

U. S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

REGION III

IE Investigation Report No. 050-346/75-10

Subject: Toledo Edison Company
Edison Plaza
300 Madison Avenue
Toledo, Ohio 43652

Davis-Besse Nuclear Power Station License No. CPPR-80
Oak Harbor, Ohio Category: B

Allegation - A former electrical contractor employee made allegations concerning the electrical work performed during construction.

Dates of Investigation: May 29 and June 4, 1975

Investigators: *F. J. Jablonski* 7-1-75
F. J. Jablonski (Date)
J. W. Sutton 7-1-75
J. W. Sutton (Date)
G. A. Phillip 2-1-75
G. A. Phillip (Date)

Other Accompanying Personnel: J. C. LeDoux
June 4, 1975 (only)

D. W. Hayes
June 4, 1975 (only)

Reviewed By: *D. M. Hunnicutt* 7/1/75
D. M. Hunnicutt, Chief (Date)
Construction and Engineering
Support Branch

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REASON FOR INVESTIGATION

Following receipt of a telephone call on May 28, 1975 from a former employee of the electrical contractor at the Davis-Besse Unit 1 site alleging deficiencies relating to the electrical work, Region III initiated an investigation.

SUMMARY OF FACTS

On May 28, 1975, information was received by the NRC alleging that electrical construction activities at the Davis-Besse site were not being performed in accordance with good work practices.

On May 29, 1975, Region III representatives interviewed the alleged at his home in Port Clinton, Ohio. A list of 32 allegations was developed on the basis of the information provided during this interview. The alleged was not certain if work which he had performed or had seen was in some instances safety related. He was unable to provide specific physical locations of the alleged poor work practices. Locations were given in general terms, such as "Auxiliary Building Basement." The alleged agreed to accompany a Region III inspector to the site to assist in locating deficiencies in electrical installations as a means of substantiating the allegations.

The alleged was informed, by a telephone message, that an inspector would be at the Davis-Besse site during the evening of June 3, 1975. The alleged agreed to meet with the NRC inspector in Port Clinton, Ohio, at 7.p.m., and proceed to the construction site to point out areas and items alleged to be of poor quality. On June 3, 1975, Region III was advised, by a telephone message, that the alleged would not be available to accompany the NRC inspectors.

On June 4, 1975, an NRC inspector arrived at the Davis-Besse construction site to investigate the allegations. The 32 separate allegations were reviewed. Nine items were substantiated, or partially substantiated; the others could not be substantiated. Seven of these nine items were previously identified as items of noncompliance by NRC inspectors during a Special-Electrical inspection performed on May 19-22, 1975 as part of the continuing construction inspection program. Enforcement action concerning those items has been initiated on the basis of that inspection. During this investigation, one item of apparent noncompliance with NRC requirements not previously identified was noted and one item will require follow-up review.

The following item of noncompliance was identified during this investigation:

Infractions

Contrary to 10 CFR Part 50, Appendix B, Criterion XIII, electrical equipment was not stored, cleaned, and preserved in such a way as to preclude damage or deterioration. (Report Details, Paragraph 24)

Other Significant Findings

System and Components

Prior to October 1974, equipment secured by "Hilti-Kwik" devices was not tightened with a torque wrench according to requirements of Fischbach & Moore, Incorporated (F&M) Procedure QWS III. This matter will require subsequent review. (Report Details, Paragraph 29)

DETAILS

Introduction

This investigation was initiated under the provisions of 10 CFR Part 50, Appendix B, to ascertain the licensee's compliance with NRC regulations at Davis-Besse Unit 1 site of the Toledo Edison Company (TECO). Allegations were made to the NRC on May 28, 1975, by an individual who had been employed as an electrician by Fischbach & Moore, Incorporated/Colgan Electric Company, Incorporated, the electrical contractor.

This investigation was commenced at the home of the alleged on May 29, 1975. Messrs. G. A. Phillip, J. W. Sutton, and F. J. Jablonski of the NRC compiled a list of 32 allegations from discussions with the alleged who stated he had been an electrician for 22 years and had worked at other nuclear power plant construction sites. He had worked at the Davis-Besse site for approximately 18 months, the first nine months of which were spent performing conduit work and the remaining time working on terminations.

The alleged stated that some of the allegations applied to safety related systems. He was, however, uncertain concerning others. He was unable to provide specific physical locations, for the most part which could be examined as a means of substantiating the allegations. Locations were described in general terms such as the Auxiliary Building Basement. The alleged stated that he had no concern about being identified as the source of the information he provided and agreed to accompany an NRC inspector to the site to assist in locating installation deficiencies. Arrangements were made through telephone conversations with the alleged to make such a visit to the site on June 3, 1975. On that date, however, Region III was informed by the alleged's wife that he would be unable to accompany the inspector.

During the May 28, 1975 interview, the alleged was informed that Region III had performed an inspection of the electrical work at the Davis-Besse site during the period May 19-22, 1975 and that several items of noncompliance had been identified, some of which corresponded with his allegations. It was indicated that the report on that inspection had not yet been prepared but that enforcement action regarding any common items of noncompliance would be taken on the basis of the inspection findings.

On June 4, 1975, Mr. F. J. Jablonski performed an electrical construction site inspection using the list of allegations as a guide. The investigation consisted of inquiries of workers and management personnel, examination of records, and observations of completed electrical installations.

Persons Contacted

Fischbach & Moore, Incorporated (F&M)

W. L. Columbia, Assistant Project Manager
F. Kollin, Project Manager
D. M. Moeller, Quality Control Manager

R. Groll, Electrician
T. Macy, Electrician

Toledo Edison Company (TECO)

M. D. Calcamuggio, Power Plant Electrical Engineer
J. Lehnert, Electrician
J. D. Lenardson, Quality Assurance Manager

Areas of Inspection and Equipment Identification

1. Areas of the Auxiliary Building Basement
2. 4KV rooms, 323 and 325
3. 480-volt switchgear rooms, 428 and 429
4. Control room panel C5715
5. Cables 1CBEL156L, ALSPARE08, 12RPSS, and 2CBF1142A
6. Cubicles BE1202, MCCF12A, AC107, A908, AD107, and AD108
7. Tray support at Section 1CKD, Section 12
8. Cable spreading room
9. Battery room
10. Motor control center E11B

Allegations and Findings

1. Allegation: Similar conduit mounting hardware is used, no matter how many or what size conduit is being supported. No field standards are available for reference.

Finding: Partially substantiated. Conduit installation details are available in the form of the Bechtel 7749-E-302A series of drawings. However, details were not available which delineate the seismic installation requirements for conduits, boxes, or other devices which carry safety related cable. This item was identified during the NRC's Special-Electrical Inspection of May 19-22, 1975, as an item of noncompliance.

2. Allegation: Conduit has been installed with more than four 90° angle bends. No field standards available for reference.

Finding: Not substantiated. The inspector observed several installations, none of which had more than four 90° angle bends. F&M Procedure IIP-7749-E14-6a.001, paragraph 6.5.2.4, covers this item.

3. Allegation: Conduit was never swabbed before cable was pulled.

Finding: Not substantiated. Procedure IIP-7749-E14-6a.001, paragraphs 6.3.5 and 6.5.27, require this action to be performed. One hundred percent inspection effort is required before pulling. Inspection records indicated that conduit had been swabbed before cable pulling operations were performed.

4. Allegation: Conduit was not doped before coupling actions were performed. Water was found in a conduit installed underground.

Finding: Not substantiated. Specifications do not require conduit couplings or hardware to be doped prior to installation. All imbedded and underground conduit was installed by other contractors. The specific conduit in which water was found was determined by the inspector not to be safety related.

5. Allegation: Conduit was flattening out during bending operations.

Finding: Not substantiated. F&M Procedure IIP-7749-E14-6.a.001, paragraph 6.5.2.3, addresses itself to this matter. The inspector observed several conduits none of which were flattened.

6. Allegation: Conduit galvanizing material had flaked off during bending operations. In spite of this, conduit is still installed.

Finding: Not substantiated. F&M Procedure IIP-7749-E14-6.a.001, paragraph 6.5.2.3, addresses itself to this matter. The inspector observed several conduit installations, none of which was found to have flaking of galvanized material.

7. Allegation: Conduit is installed closer than six inches to a steam pipe.

Finding: Not substantiated. Specifications do not require specific steam pipe-conduit separation criteria.

8. Allegation: Conduit in 4KV rooms in the auxiliary building is not properly supported either vertically or horizontally.

Finding: Substantiated. Details were not available which delineate the seismic installation requirements for the support of conduits, boxes, or other devices which carry safety related cable. This item was identified during the NRC's special-electrical inspection of May 19-22, 1975, as an item of noncompliance.

9. Allegation: Conduit is run for excessive lengths without junction boxes.

Finding: Not substantiated. No actual requirement was available for the inspector's review. The National Electrical Code, Section 300-19, provides spacing requirements for vertical conductor supports. The scope of this inspection did not include provisions to deal with this specific area. However, the inspector did observe several installations which had junction boxes that provided proper vertical cable support.

10. Allegation: Conduit changes are made without the benefit of drawings.

Finding: Not substantiated. The F&M assistant project manager stated that all changes are made using modified drawings. The inspector had verified this fact on previous inspections.

11. Allegation: Cable conductors are stripped with tools that cause damage to individual conductors. No field procedures for stripping operations.

Finding: Not substantiated. Cable conductor cutting tools are quality controlled. Calibration procedures and time elements are documented by F&M Procedures No. IIP-7749-E14-6.c.003, paragraphs 4.2.1, 6.2.1.1, 6.2.1.2, and 6.3.1, and No. QAP-7, paragraphs 3 and 11. Because of the type of lug used on the installed conductors, physical verification could not be made.

12. Allegation: Insulated lugs do not allow for the inspection of individual cable conductors after lugging has been performed. No procedures.

Finding: Not substantiated. Only one manufacturer supplies lugs for this job and are specified to be insulated. Several cables observed by the inspector were determined to be lugged per procedures. Reference F&M Procedure IIP-7749-E14-6.c.003, paragraphs 4.1.1, 6.2.1.3, and 6.3.2.

13. Allegation: Cable stripping operations by the use of an electrician's knife was cause for conductor damage. The wrong type of tool was used. No procedures were available which pertained to this operation.

Finding: Not substantiated. Cable stripping is accomplished by use of an electrician's knife per F&M Procedure IIP-7749-6.c.003, paragraph 6.2.1.1. The inspector observed five cables in this stage of construction. In one case, two conductors of a seven-conductor cable had surface cut marks which were determined not to be detrimental.

14. Allegation: Cable terminating operations are ongoing without the use of washers or locknuts. There are no procedures pertaining to these operations.

Finding: Not substantiated. There is no requirement for locknuts or washers, therefore no procedures exist.

15. Allegation: Cable conductors are, in some cases, terminated with three lugs under one screw. There are no procedures pertaining to this operation.

Finding: Partially substantiated. There is no provision to prohibit this from occurring. The inspector observed several installations, but did not observe any installations with three lugs under one screw. Terminations of this type would be poor practice but would not present any significant safety problems.

16. Allegation: Cable conductors are jammed into remote push-button control stations.

Finding: Not substantiated. The inspector was not able to substantiate this matter. Craft personnel were not available to remove covers to this equipment. Several other electrical boxes were observed by the inspector. None appeared to be overloaded.

17. Allegation: A cable-pulling tension meter was not used for hand pulling operations.

Finding: Not substantiated. No tension meter is required by TECO, Bechtel, or F&M during hand pulls. F&M Procedure IIP-E14-7.c.001, paragraph 3.2(4) provides detailed cable pulling instructions.

18. Allegation: Cable pulling compound "Blue Soap" was originally used, but was found to solidify in place. Pullbacks were extremely hard to do.

Finding: Substantiated. Thomas & Betts Company's "Jet Line MTW" is a compound which is blue in color and was used up to September 1973. Because the pulling back of cables was extremely difficult, this compound was unofficially taken out of circulation. Pulling compounds now in use include Jetline MWP-66, Ideal Industries' "Yellow 77", and ITT Holub Industries' "Hi Green". The use of these compounds was a matter included in the NRC special inspection. Chemical characteristics are matters which remain unresolved.

19. Allegation: Cable trays contain dirt, metal pipe, and other debris.

Finding: Substantiated during the NRC Special-Electrical Inspection of May 19-22, 1975, and was identified as an item of noncompliance.

20. Allegation: Cable was being damaged by sharp edges at motor control centers and DC distribution boards.

Finding: Substantiated during the NRC Special-Electrical Inspection of May 19-22, 1975, and was identified as an item of noncompliance.

21. Allegation: Cable tray hangers, anchors, and bolts are not installed properly. No field standards are available.

Finding: Not substantiated. Drawings are available in the form of Bechtel's 7749-E-302A. Physical verification of proper installation was performed by the inspector.

22. Allegation: Junction boxes are not mounted in accordance with any field standards.

Finding: Substantiated. Installation details were not available which delineate the seismic installation requirements for conduits, boxes, or other devices which carry safety related cable. This item was identified during the NRC's Special-Electrical Inspection of May 19-22, 1975, as an item of noncompliance.

23. Allegation: Device boxes and switch boxes are not mounted according to any field standards.

Finding: Substantiated. Installation details were not available which delineate the seismic installation requirements for conduits, boxes, or other devices which carry safety related cable. This item was identified during the NRC's Special-Electrical Inspection of May 19-22, 1975, as an item of noncompliance.

24. Allegation: 4KV circuit breakers were observed to be covered with cement-like dust.

Finding: Substantiated. 4KV circuit breakers, which were released from construction status, as well as breakers still under construction status, were observed to have what appeared to be cement dust on the breaker proper. Pieces of wire insulation and a washer were observed within a breaker. Water spots were apparent within a breaker, and evidence of water was observed both inside and outside a breaker cubicle door. The breakers had not been properly cleaned prior to construction turnover to operations. This matter is considered to be an item of noncompliance, contrary to 10 CFR Part 50, Appendix B, Criterion XIII.

25. Allegation: "Galvenoleum" primer was not put on conduit supports and brackets at welded or cut areas.

Finding: Not substantiated. "Galvenoleum" is not used by F&M. "Gal-V-Tal 3-99" primer is required at all welding joints and cut areas, per F&M Procedure IIP-7749-E14-7.a.001, Section 3.2(7). Several areas were observed by the inspector. All appeared to be acceptable.

26. Allegation: Equipment, such as motor control centers, is not being properly secured by the use of the correct number of corner bolts.

Finding: Not substantiated. Motor control centers have bases which are shipped as bolted pieces to the panel proper. The base is then welded to a piece of channel steel which is an integral part of the concrete foundation. Reference: Bechtel 7749-E-302A, SHT. 30. Several areas were observed by the inspector. All appeared to be acceptable.

27. Allegation: Terminal blocks in "Q" junction boxes may be too large.
- Finding: Not substantiated. Specification E14 provides information for terminal block and junction box sizes. The inspector did not observe any terminal blocks which were too large.
28. Allegation: Explosion-proof boxes are not installed in required areas.
- Finding: Not substantiated. Areas of the battery rooms were observed to have explosion-proof light fixtures. No other areas were known to be designated as a hazardous area.
29. Allegation: The alleged indicated he had seen a instruction sheet indicating that all "Q" bolts must be torqued. This requirement has not been backfitted.
- Finding: Substantiated. Revision N/C of F&M Procedure QWS-III, dated October 15, 1974, requires that Hilti-Kwik anchor bolts, installed per F&M/Ce QWS-III, be tightened with a torque wrench. The F&M QC manager indicated that installations prior to this date were not torqued. This matter will require further review.
30. Allegation: Startup crew removes conductors which have been torqued, but are never retorqued when replaced.
- Finding: Not substantiated. There is no requirement that individual conductors which are secured to terminal blocks be torqued.
31. Allegation: Startup crew removes wires, but does not follow procedure of having a "Q" (quality) man available to log actions as is required by construction electricians.
- Finding: Not substantiated. TECO, Johnson Controls Company, and F&M all have detailed jumper and wire lifted procedrues. According to the TECO start-up procedure only "critical" circuits are required to be physically examined to insure correctness. The inspector observed various conductor tagging and logging operations to be in effect. Reference procedures: TECO No. AD 1823.00, Johnson No. SP 225, and F&M No. CTP-7749-E14-SP-1.
32. Allegation: Welding operations have damaged cables.
- Finding: Not substantiated. No damage was observed by the inspector during this inspection or the Special-Electrical Inspection of May 19-22, 1975.

Enclosure 2

Response to Congressman Mottl's statement that "... the probability of an accident is extremely remote. Obviously, this statement depends upon a 100 percent efficient operation of the nuclear power plant's safety-related equipment."

The Nuclear Regulatory Commission bases its evaluation of nuclear power plant safety on the defense-in-depth concept which has been developed as a result of experience over many years. Defense-in-depth implies multiple levels of protection for health and safety of the public and does not rely on 100 percent efficient operation of safety-related equipment.

In determining the level of safety needed for nuclear power plants, the Commission recognizes that operation of such plants can never be completely risk-free. However, through its defense-in-depth concept, assurance is provided that the risk from normal operation and from design basis accidents is extremely small. This is accomplished by a multi-layered safety concept: (1) conservative plant design and construction practices, (2) protection against incidents and malfunctions in spite of the assurance offered by conservative plant design and construction, and (3) provisions to protect the public even in the unlikely event of major accidents.

As part of this concept, we have specific design, testing and operational requirements for equipment that would play an active role in implementing the second and third levels of safety. We require backup equipment be installed in nuclear power plants such that less than 100 percent efficient operation (in fact, in many cases we require total loss of function be assumed) of this equipment can be tolerated without loss of adequate protection of the public.

Enclosure 3

Response to Congressman Mottl's statement that "Only a few weeks ago workers at the nuclear power plant at Lusby, Maryland, were exposed to dangerous radiation after a reactor coolant pump malfunctioned."

The NRC's Office of Inspection and Enforcement (OIE) reviewed events that have occurred during the past several months at Calvert Cliffs Unit 1, Lusby, Maryland, to identify the specific event referred to by Congressman Mottl. During the time period reviewed there have been no reported events involving radiation exposure following the malfunction of a reactor coolant pump.

OIE's Region I (Philadelphia, Pennsylvania) staff believes the event to which the Congressman was referring, occurred on July 1, 1975, and involved an unplanned release of radioactive gas resulting from excessive leakage of reactor coolant through the piston rod packings of two charging pumps.

The Regional Office dispatched an inspector to the reactor site on July 1 to review the circumstances relating to the event. The details of the event and the inspection findings are contained in the letter to Baltimore Gas and Electric Company dated August 6, 1975, (Attachment 1) and IE Inspection Report No. 50-317/75-17 (Attachment 2). The Region's assessment of the airborne radioactive materials is contained in the Region's internal memo, Evaluation and Clarification of Incident (Attachment 3).

The release rate of radioactive gas from the plant ventilation system was approximately 4% of the technical specification limit. Personnel were exposed to low levels of airborne radioactive materials (approximately 1% of the maximum permissible concentration).

Attachments:

1. Letter to Baltimore Gas and Electric Company from Paul R. Nelson, dtd 8/6/75
2. IE Inspection Report No. 50-317/75-17
3. Internal Memo, Evaluation and Clarification of Incident