U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

Region I

Report No. 50-443/81-08
50-444/81-07

Docket No. 50-443
50-444

License No. CPPR-135
CPPR-136 Priority -- Category A

Licensee: Public Service Company of New Hampshire

1000 Elm Street

Manchester, New Hampshire 03105

Facility Name: Seabrook Station, Units 1 and 2

Inspection at: Seabrook, New Hampshire

Inspection conducted: June 29-July 24,1981 and August 10-21,1981

Inspectors: A C Cerne 8/21/81
A. C. Cerne, Sr. Resident Inspector date signed

for S. E. Sipp 9/2/81
S. D. Reynolds, Reactor Inspector date signed

date signed

Approved by: Robert M Gallo 9/2/81
R. M. Gallo, Chief, Projects Section 1A, date signed
Division of Resident and Project Inspection

Inspection Summary:
Unit 1 Inspection on June 29-August 21,1981 (Report No. 50-443/81-08)
Areas Inspected: Routine inspection by the resident inspector and a regional based inspector of work activities relative to pipe and pipe support welding, the RPV and other NSSS components, design considerations for pipe and electrical cable routing, and miscellaneous structural connections and QA. The inspectors also reviewed licensee action on previously identified items and 50.55(e) reports and performed plant inspection-tours. The inspection involved 94 inspector hours, including seven off-shift hours by two NRC inspectors.
Results: No items of noncompliance were identified.

Unit 2 Inspection on June 29-August 21,1981 (Report No. 50-444/81-07)
Areas Inspected: Routine inspection by the resident inspector of piping, licensee action on previously identified items and 50.55(e) reports, and plant inspection-tours. The inspection involved eight inspector-hours by the resident inspector.
Results: No items of noncompliance were identified.

DETAILS

1. Persons Contacted

Yankee Atomic Electric Company (YAEC)
F.W. Bean, QA Engineer
B. B. Beckley, Manager of Nuclear Projects (PSNH-Manchester)
D. L. Covill, QA Engineer
J. DeVincentis, Project Manager (Framingham)
W. J. Gagnon, QA Engineer
D. E. Groves, QA Engineer (Framingham)
R. E. Guillette, QA Engineer (Framingham)
J. H. Herrin, Site Manager (PSNH)
G. F. McDonald, Jr., QA Manager (Framingham)
W. T. Middleton, QA Engineer
W. J. Miller, QA Consultant (Framingham)
C. J. Moynihan, QA Engineer
J. F. Nay, Jr., QA Engineer
W. K. Peterson, QA Engineer (Framingham)
S. B. Sadosky, QA Engineer
J. W. Singleton, Field QA Manager

United Engineers and Constructors (UE&C)
R. H. Beaumont, QA Engineer
M. A. Edgar, Resident Construction Engineer
R. A. Kountz, Welding Superintendent
D. C. Lambert, Field Superintendent of QA
D. E. McGarrigan, Project QA Manager(Philadelphia)
R. A. Mills, Assistant Liaison Engineer
B. E. O'Connor, QA Assistant
R. W. Swift, Welding Engineer

Perini Power Constructors (PPC)
G. J. Candela, Project Engineer
G. E. Koenig, Construction Document Control Engineer
G. E. Myers, Assistant Site QA Manager

Royal Insurance
J. C. Anzivino, Authorized Nuclear Inspector
G. Voishnis, Autnorized Nuclear Inspector

Pullman-Higgins (Pullman)
J. Corcoran, Assistant Resident Manager
R. G. Davis, Field QA Manager
R. R. Donald, Field QA Supervisor
M. MacCrae, NDE Supervisor
B. Madron, Welding Supervisor
A. D. Nance, Mechanical Supervisor
C. Scannell, Chief Field Engineer

Westinghouse
J. Ellis, Welding Engineer
R. Powell, Project Manager
C. E. Walker, Liaison Engineer

2. Plant Inspection-Tours (Units 1 and 2)

The inspectors observed work activities in-progress, completed work and plant status in several areas of the plant during general inspections of the plant. The inspectors examined work for any obvious defects or noncompliance with regulatory requirements or license conditions. Particular note was taken of the presence of quality control inspectors and quality control evidence such as inspection records, material identification, nonconforming material identification, housekeeping and equipment preservation. The inspectors interviewed craft personnel, supervision, and quality inspection personnel as such personnel were available in the work areas.

Specifically, an inspector witnessed a portion of the concrete placement for the Unit 1 Refueling Water Storage Tank foundation and verified in-process concrete testing, QC inspection, and acceptable placing techniques. Preparation for a Unit 2 concrete placement for a nonsafety crane foundation fill were discussed with responsible construction personnel to assure that the safety-related aspects (eg: encasement of ASME pipe) had been properly addressed.

In the Unit 1 Diesel Generator (DG) Building, the workmanship of some bolted cable tray support bracing assemblies was examined and discussed with QA personnel relative to work criteria (UE&C Drawings M300228, SH C-12 & C-13), bolt/nut engagement, and the direction of welding. The inspector also verified the temporary nature of nonseismic clip anchor/strut assemblies for the support of electrical conduit above the DG fuel oil storage tanks. The activitation of the internal strip heaters for both Unit 1 diesel generators, stored in place, was confirmed and preventive maintenance tagging and status for various components throughout the plant area were verified to be current.

No items of noncompliance were identified.

3. Licensee Action on Previous Inspection Findings

a. (Closed) Unresolved item (443&444/79-08-04): Long delays in audit responses. The inspector reviewed the results of an audit by YAEC corporate QA personnel of response and closure times for UE&C surveillance findings on Pittsburgh Testing Laboratory (PTL) activities. Examination of the action verification on closure dates for several UE&C Corrective Action Requests (CAR) and Contractor Notification Reports (CNR) revealed generally responsive and timely corrective action with regard to the findings. The inspector's general discussions with site and corporate licensee QA personnel revealed no indications of further problems in this area. This item is considered resolved.

b. (Closed) Infraction(443/80-10-01): Flame cut holes in structural steel (reported as a potential construction deficiency on 10/7/80 under 10CFR50.55(e) and subsequently cancelled). The inspector reviewed the acceptable results of laboratory tests on the subject structural steel. Licensee corrective action relative to assuring the supply and existence of

mill-surfaced slots in bearing-type, structural bolted connections was confirmed. The NRC staff reviewed the licensee position, supported by UE&C research and consultation with an acknowledged expert from Lehigh University, that observed notches would have no adverse effect upon the performance of friction-type connections. The potential for the existence of areas of high hardness was considered and metallurgically evaluated.

Licensee corrective action appears adequate and satisfactory resolution of the safety issues associated with this noncompliance has been achieved.

c. (Closed) Unresolved item (443/80-13-02): Applicability of ASTM A6 requirements to structural steel field grinding. The licensee indicated that ASTM A6 fabrication tolerances would be utilized to control field grinding or other operations applicable to the adequacy of structural member thicknesses. The inspector reviewed an engineering evaluation of field inspection reports documenting overgrind conditions. Any nonconforming conditions were dispositioned on Perini Nonconformance Report (NCR) 1351, Revision 1, and necessary repair was effected. The inspector verified that no substantive safety issue had been raised by the identified nonconformances and he confirmed appropriate licensee corrective action.
This item is resolved.

d. (Closed) Unresolved item (443/81-02-02): Adequacy of construction controls on embed grinding operations. The inspector discussed the results of QA surveillances on grinding operations with responsible supervisory personnel. Perini Inprocess Inspection Report No. 375, identifying deficient overgrind conditions on structural embed plates, was examined and repair welding requirements noted. Resident inspections throughout various areas in the plant have identified no new incidents or examples of improper construction grinding or grinding controls.
This item is resolved.

4. Evaluation of 50.55(e) Reports and Actions

a. The following item reported by the licensee as potentially reportable under 10CFR50.55(e) was subsequently evaluated as either not "significant" or not capable of having "adversely affected the safety of operations" and therefore as not reportable under those regulatory requirements.

-- A YAEC surveillance revealed the use of liquid penetrant examination (LPT) techniques which were not in conformance with approved NDE procedures relative to minimum cleaner-drying times and repeated applications of developer in evaluating the acceptability of pipe welds. An investigation indicated that technician error and misunderstanding of procedural requirements were the root causes to the problem. While the individuals involved were suspended from LPT operations until they received and passed further proficiency testing, a reinspection of over 10% of the welds originally examined by the subject technicians revealed acceptable surfaces in all cases.

The inspector reviewed licensee and A/E reports on the above issue and specifically evaluated the justification for the eventual decision of

nonreportability with regard to 10CFR50.55(e). He has no further questions on this aspect of this item.

b. On 11/6/79, the licensee initially reported a significant deficiency under 10CFR50.55(e) in which ASME safety class piping were seismically analyzed using incorrect, low values of the Amplified Response Spectra (ARS) for the supporting containment annulus structural steel. On 8/28/80, a final written report on this issue was submitted by the licensee and included the status of corrective actions and the results of further audits. Followup of this Construction Deficiency Report (CDR) was conducted during inspections by the NRC Region IV Vendor Inspection Branch (VIB) (Inspection Nos. 99900510/79-04, 80-01, and 80-02) of the UE&C home office in Philadelphia.

During this inspection, the inspector verified that the following corrective actions either had taken place or were in progress:

-- Containment annulus structural steel columns have been redesigned (ie: stiffened to lower the ARS for piping reanalysis.) (Reference: UE&C Drawing F102323, Revision 3 and Engineering Change Authorization, ECA 01/1847C).

-- The addition of shear lugs to certain column base plates, as required by the redesign, has been accomplished.

-- The attachment of channels to both flanges of columns between certain elevations has commenced.

-- A current copy of UE&C Administrative Procedure No. 36, "Control of Seismic Design", written and issued in conjunction with the quality design considerations highlighted by this CDR, is available on site.

-- Discussions with QA and engineering personnel and review of engineering memoranda on related subjects (eg: pipe support details) indicate that the "Seismic Verification Program", as committed to by UE&C for use of as-built data in seismic analyses of all Category 1 systems and components, has been implemented and coordinated to interface with design related activities on site.

The inspector's confirmation that the above corrective actions have taken place or been initiated, while not all inclusive, provides a basis for substantiation of the adequacy of the licensee and A/E corrective action program on this problem. This evidence, in conjunction with the Region IV VIB inspections and further licensee documented commitments, justify closure of this CDR and its related safety issues.

5. Hardfacing of Valve Seats

A routine inspection by the Resident Inspector of the documentation for check valve SI-V-36 indicated that the hardfacing filler metal utilized did not meet

the Westinghouse (W) NSSS equipment specification (G-678853). Paragraph 4.1.1.2 (Acceptable materials) indicates that the contact faces shall be surfaced with Stellite #6 per AWS A 5.13 (ASME SFA 5.13) Type RCoCr-A. Westinghouse Electric Corporation EMD Shop Order 1H042 documentation form AEQA 1403 (Rev 4 dated 11/77) for Certification of Compliance for this valve dated 7/26/79 indicated that the filler metal utilized for the hardfacing (Metallurgical International, Inc. Certificate of Analysis for Lab Number A-77783 Sample S-156 dated 9/12/77) was a powder, not solid rod. The powder met A5.13 Type RCoCr-A chemistry except for carbon content. Further inspection by a regionally based inspector led to the following information:

1. The valve hardfacing was performed with the automatic transferred arc plasma surfacing process which utilized an Argon gas-fed powder filler metal rather that by the oxyfuel hardfacing process utilizing a solid rod filler metal.

2. The PAW-AU process is a standard surfacing process utilized by W AED. The NRC inspector reviewed W WPS 82142PU518 Rev 8 and PQR 42013 for hardfacing P8 materials with 156 powder.

3. The carbon content for the powder is 1.4 to 1.8% as compared to 0.75 to 1.4% for RCoCr-A. The carbon content of the deposited hardfacing (including reduction by dilution) must meet a minimum requirement to maintain the Rc38 minimum hardness requirement for the hardfacing.

4. The PAW process results in dilution levels in excess of that of the OFW hardfacing process.

5. The increase in carbon content of the filler material is required to compensate for the dilution effects.

6. Although powder filler metals are not included in A5.13, they are a standard filler metal obtainable in (USN) MIL-R-17131B.

7. The PAW-AU hardfacing process utilizing 156 powder has been qualified for P8 materials in accordance with ASME requirements for multilayer applications.

8. W EMD routinely manufactures 3" to 12" gate and check valves utilizing this process.

The NRC inspector reviewed the Licensee's Blue Sheet 30 (dated 6/4/81) answer to the hardfacing question and concurred with the technical intent of the response. He also requested and discussed further clarification of some of the details with W personnel.

He has no further questions on the technical adequacy of or practices used in the subject hardfacing.
No items of noncompliance were identified.

6. Observation of Welding Activities (Unit 1)

An NRC inspector, by direct observation and independent evaluation of work

performance, inspected pipe welding activities. The following welds were inspected:

-- RH 163-02, Field Weld F0201 (Residual heat removal system piping), P8 to P8, 6" OD x 0.719 wall, E2936-1503 to E2936-1504. Welding was in accordance with WPS 24-III-8-KI-12 (Rev 3); P8 material was 316 austenitic stainless steel (SA312, TP316-Seamless).

-- SI 203, Field Weld F0201 (safety injection system), P8 to P8, 10" schedule 40 pipe to valve in accordance with WPS 24-III-8-KI-12 (Rev 3). Inspector observed flat top grinding operation for ISI.

The inspector reviewed the Field Weld Process Sheets, Weld Rod Stores Requisitions, weldor qualification records, filler metal certifications and base metal certifications (for RH 163-02).

Welding conditions and conduct and the sequence of operations were spot-checked. The inspector noted the presence or availability of QC welding inspectors and checked their inspection verification of hold point items on the weld process sheets. The Welding Procedure Specification (WPS) was reviewed for conformance of the welding parameters and to verify qualification of the essential welding variables in accordance with the ASME B&PV code, Section IX.
No items of noncompliance were identified.

7. Cross Over Pipe Supports (Unit 1)

An NRC inspector reviewed FI-92 Sheets 1 through 7 (Pullman Higgins Field instructions) for welding the Cross Over Supports to meet UE&C (Drawing F-101482, Rev. 3). This document has not yet received review and approval by the licensee. The NRC inspector questioned a possible conflict between paragraphs 2.12 and 2.14 on the application of preheat. Further review indicates the current document states that 300F preheat (rather that 200F erroneously indicated by the NRC inspector in paragraph 8 of combined inspection report 50-443/81-07 and 50-444/81-06) shall be employed. Preheat shall be applied for all weld beads deposited and the preheat shall be maintained as equivalent to a minimum interpass temperature until 1/3 of the weld joint is completed. Preheat may be withheld following deposition of 1/3 of the weld joint, but shall be reapplied immediately prior to further welding.

The inspector communicated to the licensee the beneficial effect of two layer buttering recently reported in the WRC paper "An Evaluation of Factors Significant to Lamellar Tearing" by Kaufmann, Pense and Stout (March 1981 Welding Research Supplement to the AWS Welding Journal). The inspector also reviewed the UE&C (draft) letter dated 7/13/81 on the current proposed metallurgical approach to the crossover support welding. While the Pullman Field Instruction (FI-92) has not yet been amended or approved to incorporate techniques and procedures consistent with the draft letter's response to NRC concerns, the inspector did evaluate and particularly note the following significant portions of the subject UE&C letter: Actions (1) - concerning prebuttering and MT inspection of the buttering on Sequence welds 1 and 2, (3) - the slow cooling from preheat temperature following welding, and (4) - the UE and C commitment to provide

"close scrutiny of the in place buttering sequence welds by a Home Office Welding Engineer."

This item remains unresolved (443/81-07-02) pending review of the final field instructions, welding process and results.

8. Reactor Pressure Vessel (RPV) Safe End Inspection (Unit 1)

An NRC inspector previously conducted a visual inspection of the safe end nozzle joint preparation for the Unit 2 RPV reported in Combined report 50-443/80-12 and 50-444/80-12. The inspection was for the determination of the length (protrusion) of the stainless steel portion of the safe end extending past the Ni-Cr-Fe P3 to P8 dissimilar metal joint on the OD of the safe end (to avoid potential metallurgical safe end to pipe welding problems). The measurement was necessitated by possible machining irregularities during the RPV fabrication at Combustion Engineering as reported in Westinghouse Electric Corporation Inspection Report PC-RPV-3507.

The inspector reviewed the results of the Westinghouse inspection of the safe ends on Unit 1. In this case, the bond line was not visible in all of the hot leg (outlet) safe ends and chemical etching was performed to reveal the bond line on two of the four hot leg safe ends. Nozzles B (Loop 2) and C (Loop 3) were acid etched. Nozzle B required etching to reveal the bond line due to polishing of the area subsequent to welding. Nozzle C was etched to reconfirm the visual method for indication of the bond line. The results of visual and acid etching at four locations indicated that 1/2" or more (up to 1") of stainless steel is present on the OD of these nozzles.

The inspector also visually inspected to OD of Nozzle D which reportedly has the least protrusion of stainless steel on the OD of the safe end. The nozzle (safe end to pipe joint) was over 90% welded by the dimetrics machine welding GTA process. The heat from welding caused sufficient oxidation on the OD of the safe end to make the bond line between the Ni-Cr-Fe weld and stainless safe end more visually apparent. The NRC inspector confirmed the 1/2" protrusion of stainless on the OD, as reported by the NSSS Welding Engineer.

The inspector examined the Dimetrics welding on the previously mentioned safe end to pipe weld. The welding is being accomplished by qualified Pullman-Higgins welders "under instruction" from more experienced, qualified GAPCO welders. Detailed technique (parameter) data is being developed which will be issued in a form similar to "field instructions" on future machine welds. A considerable number of in-process (for-information-only) NDE tests are being performed at the inception of this procedure. The results of these tests indicate satisfactory quality is being produced.

The inspector reviewed the Dimetrics machine calibration records for all machines and the most recent calibration records on stations #58-90,91,92 and 93. No items of noncompliance were identified.

9. Followup of Welding Issues (Unit 1)

In support of and in conjunction with a regional based inspector's review of

items documented in paragraphs 6,7 and 8, the resident inspector reviewed the following activities to assure conduct in accordance with quality considerations and NRC concerns.

(1) Automatic GTAW welding of RCPB loop piping. The inspector witnessed welding of the hot leg on loop 4 to the RPV and Steam Generator. The Field Weld Process Sheet, Weld Rod Stores Requisition, and Weld Shrinkage History Record were all examined and hold points verified. The inspector also witnessed grinding operations for removal of the spacer blocks and subsequent LPT examination. The use of technique sheets to aid in the control of pendant settings for weld passes was also substantiated on a later steam generator to loop weld.

(2) Acid etching of RPV safe ends. The inspector witnessed the acid etch operation used on RPV nozzle "L" (hot leg loop 2) to establish the acceptability of the stainless steel safe end dimension. He verified that the Westinghouse approved etching procedure had been followed.

(3) Crossover support welding butter. The inspector examined the butter welding on the structural steel (Piece 9C7A) for the crossover leg support groove weld end preparation. The Field Weld Process Sheet was reviewed and preheat temperature, hold points, controlling field instructions (Pullman FI-92), and scheduled magnetic particle testing (MT) were verified.

(4) Procedure Qualification Record (PQR) approval. The inspector verified that increases in the thickness range of welding for the GTAW portion of Welding Procedure Specification, WPS 24-8-KI-12 had been correctly qualified by PQR 114-8-OB-1 and that these documents had been approved for field use by the proper authorities.

No items of noncompliance were identified.

10. Safety-Related Structural Connections (Unit 1)

The inspector witnessed in process work or as-built details relative to the following safety-related structural steel connections. The below items were evaluated with regard to criteria delineated in the AISC Manual, AWS Standard D1.1-75, UE&C Specification 12-2 (Revision 1), or the appropriate design drawing or other approved documents, as listed.

-- High-strength bolted connections at Elev. 0 in containment for framing beam to embed attachment (UE&C Drawing F102324, Revision 4) with specific check of subject connection at azimuth 55° for authorization of modification (UE&C ECA 01/2112D).

-- Welded connection of clip angles to beams at Elev. 53 in the (PAB) Primary Auxiliary Building (UE&C Drawing F101551, Revision 5) with specific check of the Perini Weld Data Card, QA Report W367, and WPS 156.7F (Revision 1) governing criteria.

-- Slip joint steel connection between the PAB and Waste Processing Building at Elev. 12 (UE&C Drawings F111828, Revision 4, and F111827, Revision 3) with

specific check of material type and sizes and the joint configuration to maintain seismic isolation between the two buildings.

-- Structural steel expansion joint details at Elev. 25 on azimuth 195° within containment (UE&C Drawings F102317, Revision 5, and F102328, Revision 3) with specific check of the material type and clearances and welding details.

-- High-strength bolted and welded connections of stiffening channels to containment columns between Elev. 0 and 25 (UE&C Drawing F102323, Revision 3 and ECA 01/1847C) with specific check with the welding details of the column on azimuth 100° in accordance with WPS 156.5, Revision 2.

-- Finger-tight bolted connections of columns to beams along the 3 and 4 lines at approximately Elev. 70 in the Control Building (UE&C Drawings F101366, Revision 5, and F101370, Revision 7) with specific check of clip angle sizes, slotting and welding, and bolt hardware.

For all cases of the structural connections noted above, no items of noncompliance were identified.

11. Design Analysis of Moderate Energy Pipe Breaks (Unit 1)

The inspector examined as constructed piping lines for the Primary Component Cooling Water (CC) System located in the PAB. Redundant train pipes (Train "A": 1-CC-777-8, Train "B": 1-CC-827-7) run parallel and in close proximity of each other for some distance and are supported from a common siesmically desigred hanger (MS 827-02-777-SV-19). Above Elev. 25 in the PAB, a 5 Kv. power cable for the Train "B" Cooling Tower Pump is scheduled for routing in close proximity to the Train "A" CC line.

The inspector verified the as-built conditions of the noted common hanger, checked the general area for equipment and/or high energy lines which could adversely impact upon the redundant CC lines relative to a common mode failure, and discussed the design bases for routing these lines with engineering and QA personnel. Specific criteria in the Seabrook FSAR (tendered, but not yet docketed), Sections 3.5 and 3.6, the Westinghouse RESAR, USNRC Regulatory Guide 1.70 (Revision 3), and applicable UE&C drawings were evaluated with regard to the failure analysis of this reactor auxiliary cooling system.

With respect to the routing of the 5 Kv cable, the UE&C Conduit and Cable Schedule (CABP) - Drawing L-310991, Revision 3 - Report D was reviewed, as was UE&C Specification 113-1 (Revision 3) relative to the qualification of the cable to withstand the environmental effects of a moderate energy pipe crack in the subject CC lines. The inspector learned that the cable in question is qualified to withstand LOCA effects, despite not being routed through containment, because of operating condition criteria imposed upon the cable manufacturer (Anaconda) by the specification.

Evaluation of the CC pipe and 5 Kv. cable routing has resulted in the conclusion that proper design bases were utilized in analyses of these lines for a potential

common mode failure, which would be contrary to 10CFR50, Appendix A single failure criterion considerations.

All the inspector's questions relative to this inspection item have been answered and no unresolved safety issue remains. No items of noncompliance were identified.

12. Safety-Related Pipe Spool Pieces (Units 1 and 2)

The following vendor pipe spool pieces, located in the field either waiting installation or already welded, were checked against their applicable Dravo sketches.

	Spool Piece	Dravo Sketch
--	1-RC-97-1-2501-3"-9	E2936-1297
--	2-CO-4081-01-151-8"-3	E2938-74
--	2-CO-4082-01-151-8"-3	E2938-71

Identification, material, weld locations, and weld records were all checked against the applicable UE&C material specifications (in Specification 248-1, Revision 4). The inspector verified documentation of the proper NDE in accordance with ASME Section III.

For the Unit 2 spool pieces, documentation and disposition of nonconforming surface conditions as received from the fabricator (Pullman NCR 300) were noted and reviewed. For the Unit 1 spool piece, an error in the fabrication of a weld end prep bevel angle with regard to UE&C Drawing D-805000 requirements was identified. This was evaluated by engineering to have no effect upon the quality of the weld and a QA investigation revealed that an isolated human error proved to be the root cause of the nonconforming condition. The inspector had no further questions on this issue.

No items of noncompliance were identified.

13. Management Meetings

At periodic intervals during the course of this inspection, meetings were held with senior plant management to discuss the scope and findings of this inspection.