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

Report of Inspection

CO Report No. 289/69-2

Licensee: Metropolitan Edison Company
(Three Mile Island Unit 1)
License No. CPPR-40
Category A

Date of Inspection: April 8-10, 1969

Date of Previous Inspection: January 7, 1969

Inspected By: D. E. Whitesell 5/7/69
D. E. Whitesell, Reactor Construction Inspector Date

Reviewed By: N. C. Moseley 5/7/6
N. C. Moseley, Senior Reactor Inspector Date

Proprietary Information: None

SUMMARY

Pittsburgh Des Moines (PDM) welders' performance qualification reports were unacceptable for the field fabrication of stainless steel tanks in conformance with Section III, Class C, of the ASME code.

The fit-up of head to shell on one of the reactor bleed tanks was questionable, but found to be acceptable to the ASME code inspector.

Poor welding performance by Chicago Bridge & Iron (CB&I) has resulted in the rework of all weld joints in the t.o-conical section of the liner plates and the making 100% radiographs of the reworked welding.

Quality assurance manuals and quality control procedures have been written for the control of the work and are being expanded as the need arises, in a sincere effort to implement and enforce a good, sound and workable quality assurance program.

The records covering site preparation, foundations, containment liner, cadweld splices, concrete, etc. were audited and no deficiencies were noted, other than the above mentioned.

The repair procedure for filling the concrete voids in the ceiling of the tendon access gallery was reviewed and approved by DRL*. The repair work was inspected and found to have been completed and to be sound.

I. SCOPE

A routine announced inspection was made of the 2452 Mwt Pressurized Water Reactor being erected on Three Mile Island near Middletown, Pa. The inspection was for the purpose of observing the progress of the work and to review in depth the quality assurance program being implemented for the control of the field work.

II. PERSONS CONTACTED

A. Metropolitan Edison Company

Mr. Vernon Stuebner, Resident Engineer
Mr. T. Hreczuch (Raychuck) Resident Q.A. Engineer
Mr. E. D. Geist, Jr., Q.C. Engineer

B. M.P.R. QA Consultants

Mr. Jeff Gorman, Q.C. Engineer

C. Gilbert Associates

Mr. Tom Graves, Q.C. Engineer

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*Letter from Mr. A. W. Dromerick to Mr. R. H. Engelken, dtd 2/25/69

D. United Engineers & Constructors

Mr. E. A. Payne, Project Manager
Mr. George Dorn, General Superintendent
Mr. Milo Prisuta, Site Q.C. Manager
Mr. Dick Mason, Job Engineer
Mr. Bud Cooper, Metallurgist (Philadelphia)
Mr. J. Hall, Welding Engineer
Mr. Karl Brooks, Welding Inspector
Mr. Jack Rebok, Receiving Inspector

E. Conam Inspection

Mr. John Luksic, Radiographer

F. Chicago Bridge & Iron

Mr. John B. Trout, Welding Manager, Eastern Construction
Mr. R. J. Naegelen, Eastern Operations
Mr. Lerch, Welding Supervisor

G. Pittsburgh Des Moines

Mr. Lou Mick, Supervisor
Mr. Don Steiger, Site Q.C.

H. Factory Mutual System

Mr. Ed C. Cox, Inspector (ASME coded vessels)

III. SITE PREPARATION

A. Compaction Control

1. The quality control of the structural fill is covered in GAI's specification 5406 and U.E.&C. QC-1. It provides the borrow pit to be approved by the A/E and the Testing Laboratory to determine the moisture density relationship. The compaction shall conform to ASTM D0249 and the acceptance standard is specified as 70% minimum relative density.

2. The only compaction work being done during the visit was backfilling around the perimeter of the Containment Building. The backfill material was granular and, due to the restricted space, consolidation and compaction was being accomplished with mechanical tampers.

3. The compaction records were audited and found to be well in excess of the acceptable minimums. The inspector was informed by UE&C's Job Engineer, that any areas that tested less than minimum, were scarified and recompacted until the minimum percentage was reached or exceeded.

B. Blasting

1. Test shots were made at the site and were monitored with seismographs by GAI to establish the size of shots and delays to be used in production blasting. GAI specified a peak particle velocity not to exceed 2.0 inches per second, in any of the three planes, in the vicinity of new concrete.

2. The blasting at the site was done by Langenfelder and Sons in accordance with the Pennsylvania blasting code. Blasting operations were under the control of a blaster licensed by the Commonwealth of Pennsylvania.

3. Drill holes were located by scale on a site map and the shot records were identified by hole number. The records showed the date, time, depth of hole, hole spacings, burden, stemming, delay no., total weight of explosive, average per hole, maximum per firing period.

4. Records of the blasts made within twenty-five feet of new concrete covering the water line to the cooling towers were reviewed. The shots were made by Vibra-Tech Engineers, Inc. and were monitored with two (2) three axis seismographs in order to certify that peak particle velocities had not been exceeded. The camera traces of all shots made recorded particle velocities at less than 1.0 inch/sec. in all three planes.

5. Ground Water Control

The inspector was informed by Mr. Milo Prisuta that well points had not been installed. It had been possible to dewater the excavations by using portable pumps.

IV. FOUNDATIONS AND CONTAINMENT

A. Quality Control Procedures

1. The quality control procedures for the testing of concrete materials, rebars, and cadwelds were reviewed. The procedures define the scope of work, specify the tests required, establish the methods of the tests and acceptance standards, and specify records to be kept, by both the field inspectors and testing laboratory.

2. The procedures establish a requirement for inspecting the batch plant, transit mix trucks, and all weighing, measuring and dispensing units. They also establish a frequency for the calibration of weighing and measuring equipment.

3. They provide for the use of vapor barriers and sealing mats under foundations and the preparation and cleaning of rock subgrade and cold concrete prior to placing mortar and new concrete. They also provide for the inspection of forms, rebars, inserts and sleeves and establish a checkout sheet for such inspections.

4. The procedures define the duties and responsibilities of both the Batch Plant Inspector and the inspector at the point of placement.

5. A procedure is established for reporting deficiencies and for resolving any discrepancies between quality control supervision and production supervision.

6. Provisions for making changes for the procedures are also established.

B. Concrete

1. Materials

a. Coarse aggregates of 1 1/2" and 3/4" are used and reports from U. S. Testing show that the aggregates have been satisfactorily tested for reactivity (ASTM-C-289), soundness (ASTM C-88), and a petrographic examination was made per ASTM C-295 and in accordance with the PSAR.

b. The cement is Allentown Type II and the test report shows it conforms to ASTM C-150, and that the following tests were made. Chemical analysis (ASTM C-114) autoclave expansion (C-151), time of setting (C-266) compressive strength (C-109).

c. The admixture is "Placement", a water reducer and retarder, conforming to C-494, Type D.

d. The water used is from a well driven on-site and an analysis is made weekly. The latest report was as follows:

Cl. 10.1 mg/L	maximum allowable		100 mg/L
NO_3 0.21 mg/L	"	"	100 mg/L
Sulfide as H_2S 0 mg/L	"	"	100 mg/L
Turbidity 2 mg	"	"	2000 mg/L

No deficiencies were noted in any of the reports audited.

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2. Design Mix

a. U. S. Testing prepared several trial mixes for both 3000 psi and 5000 psi. Test cylinders were prepared for each trial mix and the 7 day and 28 day compressive strengths were submitted to GAI for evaluation and selection of the mix to be used for each class of concrete. The slump for the mix is specified to be not more than 4" or less than 1".

3. Rebar Material and Test

a. The mill certificates for the rebars were audited and found to conform to ASTM A-15 and ASTM A-408. The chemical analysis and mechanical properties were shown.

b. Test bars are selected from each size bar and for each heat and a users test is made to verify the yield and tensile strength of the bars. The bars are bundled and tagged by heat and size and remain quarantined until the results of the users test are known.

4. Cadweld Splice Test

a. Splicing procedures, previously reported*, require the splices to be tested to the tensile strength of the bar (70 Ksi). The cadweld splice test records were audited and no deficiencies were noted.

5. Batch Plant

a. The batch plant is an Erie-Strayer with automatic tape control and moisture compensator. It is located approximately 1/2 mile from the building area and communication with the point of placement is by telephone. Cement is stored in a weather-proof hopper on top of the plant. The plant has facilities for heating both the aggregates and the water.

b. The duties of the Batch Plant Inspector are defined in the procedures and includes checking the gradation and moisture content of the aggregates. He is solely responsible for the adjustments of the water content of the mix and adjusting the moisture compensator. A satisfactory frequency of testing the moisture content in both fine and coarse aggregates are established.

*CO Report No. 289/68-2

c. The procedures provide for the calibration of the scales on a monthly basis, the water measurements and admix dispenser are checked weekly and the automatic moisture compensating probe is checked daily against known sand moisture content.

6. Placement & Tests

a. The concrete is hauled from the batch plant to the point of placement in transit mix trucks equipped with revolution counters and speed controls for agitating or mixing.

b. The concrete is handled from the truck to the point of placement by using both conveyors and/or buckets. Communication is maintained between the point of placement and the batch plant by telephone and in some instances with two-way radio, if the pour point is isolated.

c. Procedures require that the forms, rebars, inserts and sleeves be inspected prior to placement. A signoff sheet is provided for supervision of the various crafts to sign verifying that the area is ready to receive concrete.

d. The inspector at the point of placement is responsible for making slump tests and recording concrete temperature for each truck of concrete. He also casts one set of test cylinders for each 50 cubic yards of each class of concrete used.

e. A field testing laboratory is located on the site and has the equipment for making the users test of the rebars, testing cadweld splices and testing the compressive strength of concrete. The curing room is monitored with a temperature and humidity recorde The inspector noted that the humidity was 100% and temperature was 72°. The inspector also observed that the date of calibration was posted on each testing scale and the due date of the next calibration was posted. All instruments were within their calibration periods.

f. The concrete records were audited and found to be traceable and no deficiencies were noted.

C. Prestressed Structures

1. The mill certifications for the bearing plates were reviewed and found to conform to ASTM-A-36, in compliance with the PSAR. The chemical analysis heat numbers and mechanical properties were given.

2. The mill certifications for the tendon ducts showed the material to conform to ASTM A-513 galvanized per ASTM-446-63, Class 2 (1.25 oz/ft^2).

3. No wire tendons, split shims or washers have been received.

4. All bearing plates, trumpets and a portion of the tendon ducts have been installed and all exposed surfaces have been coated for corrosion protection.

5. No deficiencies were observed in the work or in the audit of the records.

D. Containment Liner

1. The mill certifications for the liner plates, penetration plates were audited and found to be in conformance with the PSAR on a previous visit*.

2. The welding procedures, procedures qualification tests, welders' performance qualifications were reported in a previous report.

3. The heat treatment of the penetrations are made in a furnace erected on the site. The heat treatment records were audited and found to comply with the specifications.

4. CB&I did not perform the 2% radiography, as required, in the toro-conical portion of the liner. This section is the transition cone from the base plates to a point approximately 10' to 12' above the floor. The welding

*CO Report No. 289/69-1

work was of poor quality under visual inspection, and UE&C contracted with Conam Inspection Company to make the radiographs. The radiographs supported the visual check as to poor quality welding. UE&C required CB&I to rework all the weld joints, in the toro-conical portion, by back gouging to sound metal and rewelding. UE&C had Conam to make radiographs of 100% of the reworked welds.

UE&C interprets all radiographs, and maps the areas where CB&I are to make repairs.

5. The inspector observed that one holding oven is provided in the weld rod storage building for conditioning electrodes. Since no unusual quantity of electrodes were observed in the welding areas, it appears that the welders are only withdrawing approximately a four hour supply.

6. UE&C has a written procedure defining the scope of work, tolerances, required tests and records to be accumulated and maintained in connection with the fabrication and erection of the liner plate. This procedure references several written Q.C. procedures developed by CB&I applicable to their work on the liner. The inspector did not review these procedures but will review and evaluate them on a future visit.

7. The inspector audited the radiographs made in the toro-conical portion of the liner plate, and also a trip report made by MPR relative to the above welding performance. The liquid penetrant examination, leak test of cover channels, etc., were not audited, but will be on a future visit.

V. TANK FABRICATION

A. Section III, Class C, Reactor Bleed Tanks

1. Pittsburgh Des Moines is fabricating three (3) reactor bleed tanks at the site. The tank material is 304 stainless steel.

2. During a tour of the job site the inspector noticed that the head on one of the tanks seemed to have a diameter larger than the shell, requiring the head material to be drawn in to obtain a satisfactory alignment of the joint, creating a bulge effect on the head side of the joint. Since Ed Cox, the Code Inspector, was at the site, the inspector asked Mr. Cox what limits the code would allow, for cold springing material to bring the joint alignment to within code tolerance. Mr. Cox responded that there was nothing in the codes to cover this, but that this condition was not unusual in the fabrication of thin wall tanks. The inspector then asked Mr. Cox if he would accept the tank under this condition. Mr. Cox responded that, as of that date, the tank was acceptable to him.

3. The inspector reviewed PDM's welding procedure number 119-189, Rev. 3, dated 3/20/69. The procedure was for joining 304 base metals using an ASTM-A-298, B-308-16 electrode and joining stainless steel to carbon steel using an E-309-16 electrode. The procedures provided for joint preparation, current characteristics, cleaning and repairs. 100% radiographs were specified and liquid penetrant examination of the cover pass.

4. The procedure was qualified in all positions and was found to be in conformance with Section IX of the ASME codes.

5. The performance qualifications of the five (5) welders working on these tanks were dated in 1962 to 1964, were to a specification #16521 and failed to specify the electrode used or the base metal material. The joint was for welding from one side with a backing strip. The bend tests were passed and the word stainless steel was typed at the bottom of the sheet. The inspector was informed by Mr. Mick that the word stainless steel referred to the base metal. The inspector pointed out that that could mean any stainless steel from the 200 series through the 500 series. The inspector asked Mr. Cox if he had accepted these performance qualifications as

complying with Section IX. Mr. Cox responded that he had not reviewed the welders' performance records, that he knew the welders personally, that he had seen their performance records on other jobs. He further stated that in his opinion, with the exception of the omission of the electrode used, that he would be inclined to accept the documents, as he considered that welding from one side with a backing strip was essentially the same as welding from both sides and back gouging to sound metal. He stated that he would pass the information on to his supervisors at the home office for their opinion. The inspector informed both Mr. Mick, of PDM, and Mr. Cox, of Factory Mutual, that he considered the performance qualifications to be unacceptable and would so inform the licensee.

VI. EXIT INTERVIEW

A. Persons Present

1. Met-Ed

Mr. Vernon Stuebner, Resident Engineer
Mr. T. Hreczuch, Resident Q.C. Engineer
Mr. E. D. Geist, Jr., Q.C. Engineer

2. MPR

Mr. Jeff Gorman, Q.C. Engineer

3. UE&C

Mr. E. A. Payne, Project Manager
Mr. George Dorn, General Superintendent
Mr. Milo Prisuta, Site Q.C. Manager

B. Discussion

1. Welding

a. The inspector informed the licensee of his concern regarding the fit-up of the shell to head of one of the reactor bleed tanks being fabricated by PDM. The question as to what extent would stresses be effected by those bulges, as opposed to flat spots. Mr. Prisuta, of UE&C, responded that he would ask for an engineering evaluation to determine to what extent, if any, the stresses would be affected.

b. The inspector then informed the Licensee the reasons that PDM welders' performance qualifications documents were considered unacceptable.

c. Poor quality of welding being performed by CB&I was discussed and the inspector was assured by both the Licensee and UE&C that they were cognizant of this problem and were closely policing CB&I's work.

d. The inspector informed the Licensee that all other records audited had been found to be traceable and, with the exception of the foregoing, no deficiencies had been noted.

e. The inspector informed the Licensee that the written quality control procedures being implemented should give everyone a better handle on the control of the work, if adequately policed and enforced, and the promptness of action exhibited by the quality assurance personnel to date was a good indication that the procedures were being enforced.