

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

Report of Inspection

CO Report No. 286/69-5

Applicant: CONSOLIDATED EDISON COMPANY  
INDIAN POINT NO. 3  
License - Not Issued

Dates of Inspection: April 30 and May 1, 1969

Dates of Previous Inspection: March 18 and 24, 1969

Inspected by: A. A. Varela 6-2-69  
A. A. Varela, Reactor Inspector (Construction) Date

Reviewed by: N. C. Moseley 6/3/69  
N. C. Moseley, Senior Reactor Inspector Date

Proprietary Information: None

SCOPE

A routine announced inspection of Consolidated Edison Company's Indian Point No. 3 site at Buchanan, New York was made by Messrs. G. L. Madsen and A. A. Varela on April 30 and May 1, 1969. Most of the work on the containment building under the exemption granted by the Director of Regulation on November 15, 1968, is completed and work on the nuclear portion of the facility is presently suspended. The exemption permitted, (a) pouring the concrete for the base mat, (b) installing the bottom liner plates and transition knuckle plates and, (c) installing the reinforcing steel for the base concrete over the bottom liner plates. The last item has not been done but some circumferential rebars in the containment above the transition knuckle plates were installed. Concrete work is now under way on the discharge canal wall, turbine hall and heater bay footings and piers and screen well house intake walls. The purpose of the inspection was to evaluate the quality control program relative to the containment building base mat concrete and rebar and the liner floor.

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SUMMARY

The following items of nonconformance to the PSAR, Supplement 2, were found by the inspector to exist:

- 1. Cement certificate from cement manufacturer attesting conformity to ASTM C-150 are not available for cement used between November 27, 1968 and January 10, 1969. ✓
- 2. User samples of cement at the batch plant have not been made. ✓
- 3. Type II cement was and is still being used, whereas Type I has been specified. ✓
- 4. Slump tests are taken for every third truck load instead of each truck load, as specified. ✓
- 5. The cement brand tested in original trial mixes of September, 1968, was discontinued December 18, 1968; another brand was used until March, 1969, at which time new trial mixes were tested incorporating the second brand. Change of trial mix brand of cement does not conform to ACI 613. ✓
- 6. On horizontal cadweld splices in the containment wall, four inside diameter circumferential rebars, from about elevation 45 to 49, are spliced without stagger, not conforming to the specified minimum separation of 2'-4". ✓

DETAILS

I. Persons Contacted:

The following persons were contacted during the visit:

Con Ed

- Mr. A. Corcoran, Site Construction Engineer
- Mr. J. Verbeyst, Site Construction Engineer Assistant
- Mr. E. Dadson, Quality Control Engineer
- Mr. J. Dragosits, Welding Inspector
- Mr. F. Matra, Piping Inspector

U. S. Testing

Mr. D. Edley, Concrete Specialist

UE&C

Mr. J. Fant, Quality Control Engineer

Westinghouse

Mr. G. Waldrop, Quality Control Engineer

II. Results of Visit

A. Concrete

The inspector's audit of the original (September, 1968) trial mixes disclosed that five (5) sources of fine aggregate and five (5) sources of course aggregate were combined with one specific brand of cement to give 25 different mixes for each design strength of 2,000, 3,000 and 4,000 psi. These were tested according to ACI-613 by Pittsburgh Testing Laboratory for UE&C. PTL recommended these specific mixes and UE&C accepted the recommendations. Quality control for production concrete is by PTL who maintains inspectors at the batch plant and at the pour location.

The inspectors audit of UE&C quality control records shows that in 1968 the brand of cement used in all production concrete was that used in design mixes and concrete cylinder breaks were above the design strength. The 3,000 psi mix used on the containment mat has a record of cylinder breaks 150% of design strength in September, increasing to 175% of design strength in December. On December 18, 1968, the cement brand was changed by the batch plant.

In January, February and March, 1969, the monthly average of concrete cylinders dropped to 125% of design strength for the 2,000 and 3,000 psi mixes, a drop of over 25% from the December high. Mr. Fant of UE&C could give no explanation for these results. Curiously, the change of cement brand in mid December 1968 did not show an effect, in concrete cylinder strengths for that month.

In December, 1968, UE&C's quality control records show the first use of 4,000 psi mix for production concrete, and concrete cylinders indicated 135% of design strength for that month. But in

January and February, 1969, concrete cylinders for the 4,000 psi mix dropped in strength to about 120% and, in March 1969, 762 c.y. of the 4,000 psi mix used on the turbine generator beam tested below design strength. Mr. Fant explained to the inspectors that when 24 seven-day concrete cylinders, tested by PTL at their on-site laboratory, were found low, the 28-day tests were performed at PTL's Varick Street, New York City laboratory, after recalibration of test equipment. The results of these eight 28-day tests are erratic from a high of 5170 psi to a low of 3,590 psi. UE&C quality control records contain a letter from Mr. Fant to UE&C Engineering informing them that if 45-day concrete cylinder strengths fall below design strength, alternate strength tests will be performed in accordance with ASTM C-42.\* An engineering evaluation will then be made in conformance to Building Code requirements, ACI-318 and as specified in the PSAR, Supplement 2.

The inspector's audit of UE&C concrete quality control records disclosed the following nonconformance with codes and/or the PSAR:

1. No cement was ever sampled at the batch plant and no cement was tested by user for conformance to ASTM C-150 standards. Con Ed's response to Question 3.1 of PSAR Supplement 2, stated that cement would be sampled at the batch plant.
2. Compounding the deviation above, the cement used between November 27, 1968 and January 10, 1969, is not certified, for compliance to ASTM C-150 and C-94, by manufacturer's chemical and physical certificates as specified in response to Questions 3.1 and 5.1.
3. Cement Type I is specified in response to Question 3.1 PSAR, Supplement 2, but Type II is being used.
4. Slump tests have not been taken on every truck load of concrete delivered, frequency is every third truck. This is a deviation from applicant's response to proposed program as stated in PSAR, Supplement 2, Question 6.5.

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\*Core Drill Test Specimens.

5. Applicant, in PSAR Supplement 2 accepted ACI-613 Code but deviated from recommendations set forth in the code by accepting a change in brand of cement. Cement brand used in design mixes was changed by batch plant without approval of contractor's concrete quality control inspectors, Pittsburgh Testing Laboratory. After several months of lower strength concrete cylinders, PTL performed new laboratory design mixes, as specified in PSAR Supplement 2, Question 5.1, incorporating the new cement brand.

An example of the different proportions of ingredients for one cubic yard of concrete for 4,000 psi mix using the first brand of cement, Marquette, and the second brand, Hudson, and, with certain sources of aggregate is given below:

<u>Brand Name</u>	<u>Cement (Lbs)</u>	<u>Saturated Surface Dry Weights (lbs)</u>	
		<u>F.A. (Source)</u>	<u>C.A. (Source)</u>
Marquette (1968)	660	1293 (Windsor)	1782 (Lemac)
Hudson (1969)	660	1250 (Windsor)	1793 (Windsor)

The inspector's audit of manufacturer's cement certificates shows both brands to be characteristically Type II cement with little difference between their chemical and physical properties except that, for compression strength, the certificates show Hudson cement about 4% and 7% respectively weaker than Marquette at 3 days and 7 days.

B. Cadweld Splices

The inspectors audited UE&C's quality control records on Cadweld splices and found no item of nonconformance. UE&C's records of work progress, testing done and certificates of material were easily recoverable. Records showed that 494 splices had been made to date by eight crews. All crews were qualified on work at Unit No. 2 where they had made over 1,000 splices each. Only one crew had made over 100 splices on IP-3. According to approved quality control procedure and the PSAR two splices made by this crew were tested. PTL reports on these tests show the following:

Test No. 1 - Bar No. 18 spliced to No. 11, break occurred on No. 11 with tensile strength of 100,950 psi.

Test No. 2 - Bar No. 18 spliced to No. 18, break occurred on bar with tensile strength of 92,500 psi.

These tests show that the Cadweld splices are capable of developing in tension at least 125% of the specified yield strength of the reinforcing bar, in accordance with the requirements of ACI-318-63, Section 805-d specified by applicant in response to Question 6.8 in PSAR Supplement 2.

C. Inspection of Rebars in Place

The inspectors made a field inspection on work performed to check Cadweld splice stagger on containment wall. In answer to Question 5.4 raised by DRL, the applicant responded that containment wall splices would be staggered a minimum of 2'-4". The inspectors found four circumferential wall bars were installed above the base liner plate. The inside hoops were all spliced without stagger, i.e., all splices were practically on the same vertical line. This condition exists at almost all segments of the 135' diameter wall. In addition, some of the larger diameter hoops were spliced on the same horizontal line, in back of the inside hoop slices. Photographs taken of this deviation from PSAR Supplement 2 are shown in Appendix A.

D. Audit of Quality Control Records - Rebars

Audit was made of UE&C's quality control records on rebars. The records of work progress, testing, certificates and identification of delivery were easily recoverable. Records showed one user's test was made for each heat and in addition, a user's test was performed on each bundle of No. 18 bars delivered to the site. Metallurgical certificates showed the following:

1. Supplier was Bethlehem Steel Company, Steelton Plant.
2. Stock was open-hearth, Grade 60 billet.
3. Compliance was certified for ASTM 432-65, ASTM 305-65 and ASTM A-615-68.

The above complies with applicants response to Question 5.1 in the PSAR.

E. Audit of Quality Control Records - Liner Plates

An audit of liner plates and channel quality control records disclosed no item of nonconformance. Metallurgical certificates for each channel heat were reviewed and found to comply with ASTM A-131 (Grade "C"), as specified in response to Question 5.1 PSAR, Supplement 2.

Erection and pressure testing is being done by Chicago Bridge & Iron, however, not all work permitted by exemption, in this category, has been completed. In locations where radiography is not possible CB&I welded 2" long overrun coupons as test pieces on liner welds. This is in accordance with applicant's response to DRL Question 5.8 as contained in PSAR Supplement 2. The overrun coupons were clipped off and marked for location and were turned over to UE&C for "U" bend tests, but no "U" bend tests have been performed on coupons yet.

CB&I reports filed by UE&C quality control manager, on work performed up to this time, comply with applicant's response to Question 6.17. Yet to be done is the 100% two-hour hold air test on channels of base and where channels will not be possible to repair, or are inaccessible due to concrete cover, this will be done by UE&C after all work is completed by CB&I.

The above information is reported at this early stage of construction to show that the applicant's quality control program and documentation of records is in operation. Investigation of records now leaves some gaps but, UE&C and CB&I records of supplies received, some placed and some still in vendor shops, is detailed sufficiently to show that system of control is functioning step by step from purchase to placement.

F. Review of Written Quality Control Procedures

UE&C's quality assurance procedures and organization were reviewed to ascertain UE&C's involvement in implementing the program as outlined in the Quality Assurance Supplement to the PSAR, Appendix D. The inspectors reviewed an unapproved procedure for vendor surveillance and quality assurance organization and administration. The above information is noted in this report for continuation with data reported in CO Report No. 286/69-3 under 5.b. Six other procedures are outstanding.

G. Audit and Surveillance by Applicant

Con Ed's independent surveillance group, United States Testing Company, Inc., performed a quality assurance audit on February 28, 1969. The inspectors reviewed the report dated March 6, 1969. UST's report includes a review of the Westinghouse deficiency report file, the UE&C's file of items in the field that do not meet quality control requirements, the Cadweld records and the records of the containment liner. This four page report states that Westinghouse reported six deficiency items, that corrective action was complete on three of the six items and resolution was pending on the remainder. UST lists no items in UE&C's file that do not meet quality control requirements. The report concludes: "There are systems established by both Westinghouse and UE&C that allow for identification, follow-up, and documentation of items, components, and field fabrication of systems for Indian Point Nuclear Plant No. 3. At this time, with particular reference to the containment shell, file information is not complete. Such items will be re-audited in the next visit."

H. Exit Interview

An exit interview was held with Con Ed's site superintendent and assistant. Inspectors reported their findings, obtained from UE&C's quality control records and field inspection, indicated a failure in the quality control system. The deficiencies reported are as follows:

1. Concrete
  - a. Cement was not sampled by user at batch plant.
  - b. Cement manufacturer's site certificates do not exist between November 27, 1968 and January 10, 1969.
  - c. Type II cement was used instead of Type I.
  - d. Slump tests were not taken on every truck from batch plant.
  - e. Batch plant's change in brand of cement went uncontested for three months, when drop off in concrete cylinder strengths forced new trial mixes.

2. Cadweld Splices

- a. Splices were not staggered.

Con Ed superintendent replied to inspectors that he was not fully aware of all the concrete deficiencies but as a result of our findings he would request UE&C to make a full report. In addition, the superintendent informed us that Con Ed's independent audit and surveillance consultant, U. S. Testing Company's concrete specialist would make an investigation into all aspects of concrete and concrete ingredients and audit all records and reports by UE&C and PTL inspectors. Con Ed expects to have completed resolution of these deficiencies by June 1, 1969.

Con Ed's superintendent also informed us that letters by UE&C to Westinghouse and Con Ed have requested changes in the PSAR for these items:

1. Change of Type I to Type II cement.
2. Change in frequency of slump tests to every third tank.

Inspector's reply to above stressed that Con Ed must make a written request to DRL for changes in PSAR.

On May 8, 1969, Con Ed site superintendent informed us by telephone that he had written a letter to Westinghouse ordering them to remove the non-staggered Cadweld splices and informing them that no more concrete could be poured until deficiencies were removed and until items of cement type and slump frequency were resolved.