate the allegations provided by Individual A, the contractor Quality Assurance programs past and present were reviewed. This included a review of the QA manual and procedures, installation documentation, drawings, interviews with personnel, observation of the present training and testing of welders, review of the inspector training and certification program, and observation of the present inspection program and repair program. Also the licensee's surveillance and audit reports, and 50.55(e) reports were reviewed.

In accordance with S&L Specification L-2782, the contractor's program for installation of the HVAC systems required inspection of only 10% of the HVAC installation. In November 1982, the contractor was instructed to develop a program and inspect 100% of the installed systems. The results of this inspection identified almost 2000 weld and other deficiencies. Repairs of the deficiencies started in May 1983. In July 1983, welding of all safety-related HVAC equipment was stopped. Work was resumed in November 1983, and stopped again in February 1984 to complete the repair work.

During the 1983 stoppage the contractor reorganized the site organization and erected a weld training and test facility and document control center. The contractor also started adding personnel to the inspection staff and other departments, revising all welding and site procedures and developing an adequate training program. The schedule for completion of all repair work is July 1984; however, it is doubtful that this completion date will be met due to S&L design changes.

The only new installation activity being performed is on the control room system. All other activity is repair and re-inspection of installed systems.

(1) Quality Assurance Program

The Pullman Quality Assurance program outlined in their QA Manual is written to meet the requirements of 10 CFR 50, Appendix B, ANSI N45.2.6, and S&L HVAC Specification L-2782. Pullman has no design responsibility for the HVAC systems.

The QA Manual addresses the criteria of 10 CFR 50, Appendix B, in the sections listed below.

- . Procurement Document Control.
- . Instructions, Drawings, and Procedures.
- . Document Control.
- . Control of Purchased Material, Equipment and Services.
- . Identification and Control of Materials, Parts, and Components.
- . Inspection.
- . Control of Special Processes.
- . Test Control.
- . Control of Measuring and Test Equipment.
- . Handling, Shipping, and Storage.
- . Inspection, Test, and Operating Status.
- . Nonconforming Materials, Parts, and Components.
- . Corrective Action.
- . Quality Assurance Records.
- . Audits.

(2) Procedure Review

Pullman's site procedures for installation of the HVAC systems were revised in the past year during the 100% re-inspection and repair program. They are presently being reviewed and revised to incorporate comments made by the licensee and AE reviews.

The procedures identified below were reviewed by the inspector:

- . B2.1F, Rev. 3, QC Personnel Qualifications.
- . B2.2F, Rev. 0, Housekeeping.
- . B3.1F, Rev. 3 & 4, Design Control.
- . B3.2F, Rev. 0, Drafting.
- . B5.1F, Rev. 3, HVAC Repair/Adjustment Procedure

- . B6.1F, Rev. 2, Document Control.
- . B8.1F, Rev. 1, Identification and Control of Materials, Parts, and Components.
- . B9.1F, Rev. 4, Welder Qualifications.
- . B9.2F, Rev. 2, Control of Weld Filler Metal.
- . B9.4F, Rev. 5, Installation Procedure.
- . B9.5F, Rev. 3, Coatings.
- . B10.1F, Rev. 3, Field Receiving Inspection.
- . B10.2F, Rev. 5, Visual Weld Inspection.
- . B10.3F, Rev. 5, Installation Inspection Procedure.
- . B10.4F, Rev. 1, Final Inspection.
- . B12.1F, Rev. 4, Equipment Calibration & Verification.
- . B13.1F, Rev. 1, Handling & Storage.
- . B16.1F, Rev. 3, Nonconformance/Corrective Actions.
- . B17.1F, Rev. 1, Quality Assurance Records

(3) Welding Procedure Review

Welding being performed by Pullman on the HVAC systems is in accordance with AWS D1.1 for auxiliary steel and D1.3 for sheet steel. The prequalified weld joint procedures of these codes are being used. In addition, other procedures have been qualified for use on site.

All welding procedures have recently been revised and are presently undergoing another revision to incorporate comments made by the licensee and AE during their review. The inspector reviewed the following procedures and the comments.

- . D1.1-F, Rev. 2, General Welding Procedure.
- . D1.3-F, Rev. 1, General Welding Procedure.
- . BF-12-F, Rev. 1, FCAW, dated 5/8/84.
- . BS-11F, Rev. 3, SMAW, dated 4/11/84.
- . BC-31F, Rev. 2, CAW, dated 1/5/84.

- . BF-31F, Rev. 1, FCAW, dated 1/5/84.
- . BF-32F, Rev. 1, FCAW, dated 4/3/84.
- . BG-11F, Rev. 1, GMAW, dated 1/5/84.
- . BG-31F, Rev. 0, GMAW, dated 7/9/83.
- . BG-32F, Rev. 1, GMAW, dated 1/5/84.
- . BG-33F, Rev. 0, GMAW, dated 7/9/83.
- . BG-34F, Rev. 0, GMAW, dated 7/9/83.

(4) QC Personnel Record Review

As was alleged, Pullman did not have enough QC inspectors to adequately cover HVAC installation activities prior to the 100% reinspection and repair program now in effect; there were only seven QC inspections. Pullman now has twenty-two inspectors and is trying to hire five more qualified inspectors. The allegation that Pullman didn't have enough QC inspectors has been substantiated.

The certification records of the following inspectors were reviewed:

<u>Name</u>	<u>Level</u>	<u>Discipline</u>
. R. Edgett	II	Mech. Visual Welding Material Insp.
. B. Waterfield	II	Mech. Material Inspection
. T. Ross	II	Visual Welding, Mech. Material Insp.
. D. McCollough	II	Visual Weld, Mech. Material Control
. K. Diederich	II	Visual Weld, Mech. Material Control
. S. Brow	II	Visual Weld, Mech. Material Control
. L. Kech	II	Visual Weld, Mech. Material Control

The above inspectors were onsite working for Pullman during the time frame of the allegations. The following inspectors have recently been added to the staff:

.	R. Madara	II	Visual Weld, Mech. Material Control
.	D. Proffett	I	Visual Weld, Mech. Material Control
.	J. Serafine	II	Visual Weld, Mech. Material Control
.	C. Rowe	II	Visual Weld, Mech. Material Control

The review of QC inspectors certification records verified that the inspectors are presently being trained in accordance with the requirements of Pullman procedure B2.1.F. This procedure meets the requirements of ANSI N45.2.6. As revisions to procedures are approved for use, personnel are being trained or instructed to read the revised procedures.

(5) Welder Certification Review

Prior to erection of the present weld test facility, Pullman did not have a welder training program. Welders were hired from the Union Hall and tested in the power block of the plant or at another contractor's facility when they were available.

In October 1983, the present weld training and testing facility was erected. The inspector examined the facility and observed two welders being tested for certification. The inspector also examined completed test coupons awaiting examination and testing by Pittsburgh Testing Laboratory (PTL). The inspector also interviewed the welding engineer and inspector assigned to the facility.

Sheet metal and structural steel weld test coupons are prepared at Pullman's offsite fabrication plant and shipped to the site. Material traceability numbers are stamped on structural steel, and on sheet steel with marking pens. When a welder is brought into the facility for certification or recertification, he is instructed in the procedure to be used. When the welder feels he is ready to be tested the welding machine is zeroed by the welding engineer. The coupon is then given to the welder who sets the machine in accordance with the procedure. Once the coupons are in place and welding started, the coupons are not permitted to be moved until welding is complete. Welders being tested are not issued grinders; should a weld need grinding the welder has to check out a grinder from the tool issue station. The completed test coupon is sent to PTL for visual examination and a thickness measurement; having passed it is returned to the welder who will remove the backing plate and cut the required sections for testing by PTL.

Pullman's welder certifications are maintained on computer printout that is upgraded each week and distributed to the welding engineers and foreman. As welders are needed, they are selected from the printout. Welder original certifications are maintained in the QC vault.

The welder qualifications listed below were reviewed:

<u>Name</u>	<u>Stamp No.</u>	<u>Process</u>
S. Lawrence	4	SMAW
L. Yarno	14	SMAW/CAW
J. Morris	5	FCAW/GMAW
J. Crosman	18	SMAW/CRW
M. Kerr	20	GMAW/SMAW
L. Lamie	21	SMAW
R. Kelleher	23	SMAW/CAW
J. Weaver	42	FCAW/GMAW
C. Paris	51	FCAW/SMAW/CAW
B. Hubert	73	SMAW/CAW
J. Trimby	81	FCAW/GMAW/SMAW/CAW
C. Hinich	87	SMAW/CAW
J. Hrpcha	93	FCAW/SMAW
C. Triplett	98	SMAW/CAW
W. McElroy	126	SMAW/CAW
D. Majesky	128	SMAW
M. Moranski	149	FCAW/SMAW/CAW

(6) Audit Report Review

Audits of Pullman by the licensee indicate that some problems with their installation activities have been identified and corrective actions taken. The following audit reports of Pullman were reviewed:

- . Audit Report No. QA-20-84-505
Date - 1/24/84 through 2/1/84
- . Audit Report No. QA-20-84-514
Date - March 12 through 16, 1984
- . Audit Report No. QA-20-83-29
Date - June 13 through 15, 1983
- . Audit Report No. QA-20-83-12
Date - March 14 through 18, 1983
- . Audit Report No. QA-20-83-63
Date - December 7 through 9, 12, 13, 1983

(7) Nonconformance Report Review

At present there are 15 outstanding licensee nonconformance reports against Pullman. These NCR's resulted in the licensee submitting a 50.55(e) report to the Commission, conducting a 100% reinspection and repair program, and stopping new HVAC installation until completion of the repair program.

The following NCR's were reviewed:

- . NCR No. 349 - Hanger welds do not meet drawing requirements.
- . NCR No. 353 - Welds do not meet detail drawing requirements.
- . NCR No. 355 - Welds on tie rods are not in accordance with detail drawings.
- . NCR No. 377 - Hangers and auxiliary steel were fireproofed prior to inspection. 138 hangers, 126 pieces auxiliary steel.
- . NCR No. 384 - Defective fusible links on fire dampers supplied by American Warming & Ventilation Company.
- . NCR No. 388 - Dampers supplied without approved details.
- . NCR No. 391 - Welding was not in accordance with approved procedure.
- . NCR No. 407 - Hanger installation did not meet S&L fit-up criteria, FCR-L-7741 resulted.
- . NCR No. 460 - Installation of hangers, braces, and auxiliary steel is not in accordance with approved detail drawings. 900 hangers.
- . NCR No. 477 - Plenum panels were welded without an approved procedure. Procedure was revised to include 14 gauge material.
- . NCR 483 - Insulated duct in upper cable spreading room unable to be inspected.
- . NCR 484 - Attachments for duct supports fire proofed prior to configuration inspection.
- . NCR No. 515 - Angle iron installed using concrete expansion anchors without installation - inspection requirements.
- . NCR No. 540 - Duct fittings fabricated without S&L or vendor documentation.
- . NCR No. 545 - Welding of stiffeners does not meet approved drawing or Pacific Air Products inspection procedures.

. NCR No. 558 - Welders failed to stamp their welds.

These nonconformance reports and discussions with personnel indicate that much of the welding on the HVAC systems did not meet specification or Code requirements, that welding symbols on the drawings were misinterpreted and that inspections were not performed in a timely manner and, in many cases, not at all.

Pullman NCR Review

The inspector reviewed the Pullman open and closed NCR's listed below:

Open NCR's

No. BR-83, 5/25/84, Backup plates not installed per detail.

No. BR-81, 5/25/84, Anchor bolt slippage of more than (1) diameter.

No. BR-78, 5/25/84, Damper blank-off seal angles not per detail.

No. BR-75, 5/24/84, Hanger No. S-1350 not installed per approved detail.

No. BR-74, 4/24/84, Hanger No. S-1349, Legs not installed per S&L drawing.

No. BR-72, 5/24/84, Hangers No. S-1506 & S-1505 not installed per detail.

No. BR-70, 5/24/84, Hanger No. S-2311, Legs not per detail on drawing No. M-1261-7.

No. BR-67, 5/21/84, Anchors installed too close to embed plates.

No. BR-65, 5/17/84, Welding of A-515 Cr. 70 material with unqualified procedure.

No. BR-64, 5/17/84, Damper No. OVC32Y dropped and damaged.

No. BR-63, 5/15/84, Hanger No. S-1896, Installation instructions not followed.

No. BR-62, 5/11/84, Attachment welding on hanger No. S-3650 exceeds drawing detail.

No. BR-57, 4/24/84, Proper preheat not used on hanger brace No. S-6759.

No. BR-56, 4/18/84, Hanger No. S-1624, Installation not in accordance with drawing M-1261-7 detail.

No. BR-54, 4/16/84, Hanger No. S-3245, Installation not in accordance with drawing detail.

No. BR-53, 4/11/84, Hangers No. S-1924, S-1923, S-1921, S-1920, Welded transverse across flange of beam.

No. BR-50, 12/12/83, Elbow No. 6666, on drawing No. 1317-2, 3/8" plate welded to 16 gage sheet.

Closed NCR's

No. BR-48, 10/26/83, Melt rate of WPS-BC-31F violated, closed 12/1/83.

No. BR-46, 10/5/83, Access doors do not meet minimum size, closed 2/24/84.

No. BR-34, 11/3/82, Welds exceed max. length. FCR-1-6459, closed 5/19/83.

No. BR-30, 9/13/82, Continuous weld where 1" on 9" centers required, FCR-L-4933, closed 10/20/82.

No. BR-29, 8/26/82, No detail on any S&L drawing. FCR-L-5003, closed 6/1/83.

No. BR-27, 7/14/82, Column size change. FCR-L-4911, closed 3/14/83.

No. BR-26, 7/16/82, Hanger brace not per approved detail. FCR-L-4955, closed 3/18/83.

No. BR-21, 4/1/82, Installed penetration could not be used. FCR-L-4179, closed 7/20/82.

(8) 50.55(e) Report Review

At present there are five 50.55(e) reports that have resulted from HVAC installation activities.

- . Report No. 82-01. Deficiencies with HVAC shop and field welded supports.
On September 9, 1982, the licensee reported that all necessary field modifications would be complete prior to fuel loading.
- . Report No. 82-02A. Fusible links on fire dampers were not as required.
Inspections and replacement of the links were completed on January 9, 1984.
- . Report No. 83-01. Installation of hangers, braces, and auxiliary steel was not in accordance with approved design drawings.

On March 1, 1983, the licensee reported that the backfit program established would be complete prior to fuel loading.

Report No. 83-08. Fabrication of duct fittings without approved documents.

Inspection of installed duct fittings is expected to be complete by September 1, 1984.

Report No. 84-08. Liner plates for auxiliary building ventilation filter exhaust housings, reactor containment fan cooling housing, and 84" diameter return air risers may not have been installed in accordance with design drawings and S&L specification.

This report was phoned into the Region III office on June 5, 1984. The licensee is still investigating to determine if this is reportable. (30-day report due July 5, 1984).

c. NRC Findings

- (1) "Employees were pushed to install metal without care for quality." While it could not be determined that employees were being pushed to install metal without care for quality, the inspector has determined that prior to Pullman's site reorganization their QA program did not meet specification or NRC requirements. The 100% reinspection program identified many deficiencies in the installed equipment. Part of this allegation was substantiated.
- (2) "Craft personnel were not following S&L requirements." Most craft personnel are not made aware of the design specification requirements except through the contractor's procedures developed to meet these requirements. The inspector has determined that although installation procedures may have been followed, they did not meet the design specification nor was there an adequate training program. This allegation has been partially substantiated.
- (3) "Pullman had only 3 or 4 inspectors, which was insufficient to properly cover the work." During the period referred to, Pullman had 7 QC inspectors. However, some of these inspectors were assigned to document control and other positions. Even with having to inspect only 10% of the installation, the QC department staff was inadequate and was not able to perform the required inspections. This allegation was substantiated.
- (4) "Nonconforming conditions identified during final inspections were documented on FCR's rather than on NR's, and submitted to S&L for approval of the as-built condition." Under Pullman's earlier program when conditions not meeting design drawings were encountered or approved drawings had not been received, Pullman continued with installation documenting the installation on a Field Engineering Memo (FEM). The FCR form was used as the FEM and submitted to S&L identifying the nonconforming condition and requesting disposition. If the FEM was disapproved, an NR and an FCR were submitted to S&L. This allegation was substantiated.

- (5) "Some inspectors would tell craftsmen to fix a nonconforming condition without documenting the inspection finding." It appears that some craftsmen were instructed to remove weld slag, spatter or paint in order for the inspector to perform his inspection. During inprocess inspections, when a discrepancy is found that can be repaired using approved procedures, it is not considered an item of noncompliance. This allegation was not substantiated.
- (6) "Certification of welders was improperly conducted. Welders were allowed to use excessive grinding on test coupons." While there is nothing in the AWS Welding Code addressing "excessive grinding" on test coupons, should a welder have to use a grinder often in order to complete an acceptable weld, it would be an indication that he may not be able to make production welds that meet the requirements of the welding code being used. Prior to 1983 and the erection of the present training and test facility, Pullman had no welder training program. Welders were hired from the Union Hall. An area within the power block was used to test the welder, or when available one of the site contractor's test facilities was used. Pullman's welder certification program did not meet the requirements of the AWS D.1.1, 1979 Welding Code. This allegation was substantiated for reasons other than those alleged.
- (7) "Some hanger welds were made without removing the galvanized coating." Some welds were made without removing the galvanized coating; however, it could not be determined which welds. Some welding processes do not require the removal of galvanized coatings prior to welding. While this allegation may be true, it could not be completely substantiated.
- (8) "Poor workmanship is indicated by the rework and repair work currently being performed." The 100% reinspection of installed HVAC equipment identified almost 2000 deficiencies with welding, and hanger and duct installation. A repair program was developed to repair or replace items identified. All new installation activities have been stopped except in the control room HVAC system until all repairs have been completed. This allegation was substantiated.
- (9) "A lot of hangers are distorted due to excessive heat." The inspector examined installed hangers in both units. No distorted hangers were noted. Most welds performed during installation of the HVAC systems are fillet welds. Many of these are stitch welds rather than full penetration welds. It would be rather difficult to distort the thicker materials; some sheet metal ducting is distorted. However, this will not affect the safety of the system. This allegation could not be substantiated.

d. Conclusions

This inspection into alleged deficiencies with the installation of the HVAC system made by individual A during his period of employment at

Braidwood Station resulted in seven of the nine allegations being substantiated. However, these conditions no longer exist. The 100% reinspection program identified many of these deficiencies and led to the work stoppage and repair program currently in progress. The reorganization of Pullman's site organization, the new QA and training program and the revision of all installation procedures to meet the design specification and regulatory requirements are considered acceptable. Pullman's present program for installation of the HVAC systems will meet these requirements.

3. Exit Meeting

The inspector met with licensee representatives (denoted in Persons Contacted) at the close of the investigation on June 21, 1984. The scope and findings of the investigation were discussed.