

U.S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-353/87-06

Docket No. 50-353

License No. CPPR-107 Priority - - Category B

Licensee: Philadelphia Electric Company
2301 Market Street
Philadelphia, PA 19101

Facility Name: Limerick Nuclear Generating Station, Unit 2

Inspection At: Limerick Generating Station

Inspection Conducted: May 4-15, 1987

Inspectors: Carl H. Woodard June 5, 1987
Carl H. Woodard, Reactor Engineer date

Approved by: C. J. Anderson 6/8/87
C. J. Anderson, Chief Plant Systems date
Section, DRS

Inspection Summary: Inspection on May 4-15, 1987 (Inspection Report
No. 50-353/87-06)

Areas Inspected: Routine, onsite, unannounced inspection by one region-based inspector of activities pertaining to the safety-related electrical systems and components.

Results: One deviation and two unresolved items were identified.

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DETAILS

1.0 Persons Contacted

1.1 Philadelphia Electric

- * G. Lauderback, Quality Assurance Branch Head
- * P. Naugle, Assistant Construction Superintendent
- * J. Harding, Lead Facility Engineer
- * T. Tucker, Quality Assurance Engineer
- * J. Corcoran, Manager, Quality Assurance
- * P. DiPaolo, Quality Assurance Branch Head
- G. Tepper, Electrical Engineer
- W. Shraff, Electrical Department Branch Head
- W. Coyle, Electrical Project Engineer
- C. Tuttle, Electrical Project Engineer
- R. Panunto, Electrical Facilities Engineer
- T. Dey, Quality Assurance Engineer.

1.2 Bechtel

- * W. Bradley, Quality Assurance Engineer
- * S. Loofbourrow, Quality Assurance Engineer
- * G. Kelly, Quality Assurance Engineer
- * D. Harder, Quality Assurance Engineer
- * B. Mukherjee, Project Engineer
- M. Drucker, Quality Assurance Engineer
- G. Bell, Quality Assurance Engineer
- G. Konecny, Quality Assurance Engineer
- K. Stout, Quality Assurance Engineer
- M. Dixon, Cable Yard Foreman
- M. Twardowski, Lead Long Term Maintenance Engineer
- R. Sewell, Electrical Engineer
- N. Roy, Electrical Engineer
- J. Schwamb, Lead Maintenance Quality Assurance Engineer

1.3 Nuclear Regulatory Commission

- * R. Gramm, Senior Resident Inspector
- * J. Kaucher, Resident Inspector

* Attendees at exit interview on May 14, 1987.

2.0 Procedure Review

A sample of the licensee's documents associated with the procurement, storage, installation and inspection of the class IE electric system components including wire and cable as listed in Attachment A were reviewed by the inspector.

This review was to ascertain whether the technical elements of the licensee's safety analysis report (SAR) and NRC requirements had been adequately translated into applicable documents. Also, to determine if the construction specifications, drawings, work procedures and instructions were of sufficient detail and clarity to perform and control the work.

No deficiencies were identified.

3.0 Record Review

A sample of licensee records, associated with the class IE electric systems was reviewed by the inspector. These records are listed in Attachment A.

This review was to ascertain the effectiveness of the licensee quality assurance program in the areas of procurement, storage, work activities and inspection of the class IE electric systems to assure that the systems and components perform their safety-related functions. No deficiencies were identified.

4.0 Electrical Components and Systems - Work Observation

The inspector observed work in progress and completed work to determine whether activities related to safety-related electrical systems and components are being controlled and accomplished in accordance with NRC requirements, safety analysis report commitments, and licensee procedures.

4.1 Electrical Installations

The following installed electrical systems and components were observed by the inspector.

- The B Train Emergency Diesel Generator System
- 4 Kv Safeguards Switchgear Panels
- 480 Volt Safeguards Load Center Panels
- Reactor Enclosure Damper Indicator/Control/Test Panel
- ATWS 4.16 Kv Switchgear Panel
- 125 Volt DC Battery Room 361

The following electrical systems work in progress was observed by the inspector

- Replacement of Agastat 7000 series relays in the B Diesel Generator Engine Control Panel with Agastat ETR series relays. This replacement was in response to Information Notices 77-01 and 82-04.

- In place storage/maintenance program for the emergency diesel generators.

Observations made by the inspector included the following.

- The components and panels were properly identified.
- Protective dust covers were in place over the equipments/panels.
- Protective plywood covers were installed around the bases of panels in heavy construction activity areas.
- Electrical space heaters were properly energized in electrical panels and generators.
- Components were installed in the correct locations with the correct orientation.
- Electrical separation was maintained.
- Electrical installation was being performed with approved procedures.
- Where cable had been pulled to panels but not terminated, it was wrapped with protective paper, the ends were taped and it was neatly coiled to an acceptable radius and secured with tyraps.
- In place storage/maintenance of the diesel generators was in accordance with the manufacturers recommendations and approved licensee procedures.

No violations were identified.

5.0 Electric Cable-Work Observation

The inspector reviewed activities related to safety-related cables for safety related systems to determine if they are controlled and accomplished in accordance with NRC requirements, safety analysis report commitments and license procedures. This included direct observations and an independent evaluation of work performance, work in progress and completed work.

5.1 Storage

The following storage/maintenance attributes of licensee construction procedures CP-E-2 and CP-F-2 were observed by the inspector in the cable receipt/storage/cut yard (Note: All permanent in plant cable is procured to the same "Q" Specification requirements regardless of the application (Q or Non-Q) except for GE furnished "non Q" PGCC cable).

- Permanent plant cable and PGCC (Q and Non Q) were stored/maintained in separate areas of the cable yard.
- Master cable reels (as received from the manufacturer) were identified with manufacturer's information and the Bechtel cable code to provide cable identity and traceability.
- Sub-master cable reels were provided identity to provide traceability to the master reel.
- Cable ends were sealed with end caps or tape.

- Cable reels were stored above the concrete/ground to preclude cable contact with surface water.
- Temporary cable was stored in a remote area with a large letter "T" painted on the cable reels.
- Licensee procedure CP-F-2 requires that the temperatures of cable on reels be above 10° F for removal of cable. The cable temperature upon removal was not currently being recorded. The cable yard foreman stated that when weather is cold, reels of cable are brought inside to warm up prior to cable removal. This is an unresolved item (50-353/87-06-01) pending licensee demonstration of the adequacy of existing controls for cable already pulled and the potential need for additional controls for future cable pulls.

The following cable storage/maintenance attributes were observed by the inspector in the permanent plant pre-cut cable laydown (interim storage) area outside the turbine building.

- Pre-cut cable lengths were each uniquely identified by attached labels which included the application information (pull from location to destination) and traceability back to the master reel from which it was pulled.
- Construction procedure CP-E-2 paragraph 5.2.3.22 requires measures to "assure that cable in interim storage pending installations is adequately protected including maintaining the reels in an upright position, preventing cable contact with surface water or ground." Some of the pre-cut cable in the laydown area was found to be on reels and stored in an upright position; however, most of the pre-cut cable was in tied coils. The coils were stored off the ground on wooden pallets. The inspector observed this area daily from May 4-14, 1987. On May 13 the inspector observed a few cable coils (approximately 20) which were not stored on pallets so as to keep the cable off the ground and away from water submersion damage. These cable coils were stored on a plastic sheet. The inspector noted that the plastic sheets were dry and there was no contact of the cables with water. The inspector pointed out to the licensee that at a future time rainwater could pool on the plastic and expose the cables to water. The licensee agreed and took prompt action to place the subject cable coils off the ground on wooden pallets. Further, since the cable storage procedure, CP-E-2 paragraph 5.2.3-22 did not specifically address coils of cable off the cable reels the licensee agreed to issue a clarifying memo to this procedure. The licensee's proposed corrective actions include revisions paragraph 5.2.3.22 to the procedure and providing instructions to cable handling personnel in proper storage practices. This is an unresolved item pending licensee development of a procedure to control the temporary storage and protection of coils of cable that are not on cable reels. (50-353/87-06-02)

5.2 Electrical Cable-Installation

Recorded installation data for several class IE cable installations was reviewed for conformance with specification 8031-E-1412 and construction procedure CP-E-2. The calculated maximum cable pulling tension and sidewall pressure for the installed cables was compared to the data recorded during the installation. In all cases the actual pull tension and sidewall pressure was determined to be less than the specified limits.

The inspector reviewed cable calculations E-587 for cable pull package SE.01076. This was a bulk pull of six single conductor 500 KCMIL and one single conductor 250 KCMIL cables through a five inch PVC conduit from Safeguards Load Center Distribution Panel 20B201 to MCC Panel 20B129.

The inspector witnessed a portion of the pull which was from junction box 2AJ019 elevation 313' to junction box 2AJ020 elevation 299' and then to the cable duct at elevation 269' which led to panel 20B129. The maximum allowable cable pull tension was 2245 pounds. Calculated expected maximum pull tension was 1486 pounds. However, as a result of the good cable and conduit prelubrication, the pull was made with a maximum of five men pulling by hand. The pull tension was estimated to be not in excess of 500 pounds based upon an average tension per man of 100 pounds per paragraph 2.1.3 of specification E-1412.

No deficiencies were observed in either the cable pulling procedure, records, calculations or the actual cable pull witnessed.

5.3 Electrical Conduit and Cable Tray Installation

The inspector observed installed cable tray and conduit at various locations throughout the plant. Inspections were made of conduits 2CL046 from Motor Control Center MCC 20B221 to MCC 20B217 and conduit 2CL047 from Motor Control Center MCC 20B221 to MCC 20B217 and conduit 2CL047 from Motor Control Center MCC 20B217 to RHR pump 2AP210.

No deficiencies were observed in the identification, routing, configuration, or seismic supports for these conduits.

5.4 Electrical Cable Terminations

The inspector observed wire and cable terminations in load centers, motor control centers, fuse panels, and in control cabinets at several locations. An inspection was made of licensee cable terminations in Motor Control Centers MCC 20B221 and MCC 20B217 of cable which was installed in accordance with cable schemes CB217-03A and CB217-04A. In addition, an inspection was made of control wire terminations made by licensee in the "B" emergency diesel generator engine control panel. No deficiencies were observed.

6.0 Electrical Distribution System

6.1 Adequacy of Electrical Distribution System to Provide Required Voltage Levels to Class IE Equipment.

The inspector reviewed the licensee's voltage profile studies and a licensee letter to NRC dated October 22, 1981, in which low voltage problems in certain class IE circuits were identified under Significant Deficiency Report No. 52 for both Limerick Units #1 and #2.

In this letter the licensee confirmed a previous 50.55(e) telecon to the NRC in which potential undervoltage conditions for 166 safety related circuits were reported. Commitments were made by the licensee to the NRC, in this letter, to complete design changes and installation to correct the affected circuits for Unit 2 by June 1986.

The inspector reviewed the Bechtel "Final Report on Undervoltage Problems in Certain Power And Control Circuits For LGS Unit #1 And Common" dated February 1983 in which corrective actions were detailed to correct a total of 534 deficient circuits for Unit #1 and circuits common to Units 1 and 2. The inspector was unable to locate a record of design changes and installation in Unit 2 to correct the undervoltage deficient circuits. This technical item is a construction deficiency outstanding open item (50-353/80-00-12). Failure to meet the Unit 2 June 1986 commitment to NRC is a deviation to their commitment. (50-353/87-06-03)

7.0 Definition of Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable, violations, or deviations relative to the bulletin requirements. Unresolved items identified during this inspection are discussed in paragraphs 5 and 6 above.

8.0 Exit Meeting

The NRC inspector conducted an exit meeting on May 14, 1987 with licensee representative (denoted in paragraph 1). The NRC inspector summarized the inspection findings and the licensee acknowledged these comments. No written material was provided to licensee personnel.

Attachment A

Documents Reviewed

1.0 Final Safety Analysis Report, Chapter 8 - Electric Power

2.0 Construction Procedures (CP)

- D-1 Processing of Nonconformance Reports, Rev. 4, 6/26/86
- D-7 Construction Administration Control, Rev. 8, 5/20/87
- E-1 Electrical Panel Modifications, Rev. 6, 5/20/87
- E-2 Permanent Plant Cable Installation and Termination, Rev. 3, 2/2/87
- E-3 Electrical Raceway, Rev. 3, 10/15/86
- G-3 Long Term Storage/Maintenance/Lubrication of Permanent Plant Equipment and Materials Prior to Turnover, Rev. 3, 10/22/86
- F-2 Receipt Inspection-Storage and Withdrawal of Materials/Equipment, Rev. 9, 5/18/87

3.0 Drawings

- E-1412 Wire and Cable Notes and Detail, Rev. 30, 2/4/87
- E-1406 Conduit and Cable Tray Notes, Symbols and Details, Rev. 6, 5/6/87
- E-1420 Maximum Allowable Cable Length - Power and Control Circuits, Rev. 1, 12/14/83
- E-66 Single Line Meter and Relay Diagram, MCC Load Tabulation, Rev. 5, 4/26/83
- E-159 Load Center SWGR-MCC FDR Bkrs. 440v, Rev. 27, 1/23/87
- E-160 Safeguard Buses - 101 and 201, Safeguard Bus Feeders, 4Kv, Rev. 19, 1/3/85
- E-162 Safeguard Buses - Load Center Transformer Bkrs. 4Kv, Rev. 6, 12/14/82
- E-163 Safeguard Buses - Load Center Transformer Bkrs. 4Kv, Rev. 12, 1/7/85
- E-164 Safeguard Buses - Generator Bkrs 4Kv, Rev. 19, 10/18/84
- E-1 Single Line Diagram - Station, Rev. 13, 4/26/85
- E-16 Single Line Meter and Relay Diagram, 4Kv Safeguard Power System, Rev. 15, 8/1/85
- E-29 Single Line Meter and Relay Diagram, D214, D224, D234, D244, Safeguard Load Centers, 440 volt, Rev. 10, 12/18/85

4.0 Reports

- Significant Deficiency Report No. 52 - Undervoltage Condition in Certain Electrical Power and Control Circuits, 10/22/81
- Final Report on Undervoltage Problems in Certain Power and Control Circuits for LGS Unit 1 and Common, 2/16/83

5.0 Quality Records

PECO Audit Reports

2E-230 GE Cable Installation (5/8 - 5/19/86)
2E-245 Diesel Generator Control Panels (12/16 - 12/31/86)
2E-227 Motor Control Center 20B224 (3/25 - 4/2/86)
2E-248 Cable Pulling of PGCC Cables (2/13 - 2/20/87)
2E-225 Material Control (11/13 - 11/20/85)
2E-236 Electrical Cable Storage Program (7/10 - 7/31/86)
2E-180 Control of Electrical Parts and Components (11/13 - 11/20/85)

Maintenance Action Records for In Storage Maintenance of "B" Emergency Diesel Generator

6.0 Calculations

E-587 Cable Pulling Tension, 4/27/87
E-590 Cable Pulling Tension, 5/4/87
LGS Units 1 and 2 Final Calculations Index
EE.350 Bechtel Computer Program Manual for Cable Tension Calculations.