SEP 3 1969

R. S. Boyd, Assistant Director
for Reactor Projects
Division of Reactor Licensing (2)

PRESSURE VESSEL INSPECTION REPORT - COMBUSTION ENGINEERING COMPANY

The enclosed report of a pressure vessel inspection at the Combustion Engineering Company's Chattanooga, Tennessee plant is forwarded for information. Reactor pressure vessels for the Indian Point 3, Calhoun and Cooper reactor stations were examined.

The inspection of the Indian Point 3 vessel was our final shop review of this vessel and, from our observations, we find that this vessel meets the requirements of Section III of the ASME Code. Additional inspections of the Calhoun and Cooper vessels will be made when the vessels are in the final fabrication and testing stages.

Original signed by
J. P. O'Reilly

J. P. O'Reilly, Chief
Reactor Inspection and
Enforcement Branch
Division of Compliance

Enclosure:
Vendor Insp Rpt CE 69-2
(50-285, 50-286, 50-298)

cc w/enclosure:
E. G. Case, DRS
S. Levine, DRL (6)
D. J. Skovholt, DRL (3)
L. Kornblith, Jr., CO
R. W. Kirkman, CO:I
J. G. Davis, CO:II (2)
B. H. Grier, CO:III (2) mark one cy for Oller
D. I. Walker, CO:IV
R. W. Smith, CO:V
REG Central File Reminder; give GWR a cy

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| OFFICE ▶ | CO | CO | | | | |
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| SURNAME ▶ | GWReinmuth | JPO'Reilly | | | | |
| DATE ▶ | 8/28/69 | 8/28/69 | | | | |

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

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R. W. Smith, CO:V
REG Central File

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

VENDOR INSPECTION REPORT

Reactor Pressure Vessel

Vendor: Combustion Engineering, Inc.
Chattanooga, Tennessee

Report No.: CE 69-2

Components Inspected for: Fort Calhoun (50-285)
Indian Point 3 (50-286)
Cooper (50-298)

Date of Visit: 7/21-23/69

Inspector(s): Uldis Potapovs 8/20/69
U. Potapovs, Reactor Inspector (Metallurgy) Date

F J Long 8-20-69
F. J. Long, Senior Reactor Inspector Date

Persons Contacted: Combustion Engineering

E. S. Proctor, Manager Nuclear Quality Control
E. L. Maclin, Chief Quality Control Engineer
P. Kiefer, Quality Control Engineer - Fort Calhoun
J. A. Anderson, Quality Control Engineer - Westinghouse Contracts

Westinghouse

R. D. May, Senior Quality Assurance Engineer (Resident)

General Electric

S. G. Hall, Resident Quality Control Engineer

Stearns-Roger

C. Wilks, Inspector for Consumers Power District

Report Reviewed by: W. C. Seidle, Senior Reactor Inspector 8/22/69 Date

Proprietary Information: Entire Report

## SCOPE

A routine, announced visit was made to the Combustion Engineering Reactor Pressure Vessel shop to inspect Fort Calhoun, Indian Point 3, and Cooper pressure vessels, and to perform a partial audit of quality control records pertaining to these units. No attempt was made to conduct a detailed quality assurance evaluation of the facility although general material handling procedures and selected fabrication processes were reviewed and are discussed in the report.

## SUMMARY

1. Fort Calhoun Pressure Vessel is approximately 85% completed. All welding and stress relieving has been accomplished and the vessel is undergoing final machining. No significant material or fabrication problems have been encountered. (Section B)

2. The Indian Point 3 pressure vessel has been hydrostatically tested and is undergoing post-hydro inspection. Review of records did not disclose any material or fabrication problems which could have significant effect on the pressure vessel integrity.

3. The Cooper I pressure vessel was in subassembly stage at the time of inspection: upper assembly, lower assembly and closure head assembly.

   UT inspection of the plate material at CE disclosed two rejectable indications which were subsequently removed and weld-repaired. (See Section D.3)

   In August of 1968, an accidental fire started inside the lower head assembly depositing charred residue on the clad surface. Comprehensive evaluation of the incident did not disclose any structural damage. (See Section D.6)

   Preheat was lost during the fabrication of the lower intermediate shell assembly. Magnetic particle inspection of affected areas showed no evidence of structural damage.

4. CE is employing a "vertical-up" process (See Section A.4) for joining torus sections and some longitudinal shell course seams. The process is adopted to both manual and submerged arc welding and results in a weldment where the beads run perpendicular to the plate thickness. The main advantage of the process is a reduction in component handling time. The use of a welding positioner is not required.

5. A significant portion of this visit was devoted to the review of documentation on pressure plate material for the three units inspected. No significant material-related problems were uncovered. A summary of pertinent mill certification data for the individual plates appears in Appendices A, B, and C.

6. Twenty-one pressure vessels are currently in the CE shop (6 CE, 6 Westinghouse and 9 GE). The shop does not appear overcrowded and meeting of delivery dates has not been a problem.

## DETAILS

### A. General Observations

#### 1. Shop Work Load

The CE shop fabricates PWR and BWR pressure vessels, steam generators, pressurizers and primary coolant pipe. The latter three items, however, are manufactured only for plants where CE is the NSS supplier. Twenty-one pressure vessels were on the shop floor at the time of this inspection. These can be categorized as follows: (9) GE boiling water vessels, (6) Westinghouse PWR vessels, and (6) CE PWR vessels. The shop did not appear to be overloaded. The current production capacity was estimated (by CE) at 18 units per year. This figure, however, includes pressurizer and steam generator units. After the completion of the current expansion program, the capacity is expected to increase to 23 units per year. Meeting of delivery dates has not been a problem. It was noted that, at the time of this visit, negotiations were in progress to store a currently completed pressure vessel at CE since the site was not ready for delivery.

2. Material Flow

In reviewing material handling, emphasis was placed on pressure vessel plate. The plate is ordered to a CE specification which references the applicable ASTM designation and specific requirements. All pressure vessel plate reviewed during this inspection was purchased from Lukens Steel Company.

The plate is purchased to UT quality (ASTM E435) but is not UT examined at the mill. CE performs UT inspection upon receiving of the material and has the right to reject nonconforming plate. Repairable defects are corrected by CE and back-charged to Lukens Steel Company.

All plates are immediately identified with a CE code number. The material travelers are held by receiving and are not released to fabrication until all mill certifications are checked and found to be in compliance with the applicable CE specifications referenced on the purchase order.

The pressure vessel plate is purchased in as-rolled and stress relieved condition since CE performs the heat treatment after hot forming. CE hot forms, heat treats, and cold sizes the individual pressure boundary segments prior to welding fabrication. The plate vendor is supplied with detailed heat treatment information including the cooling rates and the cummulative stress relief duration. This information is used to simulate the actual plate history for the mechanical property acceptance samples. Typically ASTM A533 Grade B, Class I steel, produced by vacuum improved process and descaled on both sides is ordered to a CE specification. Heat treatment requirements for the mill-test samples are as follows:

1550-1650°F, 3/4 hr/in with programmed cooling rate depending on plate thickness (provided by CE)

1225±25°F, 3/4 hr/in, air cooled

1150±25°F, 40 hrs., air cooled

All samples to be taken at 1/4 thickness, at least one thickness away from any quenched edge.

3. In-Process Controls

CE uses a shop traveler system and separate inspection reports. The inspection requirements are spelled out in the traveler.

Inspection reports are made out in triplicate for all required NDT. A white copy of the inspection report goes to the records area where a duplicate set of travelers is maintained. There inspection report compliance with the traveler is verified and the number of the report is recorded on the traveler. The inspection reports are then filed in numerical order. A pink copy of the inspection report goes to quality engineering and a blue copy to the customer's resident engineer.

Material can be rejected in three stages of fabrication: receiving, in-process and following repair. Approximately 80% of rejections are disposed by quality engineering. Noncompliance with customer's specifications must be referred back to the customer for approval if a waiver is desired. A red tag on a rejected part means that no further work can be done until repair or re-work is completed.

A yellow tag means that other operations, not directly involving the defective part, may be continued. These operations must be specifically identified on the tag.

A green tag is used in receiving inspection of material when no traveler is accompanying the part. Green tag indicates satisfactory test.

4. Special Processes

CE is using a "vertical-up" welding procedure for joining torus plate segments for PWR and BWR vessels and also for making the longitudinal seams in many PWR shell sections. The procedure involves either manual or submerged arc process with a square butt joint. The plate segments are fitted on the shop floor with the long direction of the seams running essentially vertical. Welding is started at the bottom of the assembly in the flat position, progressing upward as the joint is gradually filled. The weld beads are running essentially perpendicular to the plate surfaces. In manual welding, the welder stands on the outside of the assembly, passes the electrode through the gap, strikes arc at the inside of the assembly and draws the electrode towards him, consuming the entire electrode in the process. Small metal tabs are tacked at the surface as the weld is built up to reduce the overruns. These tabs and all excess buildup are machined off following the completion of the weld.

The specific procedures have reportedly been qualified in accordance with Section IX of the ASME Code although this was not verified during the visit.

The main advantage of the process is in reducing component handling since the entire torus or shell course assembly can be welded simultaneously by adding more welders and a welding positioner is not required.

CE was questioned about radiographic inspection of these joints since typical flaws such as slag inclusions or lack of fusion would appear essentially as point defects and could conceivably go undetected. CE advised that seams welded by this procedure are subjected to UT inspection in addition to radiography and that if a defect is suspected, the particular location is re-radiographed at an angle to determine the length of the defect. In addition it was stated that, because of the "end view effect" any defects of this type show up very clearly.

5. Machining of Shell Courses

It was noted that CE purchases all pressure plate approximately one inch oversize and machines I.D. and O.D. of the shell rings following welding. This technique compensates for spring back resulting from the postforming heat treatment and assures good fit-up.

B. Fort Calhoun Vessel (Omaha Public Power District)

1. Current Status of Fabrication

The Fort Calhoun pressure vessel (CE NSS) was approximately 85% complete at the time of the inspection. All welding and stress relieving had been completed and the vessel was undergoing final machining which includes stud holes, core support ledges, keyways and surveillance attachments (horizontal mill work). Following the finish machining operation, the vessel is scheduled for optical inspection (dimensions and alignment), hydrostatic test, cleaning and post-hydro inspection.

2. Mill Certifications

Mill reports pertaining to the pressure plate material were audited - the significant data for individual plates are condensed in Appendix A. All plate for the Fort Calhoun vessel was ordered to CE specification P3F12(b) which calls for A533 Grade B, Class I steel plate produced in accordance with vacuum improved process and descaled on both sides. In addition, the purchase order requires a restricted copper content (limits not given) for all plates which will be hot formed into spherical heads and specifies that copper analyses for these plates be included in the mill report. The main reason for this requirement, according to CE, is that high copper contents can contribute to hot forming defects. It was noted that high copper is also undesirable from the standpoint of radiation embrittlement sensitivity. Therefore, copper analysis of the core level shell courses would also be desirable. The reported values for the dome and torus segments (Appendix A) appear to be in line with current production practice.

Tensile properties of all plates identified in Appendix A were reviewed and were found to be within the specified limits.

3. Inspection Reports

The inspection reports and corresponding shop travelers for the longitudinal seams on the middle shell course were reviewed. These seams were welded using the vertical submerged arc process (Section A.4) and required numerous weld repairs resulting from defects disclosed during radiographic inspection. Kiefer related that at the time these welds were made the vertical process was relatively new and consequently more defects were encountered. Satisfactory repair was indicated. It is noted that CE does not keep rejected radiographs - only the final (acceptable) radiographs are maintained for permanent record.

4. Material Defects

A spot-check of material records indicated that several plates were initally rejected upon receiving, but all defects were of such nature that they could be tolerated, mainly because CE orders oversize plate. The most common defects were light gage areas and "snakes" (hot rolling surface defects). All questionable areas were ground and MP inspected prior to acceptance, the work being back-charged to Lukens Steel Company. Typical receiving defects are given below:

CE Code D 4811 (Bottom Head Dome) - Light gage area
CE Code D 4801 (Closure Head Dome) - Three small "snakes" of the following sizes:

.255" deep x 1" x 7"
.225" deep x 2" x 8"
.140" deep x 1" x 6"

## C. Indian Point 3 Vessel (Consolidated Edison)

### 1. Status of Fabrication

The Indian Point 3 vessel (Westinghouse NSS) was essentially completed and had been hydrostatically tested. The hydrostatic test pressure was 3125 psig (2500 psig design) using 115°F water (before pump-up). Actual temperature readings during the hydro-test, from thermocouples attached to the vessel shell and head, ranged between 111 and 105°F.

According to May, the following operations remain to be completed after the hydro-test.

Liquid penetrant testing of non-ferrous welds
Liquid penetrant testing of nozzle safe ends
Liquid penetrant testing of cladding
UT inspection of cladding, including base-line grid of all critical areas
100% MT inspection of vessel exterior
100% Visual inspection
Cleaning

The completed pressure vessel is identified as follows:

Serial No. - Vessel: CE 66102
Serial No. - Head: CE 66202
National Board No.: 20758
Westinghouse P.O.: 54-F-55179
CE Order No.: 3366

### 2. Mill Certifications

Mill reports pertaining to the pressure plate material were audited and significant data are summarized in Appendix B. All plate for the Indian Point III pressure vessel was ordered to CE specification P3F12(a) which designates ASTM A533 Grade B, Class I steel and the same general comments as for the Fort Calhoun vessel material (Section B.2) apply in this case also.

### 3. Radiography of Welds

The radiographic inspection acceptance forms for the longitudinal welds of all shell courses were audited. Noted defects were in the form of porosity, slag and surface markings, but well within the acceptance limits (ASME Code, Section III, N-624). In addition random radiographs from representative welds were examined. These are identified below:

Nozzle to shell seam 5-045B
Middle shell to upper shell seam 8-042
Lower shell long seam 3-042A
Closure head torus seam 1-046C

The image quality was satisfactory and no deficiencies in the radiographic technique were apparent. Scattered porosity and slag inclusions (up to approximately 1/2 in.) were noted.

4. Fabrication Deviations

A review of deviation notices in the Westinghouse resident inspector's file did not reveal any significant fabrication or material problems which could affect the pressure vessel integrity. Typical variations are summarized below:

The as-built vessel diameter in zone D-5 is 172 27/32 in. (specified 172 9/16 in.) and concentricity to the center line is .012 in TIR (specified .005 in.). The specified requirements were waived and as-built condition accepted by Westinghouse.

Several minor dimensional variations in the alignment of closure head CRDM penetrations have been corrected by boring oversize holes and specifying oversize housings.

MT indications were noted on the closure head following stress relief. These were removed by grinding; weld repair was waived. Also, five PT indications, noted on the closure head cladding after stress relief, were removed by grinding.

Several thread defects in the stud holes, mainly associated with surface finish requirements, have been corrected.

D. Cooper I Vessel (Consumers Power District)

1. Status of Fabrication

At the time of the inspection, the Cooper I vessel was in three sections (subassemblies): closure head assembly, upper vessel assembly and lower vessel assembly. The sub-assemblies are stress relieved separately and, after joining the upper and lower assemblies, a local stress relief will be performed on the circumferential seam.

2. Mill Certifications

Mill reports pertaining to the pressure plate material were audited - the significant data for individual plates are summarized in Appendix C. The same general comments as for the Fort Calhoun pressure vessel material apply in this case also.

3. Material Defects

Several of the plates were found to contain defects although all were eventually accepted, some following weld repair. A brief description follows:

CE Code 2801-1

Ultrasonic inspection at CE disclosed two defects, the largest being a lamination 3 in. deep x 4 1/2 in. wide x 11 in. long. Prior to cladding, the defective area was ground out and weld repaired following hot forming and heat treating operations.

CE Code 2807 (Upper Torus)

Ultrasonic inspection at CE disclosed a 2 1/2 in. deep x 3 3/4 in. wide x 14 in. long defect which was subsequently chipped out and rewelded prior to cladding.

CE Code 2801-7 (Lower Intermediate Shell Plate)

Roll marks on top surface; "snake" on bottom.

CE Code 2802-2 (Lower Intermediate Shell Plate)

Several "snakes" and cinder pits.

CE Code 2802-1 (Lower Shell Plate)

Cold piece and cinder pit, 130 in. deep.

4. Test Plate for Pressure Vessel Surveillance Program

A special plate measuring 61 in. x 74 1/4 in. x 6 1/2 in. has been obtained from Lukens Heat No. C-2331-2 for use in the fabrication of pressure vessel surveillance specimens. Lukens was also requested to supply detailed (through-thickness) impact and tensile property evaluations. Significant data is summarized below:

| Test temp. | Charpy-V Notch Ductility (Ft-lb.) | | | |
|---|---|---|---|---|
| (°F) | at surface | 1/4 thickness | Center | 3/4 thickness |
| -60 | 18,19,15 | | | |
| -50 | 21,23 | | | |
| -45 | 26,39 | | | |
| -40 | 35,37,33 | 15,10,7 | 11,8,10 | 12,11,11 |
| +10 | 63,61,75 | 21,37,21 | 31,30,30 | 40,23,33 |
| +40 | 86,78,78 | 58,64,63 | 36,55,54 | 45,63,73 |
| +110 | 112,113,112 | 114,115,114 | 116,97,110 | 95,107,106 |
| +160 | | 132,130,13[illegible] | 129,133,140 | 136,120,127 |

5. Vessel Weld Test Reports

Nondestructive and destructive tests were performed on production samples of welds made by all processes used in fabrication of the vessel. Nondestructive testing (MP,RT, UT) failed to disclose rejectable defects. All guided bend tests were acceptable. A comparison of impact properties between the base plate, weld deposit and heat affected zone (HAZ) of the different weldments is given below:

Nozzle weld (G 2803-2)
Charpy-V energy absorption at 10°F

| Base (Ft-lb) | Heat Affected Zone (Ft-lb) | Weld (Ft-lb) |
|---|---|---|
| 63 | 55 | 192 |
| 79 | 39 | 166 |
| 72 | 84 | 147 |

Girth weld - lower shell (G-2805 & G-2805)
Charpy-V energy absorption at $10^{o}F$

| Base (Ft-lb) | Heat Affected Zone (Ft-lb) | Weld (Ft-lb) |
|---|---|---|
| 20 | 69 | 82 |
| 62 | 61 | 80 |
| 51 | 49 | 73 |

The drop-weight NDT temperatures for the weld and HAZ were -60 and $-50^{o}F$ respectively.

Torus weld (vertical-up method)
Charpy-V energy absorption at $10^{o}F$

| Base (Ft-lb) | Heat Affected Zone (Ft-lb) | Weld (Ft-lb) |
|---|---|---|
| 52 | 75 | 85 |
| 54 | 48 | 86 |
| 47 | 52 | 105 |

It is noted that in all cases the weld metal and HAZ properties compare favorably with the base metal.

6. Fabrication Deviations and Special Problems

GE resident engineer's records indicate that the Cooper I pressure vessel was formerly assigned to the Niagara Mohawk Power Corporation (Niagara 3). In August 1968, during a one-day strike, preheat was being maintained on the bottom head and caused a fire to start in that area. Attempts to extinguish the fire with $CO_2$ units were unsuccessful and the fire was permitted to burn out. The fire was confined to the inside of the bottom head and consumed several card-board boxes and other flammable items leaving charred residue on the clad surface. An interstage stress relieving treatment had to be performed before the lower head could be cooled to room temperature for cleaning. In order to demonstrate that the fire residue and the subsequent stress relief cycle had no detrimental effect on the cladding, stressed bent-beam specimens representative of the clad surface were coated with the fire residue and subjected to simulated stress relief cycle. Metallographic and microprobe analysis of the specimens failed to disclose detrimental effects. In addition a 2 in. x 3 in. area of the head in the center of the fire was electrolytically polished and cellulose acetate tape used to obtain specimens for metallographic examination. A total of three specimens were examined: clad surface, 3/64 below surface and 3/32 below surface. No evidence of any material deterioration was observed. Negative results were also obtained from a wedge sample taken from a stub tube which was exposed to the fire. The charred residue was removed by grit-blasting and the entire cladding surface was liquid penetrant inspected.

Upper Shell

Two one-inch holes (nozzle cut-out start holes) were drilled in the wrong location. Repair was accomplished by air-arc gouging from both sides followed by MP inspection and rewelding using CE's standard repair procedure.

Lower Intermediate Shell Course

Preheat was lost before the final stress relief operation. To demonstrate that no permanent damage was incurred, cladding was removed from two areas (1 in. x 3 in.) and the exposed base metal MP inspected. No defects were found.

The CRDM housing and flux monitor penetrations are slightly oversize. CE will demonstrate in the CRD stress report that the effects of the diameter change on the shell thickness requirement and on the heat transfer coefficient is acceptable.

APPENDIX A

MILL CERTIFICATION DATA SUMMARY FOR PRESSURE PLATE

Fort Calhoun Vessel

| Subassembly Plate Size | CE Code | Lukens Heat No. | SELECTED* Chem Analysis P | S | Cu | Drop-weight NDT (°F) | Charpy-V impact properties (Ft-lb.) -80 | -40 | +10 | +40 | +110 | +160 | +210 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOSURE HEAD TORUS | D4808-1 | C-3141-1 | .007 | .014 | .15 | -40 | | 13 | 21 | 48 | 84 | 115 | 126 |
| 7 1/2-in plate | | | | | | | | 14 | 35 | 50 | 99 | 121 | 132 |
| | | | | | | | | 9 | 37 | 45 | | | |
| CLOSURE HEAD DOME | D4809 | C-3143-4 | .011 | .015 | .11 | -20 | | 10 | 27 | 41 | 97 | 114 | 120 |
| | | | | | | | | 15 | 33 | 50 | 98 | 116 | 123 |
| | | | | | | | | 16 | 36 | 49 | | | |
| BOTTOM HEAD TORUS | D4810 | C-3149-2 | .010 | .016 | .11 | -60 | 8 | 37 | 64 | 96 | 132 | | |
| 4 9/16-in plate | | | | | | | 14 | 31 | 62 | 99 | 133 | | |
| | | | | | | | 16 | 21 | 66 | 82 | 127 | | |
| BOTTOM HEAD DOME | D4811-1 | C-3149-2 | .010 | .016 | .11 | -50 | 9 | 22 | 58 | 103 | 120 | | |
| | | | | | | | 14 | 27 | 84 | 110 | 146 | | |
| UPPER SHELL | D4801-1 | C-2585-1 | .009 | .012 | - | -20 | | 25 | 42 | 60 | 99 | 116 | |
| 105 in x 187 in x 11 in | | | | | | | | 20 | 47 | 61 | 103 | 117 | |
| | | | | | | | | 24 | 56 | 60 | 100 | 117 | |
| | D4801-2 | C-2585-2 | .010 | .018 | - | -30 | | 22 | 41 | 64 | 96 | 107 | |
| | | | | | | | | 20 | 42 | 63 | 100 | 109 | |
| | | | | | | | | 30 | 47 | 70 | 103 | 110 | |
| | D4801-3 | Not Recorded | .009 | .015 | - | +30 | | 9 | 32 | 52 | 93 | 103 | |
| | | | | | | | | 10 | 38 | 49 | 87 | 112 | |
| | | | | | | | | 11 | 41 | 53 | 92 | 115 | |
| INTERMEDIATE SHELL | D4802-1 | C-2585-3 | .009 | .018 | - | -50 | 7 | 23 | 37 | 77 | 110 | 115 | |
| 104 in x 189 in x 8 1/2 in | | | | | | | 10 | 35 | 50 | 70 | 114 | 117 | |
| | | | | | | | | | 45 | 74 | | | |
| | D4802-2 | A 1768 | .013 | .015 | - | -20 | | 11 | 35 | 57 | 92 | 121 | |
| | | | | | | | | 12 | 34 | 60 | 88 | 123 | |
| | | | | | | | | 15 | 39 | 58 | | | |
| | D4802-3 | 1768 | .014 | .016 | - | -30 | | 21 | 35 | 63 | 110 | 120 | |
| | | | | | | | | 12 | 38 | 65 | 105 | 122 | |
| | | | | | | | | 21 | 31 | 63 | 105 | 116 | |
| LOWER SHELL | D4812-1 | C-3213-2 | .009 | .015 | .12 | -30 | | 27 | 37 | 74 | 114 | 128 | |
| 104 [illegible] 189 in x 8 1/2 in | | | | | | | | 12 | 45 | 79 | 116 | 135 | |
| | | | | | | | | 26 | 52 | 99 | 120 | 137 | |

| Subassembly Plate Size | CE Code | Lukens Heat No. | SELECTED* Chem Analysis | | | Drop-weight NDT (°F) | Charpy-V impact properties (Ft-lb.) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | P | S | Cu | | -80 | -40 | +10 | +40 | +110 | +160 | +210 |
| | D4812-2 | C-3143-2 | .006 | .015 | .11 | -20 | | 21 | 57 | 68 | 114 | 132 | |
| | | | | | | | | 22 | 59 | 71 | 115 | 135 | |
| | | | | | | | | 14 | 53 | 73 | 125 | 136 | |
| | D4812-3 | C-3143-3 | .010 | .015 | .10 | -30 | | 18 | 26 | 60 | 115 | 137 | |
| | | | | | | | | 12 | 33 | 61 | 116 | 138 | |
| | | | | | | | | 10 | 42 | 62 | 123 | 140 | |

*Chemical analyses of all heats were within specified limits. The selected analyses reported below are for elements considered significant in determining notch-ductility properties and sensitivity to radiation damage.

APPENDIX B

# MILL CERTIFICATION DATA SUMMARY FOR PRESSURE PLATE

## Indian Point III Vessel

| SUBASSEMBLY | CE Code | Lukens Heat No. | SELECTED* Chem Analysis P | S | Cu | Drop-weight NDT (°F) | Charpy-V notch properties (Ft-lb.) -40 | +10 | +40 | +60 | +110 | +160 | +210 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOSURE HEAD TORUS | B2806-1 | C-1533-3 | .010 | .018 | .14 | +10 | 11 | 18 | 44 | | 115 | 130 | |
| | | | | | | | 7 | 13 | 41 | | 120 | 129 | |
| | | | | | | | 16 | 34 | 52 | | 99 | 128 | |
| | B2806-2 | C-1533-4 | .010 | .016 | .13 | +10 | 16 | 27 | 21 | | 93 | 120 | |
| | | | | | | | 7 | 14 | 42 | | 97 | 120 | |
| | | | | | | | 13 | 33 | 68 | | 93 | 117 | |
| | B2806-3 | C-1533-1 | .012 | .015 | .14 | 0 | 7 | 32 | 61 | | 98 | 108 | |
| | | | | | | | 7 | 40 | 50 | | 96 | 112 | |
| | | | | | | | 10 | 26 | 23 | | 75 | 112 | |
| CLOSURE HEAD DOME | B2807 | C-1533-5 | .010 | .017 | .13 | +10 | 14 | 22 | 30 | | 70 | 83 | |
| | | | | | | | 7 | 36 | 30 | | 73 | 85 | |
| | | | | | | | 15 | 36 | 52 | | 59 | 85 | |
| BOTTOM HEAD TORUS | B2804-1 | B-5549-1 | .013 | .018 | .13 | -40 | 15 | 62 | | 101 | 108 | 105 | |
| | | | | | | | 51 | 45 | | 97 | 104 | 108 | |
| | | | | | | | 45 | 71 | | 76 | 110 | 103 | |
| | B2804-2 | Not Recorded | .018 | .018 | .16 | -40 | 44 | 35 | | 104 | 96 | 109 | |
| | | | | | | | 38 | 60 | | 81 | 106 | 108 | |
| | | | | | | | 23 | 83 | | 106 | 98 | 109 | |
| | B2804-3 | B-5549-3 | .015 | .016 | .16 | -40 | 35 | 64 | | 70 | 110 | 109 | |
| | | | | | | | 34 | 73 | | 73 | 102 | 109 | |
| | | | | | | | 41 | 38 | | 86 | 110 | 106 | |
| BOTTOM HEAD DOME | B2805 | B-5549-4 | .016 | .018 | .13 | -30 | 22 | 49 | | 50 | 81 | 89 | |
| | | | | | | | 20 | 45 | | 61 | 79 | 80 | |
| | | | | | | | 22 | 35 | | 69 | 93 | 85 | |
| UPPER SHELL | B2801-1 | B-5391-1 | .010 | .026 | - | -50 | 10 | 21 | 41 | | 84 | 90 | |
| | | | | | | | 10 | 31 | 39 | | 69 | 96 | |
| | | | | | | | 10 | 23 | 42 | | 70 | 98 | |
| | B2801-2 | B-5394-2 | .010 | .023 | - | -50 | 12 | 67 | 61 | | 100 | 134 | |
| | | | | | | | 17 | 57 | 66 | | 119 | 135 | |
| | | | | | | | 19 | 64 | 87 | | 123 | 140 | |

| SUBASSEMBLY | CE Code | Lukens Heat No. | SELECTED* Chem Analysis P | S | Cu | Drop-weight NDT (°F) | Charpy-V notch properties (Ft.lb.) -40 | +10 | +40 | +60 | +110 | +160 | +210 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B2801-3 | A0516-1 | .015 | .020 | - | -40 | 18 | 42 | 48 | | 114 | 130 | |
| | | | | | | | 16 | 42 | 59 | | 99 | 136 | |
| | | | | | | | 11 | 42 | 69 | | 106 | 127 | |
| INTERMEDIATE SHELL | B2802-1 | B5394-2 | .010 | .023 | - | -50 | 12 | 67 | 61 | | 100 | 140 | |
| | | | | | | | 17 | 67 | 66 | | 119 | 134 | |
| | | | | | | | 19 | 64 | 87 | | 123 | 135 | |
| | B2802-2 | A0516-2 | .015 | .019 | - | -50 | 17 | 55 | 79 | | 114 | 129 | |
| | | | | | | | 37 | 65 | 77 | | 129 | 113 | |
| | | | | | | | 11 | 60 | 62 | | 130 | 121 | |
| | B2802-3 | B5391-2 | .011 | .025 | - | -40 | 12 | 50 | 77 | | 104 | 118 | |
| | | | | | | | 10 | 53 | 61 | | 107 | 117 | |
| | | | | | | | | 34 | 49 | | 108 | 113 | |
| LOWER SHELL | B2803-1 | A0495-2 | .012 | .026 | - | 0 | 16 | 32 | 49 | | 74 | 90 | |
| | | | | | | | 11 | 35 | 46 | | 76 | 90 | |
| | | | | | | | 10 | 32 | 33 | | 77 | 95 | |
| | B2803-2 | 1397-3 | .011 | .025 | - | -20 | 42 | 76 | 72 | | 136 | 134 | |
| | | | | | | | 40 | 57 | 80 | | 136 | 136 | |
| | | | | | | | 25 | 78 | 79 | | 123 | 135 | |
| | B2803-3 | A0512-2 | .012 | .024 | - | -10 | 13 | 32 | 33 | | 57 | 75 | |
| | | | | | | | 13 | 26 | 33 | | 61 | 69 | |
| | | | | | | | 32 | 25 | 34 | | 58 | 76 | |

*Chemical analyses of all heats were within specified limits. The selected analyses reported below are for elements considered significant in determining notch-ductility properties and sensitivity to radiation damage.

APPENDIX C

MILL CERTIFICATION DATA SUMMARY FOR PRESSURE PLATE

Cooper I Vessel

| SUBASSEMBLY Plate size | CE code | Lukens Heat No. | SELECTED * Chem analysis P | S | Cu | Drop-weight NDT (°F) | Charpy-V impact properties (Ft-lb.) -60 | -40 | +10 | +40 | +110 | +160 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CLOSURE HEAD TORUS | G2812 | C-2660-2 | .010 | .015 | .10 | <-10 | 22 | 42 | 52 | 98 | 109 | 130 |
| [illegible]28 1/2 in x 187 in x | | | | | | | 21 | 20 | 67 | 80 | 116 | 124 |
| 4 1/16 | | | | | | | | 34 | 79 | 83 | | |
| 383 in x 161 in x 4 1/16 | G2807 | C-2454-1 | .011 | .014 | .17 | <0 | | 15 | 41 | 68 | 99 | 123 |
| | | | | | | | | 17 | 40 | 54 | 99 | 124 |
| | | | | | | | | 9 | 41 | 56 | 105 | 120 |
| CLOSURE HEAD DOME | G2813 | C-2540 | .010 | .017 | .19 | <10 | 14 | 16 | 50 | 66 | 105 | 100 |
| 119 in. x 119 in x | | | | | | | 13 | 26 | 51 | 71 | 116 | 106 |
| 1/2 in | | | | | | | | 30 | 41 | 60 | | |
| UPPER SHELL | G2801-1 | C-2311-1 | .012 | .016 | - | <0 | | 34 | 60 | 58 | 104 | 127 |
| 253 in x 153 in 6 1/2 in | | | | | | | | 28 | 56 | 78 | 105 | 132 |
| | | | | | | | | 33 | 49 | 70 | 116 | 127 |
| | G2801-2 | C-2344-1 | .012 | .017 | - | <0 | | 11 | 25 | 46 | 95 | 103 |
| | | | | | | | | 10 | 32 | 52 | 84 | 103 |
| | | | | | | | | 14 | 32 | 49 | 76 | 98 |
| | G2801-3 | C2327-2 | .010 | .016 | - | <0 | | 16 | 56 | 60 | 106 | 126 |
| | | | | | | | | 23 | 43 | 62 | 112 | 123 |
| | | | | | | | | 28 | 50 | 63 | 106 | 121 |
| UPPER INTERMEDIATE SHELL | G2801-4 | C-2327-1 | .013 | .015 | - | -20 | | 21 | 45 | 68 | 100 | 108 |
| | | | | | | | | 19 | 40 | 43 | 100 | 107 |
| | | | | | | | | 10 | 33 | 73 | 100 | 113 |
| | G2801-5 | C-2315-1 | .011 | .015 | - | -30 | | 24 | 51 | 64 | | 109 |
| | | | | | | | | 28 | 47 | 68 | | 110 |
| | | | | | | | | 39 | 56 | 65 | | 107 |
| | G2801-6 | G-2344-2 | .011 | .017 | - | -30 | | 8 | 49 | 55 | 97 | 107 |
| | | | | | | | | 9 | 39 | 49 | 103 | 111 |
| | | | | | | | | 17 | 52 | 58 | 110 | 116 |

| SUBASSEMBLY Plate size | CE Code | Lukens Heat Nos. | SELECTED* Chem analysis P | S | Cu | Drop-weight NDT (°F) | Charpy-V impact properties (Ft-lb.) -60 | -40 | +10 | +40 | +110 | +160 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOWER INTERMEDIATE SHELL | G-2802-1 | C-2331-2 | .010 | .017 | - | -40 | 12 | 19 | 28 | 58 | 91 | 110 |
| 260 in x 153 in x 6 1/2 in | | | | | | | 11 | 24 | 45 | 70 | 99 | 111 |
| | | | | | | | 19 | 14 | 37 | 59 | | |
| | G-2802-2 | C-2307-2 | .010 | .014 | - | -40 | 42 | 46 | 89 | 97 | 121 | 129 |
| | | | | | | | 33 | 42 | 73 | 83 | 124 | |
| | | | | | | | | 43 | 72 | 94 | 132 | |
| | G-2801-7 | C-2407 | .010 | .016 | - | -10 | | 34 | 50 | 70 | 114 | 126 |
| | | | | | | | | 17 | 68 | 75 | 124 | 129 |
| | | | | | | | | 15 | 63 | 67 | 110 | 133 |
| LOWER SHELL | G-2803-1 | C-2274-1 | .010 | .018 | - | <0 | | 25 | 50 | 60 | 106 | 114 |
| 256 in x 152 1/4 in x | | | | | | | | 16 | 40 | 61 | 90 | 111 |
| 7 9/16 in | | | | | | | | 13 | 33 | 62 | 79 | 110 |
| | G-2803-2 | C-2307-1 | .009 | .015 | - | <0 | | 26 | 40 | 65 | 102 | 119 |
| | | | | | | | | 24 | 70 | 75 | 102 | 111 |
| | | | | | | | | 28 | 50 | 62 | 105 | 116 |
| | G-2803-2 | C-2274-2 | .009 | .017 | - | <0 | | 25 | 58 | 58 | 90 | 115 |
| | | | | | | | | 27 | 44 | 52 | 90 | 111 |
| | | | | | | | | 30 | 49 | 52 | 95 | 108 |
| BOTTOM HEAD TORUS | G-2805 | C-2297-1 | .016 | .016 | .11 | <0 | | 18 | 29 | 65 | 87 | 113 |
| 223 15/16 in x 147 in x | | | | | | | | 22 | 46 | 52 | 100 | 117 |
| 8 in | | | | | | | | 19 | 46 | 44 | 84 | 127 |
| 226 15/16 in x 73 in x | G-2806-1 | C-2137-3 | .011 | .017 | .15 | <0 | | 12 | 39 | 44 | 85 | 122 |
| 8 in | | | | | | | | 14 | 26 | 57 | 87 | 117 |
| | | | | | | | | 14 | 36 | 56 | 88 | 121 |
| BOTTOM HEAD DOME | G-2804-1 | A-1195-2 | .010 | .017 | .15 | <0 | | 10 | 27 | 49 | 78 | 108 |
| 123 1/8 in x 112 in x | | | | | | | | 12 | 39 | 63 | 89 | 117 |
| 8 in | | | | | | | | 11 | 29 | 40 | 90 | 115 |

*Chemical analyses of all heats were within specified limits. The selected analyses reported below are for elements considered significant in determining notch-ductility properties and sensitivity to radiation damage.

**MEMO ROUTE SLIP**
Form AEC-93 (Rev. May 14, 1947)

| | | |
|---|---|---|
| See me about this. | For concurrence. | For ac |
| Note and return. | For signature. | For In |

| TO (Name and unit) | INITIALS / DATE | REMARKS |
|---|---|---|
| J. P. O'Reilly, Chief<br>Reactor Inspection &<br>Enforcement Br,<br>CO:HQ | INITIALS<br><br>DATE | SUBJECT: CONSOLIDATED EDISON COMPANY<br>INDIAN POINT NO. 3 - DOCKET |
| TO (Name and unit) | INITIALS<br><br>DATE | REMARKS<br>Subject report is forwarded late due<br>workload and staff on vacation. |
| TO (Name and unit) | INITIALS<br><br>DATE | REMARKS |

| FROM (Name and unit) | REMARKS |
|---|---|
| N. C. Moseley<br>Sr. Reactor Inspector<br>CO:I | |
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