U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-456/85059(DRS); 50-457/85055(DRS)

Docket Nos. 50-546; 50-457 Licenses No. CPPR-132; CPPR-133

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

Facility Name: Braidwood Station, Units 1 and 2

Inspection At: Braidwood Site, Braidwood, IL

Inspection Conducted: December 17-18, 31, 1985; January 2, 9-10, 14, 21, 23-24; and February 4, 10, 19-20, 1986

Inspector: J. M. Jacobson 3/5/86
Date

Approved By: D. H. Danielson, Chief
Materials and Processes
Section 3/5/86
Date

Inspection Summary

Inspection on December 17-18, 31, 1985; January 2, 9-10, 14, 21, 23-24; and February 4, 10, 19-20, 1986, (Reports No. 50-456/85059(DRS); 50-457/85055(DRS))
Areas Inspected: Unannounced, special safety inspection of licensee action relating to previous inspection findings concerning welding activities and HVAC construction. This inspection involved a total of 98 inspector-hours by one NRC inspector.
Results: No violations or deviations were identified.

DETAILS

1. Persons Contacted

Commonwealth Edison Co. (CECo)

*M. J. Wallace, Project Manager
C. W. Schroeder, Superintendent Licensing
*D. Shamblin, Project Construction Superintendent
J. Dierbeck, Project Field Engineer
*P. Barnes, Project Licensing
*W. Vahle, Project Field Engineering Manager

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

*Denotes those attending the final exit interview at the Braidwood Station on February 20, 1986.

2. Licensee Action on Previous Inspection Findings

a. (Closed) Violation (456/84021-02; 457/84020-02): Failure to perform final "visual" weld inspections. Full penetration structural welds performed by G. K. Newberg (G.K.N.) under Sargent and Lundy (S&L) Specification F/L-2722 prior to May 1, 1984, were accepted based on ultrasonic examination (UT), liquid penetrant examination (PT), and magnetic particle examination (MT) only. The licensee's FSAR, Volume 7 and S&L Specifications F/L-2722 commit to AWS D1.1, 1975 Structural Weld Code for this work. The Code requires that a visual examination for weld quality including the elements of size, location, length be performed and that no unspecified welds were added. Though PT and MT examinations are essentially enhanced "visual" examinations, they do not necessarily include the elements required by the AWS code.

As stated in the licensee's FSAR, deviations from portions of the AWS D1.1 code may be made based on engineering evaluations. To this end, CECo issued NCR No. 616 requesting S&L to evaluate this weld examination issue.

The NRC inspector reviewed S&L evaluations dated July 5, 1984, and October 25, 1985, CECo QA surveillance Report No. 3910, S&L Specification F/L-2722, Revision 36, and G.K.N. Procedure No. 55, Revision 2. The S&L Specification and G.K.N. procedure have been revised to clarify the requirements for a visual inspection. The NRC inspector agrees with the conclusion to "use-as-is" those welds examined by alternate methods based on the engineering evaluations performed.

b. (Closed) Violation (456/84-34-03; 457/84-32-03): Failure of the piping contractor, Phillips Getschow Co. (PGCo), to have an approved AWS D1.1 code visual weld examination procedure. PGCo Procedure VE-01, Revision 2, contained ASME and ANSI B31.1 criteria only.

The S&L specification F/L-2739, Amendment 6, dated July 5, 1977 established the applicable codes for pipe supports. Specifically, Form 275-C, Article 2.1 states that S&L pipe class "A", "B" and "C" supports are to be in accordance with ASME, Section III, while S&L pipe class "D" supports are to be in accordance with ANSI B31.1. Article 2.2 states that S&L class "N" or "W" supports are to be in accordance with the AISC Manual of Steel Construction and AWS D1.1.

Though the S&L drawings do not explicitly identify code specified examination requirements, they do identify the applicable S&L pipe class. Since S&L class "N" or "W" piping/supports are not used at Braidwood, piping and supports not specifically designated as ASME are therefore to be in accordance with ANSI B31.1.

At the time of the inspection documented in Inspection Report No. 50-456/84034, NRC interviews with several PGCo weld inspectors indicated that all safety related welds were being inspected to the ASME criteria even though the procedure contained ANSI B31.1 criteria also. Since the ASME criteria meets or exceeds the B31.1 criteria, inspection of all support welds to ASME is acceptable.

In an effort to alleviate any inconsistency associated with pipe support weld inspections, PGCo has revised Procedure VE-01 to include inspection criteria to only the ASME Code.

c. (Closed) Violation (456/83009-07(b); 457/83009-07(b)): Inadequate corrective action concerning the acceptance of HVAC welds performed by unknown welders and failure to trend Correction Notices.

Pullman Sheet Metal (PSM), the HVAC contractor, dispositioned Nonconformance Report No. BR-08, dated June 15, 1981, "accept-as-is" after a visual examination of the 52 welds in question. The licensee response to this violation dated April 25, 1985, committed to replacement of the welds if welder identification could not be established by physical markings or records traceable to the welds.

The NRC inspector reviewed CECo QA Surveillance Report No. 5429, dated January 20, 1986, performed a representative sample inspection of the 52 weld inspections, and verified that the corrective action has been completed. During review of this issue, it was noted that PSM had since identified additional welds for which no welder identification had been found. These welds were documented on CECo NCR No. 558 and likewise will be replaced if the welder identification cannot be established. Disposition of CECo NCR No. 558 will be tracked by the NRC as Open Item 456/85059-01.

PSM had used Correction Notices as the vehicle to document and disposition minor discrepant items since December 1980. Significant hardware problems were documented, analyzed, and dispositioned using the PSM Nonconformance System. The PSM Quality Assurance program did not require that Correction Notices be evaluated for adverse trends. The trending of Correction Notices would serve to aid in identifying programmatic problems which might require corrective action.

In response to the violation, PSM performed a trend analysis on all existing Correction Notices. No significant adverse trends were identified; however, the trend analysis did lead to some procedural revisions and increased training of personnel. PSM has continued to perform trend analysis on Correction Notices since August 1983 and has implemented Procedure B15.1.F entitled "Trending" to establish the method for identifying and documenting adverse trends for management evaluation. The NRC inspector reviewed the corrective actions taken and considers this item closed.

d. (Closed) Unresolved Item (456/85023-03; 457/85024-03): Repair of holes in HVAC duct. During the course of construction, duct insulation is occasionally removed. The insulation is held in place by spot welded retainers. When these retainers are removed, often a small hole is torn in the duct. The Pullman Sheet Metal (PSM) HVAC Repair/Adjustment Procedure B5.1.F, Revision 3, while allowing for repair, did not specifically define the method or limitations of repair.

The NRC inspector reviewed the PSM Installation Procedure B9.4.F, Revision 12, which now contains the instructions for repair of small holes. Since specific repair methods, dependent on hole size as well as limitations of repair are adequately described in this procedure, this item is considered closed.

e. (Closed) Open Item (456/84036-01): The HVAC Contractor Pullman Sheet Metal (PSM) did not provide for redrying of low hydrogen welding electrodes in accordance with the AWS D1.1 code. The AWS code requires that low hydrogen electrodes, when exposed to the atmosphere for periods in excess of four hours be redried at a temperature of 450° F to 500° F for at least two hours. The PSM proceudre B9.2.F "Control of Welding Filler Metal" allowed for redrying of electrodes at 250° F for 10 hours.

Procedure B9.2.F, Revision 4, was revised to reflect the redrying conditions required by the AWS code. A review of records performed by PSM showed that electrodes exposed to the atmosphere for periods in excess of four hours were destroyed and that no redrying was performed at the Braidwood site. The 250° F temperature for 10 hours was used to recondition electrodes which had been exposed less than four hours. The use of this reconditioning process for electrodes exposed for less than four hours is technically acceptable. Based on the procedure revision to B9.2.F, and a review of past practice with regard to electrode redrying, this item is considered closed.

3. Inspection of HVAC Braze Joint Cracking

Commonwealth Edison NCR No. 6006 was issued to resolve the issue of cracking observed on the inside of some heating ventilation, and air conditioning (HVAC) ducts. Cracks were found on the inside of ducts at locations where exterior silicon bronze braze joints were used to attach the duct to its hanger. These braze joints were made using the carbon arc welding process (CAW).

In an effort to establish the extent of the cracking issue, the licensee examined the interior duct surface of 60 hanger locations encompassing 767 individual braze joints. From this sample, it was found that 9% of the joints contained cracks on the interior surface of the duct.

The cracking is associated with localized melting of the duct material due to excess heat input during the brazing process. The mixture of molten duct material (steel) and the silicon bronze braze material cracks upon cooling due to the large temperature difference in the melting points.

To assess the effect of these cracks on the installed ductwork, the licensee performed testing on duct segments containing cracks selected from the plant. The duct segments were removed, blanked off, restrained longitudinally, and subjected to a negative internal pressure in order to induce membrane tensile stress in the sheet metal. A detailed analytical model was developed to predict the state of stress for the test conditions. This model used a large deformation static elastic analysis with the ADINA computer program. This analysis indicated that the maximum longitudinal membrane stress near the welds reached the yield value at a negative pressure of about 30 inches of water. During the actual test, no crack growth was observed until a pressure of about 45 inches of water was obtained.

The results of the testing indicates that the cracks do not propagate in a brittle manner and that the sheet metal, even with cracks present, can be stressed substantially beyond the elastic limit with minor crack growth.

The NRC inspectors reviewed the S&L "Engineering Evaluation of Cracks in Silicon Bronze Welds," Report No. SAD-464, Revision 2, the supporting computer analysis and strength reduction calculations, and visually inspected a sample of the duct welds. Based on this review and the conclusion that design stresses remain within code allowables even with cracks present.

No violations or deviations were identified.

4. Exit Interview

The inspector met with licensee representatives (denoted in Paragraph 1), on February 20, 1986, and summarized the scope and findings of the inspection. The inspector also discussed the likely informational content of the inspection report with regard to documents or processes reviewed by the inspector. The licensee did not identify any such documents or processes as proprietary.