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

Report of Inspection
CO Report No. 289/71-1

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

Date of Inspection: January 18 and 19, 1971

Date of Previous Inspection: October 8-9, 1970

Inspected by: D M Hunnicutt 2/6/71
D. M. Hunnicutt, Reactor Inspector (Principal) Date

E. M. Howard 2-6-71
E. M. Howard, Senior Reactor Inspector Date

Reviewed by: E. M. Howard for 2-6-71
R. W. Kirkman, Director, Region I Date

Proprietary Information: None

SCOPE

A routine, announced inspection was made of Unit No. 1, one of the two 2535 MWt pressurized water reactors (B&W) under construction on Three Mile Island, near Middletown, Pennsylvania. The inspection effort was directed toward an appraisal of the performance of the licensee-contractor effort of various items listed in PI 3800/2 and included an inspection of Attachment C - Containment, "Concrete", (4705.04.a.1 and a.2); Attachment I - Electrical (5205.03 and 5205.04); outstanding items from previous inspections; and a review of the Polar Crane Load Testing and Inspection and the Installation of NSSS and Steam Generators Procedures.

SUMMARY

Safety Items - None

Nonconformance Items - Site records indicate that approximately 230 cubic yards of concrete were poured when the measured temperature of the surface to be in contact with the concrete was less than 32° F. A CDN is being issued to cover this deficiency.

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Other Significant Items

1. The inspection of the electrical and instrumentation area revealed that the construction had no quality control program in this area, and did not have knowledge of the latest FSAR revision. The A-E program review in this area revealed a number of significant ambiguities were not yet resolved between the licensee, constructor, and the A-E. A CDN was not considered since at the time of the inspection, no safeguards circuits were installed or in the process of installation.

2. A fire occurred on January 19, 1971, which destroyed six temporary buildings related to Unit No. 1 activities. No personnel were injured. No equipment which is associated with the project was damaged or destroyed. The inspection was terminated due to the confusion resulting from the fire.

3. A summary of outstanding items and their disposition is contained in Attachment A.

Status of Previously Reported Problems

1. Reactor vessel inspections are being performed in accordance with the approved procedure. This item is considered resolved. (See Section D)

2. Three reactor vessel nozzles were marred during transit to the construction site. Inspection and evaluation of the damage which appears to be slight is now in progress. This item is not considered resolved. (See Section D)

3. Grinnell Company will submit a "Certificate of Conformance" for those individual items which require documentary evidence of conformance to codes. Certifications will be issued by Grinnell to Met Ed when the contract has been completed. This item is not considered resolved. (See Section C)

4. Met Ed is evaluating the use of grease rather than grout for the tendon sheathing fill. (See Section I.1)

Management Interview

A management interview was held with Messrs. Hreczuch, Allen, Stuebner, Fant, Hardy, and Goodenough on January 19, 1971. The inspector stated that Deficiency Report No. DR-0323 and discussions with various site personnel indicated that a concrete pour of about 230 cubic yards in a fuel handling building wall violated ACI Standards referenced in the FSAR and a QC stop work procedure. The inspector asked how the applicant would assure adequate enforcement of procedures and commitments in the future. The answers were inconclusive. The inspector stated that formal correspondence with Met Ed would be forthcoming.

Mr. Howard stated that inspection of electrical cables and terminations indicated that the organizational structure was satisfactory. However, there was evidence that the program was not being implemented. UE&C and the applicant were attempting to perform their functions without knowledge of many aspects of the CAI program and the commitments contained in the FSAR. The applicant stated that further work would be started on the program and that they would notify CO:I when their revised program was ready for inspection.

The inspector stated that he had reviewed the polar crane testing and inspection program procedure and the procedure, if fully implemented, would provide adequate testing of the crane to determine its capabilities and structural integrity.

DETAILS

A. Persons Contacted

Met Ed

Mr. Gene Hreczuch, Construction Engineer
Mr. Earl Allen, Resident QA Supervisor
Mr. Vern Stuebner, Resident Engineer, Electrical

UE&C

Mr. J. E. Fant, Site QC Manager
Mr. David Lambert, QA Inspector
Mr. Paul Dailey, QC Engineer
Mr. A. Hardy, Assistant QC Supervisor

GPU

Mr. Neal Goodenough, Assistant QA Manager

B. Construction Status

Mr. Hreczuch estimated that Unit No. 1 was approximately 60% complete, based on man hours expended. Initial reactor fueling is estimated for about October 1972, according to Mr. Hreczuch.

C. Grinnell Documentation*

Mr. Hreczuch stated that Grinnell Company will submit a "Certificate of Conformance" with individual items which require documentary evidence of conformance with a code throughout the life of the contract. When the contract has been completed, Grinnell Company will supply Met Ed with the certifications. The inspector re-emphasized the provisions stated in Appendix B, 10 CFR 50, concerning adequate documentation prior to installing components.

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*CO Report No. 289/70-7, paragraph D.

D. Reactor Vessel*

Site records indicate that the reactor vessel is being inspected in accordance with UE&C procedure NCP-5 and the results are recorded on "Periodic Component Inspection", Form SF-SU-113.

Mr. Hreczuch estimated that the reactor vessel would not be installed in the containment vessel until about May 1971.

Mr. Hreczuch stated that Met Ed and B&W have not completed the inspection, evaluation, and procedures for repair of the three nozzles (one 14 inch core flooding, and two 28 inch coolant) that were slightly marred during transit. The inspector will continue to follow this item until it is resolved by the applicant.

E. Concrete Pour When the Measured Surface Temperature in Contact With the Concrete Was Less than 32°F

Site records and discussions with various Met Ed and UE&C personnel revealed the following:

1. Approximately 230 cubic yards of concrete were poured in a fuel handling building wall (GAI specification SP-5406) when the measured surface temperature to be in contact with the concrete was below 32°F at the beginning of the scheduled pour.

2. The location of this concrete pour is from elevation 331 feet to 346 feet running north and south from 17 feet west of the reactor centerline.

3. UE&C QA issued a deficiency report, No. DR-0323, dated January 8, 1971.

4. Volume II, Section 5 of the FSAR states in part:

   "a. The Reactor Building has been designed under the following codes:

   Building Code Requirements for Reinforced Concrete, ACI 318-63
   Specification for Structural Concrete for Buildings, ACI 301-66."

5. This concrete pour was in violation of the above referenced ACI Standards.

6. In addition, QA procedure, QC-30, Revision 2, was not used in a timely manner to stop the work subsequent to determining that the conditions of the ACI Standards were not met prior to start of the concrete pouring.

*CO Report No. 289/70-7, Management Interview.

7. A CDN has been prepared for issuance to the applicant concerning this concrete pour.

F. Proposed Polar Crane Load Testing and Inspection

Procedure MCP-6, Revision 1, dated December 23, 1970, contains the load testing and inspection requirements for the reactor building polar crane and associated lifting components to be used during installation of the two steam generators and other major nuclear components for Unit No. 1.

The procedure defines the method of load testing and inspection of the polar crane and associated components. The performance of the test and inspections are intended to demonstrate that the structural and operational capabilities of the polar crane and associated lifting components meet the requirements for lifting and handling during the installation of the heavy nuclear components.

The polar crane bridge, which consists of 125 ton and 275 ton trollies, the center support structure and 700 ton capacity jack for the center support of the polar crane will be load tested and inspected by CONAM Inspection, Incorporated. NDT subsequent to testing will include UT, PT, and MT.

Procedure MCP-6 lists related construction procedures, specifications and drawings, operation and maintenance instruction manuals, hoist, trolley and crane bridge speed data, special tools and equipment.

Preoperational check of the polar crane includes operating and maintenance checks, crane bridge thrust roller check, trolley positions, hoisting cable lifting length check, crane clearance check, minimum temperature specified is 40° F for 24 hours prior to the check, and the assembly of a load test rig (consists of 600 tons of concrete blocks). The heaviest component to be lifted is the 575 ton steam generators. Therefore, the polar crane is scheduled to be tested at about 105% of maximum anticipated lift load.

The erection and grouting of the center support for the polar crane, the polar crane and center support geometric center and thrust rollers location, installation and operation of the 700 ton jack, polar crane center support test, polar crane axial thrust testings, polar crane swivel trolley traverse, and crane rotation testing are included in the scheduled testing program.

All structural components of the polar crane will be visually inspected after the load test. The wheel to rail bearing areas will be visually inspected with 10 power magnification.

The planned polar crane testing procedure and subsequent NDT and visual inspection appear to be adequate to determine the capabilities and structural integrity of the crane.

G. Proposed Procedure for Installation of NSSS and SG

Procedure NCP-4 defines the responsibilities, states the detailed instructions, methods, precautions to be followed, as well as outlining material and equipment to complete aspects of receiving, storing, transporting, rigging, setting and cleaning the NSSS, the SG and associated components for Unit No. 1.

The procedure appears to be adequate to assure proper installation of the NSSS, the SG and associated components.

H. Attachment C - Containment

1. Review of QC System for Pre-Stressed Concrete (4705.04)

a. Material Certification on Hardware (4705.04.a.1)

The tendon wire, TUFWIRE, manufactured by the Armco Steel Corporation, Kansas City, Missouri, has been purchased and delivered to the Inland-Ryerson Company, Chicago, for fabrication into tendons. A review of the material certifications for Heat No 27568, coil No. 517, was selected as representative of the tendon material. The review indicated that this 1/4 inch diameter wire meets ASTM Specification A 421-65 (Volume 2, FSAR, page 5-21). The chemical and physical certifications are as follows:

C	Mn	P	S	Si
0.82%	0.76%	0.010%	0.019%	0.25%

Yield at 1% extension	-	221,200 psi
Ultimate tensile strength	-	255,000 psi
Ultimate elongation in 10"	-	4.80%
Modulus of elasticity	-	29,200,000 psi

b. Chemical Analyses on Greases (4705.04.a.2)

A review of the chemical analyses for the NO-OX-ID grease, manufactured by the W. R. Grace Company, indicated that the chloride was < 2 ppm, nitrates < 1 ppm and sulfide was "not detectable."

2. Containment Vessel Tendons and Sheathing

a. Tendons

Mr. Hreczuch stated that GAI has almost completed an evaluation that compares the advantages of grease (NO-OX-ID, manufactured by the W. R. Grace Company) with grouting. Mr. Hreczuch said that the tendon sheathing will probably be filled with NO-OX-ID instead of grout as originally intended.

b. Sheathing

The inspector reviewed the sheathing alignment records for 20 of the 166 vertical and for 20 of the 164 horizontal tendons. The records indicated the maximum out of plumb was ± 1/2 inch. This alignment is within the maximum permissible misalignment stated in the erection procedure.

I. Cables and Terminations

1. Implementation of Quality Assurance Program (5205.03)

The organizational structure is satisfactory; however, there was evidence that the program was not being implemented. United Engineers and Constructors and the licensee were attempting to perform their function without knowledge of many aspects of the Gilbert Associates program and the commitments contained in the FSAR.

The licensee and his agents have not implemented to any measurable extent, the QA program. The design personnel have created a program, but this program has not been reviewed by the personnel performing the work except for the cable pulling information.

2. Review of Quality Control System (5205.04)

a. Procurement (5205.04.a)

The procurement document consists of a standard purchase order stating only conductor numbers and size, quantity and price.

b. Materials Certification (5205.04.b)

(1) Conformance with Specifications (5205.04.b.1)

There are no specifications.

(2) Nondestructive Tests (5205.04.b.2)

Certification, although not required, has been received covering immersion of insulated conductors in water for a minimum of 24 hours, a guarantee that insulation resistances exceed a given ohmic value at 60° F, and a 60 cycle ac five minute voltage test.

c. Shipping and Receipt (5205.04.c) 1419 115

(1) Marking and Identification (5205.04.c.1)

No marking or identification is specified in procurement documents. UE&C personnel were not aware of whether or not cable was marked on the outside jacket.

(2) Packaging (5205.04.c.2)

Packaging techniques were not specified.

(3) Quarantine and Disposition of Nonconforming Material (5205.04.c.3)

UE&C's procedures do not require segregation, but require an identifying tag.

d. Storage and Issue (5205.04.d)

(1) Segregation of Sizes (5205.04.d.1)

Segregation will not be practiced. Procedures require that reels be tagged and procedures require a physical audit on a periodic basis. The audit had not been performed.

(2) Identification and Control (5205.04.d.2)

Reels will be tagged; however, control appears to be rather ill-defined since several 500 MCM, three conductor cables were ordered which varied only by type of ground, and no satisfactory answer could be provided describing how the craft could be assured that the correct conductor was being utilized. The design cable schedule or pull card does not provide a unique designation.

(3) Protection (5205.04.d.3)

UE&C's procedure QC-3 requires that cables be stored in a locked, fenced area, but does not provide for protection against deterioration; however, the cable external jacket is proprietary material, manufactured by Kerite which has excellent physical characteristics and does not appear to warrant physical protection against the environment.

(4) Confirmation of Issue of Specified Material (5205.04.d.4)

This area appears to be inadequately controlled. The "pull card" specifies conductor by size (i.e., 500 MCM, three conductor); however, no unique designator system has been used to assure that the correct 500 MCM, three conductor cable has been used. Procedures in this area were inadequate.

e. Handling (5205.04.e)

(1) Protection from Physical Damage (5205.04.e.1)

No procedures.

(2) Protection from Contamination (5205.04.e.2)

No procedures.

f. Installation (5205.04.f)

(1) Size and Type of Wireway and Conduits to Accomodate Expected Cabling Needs (5205.04.f.1)

There are no controls specified; however, cable tray loading is to be controlled in accordance with paragraph 8.2.2.13 of Amendment 15 to the FSAR.

(2) Location and Routing of Wireways and Conduits to Provide for Necessary Separation (5205.04.f.2)

Paragraph 8.2.2.12.d of Amendment 15 of the FSAR addresses physical separation at the penetrations which appears adequate. Paragraph 8.2.2.12.c addresses physical separation of redundant circuit trays but is very general with a separation of 12 inches being permitted with the use of fire barriers.

The treatment is considered inadequate and does not provide the QC engineer with the design guidelines against which to check.

(3) Proper Bonding or Grounding of Wireways and Conduits (5205.04.f.3)

Procedures were not available for review.

(4) An Identification System Integrating Wireways and Conduits with Routing Requirements for Cable, Assuring the Proper Size and Type of Cable Will Be Routed Properly for Identified Circuits (5205.04.f.4)

A computer program is used to route cables. The readout is in the form of a "pull card" showing routine, conductor, approximate length, and date the card is issued. The program appears deficient in that:

(a) There is no designation on the pull card which permits verification that the card being used is the latest revision, nor is a computer readout provided which lists the latest revision number.

(b) There is no unique designation provided which assures the proper cable has been used, since several cables with the same size and numbers of conductors are available.

(c) The feed back information is not verified for a determination that the latest information was used to pull the cable.

The program for verification in the field was not considered adequate in that the frequency of field verification of installation was not specified. The procedures state that a "periodic" inspection will be made. The scope of this inspection is not contained in the text of a check list form, but simply states, "periodic surveillance of cable pulling activities . . ."

(5) Redundancy, Separation of Redundant Circuits, Separation of Power Cables from Control or Instrument Cables, Separation of Control and Safety Circuits (5205.04.f.5)

Procedures were not available for review; however, the FSAR, paragraph 8.2.2.12, Amendment 15, entitled, "Separation of Redundant Cirucits", describes in detail the system. UE&C, who has the responsibility for installation,was not aware of this amendment nor the fact that there would be color coding of cables and the related safety equipment.

Paragraph 8.2.2.13 of the FSAR, entitled, "Cable Tray Loading and Separation", adequately describes the separation of power cables from control and instrument cables; however, again UE&C was not aware of the criteria. There was no program for implementation of the QC function, only a requirement for "periodic surveillance of cable pulling activities." UE&C was not aware of what they were to inspect against and had not specified frequency or provided a check list for their inspectors.

The system,as it is contained in the FSAR, does not treat non-redundant circuits that can and will be placed in redundant circuit trays to identify and prevent these cables from ultimately occupying a second and different redundant circuit tray. GAI stated that their system prevented such a cross-over; however, the system does not provide for verification that a cross-over has not occurred.

UE&C was unprepared to provide a QC function, although installation could be accomplished except for color coding, which UE&C appeared unaware of.

(6) Wireway or Conduit Fill Specifying Number, Size, Type, and Arrangement of Cables to Limit Heating Effects (5205.04.f.6)

Paragraph 8.2.2.13 of Amendment 15 to the FSAR, entitled, "Cable Tray Loading and Separation", adequately describes the intended cable tray loadings. The computer program readout is on the basis of a cross-sectional area which provides the basis for heat calculations, which are based on a square rather than a circular configuration.

The computer readout is not provided concerning the cable tray fill for a given tray to the site.

The physical fill specified for the worst case for control and instrument cables of 100% is considered reasonable.

UE&C personnel could not provide implementing inspection procedures nor did these personnel indicate a knowledge of these requirements.

(7) Cable Pulling (5205.04.f.7)

UE&C procedures state that manufacturer's recommendations would be followed; however, these recommendations were not provided to the craft, nor did the UE&C quality control procedure address this as an inspection point.

(8) Cable Terminations (5205.04.f.8)

Procedures were not developed. The GAI procedure, SP-5550, requires visual check of cable installation and terminations for visible damage and physical integrity, correct identification and tagging, continuity check at both ends of conductors, phasing and polarity checks, dc megger (500 volt) on all safeguards circuits, 2500 volt megger on all power (safeguards) circuits.

This procedure is incorrect in that meggering of iron-constantin wire will permanently damage the wire.

Implementation and documentation procedures have not been developed.