U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Reports No. 50-456/86013(DRS); 50-457/86011(DRS)

Docket Nos. 50-456; 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 & 2

Inspection At: Braidwood Site, Braidwood, IL

Inspection Conducted: March 12-13, 18-20, 25-27, April 30, and May 1, 6-8, 1986,

Inspectors: J. M. Jacobson 6/2/86
Date

D. E. Jones for 6/2/86
Date

J. A. Gavula 6/2/86
Date

Approved By: D. H. Danielson, Chief
Materials and Processes
Section 6/2/86
Date

Inspection Summary

Inspection on March 12-13, 18-20, 25-27, April 30, and May 1, 6-8, 1986, (Report No. 50-456/86013; 50-457/86011(DRS))

Areas Inspected: Unannounced, special inspection of the resolution of previous inspection findings; 50.55(e) deficiency reports; and followup on allegations.
Results: No violations or deviations were identified.

DETAILS

1. Persons Contacted

Commonwealth Edison Company (CECo)

*C. W. Schroeder, Assistant Superintendent
*P. L. Barnes, Regulatory Assurance Supervisor
*D. L. Shamblin, Project Construction Superintendent
*G. E. Groth, Assistant Construction Superintendent
C. Gray, Project Structural Supervisor
M. Gorski, Field Construction Engineer

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

*Denotes those attending the exit interview at the Braidwood Station on May 8, 1986.

2. Licensee Action on Previous Inspection Findings

a. (Closed) Violation (456/84021-08; 457/84020-08): Failure to design and install a reactor coolant pump lateral support anchorage in accordance with applicable codes.

During the installation of the reactor coolant pump lateral supports in 1980, an interference problem was discovered in that an existing box beam prevented the support brace from being bolted to an embed. This problem was documented on Field Change Request (FCR) No. 506. A design change was initiated by S&L to correct the installation problem. The new design called for a steel plate to be welded to the bottom of the box beam, and for the support brace to be bolted to this plate.

The licensee contended that certain requirements discussed in the Notice of Violation do not apply as the subject installation is not within the jurisdictional boundary of the ASME Code. The NRC inspector reviewed the documentation and agrees that the installation in question is outside of the jurisdictional boundary of the ASME Code, Section III, Subsection NF. This jurisdictional boundary is drawn in accordance with Code guidelines to separate that portion of a component which is to be built in accordance with the ASME Code from that portion which is considered structural building steel and built to the AISC. This boundary is usually drawn at a bolted or welded connection.

Upon review of the documentation, the NRC inspector found that the subject lateral support plate material had been installed without Charpy impact and bend tests as required by FCR No. 506 and that welder identification could not readily be established by records.

To address the lack of compliance with FCR No. 506 with regard to material testing, the licensee issued NCR No. 661. The NRC inspector reviewed NCR No. 661 and the associated Engineering Change Notice

(ECN) No. 23836. This ECN deleted the requirements for Charpy impact and bend tests which were required on FCR No. 506. Apparently the additional testing requirements were overlooked when this plate steel was ordered due to the fact that this material, when used for structural members, does not require these tests per S&L Specification L2735 (Structural Steel). The deletion of these requirements is technically acceptable considering the fracture toughness of this material (ASTM A588) and the service application. The service application of this material is such that the stress level is very low, and the service temperature is well above that at which brittle fracture of this material will occur.

The welder identifications were established by the licensee and the NRC inspector reviewed the qualifications of the welders. The welders were found to be properly qualified in accordance with the requirements of the AWS D1.1 Structural Welding Code.

The inspector reviewed the licensee's Purchase Order, Material Receiving Report, and Certified Material Test Reports for the plate material and found the documentation acceptable.

The design modification was initiated, reviewed and approved in accordance with the licensee's QA program. The installation was performed in accordance with the structural steel contractor's approved quality program with the exception that the welders did not place their identifying stamp on the welds. The welders have been identified and their qualifications are acceptable. NCR No. 661 adequately addressed the issue concerning the failure to perform Charpy impact tests on the plate material. Based on the licensee's corrective actions, this item is considered closed.

b. (Closed) Violation (456/84034-01; 457/84032-01): Broken shop installed HVAC companion angle to duct silicon bronze welds.

The licensee conducted a silicon bronze weld sample test program to provide confirmation of the adequacy of installed shop welds. The sample program consisted of tensile tests on 60 weld joint samples removed from shop fabricated duct pieces. Based on the tensile test results, an average weld strength of 4200 lbs with a standard deviation of 1525 lbs was obtained. From this data, weld strength with 95% confidence of 95% reliability was calculated.

An engineering evaluation was performed for 153 highly stressed duct spans using the 95/95 weld strength value. It was determined from this evaluation that design forces do not exceed this weld strength value for any of the 153 highly stressed duct spans. An additional evaluation was performed with the assumption that one weld on the duct piece was broken. Again the design forces did not exceed the calculated weld strength value.

To provide additional assurance, time history analysis was performed on eight duct systems. For this evaluation, the weld forces obtained using the time history analysis were compared to the weld forces from

typical conservative design methods. This evaluation demonstrated that load reductions averaging 37% were achieved as compared to typical design methods.

To provide assurance that no broken silicon bronze welds remain in the installed HVAC system, the licensee is performing a 100% reinspection of the companion angle to duct welds. The performance of this reinspection will be reviewed by the NRC and tracked as Open Item 456/86013-01.

Based on the above testing, inspections, and evaluations, this violation is considered closed.

c. (Closed) Violation (456/84-08-02; 457/84-08-02): The licensee did not take appropriate corrective action for an identified audit deficiency in that assessment of potential impact on work performed prior to the audit was not documented. CECo Audit No. QA-20-80-22 dated July 10, 1980, stated that in-process inspections of multi-pass welds were not documented by Napoleon, the structural contractor. The licensee closed this audit item based on QA Surveillance No. 1482 which did not clearly address work previously performed. As a result of this violation the licensee issued NCR No. 636 to evaluate and resolve the question of acceptability of previous multi-pass welding.

This report will address the NRC inspection effort with regard to the technical issue concerning the lack of documented in-process welding inspections. The more general issue concerning the licensee's practice with regard to addressing past work when closing audit items is addressed in NRC Inspection Report No. 50-456/85058; 50-457/85054 as item 456/84-07-06; 457/84-07-06.

The NRC inspector reviewed CECo NCR No. 636 and the S&L evaluation of this NCR. Full penetration groove welds performed by Napoleon were ultrasonicly tested. Partial penetration groove welds were examined using magnetic particle testing on the root and cover pass. These methods of NDE serve to identify defects located beneath the weld surface. Less critical fillet welds do not require an examination beneath the surface and are visually inspected only. Based on the weld examinations performed and the limited QC monitoring of the welding activities, the S&L evaluation recommended acceptance of all previous welding.

The inspection report quotes CECo Audit No. QA 20-80-22 as stating that in-process inspections for such items as pre-heat, interpass temperature, position, weld bead layering and interpass cleaning were not documented. The purpose of preheating thick materials before welding is to reduce the cooling rate to avoid cracking. Lack of a documented preheat inspection is technically acceptable based on two reasons. First, any cracking caused by a lack of preheat would be found during the weld inspection. Secondly, CECo site contractors have since qualified welding procedures for thick weldments without preheat and have demonstrated that these materials can be successfully welded without preheating. Interpass temperature

restraints are typically place on stainless steel welding and do not apply to the structural steel welding. The Napoleon welders were qualified to weld in all positions and the electrodes used were all position electrodes. Therefore, an in-process inspection of welding position is not warranted. Weld layering is not an essential variable for structural steel welding and is typically a question of technique attributed to the individual welder. Since all welders were tested and qualified per the Code requirements, they have demonstrated an ability to perform acceptable welds. Inter-pass cleaning is an inherent part of welding and again demonstrated by qualification.

Based on the above discussion, and actual weld examination practice, the closure of this item is technically acceptable.

d. (Closed) Violation (456/83-09-10a; 457/83-09-10a): Failure to properly control the HVAC production welding process.

A comprehensive review of Pullman Sheet Metal (PSM) welding activities and related procedures to evaluate the technical adequacy of both ongoing and past welding activities was performed. This review is documented in NRC Inspection Report No. 50-456/84-36; 50-457/84-34. In general, the welding procedures, both current and superseded, had been properly qualified and were found acceptable.

A sample of welder qualifications were reviewed and found to be in compliance with applicable Code requirements. In addition, approximately 10% of the welders onsite were selected to demonstrate their welding proficiency. The NRC inspector selected the weld joint configuration, welding procedure, position and material thickness for all demonstrations. The NRC inspector observed the welding and subsequent testing of the weld coupons. This demonstration established that the welders possessed adequate skills and that the selected welding procedures were adequate to result in quality HVAC welding.

A sample of documentation packages were reviewed to ascertain the implementation and effectiveness of PSM Weld Procedure B9.4.F. As a result of this review, it was determined that the traveler system incorporated by this procedure is an effective means of controlling the installation of HVAC components. In addition, the NRC inspector reviewed the current PSM surveillance requirements for in process welding inspections and found them to be adequate in scope and frequency.

The licensee conducted a weld sample test program to provide confirmation of the adequacy of past and HVAC welding activities (HVAC Weld Testing Report SL 7000). The sample program consisted of tensile tests on 82 welded joint samples removed from the HVAC construction at the Braidwood Station. Approximately 60% of the tests showed yielding or fracturing of the base metal prior to attaining a load which would cause any failure of weld metal. These test results demonstrate that the capacity of the weld exceeds the capacity of the base metal and thus confirms that the welds are structurally adequate. Of the remaining 40% of the tests, the "least squares

ratio" of test load to design load was 1.69 with no individual test yielding a ratio less than 1.50. These results indicate the capacity of these welds substantially exceeds design requirements.

In addition, the licensee performed a similar sample test program on silicon bronze field braze joints. The test results and engineering evaluation of these results demonstrate that the field braze joints are of adequate quality and meet design requirements. The program and results are documented in "HVAC Silicon Bronze Field Weld Testing Report SL 7012."

In conclusion, PSM's present installation program with regard to controlling the welding process was found to be adequate. In addition, the welding performed prior to the revision of PSM Procedure B9.4.F was found to be of adequate quality based on the NRC inspector's review of past welding practices, the weld sample test program, and a visual examination of more than 500 HVAC welds.

e. (Closed) Unresolved Item (456/84-043-03; 457/84-39-03): The standard assumption for the effective throat on tube steel flare bevel grove welds is invalid since the outside corner radius is sometimes less than the assumed "twice-the-thickness" (2T) dimension. This item was originally part of the Byron ASLB Hearings and was deemed applicable to Braidwood. The Byron portion of this item was closed in NRC Inspection Report No. 50-454/84-71 and 50-455/84-49. Resolution of this item will also close Braidwood Allegation No. RIII-84-A-142.

A statistical evaluation was performed on all of the installed tube steel supports using standard statistical sampling procedures. Sargent and Lundy (S&L) Calculation No. 19.I.12 "Flare Bevel Groove Welds-Probability Distribution Analysis" dated March 8, 1985, documents the results of this work. Tube steel radius measurements were taken from each contractor's work at the Braidwood site. Based on the 1,970 measurements taken, a mean radius of 2.0848T and a standard deviation of 0.2498T were determined, where "T" is the nominal tube wall thickness. Using this information, new weld specimens were machined with 1.83T radii (mean radius minus one standard deviation). Each contractor then requalified their flare bevel groove weld procedures. The Procedure Qualification Records (PQR) for Comstock, Newburg, Phillips-Getschow and Pullman were reviewed and found to meet or exceed the specified effective throat.

In most cases the specified effective throat was 1T. On this basis, instead of obtaining the American Institute of Steel Construction's (AISC) suggested effective throat of 0.3125R, where "R" is the groove radius, an effective throat of 0.546R or greater was obtained. Using these results it can be seen that the AISC suggested effective throat is conservative and in this case conservative by a factor of more than 1.5.

A random sample of 24 previous PQR's for several contractors was also reviewed by the NRC inspector. Although no outside radius measurements were recorded and the correlation between effective throat and outside radius is less definitive, there were no instances where the

effective throat was less than 5/8T. Even assuming the worst case of a 3T radius, the majority of the PQRs exceed the AISC assumed effective throat.

In addition to the new PQR verification, S&L reviewed calculations for all the Heating Ventilating and Air Conditioning (HVAC) and electrical supports to identify any flare bevel grove welds with improper effective throats specified.

S&L Calculation No. 12.1.12.20 "HVAC Support Qualification Design Basis Volume 2 of 3" was reviewed by the NRC inspector. The calculation documented 38 knee braces and 19 hangers where effective throats were not specified on the drawings. All of these instances, where recalculated using the standard 5/8T effective throat assumption, and were found to be acceptable.

Calculation No. 12.2.87.4 "Flare Bevel Grove Weld Evaluation," Revision 13 dated March 11, 1985, for cable tray supports was also reviewed by the NRC inspector. Details DV-89, DV-125 and DV-127 were documented as having no specified effective throat for the flare bevel groove welds. The details were reanalyzed using the standard 5/8T effective throat assumption. In all cases the limiting component for each detail was something other than the flare bevel groove in question.

On the basis of the review performed on the above work, this item is considered closed.

f. (Closed) Violation (456/83-09-09A; 457/83-09-09A): The adequacy of Phillips-Getschow's (PGCo) design capabilities, program provision or procedure implementation for small bore routing and support selection was not sufficiently verified by Commonwealth Edison (CECo) or Sargent and Lundy (S&L). Although CECo had audited PGCo's small bore activities in July 1983 (reference CECo Audit No. QA 20-83-33) and at that time had five findings and three observations, another audit was performed in October 1983 (No. QA 20-83-49) following the identification of this violation. The results of this audit indicated that "the implementation of current design guidelines is inadequate." A suspension of work was then issued for the PGCo support selection activities. Prior to resumption of these activities the following corrective actions were implemented:

(1) S&L reviewed <u>all</u> safety related process pipe supports performed by PGCo prior to the suspension of work to insure the adequacy of these supports (reference S&L transmittal No. SLBRF-1194). Three supports required an installation tolerance restriction and three isometric packages were incorrectly included in the procedure.

(2) Procedure PGCP-22 was completely rewritten in Revision 8 to simplify the support selection process for better calculational consistency and to reduce the chance of error (reference S&L ECN No. 5773). Training requirements from Procedure PGCP-29 were also incorporated into this revision of the procedure.

(3) Extensive retraining and qualification requirements were implemented for all support selection personnel (Reference PGCo No. EP-1, Revision 0).

Upon resumption of support selection activities, both S&L and CECo performed periodic technical audits and surveillances of PGCo's small bore work. S&L conducted reviews on December 28, 1983, and January 5, 1984, of 100% of the small bore support selections performed after the revision to Procedure PGCP-22. Additional audits were performed by S&L in February, March, June and July of 1984, (reference transmittals SLBRF-1754, 2779 & 4919) which reviewed approximately 10% of the new supports. The CECo audits were performed December 5, 1983, April 17, 1984, and July 26, 1985, (Reference Audits No. QA 20-83-62, No. QA 20-84-518 and No. QA 20-85-538). Although some minor observations were made in the above reviews, no design significant concerns were found.

The NRC inspector reviewed the above corrective actions and audit documentation and found them all acceptable. Also a sample of 20 small bore support selections recently performed by PGCo was reviewed and found acceptable. On this basis the violation is considered closed.

g. (Closed) Violation (456/83-09-09B; 457/83-09-09B): Small bore piping procedures from Phillips, Getschow (PGCo) lacked specific quantitative acceptance criteria for clearance or separation from other components. Recognizing this deficiency, Commonwealth Edison (CECo) implemented the following corrective actions:

(1) Sargent and Lundy (S&L) Specification F/L-2739 was revised to require a minimum clearance of 3 inches from all other installations (Reference ECN No. 22822).

(2) All other site contractor specifications were reviewed for adequate definition of component clearance requirements. The following ECNs were subsequently issued for the contractors and their specifications:

ECN No. 22824, Comstock Specification L-2790

ECN NO. 22823, Pullman Specification L-2782

ECN No. 22828, NISCO Specification L-2834

ECN No. 23055, Newberg Specification L-2722

Furthermore, a comprehensive plant walkdown is planned prior to fuel load (Reference PI BB-96) to ascertain and resolve apparent component clearance problems. The various aspects of the walkdowns will include seismic interaction for 100% hot piping for all sizes, equipment nozzles, insulated Cal-Sil piping, high energy break locations/whip restraint gaps, small bore instrument branch lines thermal/seismic movements and HVAC seismic interactions. The status of each aspect is currently in various stages of completion.

An additional attribute of the clearance verification process comes from PGCo's "As Constructed" Drawing Procedure PGCP-40. From the beginning of the small bore effort, this procedure required as-built drawings to be issued to S&L with notation whenever the piping installation was within 3 inches of another installation and indicate the point of that condition. This post installation check provides S&L with the opportunity to evaluate clearances of piping from other installations.

Based on the inspectors review of the above corrective actions and the as-constructed drawing procedure, this item is considered closed.

h. (Closed) Violation (456/83-09-09C; 457/83-09-09C): The small bore process piping support selection procedure of No. PGCP-22 was not followed correctly on lines 1CCE3AA-1/2", ICCE3BA-1/2" 1DOD8BC-2" and 1DOD8BA-1". These systems were reviewed by S&L as described in paragraph 2.f above. Subsequent to this review, changes in equipment requirements deleted the first two lines such that no verification of acceptability was possible. The third line was modified which necessitated a computer analysis of the configuration. The small bore procedure, therefore, no longer applied to this line (Reference EMD-050122, 1DO-23 Diesel Fuel Oil, Revision 01F1. The fourth line was reviewed by the NRC inspector and the support selection activities were acceptable.

i. (Closed) Violation (456/83-09-09D; 457/83-09-09D): Phillips-Getrschow (PGCo) Quality Assurance Manual did not delineate the authorities, duties and qualifications of their "Field Engineers." As corrective actions PGCo revised their QA Manual Section 1.19 to read "Project Engineer" instead of "Field Engineer." Also, PGCo issued Engineering Policy EP-1 "Engineering Personnel Qualifications and Review Criteria for Responsibility Assignment." This criteria delineates the duties of PGCo's engineering department personnel.

Based on the inspectors review of the above corrective actions, this item is considered closed.

j. (Closed) Violation (456/83-09-09E; 457/83-09-09E): Phillips-Getschow's training program was considered to be inadequate and ineffective based on the numerous errors identified in the PGCo hanger calculations. Recognizing this deficiency, PGCo revised their Procedure No. PGCP-22 to include, among other things, the training requirements of Procedure No. PGCP-29. The training requirements were also expanded in scope, quantity and intensity, and included proficiency tests and on-the-job-training. All PGCo support selectors were retrained in the revised Procedure No. PGCP-22 Procedure and new work was reviewed by S&L to verify correct procedural implementation (refer to paragraph 2.f above).

The NRC inspector reviewed the "Training Records for Support Selection Personnel" documentation at PGCo. The records included a list of currently qualified support selectors, a list of support selectors currently working, as well as each support selector's resume, diploma, proficiency test and on-the-job-training records. Based on this review and the review performed in paragraph 2.f above this item is considered closed.

k. (Closed) Violation (456/83-09-09F; 457/83-09-09F): The use of the Information Request (IR) System by PGCo, in lieu of the Field Change Request System, compromised the final design change acceptance review and approval. In response to the violation, 100% of the previously issued IR's were reviewed to determine if other design information was obtained through that system. As a result NCR No. 1568 was issued on May 39, 1984, with eight IR's that contained potential design information. The NCR was dispositioned by issuing Engineering Change Notices for each IR. This process allowed proper review and approval of the change as well as a means of incorporating the change information into the final design documents.

Additionally, PGCo issued work instruction PGWI-3 "Clarification and Augmentation of PGCo, Design Change Revision Review (ECN, FCN, FCR, DRN, Specification Changes, ETC.)" to clarify and describe the method by which Change Documents are reviewed and processed by the Field Engineering Supervisor. Also, the IR form (PG Form No. 9001) itself was revised to include the statement:

> "This form in and of itself cannot be used as a directive for design change information."

Based on the NRC inspector's review of the above corrective actions, this item is considered closed.

l. (Closed) Unresolved Item (456/83-09-06; 457/83-09-06): Potentially incorrect piping material was installed due to a failure to fully implement material traceability procedures. In addition, QC verification of heat number transfers for cut pipe was performed on a sample basis only.

The licensee developed the Material Traceability Verification (MTV) Program to identify and correct any discrepant materials. The NRC review of the MTV Program and its results is documented in NRC Inspection Report No. 456/85061; 457/85057. In addition, Phillips-Getschow quality control procedures No. QCPB-28 and No. QCPB-21 have been revised to require QC verification of heat number transfers on all cut pipe.

m. (Closed) Unresolved Item (456/84-02-01): Discrepancies in the location of support columns for the Steam Generators and Reactor Coolant Pumps were documented in NRC Inspection Report No. 50-456/82-05; 50-457/82-05. This unresolved item was written to track the proposed NRR evaluation of this issue. Subsequent to issuing this unresolved item, it was determined that Region III would evaluate this item. The evaluation and closure of this item is documented in NRC Inspection Report No. 50-456/86-09; 50-457/86-08.

n. (Closed) Open Item (456/84-09-07; 457/84-09-07): This open item was issued to track the development of the licensee's Material Traceability Verification (MTV) Program. The NRC review of the MTV Program and its results is documented and closed in NRC Inspection Report No. 50-456/85061; 50-457/85057.

o. (Closed) Open Item (456/85019-04; 457/85020-04): This item relates to the installation of supports for the Steam Generators and Reactor Coolant Pumps and is the same as unresolved item 456/82-05-03; 457/82-05-03. The NRC review of the "as-built" condition of these supports is documented in NRC Inspection Report 50-456/86009; 50-457/86008.

p. (Closed) Unresolved Item (456/83-09-04B; 457/83-09-04B): This item was inadvertently omitted from NRC Inspection Report No. 50-456/85061; 50-457/85057. The basis for closure of this item is identical to that of item 456/83-09-4A; 457/83-09-4A.

3. License Action on 10 CFR 50.55(e) Items

a. (Closed) 50.55(e) Item (456/83-07-EE; 457/83-07-EE): Potentially incorrect piping material was installed due to a failure to fully implement material traceability procedures.

The licensee developed the Material Traceability Verification (MTV) Program to identify and correct any discrepant installed materials. Those discrepant materials which could not be identified by the manufacturer's marking were subjected to chemical analysis. The analysis found that all items conformed to the applicable material standard. The NRC review of the MTV Program and its results is documented in NRC Inspection Report No. 50-456/85061; 50-457/85057.

b. (Closed) 50.55(e) Item (456/84-16-EE; 457-84-16-EE): The documentation for procurement of ASME Section III materials did not meet code requirements.

The corrective action taken as a result of this item was a complete reverification of all Material Receiving Reports (MRR's) associated with ASME Section III Class 1, 2, 3, MC, CS and core support structure materials at the Braidwood Station. The reverification of some 4300 heat/lot numbers was performed in accordance with the following Commonwealth Edison (CECo) Project Field Engineering Procedures:

PFE 100-1 On-site Purchased Materials Documentation Reverification Program

PFE 100-2 Procedure for Processing Materials in accordance with Code Case N-242-1.

Based on this review, if the records did not meet the acceptance criteria of the applicable procedure, one or more of the following corrective actions were performed:

(1) Obtain revised or additional documentation from the vendor to complete the documentation package.

(2) Accept the materials in accordance with paragraph NX-2610 in the Winter 1975 Addendum of the ASME Code or Code Case N-242-1.

(3) Replace the material.

Upon completion of the reverification program it was determined that 2,200 MRRs required revised or additional documentation; 375 MRRs required additional corrective action; and 2 MRRs required replacement of the material.

A detailed review of 21 MRR's was performed by the NRC inspector to verify proper implementation of the review program and to determine the nature of the deficiencies. The following Document Review Status Sheets (DRSS's) were reviewed with the following observations:

Type 1 (above) Corrective Action

DRSS No. 133; MRR No. 2722, review date March 13, 1985
Three heats required an additional statement from the supplier giving their Quality Systems Certificate (QSC) number and expiration date.

Statement was received and documentation is now acceptable.

DRSS No. 193; MRR No. 5016, review date February 8, 1985
CMTR with raw material and heat test data was required.

Information was received and documentation is now acceptable.

DRSS No.1152; MRR No. 8873, review date August 13, 1985
A statement was required indicating that the material was manufactured under an approved QSP meeting NCA-3800.

Statement was received and documentation is now acceptable.

DRSS No. 1261; MRR No. 15686, review date March 27, 1985
(1) Heat number was not listed on MTPQ Log
(2) Brinnell Hardness did not meet acceptance criteria.

Log book was corrected. New CMTR submitted with acceptable hardness data. Documentation is now acceptable.

DRSS No. 135; MRR No. 1215, review date January 5, 1985
(1) Additional Documentation was required from vendor
(2) CMTR's were in wrong MRR
(3) An item was crossed out which was received

Appropriate documentation was received from the vendor. The CMTR's were put in proper MRR. Item was noted as received. Documentation is now acceptable.

DRSS No. 20 to 29; MRR No. 6879, review date November 14, 1984
Documentation from vendor was required to support audit of vendor.

Documentation was received and is now acceptable.

DRSS No. 112; MRR No. 6388, review date March 13, 1985

(1) Statement from vendor was required giving their QSC number and expiration date.

(2) Heat No. 0882 listed under wrong MRR in Phillips-Getschow Co. (PGCo) MT/PQ Log

Statement was received and log book was corrected. Documentation is now acceptable.

DRSS No. 956; MRR No. 6446, review date March 13, 1985
Statement from vendor was required giving their QSC number and expiration date.

Statement was received and documentation is now acceptable.

DRSS No. 121; MRR No. 6687, review date March 13, 1985
Typographical error found on purchase order.

Error was corrected, documentation is now acceptable.

DRSS No. 1221; MRR No 8787, review date January 19, 1985
Statement was required giving who approved and performed audit of vendor.

Additional review determined that the existing statement on the CMTR was sufficient. Documentation is now acceptable.

Type 2 (above) Corrective Action

DRSS No. 429; MRR 1193, review date November 13, 1985

(1) Statement with documentation on QSC and expiration date are required.

(2) Provide additional documents stating Material was produced under a QSP meeting NA-3700 or NCA-3800

(3) Material meets ASME III, NX-2000

(4) Material meets ASME III, 1974 Summer 75 Addendum

Statement with additional documentation was received and documentation is now acceptable.

DRSS No. 346; MRR 1291, review date October 7, 1985
Provide additional documents stating

(1) Material was made under a QSP meeting NA-3700 or NCA-3800

(2) Material meets ASME III, NX-2000

(3) Material meets ASME III 1974, Summer 75 Addendum

Additional documentation received and package is now acceptable.

DRSS No. 293; MRR 2759, review date November 21, 1985

(1) Provide additional documentation from vendor QSP and expiration date.

(2) CMTR's didn't indicate compliance to ASME III 1974, Summer 75 Addendum or Certification to NCR-3800 or NA-3700 or NX-2000.

Additional statements provided and documentation is now acceptable.

DRSS No. 140; MRR No. 4886, review date October 7, 1985
A statement was required to support audit by the material supplier or CECo or a qualification statement to NA-3700 or NCA-3800.

Additional information was provided and documentation is now acceptable.

DRSS No. 157; MRR No. 1456, review date January 27, 1986
(1) A statement was required to verify NA-3700 for material supplier.

(2) MRR needed to be upgraded.

Material was accepted for Class II or III per NX-2610.

DRSS No. 336; MRR No. 1187, review date August 15, 1985
A statement was required to verify the QSP to the requirements of NA-3700.

Material was accepted for Class II per NX-2610

DRSS No. 334; MRR No. 1203, review date May 17, 1985
The MRR had various deficiencies that needed to be upgraded.

Material was accepted for Class III per NX-2610

DRSS No. 301; MRR No. 1226, review date November 13, 1985
A statement was required to verify that the supplier's QSP was surveyed by CECo and found acceptable.

Material was accepted per NX-2610

DRSS No. 1088; MRR No.8953, review date September 5, 1986
A statement was required to verify that the supplier's QSP was surveyed by CECo and found acceptable.

Material was accepted per NX-2610

DRSS No. 1219; MRR No. 18047, review date September 19, 1985
A statement was required to verify that the QSP met the requirements of NA-3700

Material was accepted per NX-2610

Type 3 (above) Corrective Action

DRSS No. 177; MRR 2196, review date August 15, 1985
Miscellaneous deficiencies were unresolvable.

Material was reclassified to Class D Non Safety-related. NCR No. 4645 covers the replacement of any installed material.

For further verification of this action, an inspection of the replaced components (1½" diameter studs and heavy hex nuts) was performed by the NRC inspector. Field Change Order (FCO) 1SX-24532 was issued on December 2, 1984, with replacement materials specified. Valve No. OSX165B was observed by the NRC inspector and it was verified that all stud and nut materials had been replaced as specified in the NCR.

Based on the NRC inspector's review of the Documentation Reverification Program, the corrective actions for this item have been adequately implemented.

This item is considered closed.

4. Followup on Allegations

a. (Closed) Allegation RIII 85-A-0210

On October 17, 1985, an allegation was made to the Senior Resident Inspector (construction) concerning inadequate welding of clip angles joining column to beam in the control room area. These welds had been made by the Newberg Company and had been covered with fireproof insulation. A typical location of P and 20 at elevation 451' was given.

NRC Review

The NRC inspector selected 11 columns in the control room area installed by Newberg, including the installation at P and 20, for inspection. The licensee removed the insulation for weld inspection and supplied installation documentation for each location. The

following Structural Steel Installation Travelers were reviewed for welding requirements and weld inspection results:

Report Nos.	3493	1689
	1785	1686
	1786	1690
	1768	1311
	1641	1579
		1578

The NRC inspector visually examined approximately 100 Newberg clip angles and associated welds at the 11 locations. All welds and their documentation were examined and found to be acceptable.

Conclusion

The allegation could not be substantiated in that approximately 100 welds were examined and all were found to exhibit acceptable workmanship. Also the welding documentation was found to be acceptable. Based on the NRC inspection, this allegation is considered closed.

b. (Closed) Allegation RIII 85-A-0067 (2)

On March 20, 1985, an allegation was made to the Senior Resident Inspector concerning performance of welds by L. K. Comstock (LKC) without a properly qualified procedure. The allegation states that double flare bevel welds were performed in the field prior to a welding procedure being qualified.

NRC Review

The NRC inspector reviewed the LKC Welding Procedure Qualification Test Records Nos. 055 and 059. These test records indicate that a double flare bevel groove joint was properly qualified in accordance with the AWS D1.1 Code on October 19, 1984. LKC was asked to determine if any double flare bevel joint details were welded prior to October 19, 1984. Two examples (hanger Nos. H-126 and 014H004) were initially identified. As a result, LKC issued NCR No. 4989 on March 25, 1986, to address the issue.

The NRC inspector reviewed LKC Welding Procedure 4.3.3 which was used to perform the welds on the above hangers. The essential variables contained in Procedure 4.3.3 are similar to those qualified on Test Record Nos. 055 and 059 to the point that no technical difference exists. Test Nos. 055 and 059 were qualified essentially to demonstrate the effective throat obtained per AWS requirements, not to develop a technically distinct procedure.

Conclusion

The allegation was substantiated in that a few double flare bevel groove weld joints were performed prior to performing the Code

required qualification. Since the parameters of the procedure used to perform the welding, and the qualifications performed on October 19, 1984, are technically compatible, there is no hardware concern. Due to the limited use of the double flare bevel groove, and the subsequent qualification performed to verify effective throat, this allegation is considered closed.

c. (Closed) Allegation RIII 84-A-142
This concern identified that the design and fabrication of flare bevel welds are improperly handled at Braidwood.

NRC Review

Resolution of this allegation is documented in Paragraph 2.e of this report.

d. (Closed) Allegation RIII 85-A-204

On December 4, 1985, an allegation concerning construction practices and weld quality was received by Region III. The person who made the allegation, hereafter referred to as the individual, was subsequently interviewed in an effort to clarify the concerns and afford the opportunity to voice any additional concerns. The items of concern and NRC reviews are as follows:

Item 1

The individual made a general statement that productivity was stressed above quality. When asked for specifics he could offer none. He stated that his only "real" concerns were Allegation Items 5 and 7.

NRC Review

As the concern is of too general a nature, no NRC action was taken.

Item 2

The individual referred to the "tack in place/weld in place" program at Braidwood. The individual stated that this program was developed because "engineering was so screwed up," however, he had no hardware related concerns.

NRC Review

The individual was told that the NRC had previously reviewed this program (See NRC Inspection Report No. 50-456/85041; 50-457/85040) and accepted it and that no further action would be taken. The individual accepted this resolution.

Item 3

The individual stated that often secondary hangers are attached to primary hangers and that many clearance problems existed. He stated that he had seen situations where the pipe was not even touching the hanger; i.e., bearing no load. When asked for specifics he could

give none and added that most of his experience was with class "D" non safety-related piping.

NRC Review

Since no safety-related specifics were offered by the individual, it was explained that the NRC was currently aware of the clearance issue and that a final walkdown of pipe supports would be conducted. This walkdown will identify hanger related deficiencies such as piping bearing no load. The clearance issue is being tracked as violation 456/84-09-01 and the pipe support walkdown is tracked as Open Item 456/85019-02.

Conclusion

The allegation was substantiated in that clearance problems exist; however, the NRC was aware of this issue and is currently monitoring licensee progress and resolution.

Item 4

The individual stated that many pipes and valves are touching each other and that reporting of pipe clearance problems is not effective.

NRC Review

Same resolution as Item 3 above.

Item 5

The individual stated that he had seen large porosity holes in the completed and flat topped reactor coolant piping welds. He stated that he had brought this to the attention of a Q.C. inspector in late 1984 or early 1985. The individual could not remember the name of the inspector and added that he has since gone back to look for these "holes" and could not find them. The porosity was allegedly caused by automatic welding machines. The individual agreed that possibly the "holes" had since been repaired.

NRC Review

Three weld documentation packages (approximately 25%) from each of the four coolant loops were reviewed. Of those packages reviewed, no repairs for porosity during the time frame of interest (late 1984 to date) were documented.

Insulation was removed from nine Reactor Coolant piping welds on Unit 1 including the steam generator hot and cold leg pipe to safe end welds on each coolant loop. Visual inspection by the NRC inspector revealed no rejectable porosity. Six Reactor Coolant piping welds were also inspected by the NRC Inspector on Unit 2 with no rejectable porosity.

The NRC inspector selected 12 Reactor Coolant piping welds (approximately 25%) for review of radiographic results. Of those radiographs reviewed it was noted that some repairs for porosity had been made prior to the late 1984 time frame. It is of interest to note that a review of several Reactor Coolant welds (visual, radiograph and liquid penetrant) was conducted by the NRC Region I NDE Van independent verification personnel in 1984. This review found the welds to be acceptable and is documented in NRC Inspection Report 50-456/84-05; 50-457/84-05.

The NRC inspector interviewed personnel associated with the Reactor Coolant piping welding. During the interviews it was determined that porosity problems with the automatic welding machines had existed; however, all rejectionable porosity had been repaired.

Conclusion

The allegation was partially substantiated in that problems with porosity caused by the automatic welding machines had occurred; however, the NRC review indicates that any rejectable porosity had been subsequently repaired.

Item 6

The individual stated that the body to bonnet bolts on pressurizer valves 1AOV-RY455-A and 1AOV-RY456 may be improperly torqued. The individual described a modification of the torque wrench as an 8" extension fit onto the head of the wrench. He stated that an engineer made torque correction calculations as the wrench was positioned on the difficult to reach bolt heads. The individual doubts the validity of the calculations.

NRC Review

The NRC inspector reviewed the boltup records for the subject valves. Included in the records were sample calculations for torque wrench reading corrections to compensate for the extension. The NRC inspector also interviewed the engineer responsible for the calculations and found the torque wrench reading corrections to be in accordance with the wrench manufacturer's recommendations. In addition, the NRC inspector requested that the bolts on one of the two values be broke loose and torque values recorded. The torque values found on the valve were determined to be acceptable.

Conclusion

The allegation could not be substantiated in that torque correction calculations were made in accordance with the wrench manufacturer's recommendations and the torque values for the valve checked by the NRC inspector were found to be acceptable.

Item 7

The individual stated that the welding electrode weave width as stated in the welding procedure (4X electrode diameter) was violated in that some welders used only 3 weld passes for a joint approximately 3" wide. His concern is that excessive heat was applied to the pipe joint, and that he knew about the pipe cracking problem at Dresden. The NRC inspector explained that the problem at Dresden was associated with the BWR system only and did not apply to Braidwood. The individual also stated that root repairs were made from the inside on the reactor coolant piping. The NRC inspector explained that the method of repair was technically acceptable and that the final radiography would detect any unacceptable repair. The individual stated that he had no problem with that.

NRC Review

The NRC inspector reviewed the Phillips-Getschow welding procedures IA-MA-88 and A-IA-88 and determined that a maximum interpass temperature of 300°F and a maximum weave width for manual welding of 3 times the electrode diameter was specified. These limitations coincide with acceptable industry practice.

Excessive heat input during the welding process for stainless steel tends to deplete the ferrite content of the weld. Ferrite is the magnetic phase found in many grades of otherwise non-magnetic austenitic stainless steel weld metals. Ferrite is desirable in weld metal to the extent that it helps prevent cracking and micro fissuring. The cracking of concern here is generally longitudinal centerline cracking or crater cracking, both of which occur during the final stages of solidification. Regarding fissuring, the consensus of experts is that it occurs in welds during the reheating process when an additional bead is deposited next to or over an existing bead. Except in very severe cases, the great bulk of fissures are microscopic in size. In a very notch tough material such as austenitic stainless steel, it would require very unusual service conditions to adversely affect the service life of the structure. From a practical viewpoint, millions of pounds of multipass fully austenitic weld metal have been used in production weldments with virtually no failures attributable to fissures (The Welding Journal, July 1974). It is generally recognized that a weld metal ferrite content of as little as 3FN is sufficient to prevent cracking or fissuring. Weld metal ferrite content is determined primarily by three factors in descending order of importance: weld electrode chemistry, nitrogen pick up during welding and heat input or cooling rate. The ASME B&PV Code, Section III, Subsection NB, requires that welding electrode and filler metal be capable of depositing weld metal with a minimum ferrite of 5FN.

The NRC inspector tested the ferrite content of 15 reactor coolant piping welds (approximately 30%). The average ferrite content was found to be approximately 10FN with no readings below 5FN. The welds thus contain adequate ferrite and do not indicate excessive heat input during welding.

Conclusion

The allegation could not be substantiated in that excessive heat input during welding was not indicated as determined by adequate ferrite readings.

Item 8

The individual stated that he had no personal knowledge, but had heard that concrete expansion anchors (CEAs) were being improperly installed. He also stated that "failed" CEAs were being dispositioned "use-as-is" via the Getschow 9006 Form.

NRC Review

Since no safety-related specifics were provided by the individual, it was explained to the alleger that the NRC was aware of the CEA installation issue. The licensee had previously notified the NRC of the problems with CEAs as a reportable item in accordance with the requirements of 50.55(e). This problem is currently being tracked and monitored by the NRC as 10 CFR 50.55(e) items No. 84-17 and No. 84-07 for Braidwood.

The Braidwood resident inspector reviewed in excess of 50 Getschow reports related to the CEA installation issue. The review showed that failed CEA installations were being properly handled by the contractor's repair program. The results of this review are documented in NRC Inspection Report No. 50-456/86016; 50-457/86014.

Conclusion

This allegation was partially substantiated in that problems concerning CEA installation do exist; however, the licensee identified and reported this problem to the NRC. The NRC was aware of this issue prior to the allegation and is currently monitoring licensee progress and resolution. The review of the 9006 Forms showed that failed CEAs were not being dispositioned "use-as-is" without proper repairs being effected, thus this part of the allegation was not substantiated.

Item 9

The individual stated that many structural welds contained undercut. When asked for specifics he replied "just look anywhere in the plant." The NRC inspector explained the recently adopted Visual Weld Acceptance Criteria (VWAC) provisions for undercut and the reasons behind this provision. He replied that he had no problem with the undercut based on the explanation.

NRC Review

The NRC reviewed and accepted the Visual Weld Acceptance Criteria for Structural Welding at Nuclear Power Plants which allows for limited undercut of structural welds. The Braidwood Station also

adoped this criteria. This allowance is made based on the non-cyclic loading of the structural members.

The NRC inspector visually examined in excess of 150 structural welds and found all of them to be acceptable, that is meeting the VWAC acceptance criteria.

Conclusion

The allegation could not be substantiated in that no evidence of unacceptable undercut was identified during the inspection.

Additional Items of Concern

a. The individual stated that hanger No. 1CV150145 was improperly installed in that it was misaligned.

NRC Review

This hanger was examined by the NRC inspector, compared to the design drawings and was found to be acceptable.

Conclusion

The allegation could not be substantiated in that the hanger was found to be properly installed.

b. The individual stated that hanger No. 1FP12005R had to be drilled out for the load pin to fit and was potentially not the correct hanger.

NRC Review

This hanger was examined by the NRC inspector, compared to the design drawings and was found to be acceptable and was the proper hanger.

Conclusion

The allegation could not be substantiated in that the proper hanger was correctly installed.

5. Open Items

Open items are matters 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 the inspection are discussed in Paragraph 2.b.

6. Exit Interview

The inspector met with licensee representatives (denoted in Paragraph 1), on May 8, 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.