

U. S. ATOMIC ENERGY COMMISSION
DIVISION OF COMPLIANCE
HEADQUARTERS

Report of Pressure Vessel Inspection
CO Report No. 286/69-2

Vendor: COMBUSTION ENGINEERING COMPANY
CHATTANOOGA, TENNESSEE

Licensee: CONSOLIDATED EDISON COMPANY
INDIAN POINT 3
DOCKET NO. 50-286

Date of Inspection: January 16-17, 1969

Inspected By: William J. Collins *W. J. Collins* 2/19/69
Metallurgical Engineer (Date)

Reviewed By: H. R. Denton *H. R. Denton* 2/19/69
Chief, Technical Support Branch (Date)

Proprietary Information: Entire Report

SCOPE

An announced visit was made to the Combustion Engineering Company's (CE) Chattanooga, Tennessee plant to conduct an initial review of quality control records relating to the reactor pressure vessel for Consolidated Edison's (Con Ed) Indian Point 3 facility. The percent completion of other pressure vessels being fabricated was determined during the inspection.

SUMMARY

Based on CE production control charts, the fabrication of the reactor pressure vessel for the Indian Point 3 facility is essentially 90% complete. According to CE, the length of the recent labor strike has caused the vessel's scheduled delivery date of March 1969 to be set forward to May 1969. Otherwise, the fabrication of the vessel has proceeded with relatively few difficulties.

It was found that CE's quality control system, as established, was being used effectively in the fabrication of this vessel. The applicant's (Con Ed) independent inspection agency, U. S. Testing Company, Inc., was found to be auditing the vessel fabrication also.

8111130147 690219
PDR ADOCK 05000286
G PDR

The specification deviation records were examined to assess the severity of problem areas experienced in fabrication of the Indian Point 3 reactor vessel. CE experienced no unusual deviations which could be defined as significant trouble areas. Prompt corrective action was taken on all deviations as evidenced by the records.

Supplier's material properties test data on major components entering fabrication of the Indian Point 3 vessel were examined. No deficiencies were uncovered which would indicate detrimental substitute, or rejectable materials entered the fabrication process.

Final heat treatment records and radiography of major welds were also examined during the visit. These were found to be within the specified requirements.

DETAILS

I. Persons Contacted

Persons participating in principal discussions and activities were:

- E. S. Proctor, Manager, Quality Control, CE (Chattanooga)
- E. L. Maclin, Chief Q.C. Engineer, CE (Chattanooga)
- W. R. May, Resident Q.C. Representative, Westinghouse
- C. H. McDonnell, Q.C. Engineer; U. S. Testing Laboratories, Inc.*

II. Status of Vessel

Based on information shown on CE production control charts, the fabrication of Indian Point 3 reactor vessel is 90% complete. Present schedules indicate hydrostatic pressure testing will be conducted in April 1969. Vessel proper and detachable upper head assemblies are complete. Final machining of the vessel proper was in progress and is the last major fabrication work to be completed.

Work is in progress on the pressure vessels listed below. The percent completion is based upon CE estimates taken from production control data.

* Independent inspection agency contracted to Consolidated Edison Company, New York

<u>Facility</u>	<u>Component</u>	<u>Percent Completion</u>
Omaha Public Power District (Calhoun 1)	Reactor vessel	80 - 85
	2 steam generators	70 - 80
	pressurizer	30
Public Service Electric and Gas Co. (Salem 1)	Reactor vessel	80
Consumers Public Power Dist. (Cooper Station)	Reactor vessel	40 - 45
Boston Edison Co. (Pilgrim Station)	Reactor vessel	40 - 45
Niagara Mohawk Power (Easton Station)	Reactor vessel	60
Pacific Gas & Electric Co. (Diablo Canyon 1)	Reactor vessel	50

III. Details of Records Review

A. Materials Certification Review

The suppliers' certification reports of material tests on the outlet and inlet nozzles, vessel plates, vessel closure studs and CRD stub tube materials were reviewed and compared with the applicable specifications. No deficiencies were uncovered which would indicate marginal or defective material entered the fabrication process for the reactor vessel. All deviations evolving from the CE receiving inspection program were promptly identified and corrected, according to the purchase order file and deviation report records.

B. Deviation Records Review

At CE, any deviation from material requirements, design plans or in the planned fabrication schemes is identified as a deviation of record, irrespective of its significance or activity in which it occurred. As a continuance of the inspection, the deviation records were examined to evaluate the relative severity of problem areas experienced during fabrication of the Indian Point 3 reactor vessel. It was found that CE had experienced no unusual deviations which could be defined as significant trouble areas. All deviations were found to be promptly and adequately corrected as indicated by dated approval signatures of the responsible persons involved.

Some of the more significant deviations for the Indian Point 3 vessel are shown below. These also illustrate, in part, the overall effectiveness of the CE quality assurance system.

- 1. Insufficient cladding thickness was deposited on two of the four outlet nozzle projections. Cladding was machined out and redeposited to the prescribed thickness.
- 2. Some ten deviations reflected defective cladding in that chemistry or ferrite content requirements were not met. Correction included complete removal of affected areas, replacement and retesting.
- 3. Base metal laminations in one closure head segment were encountered during welding operations. Laminations were removed by arc-air gouging and grinding. Magnetic particle testing verified lamination removal prior to continuing welding operations.
- 4. Several Inconel CRD stub tubes were rejected in that purchase order requirements regarding linear surface indications had not been met. Satisfactory replacement was made by the supplier, International Nickel Company.
- 5. Charpy impact values of 30 ft-lbs @10°F were not obtained on several formed sections of the upper head following the final heat treatment. Since all affected sections measured above 30 ft-lbs @40°F, and satisfactory drop weight values @10°F were obtained, CE and Westinghouse considered them to be acceptable to ASME Code, Section III.

C. Radiography Review

The inspector examined, as representative samples, the radiography records of the lower vessel head to shell circle seam weld and two of the eight large nozzle welds. Radiographic examination reports which included film, techniques used, and film interpretation sheets were found to be consistent with Section III, ASME B&PV Code requirements. Quality of the radiographs, with regard to 2-2T penetrameter sensitivity, density and image contrast obtained was excellent. Weld soundness quality exhibited by the radiographs was well within the acceptance standards defined by ASME Code, Section III.

The radiographic examination reports indicated three independent parties reviewed the radiography and concluded the welds were acceptable--the CE radiography inspector, Mr. R. Wilson; the Westinghouse resident inspector, Mr. W. R. May, and the Hartford Insurance inspector, Mr. McClellan. Mr. McDonnell, as a representative of the applicant, participated in this radiography review.

D. Review of Final Stress Relief Heat Treatment

The inspector examined the final stress relief records for the reactor vessel and discussed the procedures employed with CE (Proctor) and Westinghouse (May). The following facts were obtained:

1. The prescribed stress relief temperature limit of $1150^{\circ}\text{F} \pm 25^{\circ}\text{F}$ (as for all A-302B vessels) was met.
2. Heatup rate was stabilized at $100^{\circ}\text{F}/\text{hr}$ above 600°F in the vessel, as required.
3. Holding time at stress relief temperature totaled 13 hours. Holding time of 8 hours, or 1 hr/in of wall thickness was specified as minimum. Five thermocouples, attached to evenly distributed welds of the vessel, show a maximum temperature differential of 15°F was maintained during the stress relief treatment.
4. Vessel cool down rate was maintained at $100^{\circ}\text{F}/\text{hr}$ to 600°F , then furnace cooled to 400°F followed by air cooling.
5. Both furnace and vessel thermocouples were found to be properly calibrated.

The quality control inspectors of CE, Westinghouse and Hartford Insurance have concluded the final heat treatment was satisfactory, according to approval signatures of record. The inspector agrees with this conclusion.

IV. Miscellaneous Topics

A. U. S. Testing Company Activities

Mr. McDonnell accompanied this inspector during the examination of selective records of the Indian Point 3 vessel. He stated that Con Ed has contracted the services of his organization for both on-site and off-site Q.C. surveillance for the facility. Mr. McDonnell said that he had been auditing the Q.C. records and progress of the Indian Point 3 vessel by visiting the CE plant monthly. His firm is also providing vendor inspections for Con Ed for other Indian Point 3 components; such as steam generators, pressurizer and primary coolant piping. Mr. McDonnell indicated that Westinghouse was the principal supplier of these components.

With regard to CE fabrication of the Indian Point 3 pressure vessel, Mr. McDonnell stated he had found no discrepancies between the work and specifications. Mr. McDonnell indicated this was not true for the other components, particularly the steam generators, but would not elaborate on the true nature or significance of his audit findings.

B. Nondestructive Testing

To determine whether final stress relief or hydro pressure tests causes detrimental changes in existing quality, CE is performing the following nondestructive tests on the Indian Point 3 vessel:

1. After final stress relief; 100% magnetic particle test (MPT) of external surfaces of vessel and head, 100% dye penetrant test (DPT) of all cladding in these components.
2. Post-hydro inspection; Complete DPT of nonferrous pressure boundary welds. Complete MPT of ferrous pressure boundary welds.

The base metal of the entire core area will be ultrasonic tested (UT) through the cladding using the longitudinal wave mode, circumferential scan technique. A UT map will be developed for all indications exhibiting 40% loss of ultrasonic signal amplitude as calibrated on 1/2" diameter flat bottom hole using a 1-1/8" x 1/2", 2.25 MHz transducer in a wheel-type mounting. The ultrasonic test results are to provide historical reference for in-service inspection only. No code acceptance criteria are factored into this test program, according to Mr. Proctor.

The results of the first tests after stress relief did not disclose any detrimental conditions in the materials. The post hydro inspection has not been accomplished at this time. Detailed results of the aforementioned inspections are to be submitted to the applicant with the Indian Point 3 vessel fabrication report and should be reviewed when this document is made available.

IV. Exit Interview

Persons contacted accompanied the inspector throughout the visit thus eliminating the necessity of an exit interview.