U. S. ATOMIC ENERGY COMMISSION
REGION II
DIVISION OF COMPLIANCE

Report of Construction Inspection

CO Report Nos. 50-270/71-3
50-287/71-3

Licensee:	Duke Power Company Oconee 2 and 3 License Nos. CPPR-34 and 35 Category A
Date of Inspection:	May 3-7, 1971
Date of Previous Inspection:	March 11-12, 1971

Inspected By: V L Brownlee — 06/22/71
V. L. Brownlee, Reactor Inspector (In Charge) — Date

B. J. Cochran, Reactor Inspector — 6/22/71 — Date

Reviewed By: F. J. Long, Senior Reactor Inspector — 6/24/71 — Date

Proprietary Information: None

SCOPE

An announced inspection was performed at the two 2,568 Mwt pressurized water reactors under construction near Seneca, South Carolina, known as Oconee 2 and 3.

Inspection efforts were directed toward a review of progress of construction (Brownlee), Attachment F - Reactor Coolant Pressure Boundary Piping (Brownlee), Attachment G - Other Class I Piping (High Pressure Injection, Core Flood) (Brownlee), Attachment J - Reactor Vessel (Cochran), Attachment L - Components (Steam Generators, Core Flood Tank - Cochran) (Primary Pumps, Main Steam Safety Valves - Brownlee).

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SUMMARY

Safety Items - None

Nonconformance Items - Six items of nonconformance were observed. They are as follows:

1. Removal of arc strikes on critical components without authorized repair procedures. (See Section F.3 and Exhibit A, Photo Nos. 1-5.)

2. Lack of a mechanism to assure "QA Hold" work status on Class I vessels. (See Section F.3.)

3. Weld procedure qualifications did not meet present code requirements. (See Section E.4.)

4. Lack of weld rod material control. (See Section E.4 and Exhibit A, Photo Nos. 8-10.)

5. Installation of major components without detailed installation and QC procedures as required by installation specification. (See Section F.3.)

6. Equipment receiving requirements of the purchase documents and the receiving reports do not contain references or confirmation that the special requirements of the applicable specifications have been met. (See Section F.3.)

Unusual Occurrences - None

Status of Previously Reported Problems -

1. Document Control (CDN dated April 7, 1971)

   Revision 1, "Duke Power Company (Duke) Procedure for Drawing Control," was issued to the field for comment only. The procedure has not been implemented. Compliance will perform followup.

2. Organization (CO Report No. 50-270, 287/71-2, Other Significant Items, No. 2)

   Organizational realignment has commenced to man construction of the McGuire facility. Possible problem is dilution of technicial competency and experience at the Oconee units. This is an area of concern and will be monitored closely by Compliance. (See Section B.)

3. Verification of Nuclear Valves to Design Specifications (Inspection and Enforcement Letter, April 12, 1971)

Licensee notified. Licensee comments that no Darling Valve Company (Darling) valves are being utilized in the primary coolant boundary. A search and verification for Crane Company valves is being performed by the licensee. Compliance will follow up.

Other Significant Items -

Progress of Construction

a. Unit No. 2 is estimated to be 74% complete. Pressure boundary pipe erection is 50% complete. All main coolant pump casings are installed. Containment internal support and structure work continues. Refueling cavity liner plate erection is 50% complete.

b. Unit No. 3 is estimated to be 42% complete. Containment liner is at the tenth course, containment concrete is at the seventh lift. Internal structures and support work continues.

Management Interview - The inspectors met with Rogers, Beam and Hunnicutt. The scope of the inspection was outlined and the inspector's comments were discussed. Items of discussion were as follows:

1. Organization

The inspector commented that the organizational/functional realignment of the Oconee site personnel to man the McGuire facility would be monitored closely by Compliance. The principle area of concern is that the Oconee site does not suffer a dilution of technical competency and experience. (See Section B.)

Beam and Hunnicutt defended the Duke position.

2. Deficiencies

The inspectors identified and notified the representatives that Compliance will take exception to the following nonconformance items:

a. Removal of arc strikes on critical components without authorized repair procedures. (See Section F.3 and Exhibit A, Photo Nos. 1-5.)

b. Lack of a mechanism to assure "QA Hold" work status on Class I vessels. (See Section F.3.)

c. Weld procedure qualifications do not meet present code requirements. (See Section E.4.)

d. Lack of weld material control. (See Exhibit A, Photo Nos. 8-10, and Section E.4.)

e. Installation of major components without detailed installation and QC procedures as required by the installation specification. (See Section F.3.)

f. Babcock and Wilcox Company (B&W)/Duke receiving requirements of the purchase documents and the receiving reports do not contain references or confirmation that the special requirements of the applicable specifications have been met. (See Section F.3.)

The representatives acknowledged the legitimacy of Items a, b, c and d. Items e and f generated discussion relating to how Duke has typically operated in the past. The conclusion was that Duke construction, in many areas, is controlled in verbal form with little written instructions or documentation.

DETAILS

A. Persons Contacted

Duke Power Company (Duke)

J. C. Rogers - Project Engineer, Oconee and McGuire Nuclear Station
D. L. Beam - Assistant Project Engineer, Oconee Nuclear Station
G. L. Hunnicutt - Principal Field Engineer
R. E. Blaisdell - Field Engineer (Welding NDT)
A. R. Hollins - Assistant Field Engineer (Welding - NDT)
S. Wood - General Welding Foreman
J. E. Evatt - Welding Inspector (Fabrication Shop, Core Flood)
C. G. Freeman - Welding Inspector (Reactor Coolant Loop)
F. S. Bulgin - Welding Inspector (Field Welding, HPCI)
M. M. Williams - Welding Inspector
H. B. Jones - Welding Inspector
G. W. Greer - Field Engineer (NDT, Assigned to McGuire)
D. L. Freeze - Field Engineer, Civil
M. Curtis - Design Engineering, Mechanical
W. Owens - Vice President, Engineering (Telecon)

Babcock and Wilcox Company (B&W)

W. Faase

B. Organization

The following changes have been made in the site quality control and technical support group to man the McGuire facility. T. E. Touchstone (released to McGuire), Field Engineer, Civil, has been replaced by D. L. Freeze. Freeze's previous position was Field Engineer (office, records). The inspector questioned Hunnicutt during the inspection regarding the choice of men selected. Hunnicutt defended his position. The inspector cautioned Hunnicutt regarding personnel reassignment and the effect on dilution of technical competency and experience. M. W. Foster, Assistant Field Engineer, Civil, has replaced Freeze as Field Engineer. G. W. Greer, Field Engineer, NDT, has been released to McGuire. The field engineer, NDT, position and associate field engineer, welding, position has been combined. The newly assigned Field Engineer, Welding - NDT, is Blaisdell, the previous Associate Field Engineer, Welding. Blaisdell is being prepared for release to McGuire in the future. A. R. Hollins is assigned Assistant Field Engineer to Blaisdell. The associate field engineer positions, piping and equipment, have been combined into the field engineer, mechanical, position. Sibley, previous field engineer, piping, has been assigned as the Field Engineer, Mechanical, with Martin, previous field engineer, equipment, assigned as Associate Field Engineer to Sibley. Sibley is scheduled to McGuire at a future date.

Corporate level promotions:

1. C. Horn - President
2. B. B. Parker - Executive Vice President and General Manager
3. W. S. Lee - Senior Vice President of Construction and Engineering
4. W. H. Owens - Vice President of Engineering
5. C. E. Watkins - Vice President of Construction

C. Main Steam Safety Valves

The QC record file for the Crosby-Ashton main steam safety valves for Unit 2 were reviewed. The document file contained Duke Purchase Order T-70090, Specification OS-254, Addendum 2, revised March 1, 1971, engineering change notices, mill test reports for body, bonnet, nozzle and insert, PT, UT, MT, RT tests and hydro.

The record file did not have certification of capacity as required by Section III, Article 9 of the ASME Boiler and Pressure Vessel Code (B&PV). Curtis will follow up.

D. Primary Coolant Pumps

The inspector discussed with Curtis and Owens the use of Bingham Pump Company (Bingham) as primary coolant pump supplier. The inspector was provided the following background information. Duke did participate in the original selection of bidder. Byron Jackson Pumps, Inc. (BJ), Westinghouse Electric Corporation (W) and Bingham were active bidders. Owens commented that W was rejected because of pump problems at that time. B&W and Duke agreed to accept Bingham provided full pressure/temperature/flow loop tests could be performed. Contracting time permitted approximately one year buffer. Initial operational tests identified undersized bearing and shaft problems. Minor modifications did not solve the design problem. Bingham did produce a new design but scheduling did not permit the time and B&W/Duke elected to utilize the W pumps on Unit 1. The new Bingham design pump has completed all tests of the original specification according to Owens. A 500-hour and 100-hour tests at full temperature/pressure have been successfully completed with an additional 500 hour run scheduled. All tests have been performed with no seal problems. The pump casing has not been modified since the original design with the exception of minor modifications to the double volute which is not a pressure boundary part. Owens assured the inspector that B&W and Duke's own engineers and QA personnel have followed this problem closely. The inspector made arrangements to review the pump QC file at a subsequent inspection.

E. Primary Coolant and Other Class I Pipe

1. Field Welding Control and Documentation

With the exception of the 22 field welds of the reactor coolant loops, Duke utilizes an IBM punch card for control and documentation of field welding. The weld card program encompasses USAS B31.7 pipe plus USAS B31.1.0 design with additional seismic requirements. Duke maintains a separate file for each of the reactor coolant loop welds.

See Exhibits:

a. B, Main Coolant Joint Identification Numbers.
b. C, IBM Punch Card (Field Weld Checkoff List).
c. D, System Isometric.

Field welding control is as follows:

a. Isometrics are drawn from Duke drawings. (See Exhibit D.)
b. The welding engineer places welding information on the isometric. (See Exhibit D.)

c. IBM cards are punched with weld identification information. (See Exhibit C.)
d. IBM cards and isometric are distributed to the field welding inspectors for process.
e. After completion of weld, the cards are returned to the incomplete file.
f. Printout of incomplete welds (NDI) is performed.
g. NDI is performed and signed off.
h. Cards returned to complete file.

2. Weld Procedures, Procedure and Weldor Qualifications

Duke maintains a weld procedures manual. Each welding inspector is provided a copy. The manual is composed of two sections, structural steel welding procedures and pipe welding procedures. Pipe weld procedures and weldors are required to be qualified in accordance with Section IX of the ASME B&PV Code. Weldor qualification control is by IBM card printout. Use of process by the weldor is checked at 30-day intervals against the printout. The printout defines weldor, procedure, thickness qualified, and position. Weldor proficiency feedback is monitored by IBM printout noting - weldor, joints welded, radiographs reject or accept. Followup is performed by the field welding engineer.

3. NDI Procedure and Technicians

Duke has recently implemented NDI (MT, PT, RT) and welding inspector training courses onsite. Duke has qualified/certified personnel in MT and PT only. Other training and certification has been accomplished by the Erection Department of the B&W, Barberton, Ohio. NDT personnel are certified in accordance with SNT-TC-1A requirements. Course outlines are as follows:

a. Magnetic Particle (MT) Course Training

The course consists of 16 hours scheduled classroom instruction.

(1) Principles of magnets and magnetic fields.
(2) Magnetization by means of electric current.
(3) Principles of demagnitization.
(4) MT test equipment.
(5) Types of discontinuities located by MT testing.
(6) MT test indications and interpretation.
(7) Duke procedure for MT examination, Specification MT-1.
(8) Code requirements.
    (a) ASME B&PV, Section VIII, Acceptance Standards.

(c) USAS B31.1.0, Code for Pressure Piping Acceptance Standards
(c) USAS B31.7, Code for Pressure Piping Nuclear Power Piping Acceptance Standards
(d) AWS D2.0-69, Specifications for Welded Highway and Railway Bridges.

b. Liquid Penetrant Course Training

The course consists of 12 hours scheduled classroom instruction.

(1) History of PT Method
(2) PT processing
(3) Selection of PT method
(4) PT test equipment
(5) PT indications
(6) Company inspection procedures and standards.
(a) Duke procedure for liquid penetrant examination, PT-1
(b) ASME B&PV, Section VIII, Acceptance Standards
(c) USAS B31.1.0, Code for Pressure Piping, Power Piping Acceptance Standards
(d) USAS B31.7, Code for Pressure Piping, Nuclear Power Piping Acceptance Standards.
(e) Duke procedure for leak testing using the liquid penetrant method, PT-2
(f) ASME Section VIII, Appendix VIII, Methods for Liquid Penetrant Examination.
(g) ASTM E 165-65, Methods for liquid penetrant inspection.

c. Radiographer Training Course

The training course is used as formal instruction material for individuals being trained as radiographers and radiographer's assistants under the Construction Department byproduct material license. In addition the completion of the course, an individual must have three months on-the-job training with the Construction Department as a radiographer's assistant prior to being recommended as a radiographer and three months of on-the-job training as a radiographer's helper prior to being recommended as a radiographer's assistant or the equivalent training and formal instruction, the individual must pass a written and practical examination approved by the staff health physicist.

d. Welding Inspector Training Course

The training course is administered by the Field Welding NDT Engineer, Blaisdell. Instruction consists of the following:

(c) Qualification for thickness range from 1/16-inch through 1-3/4-inch wall thickness utilizing 8 inches I.D. with .875 wall pipe with a preheat temperature range of 300°F, interpass temperature range of 500°F and postheat treatment at 1200°F - one hour.

(d) Weld procedures lacked definitive guidance relative to defect repair and verification of defect removal.

(e) Joint design figure indicates use of backing strip while actual qualification was made without backing strip.

(f) Weldor performance qualification tests were not performed as required by the weld procedure. Some weldor qualifications were being performed in accordance with the Summer 1970 Addenda utilizing the 6G position, ten-inch pipe and radiographic the weld for acceptance.

(2) Welding electrodes were found exposed to the elements for undetermined periods of time without being discarded. Loose electrodes were found in the vanes of one primary pump casing, one container of 7018 electrodes was found open and exposed to the weather, and a number of individual (small bunches) of electrodes were found on welding machines and working areas.

No further discrepancies were noted in the recordkeeping, retrievability, personnel performance or program deviations.

b. 4800 - Welding

4805.03 - Implementation of QA Program

Confirmed. See comments of E.1 above.

4805.04 - Review of QC System

a.1, 2, 3 and 4 - Qualifications

See comments of E.2 and 3 above. Discrepancies for Items a.1 and 2 are noted in Section 4.a.(1).

b.1, 2, 3, 4 5, and 6 - Identification of Weld Location, Weldor Weld Procedures, NDT Technician, NDT procedures, NDT Results

See comments of Section E.1 and Exhibits B, C, and D and Section E.3.

The radiography log and control system identifies the weld number, NDT technician and NDT results.

c.1, 2, 3, 4, 5 and 6 - Visual Inspection (See Exhibit C.)

Main loop joint recordkeeping system requires additional, fitup measurements, preheat reading, weld material control, postheat treat, etc., requirements to be maintained.

d.1, 2, 3, and 4 - Preheat, Interpass Temperature, Postweld Heat Treat (See Exhibit C.)

Main loop joint records require additional recordkeeping for above listed items. Weld procedures define maximum preheat, interpass and heat treat temperatures.

e.1, 2, 3, 4, 5 and 6 - NDT

See comments of Section E.3. Duke has developed NDT procedures and specifies standards for acceptance.

f.2, 6 - Defect Removal and Verification of Repair

Defect removal is performed in accordance with weld procedure directions and verification is by NDT methods.

g.1, 2, 3, 4, and 5 - Weld Material Control

Duke has a weld material control procedure. No deficiencies were identified.

4805.05 - Record Review

a.1 - Visual Inspection

The inspector reviewed the weld records for selected welds reviewed and found no deficiencies.

a.2 - Heat Treatment Records

Heat treatment records for those welds inspected in the reactor coolant loop and no discrepancies were noted.

a.3 - NDT Records

NDT records for those welds selected were reviewed and no discrepancies noted.

a.4 - Repair Records

Reviewed and no discrepancies were noted.

a.5 - Weld Material Control

The inspector performed a detailed review of stainless steel filler material and electrode control. Duke orders material in accordance with MIL specification and receives actual chemical and physical certifications. The certifications do contain erage ferrite content. The inspector requested that Duke personnel plot ferrite content of several heat of material onsite utilizing the Schaeffler diagram and comparing this with the actual certifications supplied. The inspector obtained heat numbers from the fabrication storage supplies, field storage supplies and from weld cards. The certifications were produced and Hollins plotted the equivalents. The inspector with Duke personnel performed severn gage tests of several welds utilizing the respective heat number material. The inspector's field findings were within approximately 2% points of Hollins plotted data and the plotted data agreed very closely with the supplied certification data. Ferrite content of field welds checked within the core flood and high pressure core injection system averaged 9 to 12%.

4805.06 - Work Observations

a.1 - Use of Weld Procedures

a.2 - Joint Preparation and Alignment

a.3 - Identification of Weld, Weldor and Inspector

a.4 - Appearance of Partial and Completed Weld

No discrepancies were noted for those welds selected for review.

a.5 - Control of Weld Material

Discrepancy noted. See Exhibit A, Photo Nos. 8-10.

F. Reactor Vessel and Steam Generators

This inspector effort was directed toward inspection followup of the Unit No. 2 installed reactor pressure vessel and steam generators plus review of the QA inspection and installation records.

The inspection was performed in accordance with the requirements outlined in Attachments J and L of PI 3800/2.

1. Summary

Unit No. 2 steam generators 2A and 2B were received at the Oconee site via railroad flat car February 1 and 22, 1971.

The Unit No. 2 reactor pressure vessel arrived at the site on a special trailer transported from the barge dock near Augusta, Georgia, by Reliance Trucking Company on March 1, 1971.

Erection of the steam generators and reactor vessel was performed according to schedule. Installation of the primary coolant piping is progressing with the welding of 18 of 22 welds completed except for NDT and stress reliefing of the accepted welds.

The licensee informed the inspector that engineering has questioned the NDT rating of 90°F shown on the No. 2A core flood tank nameplate as being in error. There are indications that the value should be 115°F. This problem will be added to the Outstanding Items List and will be reviewed during a subsequent inspection.

Several areas of nonconformance were noted:

a. Installation of major components without proper procedures. (Refer to Sections F.3, 4905.04.c.1, F.3, 4905.06.a.2, and F.4, 4905.04. c.1.)

b. Repair of construction damage to Class I components without repair procedures. (Refer to Section F.3, 4905.04.c.3.)

c. Inability of the QA group to enforce a "stop order" on repair work until proper engineering resolution is received. (Refer to Section F.3, 4905.04.c.3.)

d. Numerous arc strikes were observed on the reactor pressure vessel. (Refer to Section F.3, 4905.04.c.3)

e. Equipment receiving requirements of the purchase documents and the receiving reports do not contain references or confirmation that the special requirements of the applicable specifications have been met. (Refer to Section F.3, 4905.04.b.6, F.3, 4905.05.a.2, F.4, 4905.04.b.2, b.6, c.3, and F.4, 4905.06.a.2.)

2. Documents Reviewed

B&W Specifications

FS-111-1a Receipt, Inspection, Handling, Storage and Installation of the Reactor Pressure Vessel

FS-111-1b Receipt, Inspection, Handling, Storage and Installation of the Reactor Vessel Closure Head

FS-111-2a Receipt, Inspection, Handling, Storage and Installation of the Once-Through Commercial Steam Generator

B&W and Duke reactor pressure vessel and steam generators receiving and installation reports. (Refer to Exhibits C and H.)

3. Attachment J - Reactor Pressure Vessel - Unit 2

The B&W specification (FS-111-1a) was reviewed to determine if the requirements for receiving, handling and installation of the reactor pressure vessel were adhered to.

4900 - Mechanical Components

4905.04 - Review of QC System

b.2 - Receipt Inspection and Handling

The reactor pressure vessel was shipped from the dock near Augusta, Georgia, via a special trailer by Reliance Trucking Company. The vessel was inspected by Stokes (B&W) and Martin (Duke) for shipping damage and confirmation that the nitrogen blanket was in existence and the humidity indicator indicated that the interior was dry. The B&W and Duke QA reports confirm that the vessel was received in a satisfactory condition on March 1, 1971.

b.6 - Special Handling and Storage Precautions

The reactor pressure vessel was placed in storage on the shipping rig and trailer from March 11, 1971, until it was installed on April 12, 1971.

QA records are not available to confirm that periodic checks of the nitrogen pressure and humidity indicators were made; however, B&W and Duke personnel confirm that daily inspections of the stored vessel were made.

c.1 - Installation Specifications and Procedures

Paragraphs 13. and 2.3.1 of B&W specification (FS-111-1a), "Receipt, Inspection, Handling, Storage and Installation of the Reactor Pressure Vessel," require the erecting contractor to provide detailed procedures to describe the method for lifting, setting and aligning the reactor pressure vessel and the constructor to provide detailed instructions for installation of the sole plate.

After a review of existing procedures and conversations with B&W and Duke personnel, it was determined that the required procedures were not prepared and that the equipment was installed by technicians operating under verbal instructions.

These actions are in violation of the B&W specification and Criterion V of Appendix B of 10 CFR 50.

c.2 - Use of Expertise in Installation

The reactor pressure vessel was removed from the shipping rig, uprighted and placed in position by a rigging and hoisting crew furnished by Reliance Trucking Company. This was the same company that set the reactor vessel for Oconee Unit 1.

The setting of the reactor pressure vessel sole plates and leveling the reactor vessel was done by Duke Mill Power employees who also set the reactor vessel for Unit 1.

c.3 - Installation Inspection

A visual inspection of the installed reactor pressure vessel was performed with the general appearance of the installed vessel as being satisfactory.

The installation inspection reports furnished by B&W provide the following information.

a. Head flange mating surface installed at elevation 816' + 5-3/16". Specified elevation - 816' 6±1/4".

b. The maximum out-of-level reading across the diameter of the mating surface is 0.007-inch as compared to a permissible out-of-level tolerance of 0.001-inch/ft (0.015-inch).

c. The W-Y axis of the vessel is parallel to the north-south building center line within 0.31 inch as compared to the specified tolerance of 0.010-inch/ft (0.150-inch).

The vessel has been aligned within the specified tolerances and accepted by B&W (Faasse) and Duke (Henry) representatives.

On arrival at the Unit 2 site, the licensee advised the inspectors that sometime during the weekend several arc strikes were made on one nozzle of the reactor vessel and QA had issued a stop-work order on all work on that nozzle until the arc strike damage was reviewed by B&W and a repair procedure was approved.

Further visual examination of welding the primary coolant piping to the reactor vessel revealed numerous arc strikes against the vessel wall and nozzles. (See Exhibit E.)

On the inspectors second day at the site it was determined that repair had begun on the arc strikes without the written repair procedure and in violation to the QA stop-work order that has been initiated. The repair consisted of grinding out the damaged areas and performing magnetic particle inspection of the area. The repair of damages to Class I components without proper written procedures is in violation of Criteria XV and XVI of Appendix B of 10 CFR 50. The B&W repair procedure (Exhibit F) was received at the site two days after the repair was initiated.

4905.05 - Followup Record Review

a.2 - Storage Inspections

Prior to the installation of the reactor pressure vessel, the vessel was stored on the special transporting trailer in the shipping rig. The vessel internals were protected against the environment by a pressurized blanket of nitrogen. According to the licensee, the condition of the stored vessel was checked each day by visual inspection of the vessel surfaces and checking the humidity indicators. No QA records were available to confirm that the inspections were performed.

Special metal covers are provided to keep construction debris from falling into the vessel during the interim until clean room conditions are established. QC inspections of the installed vessel are not specified.

a.3 - Installation Inspections

QA inspections are performed on all welding of primary coolant piping to the reactor vessel.

The QA engineer assured the inspector that a QA technician will observe the torqueing of the anchor bolts when that job is performed.

4905.06 - Followup Observations of Work

a.2 - Installation Techniques

Duke Construction Department enjoys a good reputation for the quality of construction it has performed in the past. The capability of erecting large components has been demonstrated by the work done on Oconee Unit 1 and the relative ease that was experienced in the installation of the large components in Unit 2.

The installation techniques are adequate; however, the lack of QA documents to confirm that proper engineering measurements and good construction techniques were followed throughout the installation is of great concern to the inspector.

a.4 - Protection of Installed Vessel

With the exception of steel covers over the vessel there are no special precautions presently exercised to protect the vessel against the environment.

A clean area is scheduled to be set up when the temporary opening in the containment building is closed.

b.2 - Protection of Vessel in Storage

There are no special precautions being taken to protect the vessel in storage at this time.

This item will remain open for future inspections.

5500 - Cleanliness

The installed reactor pressure vessel has not been cleaned and the clean room status established.

Cleanliness of the installed vessel will be reviewed during subsequent inspections.

4. Attachment L - Steam Generators (2A and 2B)

4900 - Mechanical Components

4905.03 - Implementation of QA Program

The Duke QA program for the Oconee facilities has been evaluated and determined that the program is adequate. If the QA documents are

properly executed, they will provide reasonable assurance that the equipment has been installed within the dimensional tolerances established by the design.

4905.04 - Review of QC System

b.2 - Receipt Inspection and Handling

The steam generators were shipped to the Oconee site via rail car with steam generator 2A received and inspected on February 1, 1971, and steam generator 2B received and inspected on February 22, 1971.

The B&W inspection and receiving reports (Exhibits G and H) were signed by Stokes (B&W) and Martin (Duke) and confirm that the humidity indicators checked alright and there was no external shipping damage to either vessel.

The B&W shipping and receiving inspection procedure (FS-111-22) requires that confirmation of the nitrogen blanket be made, during the receiving inspection, by reading the pressure gauge and momentarily opening the discharge valve. The receiving report does not indicate that this requirement was complied with.

b.6 - Special Handling and Storage Precautions

Each of the steam generators were stored at the rail head in their shipping rigs for several weeks before they were installed. During this time, a daily inspection of the stored components was made; however, no record was made of the inspection findings.

b.7 - Quarantine of Nonconforming Components

The Duke QC program provides for quarantining of nonconforming components; however, no action was required for steam generator equipment received on this order.

c.1 - Installation Specifications and Procedures

The B&W installation Specification FS-111-2A requires the erecting contractor to provide the detailed erection procedure and the installing contractor to provide detailed installation procedures. These requirements were never met, and the erector provided the rigging and set the vessels in place without the required procedures. The installer installed the vessels without the required procedures.

c.2 - Use of Expertise in Installation

The Duke Construction Department is experienced in construction of power plants and the installation of heavy components. The same craftsman from the Mill Power section that installed the steam generators in Unit 1 also installed the steam generators in Unit 2.

c.3 - Installation Inspections

The installation reports were reviewed and are appended to this report as Exhibits G and H.

The welding of the primary coolant piping to the steam generators and the final torqueing of the anchor bolts remain to be done before the installation is considered complete.

During a review of the installation procedures and records, it was determined that the steam generator nozzles had not been checked for "free iron" using the B&W Specification 207 as required by paragraph 3.7 of the B&W Specification FS-111-2a. Further investigation determined that the referenced specification (207) was not available in the B&W or Duke files. Efforts were initiated to obtain copies of the required procedure.

4905.05 - Followup Record Review

a.2 - Storage Inspections

The steam generators are in the process of being installed; therefore, the storage requirements are not in effect at this time.

This requirement will be checked on subsequent inspections.

a.3 - Installation Inspections

A review of the installed tolerances, vertically, and elevations was made. The installed component inspection sheets are appended to this report as Exhibits G and H.

The installed dimensions were reviewed and approved by B&W Engineering Supervisor, R. E. Ham.

Completion of the installation by welding the primary coolant piping to the steam generators and final torqueing of the anchor bolts will be reviewed during subsequent inspections.

b - Material and Fabrication Certifications

The steam generators manufacturing inspection records and certifications were not available at the site; however, a release order for shipment, certifying that all the QC, ASME, and specification requirements had been fulfilled, was signed by W. C. Buskey, B&W Manager of QC at the Mount Vernon facility.

4905.06 - Followup Observations of Work

a.2 - Installation Technique

Duke Construction Department installed the steam generators with the same degree of quality workmanship as they have demonstrated in the past.

As referenced in paragraph 4905.04.c.1 in Section F, the craftsman performed the installation without the required installation procedures.

a.4 - Protection of Installed Components

During the interim that the primary coolant piping is being welded to the steam generators inlet nozzles, the outlet nozzles are protected with a wire mesh housing and steel cover plates.

After the installation is complete, the manways will be the only access to the vessel internals, and they will be kept in place except for periodic inspection.

The condition of the installed vessels will be checked periodically on subsequent inspections.

b.1 - Quarantine of Nonconforming Components

The steam generators were received at the Oconee site and were found to be acceptable and approved for installation.

There were no conforming components.

b.2 - Protection of Components in Storage

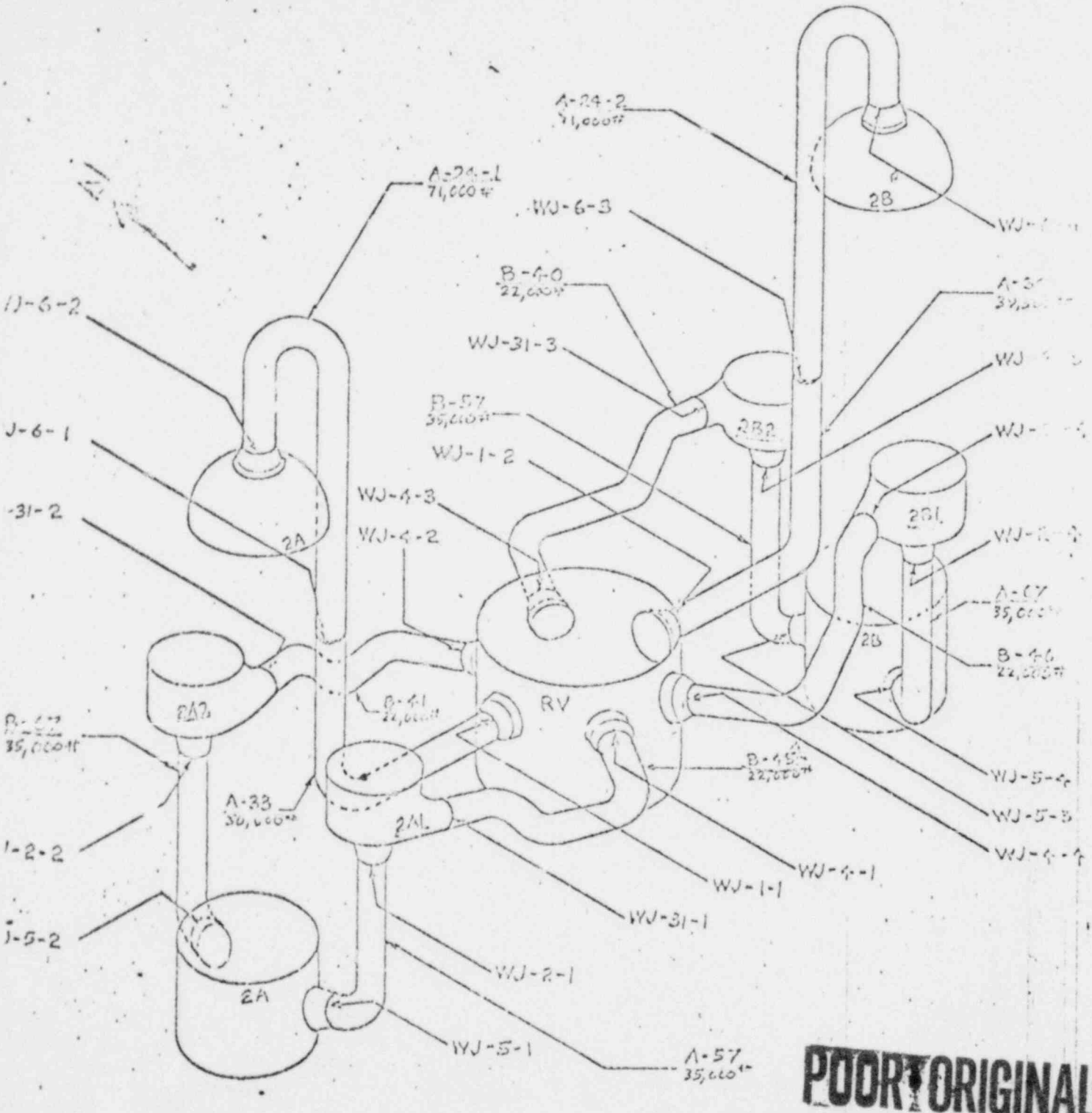
The steam generators will be placed in the installed storage condition while awaiting the completion of the plant. There are no special storage requirements for these vessels.

5900 - Cleanliness

There will be no attempt to clean the steam generators until the system is complete.

This requirement will be reviewed at a later date.

Attachments:
Exhibits A - H
(Exhibit A - CO:HQ copy only)



MAIN COOLANT JOINT IDENTIFICATION NUMBERS

UNIT 2

3-11-71

MW

ITEM	PROCEDURE/ METHOD	INITIAL	DATE
1. JOINT CLEAN			
2. FIT UP			
3. PURGE			
4. PREHEAT (____ °F) ____			
5. INTERMEDIATE NDT			
6. WELD COMPLETE			
7. VISUAL INSPECTION			
8. LIQUID PENETRANT			
9. MAGNETIC PARTICLE			
10. RADIOGRAPHY			
11. ULTRASONICS			

WELD PROCEDURE ____ BACKING RING ____
WELDERS NAME ____ NO. ____
NAME ____ NO. ____
CERTIFIED CORRECT:
FOREMAN ____ DATE ____

FILLER MATERIAL

CONSUMABLE INSERT
TYPE ____ TRADE NAME ____
SIZE ____ HEAT NO. ____

BARE WIRE
TYPE ____ TRADE NAME ____
SIZE ____ HEAT NO. ____
SIZE ____ HEAT NO. ____

COATED ELECTRODE
TYPE ____ TRADE NAME ____
SIZE ____ HEAT NO. ____
SIZE ____ HEAT NO. ____

CERTIFIED CORRECT:
INSPECTOR ____ DATE ____

DUKE POWER COMPANY CONSTRUCTION DEPARTMENT
FORM QC 36 QUALITY CONTROL RECORDS

FIELD WELD CHECK-OFF LIST

SY 51A UT2 ISO 17 WD 11 4X0.237 CRES/3/4

ITEM	PROCEDURE/ METHOD	INITIAL	DATE
1. JOINT CLEAN		78	APR
2. FIT UP		70	
3. PURGE			[illegible]
4. PREHEAT (____ °F ____		76	
5. INTERMEDIATE NDT			
6. WELD COMPLETE		76	[illegible]
7. VISUAL INSPECTION			
8. LIQUID PENETRANT			
9. MAGNETIC PARTICLE			
10. RADIOGRAPHY		[illegible]	
11. ULTRASONICS			

WELD PROCEDURE 88 BACKING RING YES
WELDERS NAME C.E. ALLISON NO. 207
NAME ____ NO. ____
CERTIFIED CORRECT
FOREMAN D.R. Thackey DATE ____

FILLER MATERIAL

CONSUMABLE INSERT
TYPE EB 308L TRADE NAME ARCOS
SIZE 5/32 HEAT NO. E 1291T

BARE WIRE 308[illegible]
TYPE ____ TRADE NAME ____
SIZE ____ HEAT NO. ____
SIZE ____ HEAT NO. ____

COATED ELECTRODE
TYPE ____ TRADE NAME ____
SIZE ____ HEAT NO. ____
SIZE ____ HEAT NO. ____

CERTIFIED CORRECT
INSPECTOR [illegible] DATE ____

DUKE POWER COMPANY CONSTRUCTION DEPARTMENT
FORM QC 36 QUALITY CONTROL RECORDS

FIELD WELD CHECK-OFF LIST

(Typical - Not completed)

POOR ORIGINAL

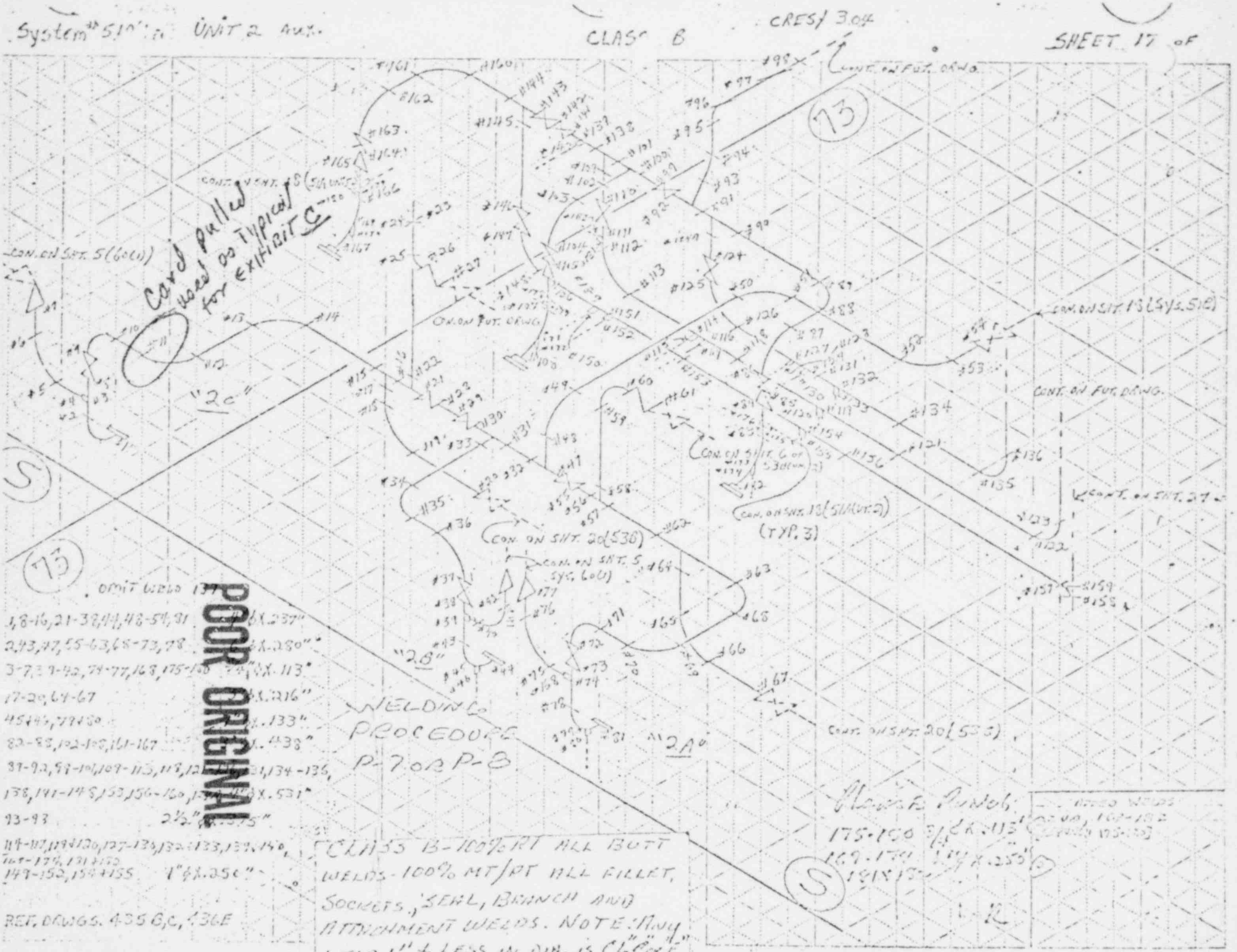
Exhibit C
Page 1 of 1

System #510 UNIT 2 AUX.

CLASS B

CRES/ 3.04

SHEET 17 OF



OMIT WELD 137

1,8-16,21-38,44,48-54,81 ... X.237"

2,43,47,55-63,68-73,78 ... X.280"

3-7,39-42,74-77,168,175-180 ... X.113"

17-20,64-67 ... X.216"

45+46,79+80 ... X.133"

82-88,102-108,161-167 ... X.438"

89-92,99-101,109-113,118,12... 31,134-136,

138,141-148,153,156-160,1... X.531"

93-93 2½" ... X.375"

114-117,119+120,127-130,132+133,139+140,

169-174,181+182

149-152,154+155 1" ... X.250"

REF. DRWGS. 435 B,C, 436E

CLASS B-100% RT ALL BUTT WELDS-100% MT/PT ALL FILLET, SOCKETS, SEAL, BRANCH AND ATTACHMENT WELDS. NOTE: ANY WELD 1" & LESS IN DIA. IS CL. "C" OR "E"

Plan of Punch

175-150 3/4 ... X.113"

169-174 ... X.255"

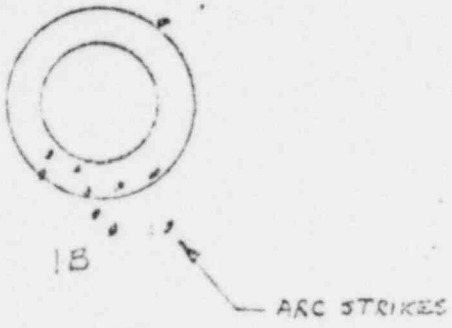
181 X 15...

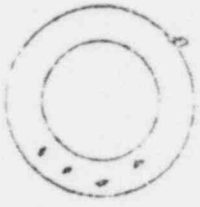
ADDED WELDS

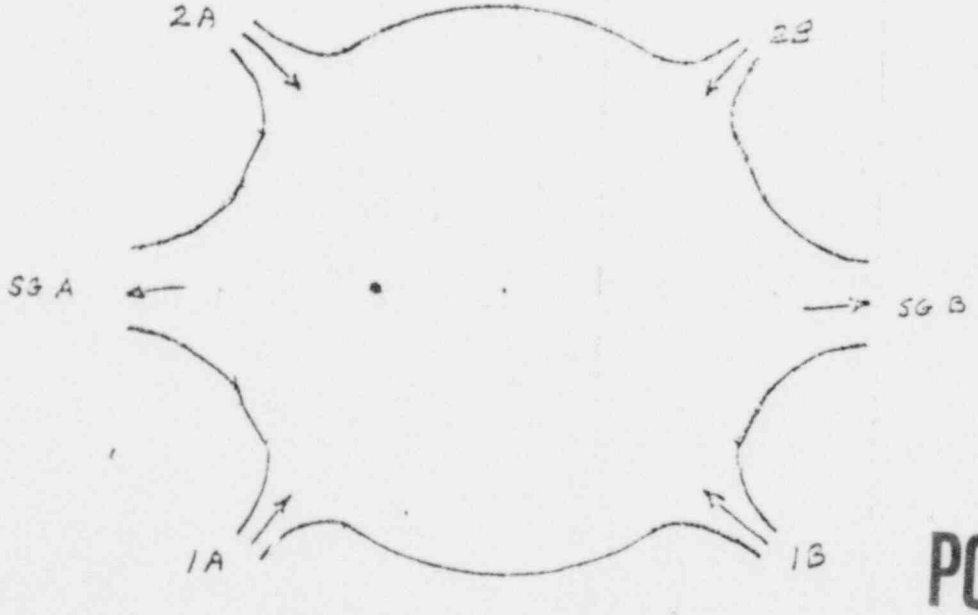
... 169-182

... 175-180

POOR ORIGINAL







POOR ORIGINAL

OCONEE #1
REACTOR VESSEL

Exhibit E
Page 1 of 1

P. O. Box 607
Seneca, South Carolina 29678

Babcock & Wilcox

B&W Construction Company

May 6, 1971

Mr. R. E. Blaisdell
Field Engineer
Duke Power Company
P. O. Box 1234
Seneca, South Carolina 29678

Re: NSS-4 - Oconee II
12-E-51

Subje Arc Strikes on Reactor Vessel

Dear Mr. Blaisdell:

Please use the following procedure for removing the arc strikes recently made on the Unit #2 reactor vessel.

1. Blend grind arc strike.
2. Etch the ground area to determine if all heat affected zone has been removed. (Ammonium-persulphate is recommended for etching.)
3. After etching, flush etched surface with clean potable water.
4. MT the ground area, using the AC yoke.
5. Document to verify location, size, and depth.

The above procedure has been obtained after consultation with our Nuclear Components Engineering Department and our Mt. Vernon Quality Control Manager. The above procedure should be performed under the supervision of J. R. McGill. Please arrange to furnish him with all copies of the documentation.

Very truly yours,

BABCOCK & WILCOX

William Faasse
B&W Construction Company

WF:ek

cc: A. R. Anderson - Barberton
D. W. Berger - B&W Oconee Site
H. C. Gransee - Houston
G. E. Kulynych - Lynchburg
C. D. Thompson - Barberton
M. P. Way - Atlanta

POOR ORIGINAL

NSS COMPONENT INSPECTION REPORT

Sheet 1 of 2

TYPE OF INSPECTION: RECEIVING_____ IN STORAGE_____ INSTALLATION XX FINAL_____

Comp./Syst. No. 55

1. Equipment/Material Description Steam Generator 2A

Vendor/Works Babcock & Wilcox P.O. #_____

Customer Duke Power Company NSS 4

Applicable Field Procedures FS-III-2a

Applicable Specifications (Instructions, Drawings, Codes):

a. CS-3-33 b. CS 5-95 c. Dwg. 128626E

2. Delivering Carrier_____

Bill of Lading #_____ Date Rec'd._____

3. Description of Inspection Date 2-20 and 2-23-71

Inspected Steam Generator 2A for verticality and contact with soleplates. The location of the W, X, Y, and Z centerlines on 36" inlet nozzle as related to the same centerlines on the base is shown on attached Field Sketch 27A, dated 2-24-71. Contact between the top of the soleplates and the bottom of the vessel was measured with feelers from both sides of the skirt support flange. Attached Field Sketch 28A dated 2-24-71 shows the location and the amount of openings found.

POOR ORIGINAL

COPIES
- B FILE - ORIGINAL
- ABERTON ERECTION - 1ST COPY
- REGIONAL REPRESENTATIVE - 2ND COPY
- PROJECT MANAGEMENT - 3RD COPY

Inspected By: B&W [signature]

Customer W. S. Henry

Vendor_____

Carrier_____

QUALITY CONTROL
INSPECTION

Sheet 2 of 3

BABCOCK & WILCOX POWER GENERATION DIVISION BARBERTON, OHIO

Y NORTH

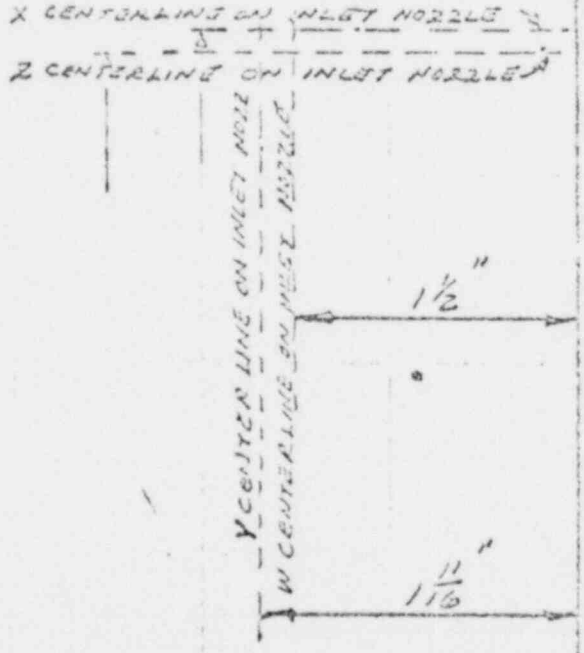
FOUNDATION AND SG 2A
SOLE PLATE CENTERLINES

WEST

EAST

X

Z



W SOUTH

POOR ORIGINAL

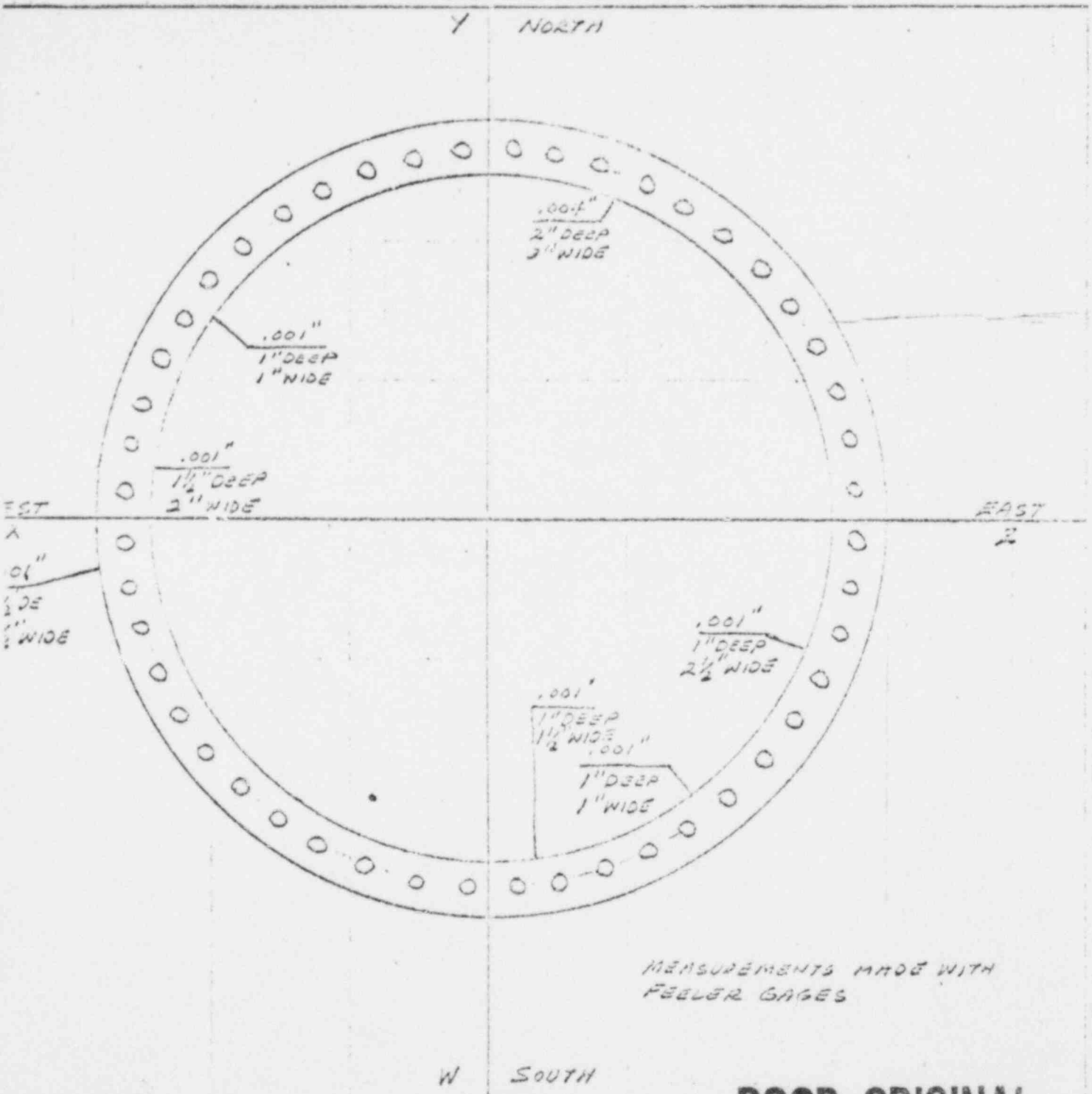
STOMER DUKE POWER CO.
BJEC ORIENTATION OF CENTERLINES FOR SG2A AS PLACED ON SOLE PLATES 2-19-71

JOB. NO. NSS-4
DWG. NO. 27A MX#
BY WF
DATE 2-24-71

Exhibit G
Page 2 of 3

QUALITY CONTROL
INSPECTION

BABCOCK & WILCOX POWER GENERATION DIVISION BARBERTON, OHIO



MEASUREMENTS MADE WITH FEELER GAGES

POOR ORIGINAL

TOMER DUKE POWER CO.

JECT CLEARANCE BETWEEN BOTTOM OF SG2A BASE AND SOLE PLATES.

JOB. NO. NSS-4

DWG. NO. 28A MK#

BY RF

DATE 2-24-71

NSS COMPONENT INSPECTION REPORT

TYPE OF INSPECTION: RECEIVING_____ IN STORAGE _____ INSTALLATION XX FINAL_____

Comp./Syst. No. 55

1. Equipment/Material Description Steam Generator 2B

Vendor/Works Babcock & Wilcox P.O. #_____

Customer Duke Power Company NSS 4

Applicable Field Procedures FS-III-2a

Applicable Specifications (Instructions, Drawings, Codes):

a. Dwg. 1288626E b._____ c._____

2. Delivering Carrier _____

Bill of Lading #_____ Date Rec'd._____

3. Description of Inspection Date 3-2 & 3-3-71

Inspected Steam Generator SG2B for verticality and contact with soleplates. The contact between the top of the soleplates and the bottom of the vessel was measured with feelers from both sides of the skirt support flange. The attached Field Sketch 30A dated March 5, 1971 shows the location and the amount of openings found. The "W" and "Y" or north and south centerlines at the top of the 36" inlet nozzle are within 3/16" of the vessel centerline at the soleplates. The "X" and "Z" or east and west centerlines as located on the 36" inlet nozzle were reported to be approximately 2" to the north of the same centerlines at the base of the vessel. It was determined that this measurement is not a true indication of the verticality of the vessel in this direction, either because the centerline is not properly located on the inlet nozzle or the nozzle itself is welded somewhat off-center in the top head. A sweep of the west or "Z" centerline as layed out on the shell of the steam generator was made with a transit. On the basis of this sweep, it appears that the true centerline of the steam generator in this direction is displaced approximately 1/2" to the north at the top of the vessel.

POOR ORIGINAL

COPIES
- SS FILE - ORIGINAL
- BARBERTON ERECTION - 1ST COPY
- REGIONAL REPRESENTATIVE - 2ND COPY
- PROJECT MANAGEMENT - 3RD COPY

Inspected By B&W W. J. [illegible]

Customer Ralph Morrison/W. S. Henry

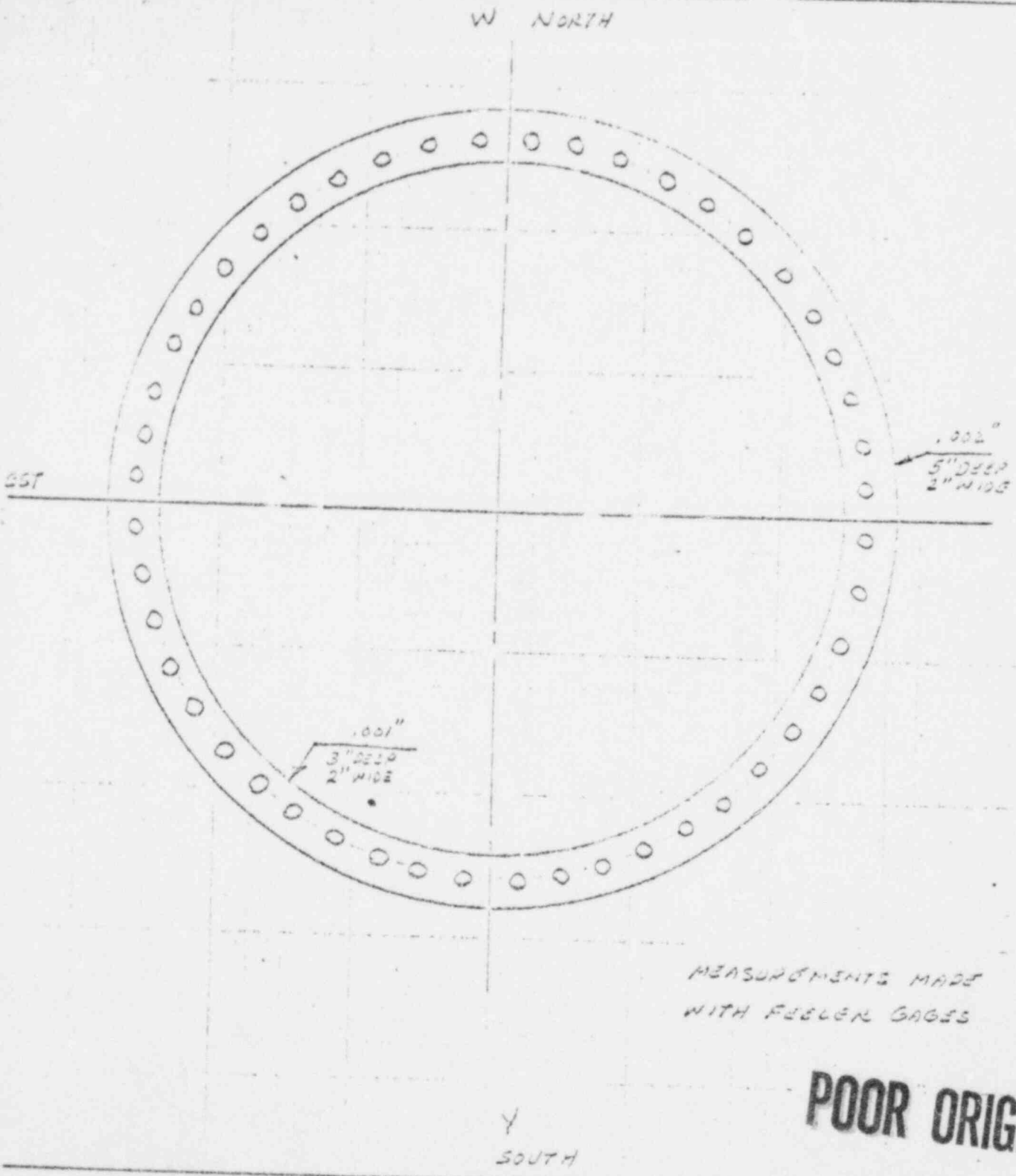
MAR 9 1971

Vendor_____

Carrier_____

QUALITY CONTROL
INSPECTION

BABCOCK & WILCOX POWER GENERATION DIVISION BARBERTON, OHIO



MEASUREMENTS MADE WITH FEELER GAGES

POOR ORIGINAL

OMER DUKE POWER CO.
ECT CLEARANCE BETWEEN BOTTOM OF SG 2,3 BASE AND SOLEPLATES.

JOB. NO. NSS-4
DWG. NO. 30A
BY [illegible]
DATE 3-5-71

Exhibit H
Page 2 of 2