

U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report Nos. 50-456/84-05 (RI)
50-457/84-05 (RI)

Docket Nos. 50-456
50-457

License Nos. CPPR-132 Priority -- Category A
CPPR-133

Licensee: Commonwealth Edison
P.O. Box 767
Chicago, Illinois 60690

Facility Name: Braidwood Units 1 and 2

Inspection At: Joliet, Illinois

Inspection Conducted: March 26 - April 6 and April 9-20, 1984

Inspectors: Harry W. Kerch 5/31/84
Harry W. Kerch, Lead Reactor
Engineer date

Richard H. Harris 5/31/84
Richard H. Harris, NDE Technician date

Randy M. Campbell 5/31/84
Randy M. Campbell, NDE Technician date

Approved by: J. P. Durr 6/6/84
J. P. Durr, Chief, Materials
and Processes Section date

Inspection Summary: Inspection on March 26-April 6 and April 9-20, 1984
(Report Nos. 50-456-457/84-05)

Areas Inspected: A routine, announced NRC independent measurements inspection was conducted at the utility construction site using the NRC Mobile Non-destructive Examination (NDE) laboratory. Selected safety related piping, structural and support weldments fabricated to ASME Code, Section III, Classes 1, 2 and 3, and AWS D1.1 were inspected. Three regional based inspection personnel assisted by two contract NDE personnel were utilized during this inspection. The inspection involved 464 onsite hours and 240 offsite hours.

Results: Four violations were identified concerning unacceptable radiographs, obsolete drawings, failure to identify nonconforming conditions and failure to identify weld defects.

DETAILS

1. Persons Contacted

Commonwealth Edison Company

M.A. Gorski, PCD Engineer
E. Fitzpatrick, Assistant Manager, Quality Assurance
T. Quaka, Site, QA Superintendent
D. Cosan, Site Construction Superintendent
D.A. Brown, Quality Assurance Supervisor
A. D'Antonio, Quality Assurance Inspector
M. Wallace, Project Manager
C. Schroeder, Licensing & Compliance Superintendent
E.D. Potter, NDE Level III Examiner
K.A. Miller, Quality Assurance Inspector
D.J. Skoza, Site Engineering
G.E. Groth, Construction Mechanical Superintendent
R. Gardner, SMAD
W.W. Witt, SMAD
M.J. Curinka, PCD, Field Engineer
R.J. Farr, PCD Field Engineer

Phillips Getschow Company

E. Ullrich, Assistant Supervisor, Quality Control
J. Carlson, Quality Control Supervisor

Westinghouse Company

W.J. Feinster, Mechanical Engineer

Illinois Department of Nuclear Safety

Dale Powell, Nuclear Safety Engineer

Hartford Steam Boiler Insurance Agency

Larry Parkey, Authorized Nuclear Inspector

Pittsburgh Testing Laboratory

F.D. Forrest, Site Manager
M.R. Tallent, Jr., Project Liaison Manager
T. Frazier, Assistant Manager
D. Gabriel, Site Superintendent

USNRC

Leonard G. McGregor, Senior Resident Inspector
 Robert D. Schulz, Senior Resident Inspector
 W.L. Forney, Region III
 D.E. Jones, Region III
 D.H. Danielson, Region III
 K.D. Ward, Region III

2.0 Independent Measurements-NRC Nondestructive Examination and Quality Records Review of Safety Related Systems

During the period of March 26-April 6, 1984 quality records received from Braidwood Nuclear Power Plant were reviewed in the regional office for completeness and compliance to the licensee's FSAR commitment to applicable codes, standards and specifications.

Subsequently, an on-site independent verification inspection was conducted during the weeks of April 9-20, 1984 using the NRC mobil Nondestructive examination (NDE) Laboratory. This inspection was conducted by regional based personnel in conjunction with NRC contract personnel.

The purpose of this examination was to verify the adequacy of the licensee's welding quality control program. This was accomplished by duplicating those examinations required of the licensee by the regulations and codes and evaluating the results. In addition to the required examinations, several other confirmatory examinations designed to verify conformance with material specifications were performed and compared to quality assurance records.

An NRC inspector made a random selection of weldments which were intended to provide a representative sample of piping systems, components, pipe sizes, shop and field weldments fabricated to AWS D1.1 and ASME Classes 1, 2, and 3. The items selected were previously accepted by the licensee based on vendor shop and onsite QA/QC records.

2.1 Quality Assurance Records Review

Thirty-nine document packages containing the following documents were reviewed:

- Material certifications, including weld wire
- NDE records
- Fabrication records
- Piping drawings (isometrics)
- Mechanical and chemical properties
- Procedures

These documents were reviewed to verify compliance to NRC requirements and licensee's commitments to industry codes and standards.

Results: No violations were identified.

2.2 Nondestructive Examinations

Examinations were performed using NRC procedures with addenda written specifically for compliance to the licensee's PSAR commitment to the ASME B&PV Code, for onsite fabrication. The intent was to duplicate to the extent practicable the techniques and methods of the original examinations.

The following examinations were performed:

Radiographic Examination

Thirty-four welds were examined by radiography using an Iridium 192 source per NRC Independent Measurements Procedure, NDE-5, Rev. 0, addenda BWD-1&2-5-1; welds examined were ASME Class 1&2.

Results: No violations were identified.

Liquid Penetrant Examination

Twenty-four safety related pipe weldments and adjacent base metal were examined per NRC Procedures NDE-9, Rev. 0 and addenda BWD-1&2-9-1.

Samples examined included ASME Class 1&2

Results: No violations were identified.

Visual Examinations

Fifty-two pipe weldments and adjacent base metal were visually inspected for weld reinforcement, overall workmanship and surface condition per NRC Procedure NDE 14, Rev. 0.

Results: No violations were identified.

Magnetic Particle Examination

Twelve safety related pipe and structural weldments were examined per NRC Procedure NDE-6, Rev. 0 and addenda BWD-1&2-6-1. Samples included ASME and AWS Code welds.

Results: No violations were identified.

Ultrasonic Examination - (anchor bolts)

Twenty-six Hilti anchor bolts were examined ultrasonically for embedment depth per NRC-18, Rev. 0.

Results: No violations were identified.

Hardness Measurements

Nineteen weldments and adjacent base metal were checked for hardness using the Equo-tip hardness tester per NRC Procedure NDE-12, Revision 0. Hardness numbers were converted to Brinnell values and the approximate tensile strengths were determined by use of conversion tables.

Results: No violations were identified.

Thickness Measurement

Thirty-nine weldments and adjacent pipe material were examined per NRC Procedure NDE-11, Rev. 0 using a NORTEC NDT thickness gauge. Minimum wall thickness was determined by using ASTM standard pipe sizes and nominal thickness chart.

Results: No violations were identified.

Ferrite Measurements

Twenty-one pipe welds were checked for delta ferrite content using a Type II Ferrite Indicator (Severn Gauge).

Results: No violations were identified.

Alloy Analyzer

Two pipe welds and the adjacent base material were examined using a Texas Nuclear Alloy Analyzer. A qualitative chemical analysis was made.

Results: No violations were identified.

Hanger Inspection

Forty-seven hanger weldments were visually inspected per ASME, NF5200, 5360, and NRC Procedure NDE-14.

Results:

During the course of this inspection, the inspector requested, through site Quality Assurance, the applicable specific hanger drawings to perform weld inspections (see Attachment number 1 for

hanger drawings used during this inspection). A physical examination of hanger M-1RE01034X using the provided "Sub-B" of this drawing disclosed that the hanger did not meet the drawing Sub. Site Quality Assurance was informed of the condition and it was discovered that there were Engineering Change Notices (ECN) and Field Change Notices (FCN) that significantly affected the hanger dimensions and material. For example, ECN 11509 was issued but not stamped or referenced on drawing M-1RE01034X, Sub B. Other drawings were also provided that did not have applicable ECN's or FCN's referenced on them. It was disclosed that site Quality Assurance operative drawings are not being maintained; however, they are being used for quality assurance functions. Another set of drawings was provided from the construction operative drawing file that did contain adequate information for the examination of M-1RE01034X (Sub-B) hanger.

The drawing control system is considered in violation of 10FR50, Appendix B, Criterion VI. This is the third violation issued for the same problem dealing with the operative drawing files not being maintained (Reference Inspection Reports 83-07, violation number 01 and 82-08, violation number 03.) (456/84-05-01 and 457/84-05-01)

Socket Welds

Thirteen socket welds were radiographed to ascertain if proper engagement was achieved during fit-up. In addition to radiographs, a visual examination was performed.

Results: No violations were identified.

2.3 Review of Procedures

The following procedures were reviewed for compliance with NRC and code requirements.

Welding Procedures:

A-IA-88	R/0
IA-88-0	R/7
IA-MA-11-N	R/5
IA-MA-11-N	R/7
IA-MA-88	R/10
IA-MA-88	R/6
IA-MA-88	R/6 5-1
IR-MA-88	R/9

Nondestructive Examination Procedure:

Phillips Getschow, Co.

Pittsburgh Testing Laboratory

VE-01 R/0

QC-MT-R/9

VE-02	R/2	QC-Rt-R's/7,9,10,11,12,13, and 14
QAP-1	R/1	
QAP-2	R/1	
QAP-2	R/1A	
QAP-37	R/0	
QAP-37	R/1	

Results: No violations were identified.

3.0 NDE Personnel Qualifications:

The NDE qualification and certification records of (9) nine employees were reviewed. The acceptance of records and review were based ASNT-TC-1A and ASME criteria.

Results: No violations were identified.

4.0 Review of Radiographs

One hundred thirty pipe weld radiographs were reviewed for Units 1 and 2 to verify accurate interpretation and the adequacy of the licensee's radiographic program at this facility.

4.1 Site Radiographs

Sixty-five complete sets of field weld radiographs were reviewed and compared with the corresponding reader sheets.

Results:

Weld CS-13-W4 had several weld repairs and was finally accepted on Report No. 12ORT-R7. The inspector inquired as to the type of administrative controls on the total number of repairs permitted on a given weld. The licensee had no established limits; however, he committed to a program that is referenced in his letter, dated April 18, 1984, from the System Materials Analysis Department.

The inspector had no further questions regarding this matter.

Radiographic reports used at Braidwood are preprinted forms with a series of blocks that identify common indications that radiographic film interpreters generally encounter. Proper radiographic interpretation requires that each discontinuity be identified, characterized, and its location be recorded. The licensee's radiographic film interpreters are not properly interpreting the radiographs, in that, they are merely checking off the blocks and are not recording the locations of all the discontinuities that have been identified. Subsequent reviewers are unable to determine what indications have been identified and dispositioned on the radiographic report. The licensee has committed to start documenting indication locations on radiographic reports in the future (reference: letter dated

April 13, 1984, Brd #10.911). Further, he will review the remaining radiographs of the 10CFR50.55(e) report, regarding the out of tolerance radiographic film densities, to the guidelines of the aforementioned letter. This is an unresolved item pending NRC review of the implementation of the letter (456/84-05-02 and 457/84-05-02).

Documentation on site radiographic report #3133RT, Getschow NCR #615 and Commonwealth Edison NCR #321, appears to have had inadequate quality assurance and engineering reviews. For example, NCR #615 does not contain the required disposition by the nuclear steam system supplier, Westinghouse. Also, NCR #321, Block #16, was marked through but not dated or initialed on the changed disposition. The inspector reviewed the radiographs and examined the indication located at film station #43. Although this indication appears to be an acceptable type of indication, it extends to the heat affected zones (HAZ). Based on existing information, it cannot be determined whether this indication stops at the HAZ or continues into the weld. This weld is in the primary piping (28") system, reactor safe-end to ell. The licensee has agreed to perform additional examinations to resolve the NRC concern.

This item is considered unresolved pending the NRC review of the licensee's additional examinations (457/84-05-03).

During these reviews of radiographic film, it was determined that Pittsburgh Testing laboratory (PTL), the site nondestructive examination contractor, was not performing and documenting any film quality tests to verify the extended archive storage life of the radiographic film. The licensee and PTL have committed to performing an archive storage test of film by letter, Brd #10.95C, dated April 19, 1984.

This is considered unresolved pending NRC verification of these tests (457/84-05-04).

Several welds were reported by the Pittsburgh Testing Laboratory (PTL), the NDE contractor to Phillips Getschow Co., the construction contractor, as containing rejectable base metal radiographic indications and the material was believed to be nonconforming. The following welds were identified as nonconforming:

M196 2-LP3-FW-12
 M196 2-LP2-FW-2
 M196 2-LP3-FW-2
 M196 LP1-FW11R1

The Phillips Getschow Braidwood QA manual, Section 15, requires a nonconformance report to be written to control nonconforming materials. No nonconformance report was written for the reported conditions. This is a violation of 10CFR50, Appendix B, Criterion XV and the Phillips Getschow Braidwood Quality Assurance Manual, Section

15.0. The licensee has taken immediate corrective action on this item and they issued a Nonconformance Report No. 605 (456 and 457/84-05-05).

Additional NRC review of the radiography program disclosed that weld W044FW11RS was rejected on Pittsburgh Testing Laboratory (PTL) Report No. 1460RTS for incomplete fusion at film station number 3 to 0. Weld SI14-FW9 was also rejected on Pittsburgh Testing Laboratory (PTL) Report No. 1537RT for incomplete fusion, a crack and root shrinkage. Both of the above welds were reinterpreted by the licensee and were found acceptable. During the course of this inspection, the NRC re-radiographed W044FW11RS and found this weld to be rejectable as originally reported by PTL. Weld SI14-FW9 radiographs were reinterpreted by the NRC and were found to also be rejectable as reported by PTL.

Further, weld CV17-FW2CRS at film station No. 22-25 contained incomplete fusion and weld SI13-FW15R1, film station No. 14 contained drop through which does not meet ASME Code density requirements in the area of the drop through. These welds were also accepted by the licensee. During the course of this inspection, the NRC reinterpreted these radiographs and found them to be rejectable.

These are violations of 10CFR50, Appendix B, Criterion IX and the Piping System Installation Specification, F-2739 L-2739 (456/84-05-06 and 457/84-05-06).

4.2 Vendor Radiographs

Sixty-five complete sets of vendor shop radiographs were reviewed with their corresponding reader sheets.

Results:

The review of Southwest Fabrication radiographs for weld Q6058CR-188 CV-32-10 W3 has a weld indication 1" from film station marker #1. This indication was not reported or dispositioned on the radiographic reader sheets and only one film was available for review.

This is considered unresolved pending licensee review and NRC verification (457/84-05-07).

Weld Q6056-CV-23-6, weld 6 film station 1 to 2, has penetrameters in area of interest and masking indications, film station 2 to 3 has artifacts on both films and there is a transverse indication 3/8" from station #3 not identified or dispositioned on the radiographic report. Weld 8, film station 3 to 4 has penetrameters within area of interest and there was sufficient room outside of the weld for penetrameter placement. Radiographic film quality has degenerated due to improper processing and is not acceptable for ASME extended archive storage requirements. The radiographic film quality for welds

Q6058CS-78 CS-16-2, welds 8,9,10,11, have degenerated due to improper processing and are not acceptable for ASME extended archive storage requirements. Weld Q6056CS-108 CS-9-16, weld 6, is rejectable due to penetrometer placement in the area of interest. Two penetrometers were placed running parallel in each film area for the entire area of interest. Proper radiographic interpretation is not possible. These are violations of 10CFR50, Appendix B, Criterion IX and the Piping System Fabrication Specification 2741 (456/84-05-08 and 457/84-05-08).

Attachments:

Attachment No. 1 is a tabulation of the specific items examined and results.

Attachment No. 2 is a list of specific radiographs reviewed.

5. Unresolved Items

Unresolved items are matters about which more information is necessary to determine whether it is a violation, a deviation, or acceptable. Unresolved items are discussed in paragraphs 4.1 and 4.2.

6. Exit Interview

An exit interview was held on April 19, 1984, with members of the licensee's staff. The inspector summarized the scope and findings of this inspection. No written material was provided to the licensee during this inspection.

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2

Page 1 of 11

ATTACHMENT NO. 1

WELD NUMBER LINE/ISO	CLASS	ALLOY ANAL.	FERRITE	THICK	N.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
CS-11 FW-1	2	N/A	ACC	ACC	N/A	ACC	N/A	N/A	N/A	ACC	
CS-11 FW-2	2	N/A	N/A	ACC	N/A	ACC	N/A	N/A	N/A	ACC	
CS-5 FW-2	2	N/A	ACC	ACC	N/A	ACC	N/A	N/A	N/A	ACC	
CS-6 FW-3	2	N/A	ACC	ACC	N/A	ACC	N/A	N/A	N/A	ACC	
CV-1 FW5-1	2	N/A	N/A	ACC	N/A	ACC	N/A	ACC	N/A	ACC	
CV-1 FW-6	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
CV-1 FW-6A	2	N/A	N/A	ACC	N/A	ACC	N/A	ACC	N/A	ACC	
CV-10 FW-5	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
CV-10 FW7D	2	N/A	N/A	ACC	N/A	ACC	N/A	ACC	N/A	ACC	
CV-10 FW23 AC	2	N/A	N/A	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
CV-13 FW2G	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
CV-26 FW6A	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
CV-10 VW-1	2	N/A	N/A	ACC	N/A	ACC	N/A	ACC	N/A	ACC	

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2 Page 2 of 11

ATTACHMENT NO. 1

WELD NUMBER LINE/ISO	CLASS	ALLOY ANAL.	FERRITE	THICK	M.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
CV-10 VW-2	2	N/A	N/A	ACC	N/A	ACC	N/A	ACC	N/A	ACC	

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2

Page 3 of 11

ATTACHMENT NO. 1

WELD NUMBER LINE/ISO	CLASS	ALLOY ANAL.	FERRITE	THICK	M.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
CV-37 FW11D	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
CV-37 FW11	2	N/A	N/A	N/A	N/A	N/A	N/A	ACC	N/A	ACC	
CV-26 VW-7	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
CV-26 VW8	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
CV-13 FW2M	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
SI-8-10 to SI-28-52	1	ACC	N/A	N	N/A	N/A	N/A	N/A	N/A	N/A	
SI13 FW3E	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
SI-26-59 to SI-26-60	1	ACC	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
SI14 FW10	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
SI7 FW5E	2	N/A	ACC	ACC	N/A	N/A	N/A	ACC	ACC	ACC	
SI7 FW6	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
SI13 FW17 AB	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
SI13 VW3	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2 Page 4 of 11

ATTACHMENT NO. 1

WELD NUMBER LINE/ISO	CLASS	ALLOY ANAL.	FERRITE	THICK	M.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
S113 FW16	2	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2

Page 5 of 11

ATTACHMENT NO. 1

WELD NUMBER LINE/ISO	CLASS	ALLOY ANAL.	FERRITE	THICK	M.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
S138 VW2	2	N/A	N/A	ACC	N/A	ACC	N/A	N/A	N/A	ACC	
S126 FW10	2	N/A	N/A	ACC	N/A	N/A	N/A	N/A	N/A	ACC	
S126 FW11	2	N/A	N/A	ACC	N/A	N/A	N/A	N/A	N/A	ACC	
S126 Elbow 26-58	2	N/A	N/A	ACC	N/A	N/A	N/A	N/A	N/A	ACC	
W044 FW11	2	N/A	N/A	ACC	N/A	REJ	N/A	N/A	N/A	ACC	
CS-12 FW11	2	N/A	N/A	ACC	N/A	ACC	N/A	N/A	N/A	ACC	
W03-1 FW1	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
W03-1 FW10	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
W03-1 FW9	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
W0-1 FW-2	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
W0-1 FW1	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
W0-1 FW3	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
SX-36 FW2	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2

Page 6 of 11

ATTACHMENT NO. 1

WELD NUMBER LINE/ISO	CLASS	ALLOY ANAL.	FERRITE	THICK	M.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
SX-36 FW2D	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2

ATTACHMENT NO. 1

WELD NUMBER LINE/ISO	CLASS	ALLOY ANAL.	FERRITE	THICK	M.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
FW03DA FW8	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
FW03DA FW9	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
FW03DA FW10	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
FW03DA FW11	2	N/A	N/A	N/A	ACC	N/A	N/A	N/A	N/A	ACC	
M196-LP1 FW11	1	N/A	N/A	ACC	N/A	ACC	N/A	N/A	N/A	ACC	
M196-LP1 FW12	1	N/A	N/A	ACC	N/A	ACC	N/A	N/A	N/A	ACC	
M196-LP2 FW12	1	N/A	ACC	ACC	N/A	N/A	N/A	N/A	ACC	ACC	
M196-LP4 FW10	1	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
M196-LP4 FW12	1	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
M196-2-LP1 FW12	1	N/A	ACC	ACC	N/A	ACC	N/A	N/A	ACC	ACC	
M196-LP3 FW12	1	N/A	ACC	ACC	N/A	ACC	N/A	ACC	ACC	ACC	
M196-LP2 VWRC02	1	N/A	N/A	ACC	N/A	ACC	N/A	ACC	N/A	unre- solve	Weld center stamped in weld

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2 Page 9 of 11

ATTACHMENT NO.	WELD NUMBER LINE/ISD	CLASS	ALLOY ANAL.	FERRITE	THICK	M.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
	M-1S198006T	NF 5360									ACC	
VISUAL INSPECTION OF SAFETY RELATED HANGER WELDS												

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2

ATTACHMENT NO. 1

WELD NUMBER LINE/ISO	CLASS	ALLOY ANAL.	FERRITE	THICK	M.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
RADIOGRAPHIC AND VISUAL INSPECTION OF SOCKET WELDS											
B-11 FW 19	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 20	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 21	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 22	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 23	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 24	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 25	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 26	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 27	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 28	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 29	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	
B-11 FW 30	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	

INDEPENDENT MEASUREMENT PROGRAM

Braidwood 1 and 2 Page 11 of 11

ATTACHMENT NO. 1		RAD'OGRAPHIC AND VISUAL INSPECTION OF SOCKET WELDS									
WELD NUMBER LINE/ISO	CLASS	ALLOY ANAL.	FERRITE	THICK	M.T.	R.T.	U.T.	P.T.	HARDNESS	VISUAL	REMARKS
B-11 FW 31	2	N/A	N/A	N/A	N/A	ACC	N/A	N/A	N/A	ACC	

LIST OF RADIOGRAPHS REVIEWED

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
CS-11	FW1 R1	X					X					X		X		
CS-13	FW4 R7	X			X											3/32 @ 2
CS-6	FW3	X				X	X					X				
CS-5	FW2	X											X			
CS-11	FW2	X											X			
CS-13	FW1		X							X		X				Indication 3/4" @ 1-2
CS-9	FW13B-R1	X				X						X				
CS-9	FW17	X										X		X		
CS-5	FW8	X				X						X		X		
CS-23	FW4	X					X					X				
CS-8	FW6A	X			X	X						X				Indication @ 1-2 in code
2CS-11	FW1	X														
2CS-11	FW2	X														
2CS-11	FW3	X														
CS-11	FW1	X														
CS-11	FW2	X														
CS-11	FW3	X														
CV-10	FW23 AC	X				X						X				
CV-10	FW6A	X					X					X				Tungsten in code
CV-1	FW5-1	X				X						X				

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
CV-37	FW11	X					X									
CV-10	FW5	X														
CV-10	FW7D	X											X			
CV-26	FW6A	X					X									
CV-37	FW11D	X											X			
CV-10	FW6	X					X					X	X			

ATTACHMENT #2
 UNITS 1 and 2
 BRAIDWOOD

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REF	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
CV13	FW2G	X				X	X									Tungston @ 2-3 in code
CV28	FW6F	X										X				
CV14EB	FW4A	X														
CVP01AB-2	FW1	X														
CV-31	FW8	X					X					X				
CV-26	FW9J	X					X					X				
CV-37	FW19A	X					X					X				
CV-1	FW5	X			X							X				SL @ 3 in code
CV-9	FW11-E	X										X				
CV-3	FW17	X				X							X			
CV-2	FW9	X				X						X				
CV-17	FW2C		X													
CV-39-1	W2	X														
CV-39-1	W3	X														
CV-39-1	W4	X														
SI-14	FW9		X													
SI-14	FW10	X														
SI-2	FW11	X														
SI-21	FW17		X													
RC-16	FW4	X				X										
SI-13	FW15 R1		X									X				Drop through
BR-9	FW7B	X					X					X	X			

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
AF-9-7	E1	X														NCR 238
AF-9-7	E2	X														NCR 238
AF-9-7	E3	X														NCR 238
AF-9-7	E4	X														NCR 238

ATTACHMENT #2
 UNITS 1 and 2
 BRAIDWOOD

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
W0-44	FW11		X		X		X		X							Indication @ 22
MS-2-7	FW19R1	X			X	X						X				SL @ 2-4
FW-13	FW10R2	X				X						X				
M196-LP2	FW12R1	X														
M196-LP1	FW12R2	X										X				
M196-LP3	FW12	X				X										
M196-LP4	FW10	X				X						X				
M196-LP1	FW11	X				X						X				@ 53-60
M196-LP4	FW12	X				X						X				
M196-2-LP1	FW12					X						X				Unresolved @ 39-49
M196-2-LP2	FW2	X										X				
M196-2-LP3	FW12	X					X					X				
M196-2-LP3	FW2	X					X					X				
6057-2FE-FW005	W1	X														
6055-FW-62FW8-3	W1	X														
Q6058 CV-188 CV-32-10	W2	X														
Q6058 CV-188 CV-32-10	W3		X													
Q6058 CV-188 CV-32-10	W4	X														
Q6058 CV-188 CV-32-10	W5	X														
Q6058 CV-188 CV-32-10	W6	X														
Q6058 CV-188 CV-46-5	W2	X														
	W3	X														

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
	W4	X														
	W5	X														
Q6056-CV-23-6	W2	X														
	W3	X														

ATTACHMENT #2
 UNITS 1 and 2
 BRAIDWOOD

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS	
Q6056-CV-23-6	W4	X															
	W5	X															
	W6		X														
	W7	X															
	W8		X														
	W9	X															
	W10	X															
	W11	X															
	Q6058-CV-79 CV-20-7	W2	X														
		W3	X														
		W4	X														
W5		X															
W6		X															
Q6056-CV-2-3		W1	X														
	W2	X															
	W3	X															
	W4	X															
Q6056-CV-2-4	W2	X															
	W3	X															
	W4	X															
	W5	X															
Q6058-CS-78-CS-16-2	W2	X															

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
	W3	X														
	W4	X														
	W5	X														
	W6	X														

ATTACHMENT #2
 UNITS 1 and 2
 BRAIDWOOD

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
Q6058-CS-78-CS-16-2	W8		X													
	W9		X													
	W10		X													
	W11		X													
	W15	X														
24-D1-4016-51-1																
WR36	24-7-1 to 24-9	X														
WR36	24-6-1 to 24-9	X														
WR37	24-4-2 to 24-8	X														
WR36	24-7-2 to 24-9	X														
WR37	24-4 to 24-8	X														
WR37	24-5-1 to 24-8	X														
WR37	24-5-2 to 24-8	X														
24-D1-4014-51-1																
WR36	24-9 to 24-7-1	X														
WR36	24-6-1 to 24-9	X														
WR36	24-8 to 24-7	X														
WR36	24-9 to 24-6-2	X														
WR37	24-9 to 24-4-2	X														
WR37	24-8 to 24-4-1	X														
WR37	24-8 to 24-5-1	X														

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
WR37	24-8 to															
	24-5-2	X														
Q6056CS-108																
CS-9-16	W2	X														
	W3	X														

ATTACHMENT #2
 UNITS 1 and 2
 BRAIDWOOD

C - CRACK
 SL - SLAG
 P - POROSITY
 T - TUNGSTEN

LF - LACK FUSION
 IP - INADEQUATE PENETRATION
 LI - LINEAR INDICATION
 UI - UNFUSED INSERT

A - ARTIFACTS
 S - SURFACE
 CC - CONCAVITY
 CV - CONVEXITY

SYSTEM/LINE	WELD ID	ACC	REJ	C	SL	P	T	LF	IP	LI	UI	A	S	CC	CV	COMMENTS
Q6056CS-108	W4	X														
CS-9-16	W5	X														
	W6		X													
	W7	X														

ATTACHMENT #2
 UNITS 1 and 2
 BRAIDWOOD