U.S. NUCLEAR REGULATORY COMMISSION

REGION III

Report No. 50-341/84-17(DRS)

Docket No. 50-341 License No. CPPR-87

Licensee: Detroit Edison Company
2000 Second Avenue
Detroit, MI 48224

Facility Name: Enrico Fermi Nuclear Power Plant, Unit 2

Inspection At: Enrico Fermi 2 Site, Monroe, MI

Inspection Conducted: May 14-17, May 29 through June 1, and June 29, 1984

Inspectors: K. Naidu — 8/14/84 Date

Z. Falevits — 8/14/84 Date

A. Gautam — 8/14/84 Date

K. Tani — 8/14/84 Date

Approved by: C. C. Williams, Chief
Plant Systems Section — 8/14/84 Date

Inspection Summary

Inspection on May 14-17 and May 29 through June 1, and June 29, 1984 (Report No. 50-341/84-17(DRS))

Areas Inspected: Investigation of an allegation on rework on EDG panels; corrective action taken on previous inspection findings; observation of instrument sensing lines and racks, electrical separation; review of equipment qualification, independent design verification on penetration backup fuses. Review of QA installation records. Discussions on induced voltages observed by the Duke Power Construction Assessment Team (CAT). The inspection involved 196 inspector-hours onsite by four NRC inspectors.

Results: One item of noncompliance with four examples - (Criterion V failure to follow procedures) was identified.

DETAILS

1. Persons Contacted

Detroit Edison Company (DECo)

W. Holland, Vice President
W. Fahrner, Project Manager
L. P. Bregni, Licensing Engineer
**E. R. Bosetti, Supervising Engineer Electrical
R. W. Barr, Supervising Engineer I&C
J. C Buck, Principal Quality Engineer
D. M. Brooks, Startup Engineer
T. G. Byrd, Supervisor, Procurement QA
P. L. Nadeau, Quality Technician, Licensing
D. Spiers, Director, Field Engineering
S. P. Zoma, Resident Engineer
R. S. Lenart, Superintendent, Nuclear Production
J. A. Nyquest, Assistant Superintendent Nuclear Production
E. Preston, Operations Engineer
J. Rotunda, Senior Quality Control Inspector
G. W. Richards, Field Engineer
T. S. Nickelson, Startup Engineer
**G. K. Sharma, Supervising Engineer
J. J. Wald, Principal Quality Engineer
*L. Ferguson, Field Engineer
*R. Tassel, Field Engineer
**S. H. Noetzel, Assistant Project Manager
**E. Iusis, Assistant Director, Nuclear Engineering
**L. Collins, Nuclear Engineer

Duke Power Construction Assessment Team

**J. R. Wells, Engineer
**B. M. Rice, Engineer
**R. S. Hulen, Engineer

*Denotes those who did not attend the exit interview on June 1, 1984. The inspectors also contacted and interviewed other licensee and contract employees.

**Denotes those who attended the meeting on June 29, 1984 on induced voltages.

2. Licensee Action on Previous Inspection Findings

Closed (Unresolved Item) 341/84-14-01. During this inspection, the inspector reviewed this matter as discussed in Section II, Paragraph 1. This item is considered closed.

(Open) Unresolved Item 341/84-14-02. During this inspection the inspector reviewed this matter as discussed in Section II, Paragraph 2, Items a and b. This item remains unresolved pending clarification from NRC NRR and licensee's action.

(Closed) Unresolved Item 341/84-14-03. It was previously identified that documents were not available to indicate that valve V13-2322 was removed and valve V13-2396 was installed. It has subsequently been determined by the licensee and NRC that a traveller was not used for this work and, therefore this item has been escalated to an item of noncompliance as identified and discussed in Section IV, Paragraph 3 of this report.

(Closed) Open Item 341/83-07-09. The inspector reviewed the action taken by the licensee to upgrade the standby liquid control system (SLCS) from BOP to QA Level 1 DECo. Letter EP-2-64548 dated August 17, 1983 to the Director of Nuclear Reactor Regulation outlines their commitments to resolve this matter, based on the meeting which took place at Bethesda on July 7, 1983 between DECo and NRC staff. The inspector determined that the corrective action taken was satisfactory.

3. Unresolved Items

Unresolved items are matters about which more information is required in order to ascertain whether they are acceptable items, items of noncompliance or deviations. Unresolved items disclosed during this inspection are disclosed in Sections II and III.

4. Open Items

Open items are matters which have been discussed with the licensee, which will be reviewed further by the inspectors, and which involve some action on the part of the NRC or licensee or both. Open items disclosed during the inspection are discussed in Sections II, III, and IV of this report.

5. Exit Interview

The inspectors met with the licensee representatives (denoted in Persons Contacted) at the conclusion of the inspection on June 1, 1984. The inspectors summarized the purpose and findings of the inspection, which were acknowledged by the licensee. See Section I paragraph 7 for description of June 29, 1984 meeting.

Section I

Prepared By: K. R. Naidu

Reviewed By: C. C. Williams

Investigation of Allegation on Work Performed on Emergency Diesel Generators (Allegation Number RIII-84-A-0062)

1. Allegation

An anonymous alleger who was previously employed as a Level II electrical inspector at Fermi 2 made the following allegations to Region III staff on May 8, 1984:

a. "There were excessive voltage drops between the battery rooms (voltage source) and the diesel generator relay panels 321, 322, 323 and 324 (located on the second floor, RHR building).

(1) Relays were turned from horizontal to vertical to help relays close because of the large voltage drop. (i.e., to use gravity assist).

(2) The licensee used smaller relays than specified, to compensate for voltage drop.

(3) Several relays malfunctioned possibly due to low voltage resulting in high amperage to relay. (Note: The alleger said that relays were replaced.)

b. Thread engagement at terminals in panels identified in a. above were less than adequate.

(1) Jumper wires used were size 12 rather than the usual size 14, therefore not allowing set screws adequate thread engagement.

(2) Some set screws were stripped because of inadequate thread engagement.

c. During rework of diesel generator relay panels 321, 322, 323 and 324 procedures were not followed.

(1) Panels for diesel generator 13 and 14 were disconnected (determinated) without using the determination log. Later the panels were reconnected using panel sketches.

(2) When the drawings were made available (after reconnections were made) the drawings did not have terminal numbers."

2. Background

a. Field Modification Requests (FMR) 2955, 2956, 2957, 2958 were issued on the Emergency Diesel Generators (EDG) numbers 11, 12, 13 and 14 respectively to perform the following modifications:

(1) Wire new wall mounted relay panels R30-P311, R30-P321, R30-P331 and R30-P341 for EDGs 11, 12, 13 and 14 respectively.

(2) Relabel existing skid-mounted relay panels as terminal boxes.

(3) Disconnect and remove cables from existing skid-mounted terminal boxes and reroute them for termination to new wall-mounted relay panels R30-P311, R30-P321, R30-P331 and R30-P341 for EDGs 11, 12, 13 and 14 respectively.

(4) Provide new cables between skid-mounted terminal box and new mounted relay panels R30-P311, R30-P321, R30-P331 and R30-P341.

Discussions with various engineering and site personnel indicate that the above FMRs were written due to the chattering of relays, malfunctioning of relays and the inaccurate operation of ITE time-delay, pneumatic type J-20 relays.

b. Design Change Request (DCR) E-2750 Revision A dated March 6, 1982 authorized the purchase of "Hoffman enclosures" for use as relay enclosures.

c. Startup Field Report on Startup (SU) System R-30 (SFR 533) dated August 3, 1982, indicated that during the checkout and initial operation (CAIO) of the ITE "J" relays, these relays did not function properly because the minimum pickup voltage requirements were not met. Nonconforming Reports (NCR) 82-025, 82-137 and 82-139 were written.

To address this problem, DECo sent 15 defective relays to their Relay Division Laboratory and requested them to perform extensive tests to determine the cause of failure during preoperational tests of the EDGs.

d. Design Change Packages (DCP) R3000 E02, E03, E04 and E05 were issued to remount the ITE J-13 relays located in panels R30-P311, P321, P331 and P341 from horizontal to vertical.

e. Colt Industies letter dated January 19, 1978 to Sargent & Lundy (S&L) indicated that "J" relays manufactured by ITE were qualified for seismic applications to IEEE 344-1975 at Wyle Laboratories, Huntsville Alabama. A summary of the seismic tests performed was attached to the above letter. Review of the summary indicates that the tests were performed to IEEE-384. The actual test results are considered proprietary and are with the manufacturer.

f. DECo purchased additional relays. Purchase Orders 55822 dated March 30, 1982 and NM-28 3471 dated October 18, 1983 to Gould Inc. ordered several J-13 and J-20 type DC relays for replacements and required certificates of conformance. Receiving Inspection Report dated June 27, 1982 indicated that the relays were received onsite without apparent shipping damage.

g. In September 1983, DECo sent fifteen relays from this batch of newly purchased relays along with six relays known to be defective in the EDG panels to their Relay Division Laboratory (RDL). DECo requested RDL to test the relays and determine the cause of failure during preoperational testing of the EDGs. The RDL performed extensive tests and concluded that the probable cause of failure of the ITE Type J13 relay was dirt and cement dust in the relay's armature assembly. This contamination prevented the armature assembly from moving far enough to open a late break "b" contact, thus causing an intermittent duty coil to overheat and burn open. The horizontal mounting of the relay makes it vulnerable to contamination. The RDL recommended that the relays be installed in a vertical position after performing the following tests:

(1) Test 1 - DC Voltage Pickup. Tests were performed with the relays mounted in the vertical and horizontal positions.
(2) Test 2 - "b" contact adjustment
(3) Test 3 - DC resistance of nominal 90 ohm coil
(4) Test 4 - Electrical force at 129V DC, ambient temperature 76°F
(5) Test 5 - Mechanical forces
(6) Test 6 - Armature assembly weight
(7) Test 7 - Armature assembly horizontal force
(8) Test 8 - Frictional force surface area of the armature assembly
(9) Test 9 - DC voltage pickup after switching coils
(10) Test 10 - Steady state current of Energized relay
(11) Test 11 - Peak in-rush current magnitude and duration of 90 ohm coil
(12) Test 12 - Defective relay analysis

h. Based on the above tests, the Relay Division Laboratory recommended:

(1) The ITE J-13 type relays should be mounted in a vertical position. (They were mounted in the horizontal position.)

(2) The DC pickup voltage of the ITE J-13 type relay should be found by instantaneously applying a preset voltage. The voltage should be increased in 1.0V DC increments until pickup. This test must be applied after the relay has been energized with full DC voltage for at least 30 minutes.

3. Definition of Terms Used in the Following Paragraphs

a. Control Panel - houses all the auxiliary relays including time delay relays.

b. Cable Pull Card - also known as CR7 Computer Printout Card. This card furnishes information on the routing of the cable, the QA level of the cable, the code, from and to destinations and the termination. There are provisions on this card for the Foreman and QC Inspector to sign this card.

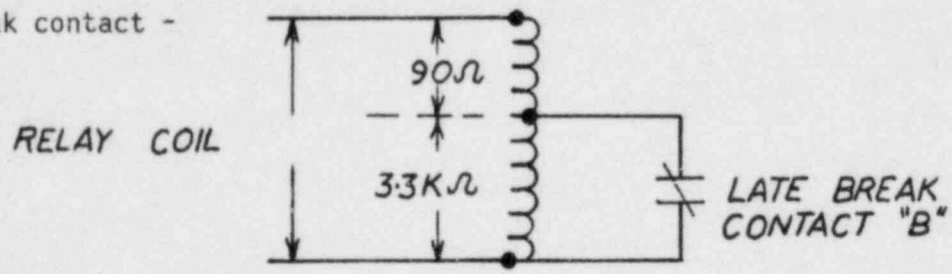
c. Determ Log - Determination Log. A log in which a person records the identification of the wire determinated (or lifted) from the location (for example relay number or terminal block number) is a misnomer. An internal/external jumper log was used. This process is usually used while trouble shooting during preoperation. This method reminds the craftsmen where the wire belongs. The jumper log is not used for major rewiring as in this case.

d. Jumper - A short piece of wire used to connect relay contact to relay contact or between terminals in a terminal block.

e. Jumper log - A log in which a person documents a jumper inserted to simulate a closed contact signal (when it is not available at the time of the test). Reminds the craft to remove the jumper for normal operation.

f. Landing of Lugs - Lugs are attached to the end of wires. Lugs are landed (placed) on the relay terminal and a screw inserted and tightened. Two lugs are landed - means only two lugs are placed between the screw and the terminal (relay or terminal block) thus providing sufficient screw thread engagement.

g. Late break contact -



h. Skid mounted - The panel being mounted on a skid attached to the Emergency Diesel Generator Skid.

4. Licensee Action on the Allegation

DECo established a Safeteam at Fermi to collect and investigate concerns from employees. The inspector ascertained and determined that the Safeteam had investigated the same concerns from one of their ex-employees as is described in the alegations in Paragraph 1 above. The licensee's investigation of this concern is considered proprietary 2.790(d) Material exempt from public disclosure. The licensee's report of their investigation contained the following exerpts.

a. Concern No. 477A as identified in the licensee report.

"Inadequate paperwork/research to make changes in the RHR building. These changes were in the control room located in the diesel generator relay panels. This created confusion to the inspectors involved. Units 11 and 12 were determinated, Units 13 and 14 were not. Individuals were told not to reinstall conductors per the determ jumper log, but by the drawings. The drawings were incorrect." The licensee's safeteam investigated this matter and concluded the following:

(1) It is true that some of the initial actions implemented in the RHR relay panels could have been observed as confusing. A Design Change Package (DCP) was issued to the field which required the modification of the relays. Due to the complexity of the work, the determ-jumper log was used. Upon completion of the physical relay modifications, it was noticed that the reterm log would not match the configuration called for by the approved design change package documents. Quality Control personnel had witnessed the determination of the relays. Due to the fact that the DCP was an approved design document, it took precedence. The confusion centered around the lack of contact terminal numbers. The DCP documents did not label the relay contact terminals, it only noted that the circuits and conductors would go to either an open or closed contact on a specified relay. In order to reduce confusion, an informal reterm guide was established. In addition, Start-Up generated as-built drawings, which were submitted to engineering in order to amend existing panel drawings.

(2) It was the general consensus that the design drawings issued by engineering were not clear with respect to the contact terminal landings and coil wire contacts, although the logic was correct. Minor deficiency logs (MDL's) were only used to correct physical errors, not to modify logic. Start-Up worked with engineering in an attempt to produce control design documents which would be more standardized and much less likely to be misinterpreted by all involved.

(3) The use of the minor deficiency log (MDL) had caused difficulties in assuming compliance and an orderly execution of construction/ startup activities. For this reason the use of the MDL was discontinued on all QA-1 systems and all existing MDLs were reviewed to ensure that they did not exceed the capabilities for which they were intended.

b. Concern No. 477-B as identified in the licensee report.

"Accountability/traceability rules not followed." The Safeteam assumed that this statement was in reference to the relay control panels in the RHR building. In addition, it appeared that these comments were directed toward the "determ - reterm" jumper log portion of work which was done in the panels. The accountability

and traceability of the work performed was validated by the completion of the design change package, including determ and reterms of the relays. Approval of Project Quality Assurance of the work on the DCP, and entries in the jumper log, are also on record. This portion of work in the RHR has accountability and traceability based on the completion and acceptance of the DCP, as-built drawings and MDL's.

c. Concern No. 477-C as identified in the licensee report.

"Operating voltage supply to RHR relays is too low (95 volts to 130 volt relays." The safeteam investigated this concern and determined that the RHR complex and the equipment contained within it (diesel generators, breakers, pumps, relays, etc.) is classified as an emergency condition system. DECo performed engineering studies and initially calculated that the diesel generators would have to operate at a degraded DC control voltage of 95 volts at the RHR. All startup preoperational and checkout and initial operations (CAIO) tests were performed to this criteria. All the relays passed the test, and the test is substantiated by documentary evidence. Months after this preoperational test was performed to the 95 volts criteria, DECo engineering revised their low voltage condition to 105 volts DC. The Safeteam concluded that since all the relays were energized at a lower voltage (95V), the preoperational test did not have to be redone.

d. Concern No. 477-D as identified in the licensee report.

"Used No. 12 wire when a No. 14 would have been appropriate." The licensee determined that the wire size in the relay modification was specified to be No. 12 per the design change package (DCP). It is not unusual to find this wire size being utilized in a relay control panel. Since No. 12 is a larger wire than No. 14, larger lugs were used in the attachment to the relays. To accommodate the increased wire size, the attachments were limited to two per landing, thus maintaining the attachment specification per connection. The increased size was used for several reasons: reduce the voltage drop in an emergency condition, increase the seismic stability of the overall panel and the availability of wire and lug attachments. In summary, the safeteam concluded that the increased wire size did not violate any procedures, but most assuredly upgraded the capability of the panel.

e. Concern No. 477-E as identified in the licensee report.

"NCR written on pump D in the subbasement of the reactor building (4160 volt pump). NCR addressed cut cables on pump power supply. Response came back, said to correct per DCN 9760 (which allows taping) and also says to 'use-as-is.' This is a QA level I system."

The safeteam investigated this concern and determined that the NCR (nonconformance report) referred to is No. 83-1016. The initial disposition as stated in the concern was issued on October 23, 1983. The revised disposition was issued with corrective action of removing the nicked portion of the conductor and applying concentric layers of Okonite T-95 insulating tape from the lug to the new insulation taper point. Although this disposition has not yet been implemented due to other investigative work presently underway with the "B" pump, corrective action will be taken as soon as all further vendor inspections and/or repairs made to the pumps are completed. This is estimated to take place mid March of 1984.

Based on the above, DECo safeteam concluded that the concerns expressed by the individual did not degrade the quality of the work performed.

5. Results of the NRC Investigation

a. Allegation 1.a. as outlined in Paragraph 1 above. There were excessive voltage drops between the battery rooms (voltage source) and the diesel generator relay panels 311, 321, 331 and 341 located on the second floor of the RHR building.

Results of the Investigation:

Batteries located in the auxiliary building supply the control voltage to the emergency diesel generator (EDG) panels located in the RHR complex: Panel 311 for EDG 11, Panel 321 for EDG 12, Panel 331 for EDG 13, and Panel 341 for EDG 14. The RHR complex was added to the Fermi II design. The nominal output voltage of the battery is 130VDC. On May 15, 1984, the licensee performed a special test for the NRC inspectors, during which the DC voltages were recorded both at the DC voltage source in the battery room and at the Panel 331 for EDG-13 in the RHR complex. Initially, the battery output voltage was 132.5VDC and the voltage at Panel 331 was 131 VDC. The maximum voltage drop occurs during the EDG start when field flashing of the exciter to the electrical generator takes place. The duration of the field flashing is 3 seconds and the voltage drop is 5 volts. Therefore, the control voltage is 131-5 = 126 volts.

During abnormal conditions, the lowest battery voltage was calculated to be 105 volts. This would correspond to 103 volts at the EDG control panels. During the EDG start, the voltage would drop to 98 volts for 3 seconds when field flashing occurs.

Conclusion:

There were no excessive voltage drops at EDG panels 311, 321, 331 and 341. Therefore this allegation was not substantiated.

b. Allegation 1.a.(1) outlined in Paragraph 1 above. Relays were turned from horizontal to vertical to help relays close because of large voltage drop.

Results of the Investigation:

The relays were turned from horizontal to vertical position based on the recommendations of DECo's Relay Division Laboratory (RDL). This aids repeatability of the armature assembly moving far enough to open a late-break "b" contact and prevents the intermittent duty coil from burning and overheating.

Conclusion:

The installation of the relays were changed from horizontal to vertical for reasons other than excessive voltage drop. Documents are available to indicate that the J-13 type relays manufactured by ITE were successfully type tested on a shake table at the Wyle Laboratories. Therefore, this allegation was not substantiated.

c. Allegation 1.a.(2) as outlined in Paragraph 1 above. The licensee used smaller relays to compensate for voltage drop.

Results of the Investigation:

DECo originally used ITE time-delay relays. These relays exhibited problems in repeatability. They were replaced with Agastat type time-delay relays.

Conclusion:

The allegation is substantiated. However, corrective action taken by DECo was appropriate and no regulatory requirements were violated.

d. Allegation 1.a.(3) as outlined in Paragraph 1 above. Several relays malfunction possibly due to low voltage resulting in high amperage to relay (The alleger said that the relays were replaced).

Results of the Investigation:

Initially, the panels were skid mounted, which means the panels were mounted on the EDG skid. This is due to the fact that the EDG control panels were included in the purchase of the EDG. During initial tests, DECo considered the vibration of the EDG panels and the relays inside them, and determined to relocate the panels upstairs where the main EDG control panels are installed. During the transition period, personnel associated with the rework informed the NRC inspector during this investigation that the relays were not adequately protected from construction dust and debris. The dust cemented the relay contacts which lead to relay malfunctions. This is confirmed in RDL's report after detailed engineering tests. The inspector reviewed the results of the Checkout and Initial Operation tests performed on the relays and determined that the relays energized at below 95 volts. Relays which energized above 95 volts DC were replaced.

Conclusion:

Several relays malfunctioned due to the accumulation of dust and debris. All defective relays were replaced with relays which were purchased. This allegation is substantiated, however, this issue was appropriately identified, controlled and corrected by the licensee.

e. Allegation 1.b as outlined in Paragraph 1 above. Thread engagement at terminals in the EDG panels were less than adequate.

Results of Investigation:

At the NRC inspectors' request, electrical craftsmen unscrewed several screws on the relay on which two terminals landed. The inspectors determined that there was adequate thread engagement. Several wires were wiggled to ascertain whether the terminal lugs were adequately fastened; no loose lugs were observed.

Conclusion:

The thread engagements of the screws at the terminals were adequate to fasten the lugs tightly. This allegation was not substantiated.

f. Allegation 1.b.(1) as outlined in Paragraph 1 above. Jumper wires used were size 12 rather than usual size 14 not allowing set screws adequate thread engagement.

Results of the Investigation:

During the manufacture, the factory used 14 size wire for jumpers. DECo used size 12 wire for internal wiring. The diameter of size 12 wire is slightly larger than size 14 wire. The NRC inspectors observed that in all the four panels, only two lugs were landed on each terminal and that the screw had adequate threads to engage itself in the terminal.

Conclusion:

Wire size 12 was used as jumper wires, however the screws which fasten the wire lugs to the relay terminal had adequate thread engagement. This allegations was not substantiated.

g. Allegation 1.b.(2) as outlined in Paragraph 1 above. Set screws were stripped due to inadequate thread engagement.

Results of the Investigation:

The NRC inspectors inspected each of the four EDG control panels. The inspectors selected several screws in each panel and requested the craftsman to loosen the screws. The inspectors did not observe any screws with stripped threads or inadequate thread engagement.

Conclusion:

The screws which fasten the wire lugs to the relay terminal were not stripped. This allegation could not be substantiated.

h. Allegation 1.c. as outlined in Paragraph 1 above. During rework of the above mentioned relay panels, procedures were not followed.

Results of the Investigation:

The NRC inspectors interviewed the electrical QC inspector, the electrical foreman and the Assistant System Completion Engineer and several other DECo engineers involved with the rework of the EDG panels. The rework consisted of rewiring the panels after the location was changed from the skid adjacent to the EDG (downstairs of the RHR building) to upstairs (in the same building). Subsequently, the relay position was changed from horizontal to vertical. The wiring change involved removing the wires on the relay terminals (downstairs) and landing them on the terminals of the relays (upstairs). During late September or early October, 1983, after having worked on the panel modification for EDG No. 11 (311) and EDG No. 12 (321), the DECo engineers, associated with the modification, decided not to use the determination log for rewiring the relays after installing them in a vertical position. This is because of considerable confusion in interpreting the design drawing.

Conclusion:

The alleger may have been confused about the way the work was performed. Procedures are established to instruct craftsmen in detail regarding how a special activity is accomplished. It also enables the QC inspector to verify whether the various steps were followed. Finally, during test and startup, the results verify and confirm that all safety functions operated according to the design. For example if the "Normally Open" contact of a relay was wired incorrectly instead of the "Normally Closed" contact, there would be a malfunction during test, startup or operation. In this instance a procedure was not developed and the absence of a procedure for this application is considered irrelavant. This allegation was not substantiated.

i. Allegation 1.c.(1) as outlined in Paragraph 1 above. Panels for diesel generator 13 and 14 were disconnected (determinated) without using the determination log. Later, the panels were reconnected using panel sketches.

Results of the Investigation:

Discussions with individuals involved in the rework confirmed that wires were disconnected from the panels without using a determination log. The determination log was not a useful tool because the relay which was initially installed horizontally was now in the vertical position. Individuals involved with the rework were unaware of

"panel sketches." Schematic design drawings were used. The craftsmen under the scrutiny of the QC inspector used the design drawings to rewire the panel because the design drawings are the binding documents.

Conclusion:

This allegation was partially substantiated, however, there was no violation of regulatory requirements. The tests performed on all four EDGs indicate that the panel wiring met the design requirements.

j. Allegation 1.c.(2) as outlined in Paragraph 1 above. When the drawings were made available (after reconnections were made), the drawings did not have terminal numbers.

Results of the Investigation:

The drawings indicated whether to use a "Normally Closed" contact, "Normally Open" contact or the relay coil. All craftsmen were aware of the distinction due to the unique marking on the relay contacts. The terminal number on the drawing was not useful.

Conclusion:

The allegation was substantiated, however terminal numbers were not required on the drawings. There was no violation of any regulatory requirements. The tests performed on all four EDGs indicated that the panel wiring met the design requirements.

Summary

The allegations outlined in Paragraph 1 (R:III-84-A-0062) above are considered closed based on the above results and conclusions.

6. Review of QA Records

a. The inspector reviewed the records related to the installation of instrument tubing to reactor pressure vessel (RPV) nozzle B21 L007 as indicated on isometric drawings 3WI-B21-7395 and 6WI-E11-7428-1.

Wismer and Becker (WB) was the mechanical instrumentation installation contractor. WB Form EF-236 lists the various tubing used and lists the heat numbers. The form lists the heat numbers for pieces 1 and 3 of the tubing 40346, and indicates that the tubing is ASME SA 213, type 304 material.

Weld process control sheet 6WI-E11-7428-4 documents the bill of materials, the various operations and inspections performed, the Authorized Inspectors signature where applicable, and includes the following:

(1) Weld joint identification
(2) Weld procedure used was WPS 608
(3) Weld filler material traceability number

(4) Oxygen purge used
(5) Weld electrode material traceability number
(6) Date when the joint was cleaned and tack welded
(7) Identifies the welder who welded the root pass, fill and cap
(8) Post weld heat treatment report where applicable
(9) Date when the weld was completed
(10) Date when liquid penetrant examination was performed and the report number
(11) Weld repair performed where applicable
(12) Provision of DECo to establish QC hold point to witness any operation

b. Receipt Inspection Report (RIR) 6298 dated November 4, 1981 indicates that 10,021 feet of stainless steel, 5/8" diameter SA-213, type 304 tubing, minimum wall thickness: 083" with heat number 40436 was received without shipping damage from Guyon Alloys, Wayne, Pennsylvania. WB purchased this material and a copy of the specification was attached to the purchase order specifying that the material was to conform to the ASME Section III, Class 2 of the 1971 edition through the '71 Winter addenda. Teledyne Columbia Summerill, Scottsdale, Pennsylvania provided the material certification, indicating that the chemical composition conforms to the requirements of SA213, type 304 and provided the results of the physical tests including ultimate, strength yield strength, elongation and the Rockwell hardness number. The tubing successfully withstood a hydrostatic pressure of 1000 psi. In reality, the tubing may be subjected to more than 1000 psi. Records indicate that DECo tested the lines to a hydrostatic pressure of (1.25 x 1250 + correction factor) 1875 psi after installation. The inspector verified that the pressure gauges, identified as WB-263 and 264, had a 0-3000 psi range which is acceptable to the ASME Section III code requirements.

c. The qualification records of three welders were reviewed and determined to be satisfactory.

d. RIRs 637 dated January 10, 1978 and 893 dated February 16, 1978 indicated that various qualities of weld rod including 600 lbs of 1/16" diameter ER308 type weld rod were received without shipping damage. This weld rod was manufactured by WASA Clinton, Connecticut. Certificate of Quality Conformance from WASA steel company indicates that the chemical analysis met the applicable requirements of ASME, SFA/AWS 5.9 class for ER 308 weld rod. Anamet Laboratories, Inc., Berkley, California performed additional tests and determined that the ferrite content was calculated per figure NB-2433-1, Summer 1975 Section III, Division 1 of ASME Boiler Pressure Vessel code.

WB RIR 4385 dated October 11, 1979 indicates that 105 lbs of 1/16" diameter ER 316L type weld rod with heat #11803 was received without visible shipping damage. Teledyne-Mckay, the manufacturer of the weld rod provided the chemical analysis and the results of mechanical tests performed on a welded sample. The results indicate that the weld rod meets the requirements of AWS A5.9-69; ASME Section II part c, SFA 5.9, 1977 edition including Winter 1977 addenda.

WB RIR 5143 dated February 22, 1980 indicates that 180 lbs of 3/32" diameter ER-316L type weld rod with Heat Number 26886 was received without shipping damage. Teledyne-McKay, the manufacturer, provided the chemical analysis which appeared to conform to AWS A5.9-69, ASME Section II, Part C, SFA 5.9, 1977 Edition including Summer 1975 addenda. Teledyne McKay certified that the weld rod was manufactured in accordance with their ASME Quality System Program and tested to the requirements of NB-2000 and NB-2400, Section III (1977 edition) including Summer 1979 addenda, Class 1 components of ASME BPV codes. Results of the mechanical tests were not provided.

e. WB RIR 1382 dated April 24, 1978 indicates that various quantities of fittings including 50 pieces of 5/8" diameter, 3000 lb elbows were received without shipping damage from Forberg Scientific Company. Parker and Hannefin, the manufacturer of the fitting issued a certificate of conformance that the supplied fittings have been designed and manufactured to the ASME Section III requirements.

Reviewed the traceability of Piece 31 on drawing 6WI-B2-7071-4. Piece 31 is a 5/8" outside diameter (OD), .083" wall thickness seamless tube made of SA 213 type 304 material with Heat Number 464547. Surveillance Report (SR) 3/84 identifies that during a walkdown, it was determined that the incorrect heat # was documented. The SR requested that the above mentioned heat number be entered into the documents. The traceability of Piece 33 on the above drawing indicates that it is a 5/8" OD, .083" wall thickness seamless tube made of SA 213, type 304 material with Heat Number 403436.

DECo reported on a 50.55(e) item that tubing with Heat Number 464547 exhibited linear indications. DECo stated that liquid penetrant (PT) tests were randomly performed on the tubing. The inspectors attempted to establish whether PTs were performed on this particular piece.

The inspector reviewed the liquid penetrant (PT) report on weld #31 and the entire length of the piece (13") between Weld 31 and 32. The PT report #24540 dated April 24, 1984 indicated that spot check cleaner SKC-S from lot number 83M069 was used to clean the pipe. Spot check penetrant type SKL-S/SKL-HF from lot number 83M051 was used. Developer SKD-S from lot number 83M012 was used. Post developer and cleaner type SKC-S from lot number 83M069 was then used to clean the area. No unacceptable indications were identified.

No items of noncompliance were identified in the above area.

7. Meeting on Induced Voltages

a. The inspector attended a meeting at Fermi site on June 29, 1984 to discuss the results of DECo's investigation on induced voltages observed on cables which shared a raceway with the flasher bus cable.

b. Background

DECo contracted Duke Power Company to perform an independent assessment of the status of construction at Fermi and determine whether the quality of installation in various disciplines met acceptable standards. Duke Power Company dispatched a Construction Assessment Team (CAT) consisting of several engineers from different disciplines for this assessment.

c. CAT Electrical Issue Followup

During the CAT inspection, the CAT team inspectors performed some tests on cables. Specifically, they disconnected the control cables of the Inlet Valve A E2150-F036A (suppression pool to core spray pump) going to the main control room panel. Similarly they disconnected the control cables of the isolation valve E2150-F004A (Core Spray Outboard) going to the control room. They used a high impedance voltmeter to measure induced voltages between the terminals and the ground. They measured 18 to 50 volts pulsating AC and observed a current of 100 to 340 microamperes.

d. Discussion

The discussion centered around the cause of the observed voltage, it's magnitude and effects. DECo stated that for the following reasons the observed induced voltages are not a cause of concern.

(1) The induced voltages were observed on a circuit which was not in its normal configuration. Hence, the induced voltages would not occur during normal operating conditions because the cables would not be disconnected and permitted to "float."

The magnitude of the energy was very low - in the order of 100 to 340 microamperes; a larger threshold is required to operate a relay (the minimum current required to operate a relay is 8 milliamperes).

(2) All low energy instrument cables are shielded to prevent spurious signals from induced voltages. Operating experience from other DECo fossil plants which use similar instruments and shielded cables indicate that spurious signals were not generated. Furthermore, at Fermi, with more than 90% of the circuits energized, no malfunctions associated with induced voltages were observed to date.

e. Conclusion

The observed induced low energy voltages do not degrade the operation or performance of safety related systems. The engineering management of Duke Power Company concurred with this conclusion. The NRC inspector has no further questions on this matter.

Section II

Prepared By: Z. Falevits

Reviewed By: C. C. Williams

1. Independent Design Review (Unresolved Item 341/84-14-01) (Closed)

a. In response to a previously identified Unresolved Item 341/84-14-01, the inspector reviewed Design Calculation (DCN) No. 969, Revision A which addresses the sizing of thermal overload heaters used in safety related circuits of continuous duty motors. The following DCN 969 items were reviewed:

(1) Item B.3 states that based on "the calculation method for sizing the thermal overload heaters, 92 continuous duty motors or other equipment thermal overload heaters, disagreed from the computer program to the MCC frontal and will be dispositioned per EF2-65012."

Letter EF2-75012 dated January 5, 1984 indicated that new criterion will be used to resolve the differences between the thermal overload relay heaters calculated in DCN 969 and those shown on the MCC frontals for MOVs and continuous duty motors. Those thermal overload relay heaters which could not be justified to the established criteria are being replaced with the "calculated heaters."

(2) Item C.1.i states that 125% of the minimum value of full load motor current listed in the heater manufacturer's tables, expected to cause all like relays to trip under design conditions, would be defined as the current rating of an overload relay. Criterion No. 1, Item 3.c states that the thermal overload relay should trip at no less than 140% of the full load current for the safety related continuous duty motors. (A minimum heater size shall be chosen to meet this criterion). This criterion, taken from National Electric Code-Article 430-34, must be met. The second criterion, which will be met if possible, states that at locked rotor current, the overload relay must actuate within the motors maximum safe stall time. The licensee indicated that they used a very conservative approach in sizing the thermal overloads. They have sized the heaters of the thermal overload relays by considering worst case conditions and assuring that the function of the motor is completed (either fully closed or open) as required by Regulatory Guide 1.106 dated March 1977. Ambient compensated overload relays are used for safety and nonsafety related pumps and valves to compensate for the change in ambient temperature at the location where the thermal overload is used.

The licensee indicated that overload operation was verified through Test Procedure CAI0.000.026 which verifies that the overload relay will operate as described on the manufacturer's time-current curve.

The inspector observed that the licensee had been using table 21 on page 147 of Gould Industrial Control Catalogue (which is to be used with three overload relays per circuit) in a DC circuit which contained two overload relays. The licensee informed the inspector that the manufacturer had allowed the use of table 21 for circuits with two overload relays.

The licensee presented the inspector with a letter dated May 30, 1984, from the Gould Company to Detroit Edison which stated that the three pole adjustable ambient compensated overload relay heater charts were applicable for two pole DC starter applications.

(3) Assumption 2.f - states that motor ambient temperature variations do not have a sizable influence on the trip setting of the thermal overload relays.

The inspector reviewed the manufacturer's (Gould) general instructions for selection of overload relay heater elements which indicated that for installations where ambient temperatures of motors and starter are different, special size specifications would have to be considered. For Instance, if the ambient temperature at the starter is lower than at the motor; one size smaller than specified in the standard selection tables for each 15°C difference would be required. If ambient temperature at the starter is higher than at the motor, the starter size would be one size larger than specified in the standard selection tables for each 15°C difference. The licensee indicated that all motors in high temperature areas (inside the containment) are Class H motors (no change in motor current up to 180°C ambient temperature), and would be minimally effected by changes in ambient temperatures. Therefore, the above requirements were not applied.

(4) The inspector observed that DCN #969, Item 3.c did not include sizing of fuses in it's design criteria for DC motors smaller than 5 HP. After discussions with the licensee, the licensee developed a criteria and initiated EF2-100.111 dated May 17, 1984, to resolve the deficiency. This is viewed as an isolated case and the licensees actions resolved this matter.

(5) The inspector reviewed 260V DC MCC 2PB-1 front elevation drawing No. SSD721-5230-14, Revision "R" and observed that the 15A fuse for position 2B of the MCC was apparently not properly sized. The licensee reviewed the calculation and initiated FMR-S7255 dated May 17, 1984 to replace the existing fuses with 20 amp fuses so as to agree with the design calculation report EF2 100.111. The inspector also reviewed drawing SS0721-2530-13, Rev. "N" titled, 'Front Elevation 260V DC MCC 2PA-1,' but found no discrepancies.

This issue is considered another example of noncompliance associated with noncompliance 341/84-17-01b described in Paragraph 5 of this section.

(6) The inspector reviewed the following documents associated with the addition of thermal overload relays per DCN 969, Revision A.

(a) FMR 6599 dated January 9, 1984 which requested the addition of overload relays to positions 1B & 1C of MCC 2PA-1.

(b) FMR 6600 dated January 9, 1984 which requested the addition of overload relays to positions 1D, 2A and 2B of MCC 2PB-1.

(c) EF2 106.175 dated February 20, 1984 which identified discrepancies with FMR 6599 and FMR 6600. Action taken here was to revise the FMR's to resolve all discrepancies. A more
detailed FMR-6938 dated March 9, 1984 was then issued to close EF 2.106.175. Item 2.2.2 of FMR-6938 required the purchase of ambient compensated overload relay heaters (if required).

The inspector questioned Commercial Quality (CQ) items being used in QA-1 system and seismic category 1 items. The licensee indicated that thermal overload heaters bought as CQ, used on directly heated ambient compensated overload relays were qualified based on past experience, reliability and engineering judgement. The licensee presented the inspector with form ANQS No. 102 which is titled, "Seismic Design-qualification Acceptance of Components Not Procured as QA-1 for Safety Related Applications," which specified the component's name, requirements, acceptability, and other items considered. The acceptability rationale in the case of the thermal overload heaters was based on engineering judgement.

Based on the above review, unresolved item 341/84-14-01 is closed.

2. Review of Installed Electrical Components

a. The inspector reviewed the installation of Main Turbine Main Steam Stop Valve position switches 2N30N165C, 2N301N166C, 2N30N167C and 2N30N168C, shown on drawing 6I721-2866-19, Revision "H" and drawing 6I721-2156-2, Revision "D". These limit switches were purchased as QA Level III and are part of Reactor Protection Scram Channels A1, A2, B1, B2 logic. (Drawing 6I721-2155-6)

The inspector observed that conduit routing to Stop Valves 2 and 3 limit switches, does not conform to Raceway System Separation Requirements Specification 3071-33 Page 115 Revision "R" dated February 1984.

The conduit into the limit switch of Stop Valve 2 contained cables belonging to RPS channels A1 and B2 while the conduit into the limit switch of Stop Valve 3 contained cables belonging to RPS channels B1 and A2.

To address the separation problem described above, the licensee indicated in a Tel-con with Region III on May 21, 1984, that English Electric drawing R/LA/20/00063, Sheet 1, dated October 7, 1970 contained limit switch type SLS-4 with 3NO and 3NC contacts. A comment on the subject drawing indicated that a spare limit switch would be purchased, however, it was not purchased because of an engineering judgement by English Electric. Had the subject limit switch been used, the separation problem could have been avoided.

It was agreed that the licensee will provide an analysis to justify the violation of separation requirements or will change the cable routing to conform to separation requirements.

This item has been previouly identified as unresolved item 341/84-14-02, and still remains unresolved.

b. The inspector reviewed the main turbine throttle valves fast closure position monitoring logic, which is part of the RPS Scram Channels A1, B1, A2, and B2 as shown on drawing 6I721-2156-2, Revision "D".

Input into RPS channels is accomplished through relays 37A, B, C, D, E, G, J and H which are mounted in Turbine protection cabinet H11-P632. These relays were purchased to QA level III requirements. The relay contacts which interlock into the RPS channels are routed thru reactor safety termination boxes mounted inside panel H11-P632 and from there the outgoing cables run via metallic conduit into the RPS system.

The inspector reviewed the following related documents and hardware.

(1) Connection diagram 6I721-2344-36, Revision C which contained the HP steam valve limit switches.

(2) Schematic diagram 6I721-2332-6, 8 which contained the turbine tripping circuit.

(3) RPS A2 reactor safety term box inside panel H11-P632
RPS A4 reactor safety term box inside panel H11-P632
RPS A1 reactor safety term box inside panel H11-P632
PRS A3 reactor safety term box inside panel H11-P632

The inspector indicated that two of the four termination boxes were mislabeled, that is, A4 should have been B2 and A3 should have been B1. The licensee informed the inspector that FMR-S7257 was written to correct the nameplates. In addition NCR-84-0751 was written to tighten a loose conductor identified by the NRC inspector in MCB Panel H11-632.

This item has been previously identified as an unresolved item 341/84-14-02 and still remains unresolved.

3. Observation of Cable Termination Activities

a. The inspector reviewed the licensees inspection and refurbishment effort being performed in order to:

(1) Assure compliance to Bulletin 78-02 which involves identifying failure of Marathon 6000 series terminal blocks. These blocks were recently identified as part of the rework on MOV E1150-F0483.

(2) Assure compliance to IE circular 83-72 dated October 28, 1983 identifying unqualified Buchanan 0824 series terminal blocks, due to uncertainties in the information from limitorque concerning the type of blocks in MOV operators. This verification is necessary to assure that only qualified blocks are being used and to assure that qualified materials such as wiring, limit switches and torque switches are being used and identified.

b. Generic FMR-7058, Revision B dated February 20, 1984 was written to perform necessary modifications to limit switch compartment components for 32 safety related limitorque operators located outside the drywell. A limitorque component identification checklist was included. Generic FMR-7043 Revision C dated April 19, 1984 was written to perform modifications necessary on the limit switch compartment components for 13 limitorque operators inside the drywell to assure that only qualified materials are installed in safety related limitorque operators. In addition to the generic FMRs each valve has a specific FMR written against it.

c. The inspector observed two journeyman electricians perform work on safety related division 1 valve V4-2080 mounted inside the drywell used for primary containment isolation. FMR-S7178, Revision 0 dated May 18, 1984 requested that power cable 201290B-1B be spliced to motor leads using project specification 3071-128 STD EQ-4-4 for general termination procedure.

The inspector observed at the valve location that the terminal blocks inside the limitorque compartment had been removed and the electricians appeared to be in the process of splicing the motor leads. The inspector identified the following adverse items.

(1) The electricians were observed to be performing a Raychem heat shrink application using the wrong procedure, spec. 3071-128 STD-EQ-4-3. The correct applicable procedure, per FMR-7178, was spec. 3071-128 STD-EQ-4-4.

(2) Splicing kit used was not the appropriate for the splicing performed.

(3) Maintenance Inspection Checklist MIC-84-1522 dated May 11, 1984, Note 2 requested that any deviations from FMR S-7178 required a QA review prior to starting of work, and a "Hold" point required step 3.2 of FMR S-7178 sheet 2 of 2 to be observed by QA. None of the above was accomplished.

(4) It was observed that the craftsmen performing the Raychem heat shrink splicing had not received any previous training for that activity.

(5) PN-21-No. 599777 indicated in the remarks column that new #14/10 lugs had been used on size #16 motor leads.

The inspector reviewed the installation and observed that the lug installed was a size #18-14/10. Thus, documentation of the lug size appeared to be inadequate.

Based on the findings outlined above, the inspector informed the licensee that lack of training to perform Raychem heat shrink application and inadequate use of procedures and QA requirements is an example of an item of noncompliance contrary to the requirements of 10 CFR 50, Appendix B, Criterion V (341/84-17-01a).

As a result of the inspectors findings, the licensee suspended work regarding Raychem heat shrink splicing and is conducting training sessions for the craftsmen involved in cable splicing.

d. The inspector reviewed the following documents related to the training of personnel to perform Raychem heat shrink splicing.

(1) Stop Work Order (SWO) No. 84-001 dated May 16, 1984 issued to DECo Maintenance required that craftsmen be trained in the installation of heat-shrink tubing in Motor Operated valves. Notice to resume work was dated May 17, 1984, 41 craftsmen had been trained under this stop order.

(2) Stop Work Order (SWO) No. 84-002 dated May 18, 1984 issued to DECo maintenance and all site contractors required that craftsmen including QC inspectors be trained in the installation of heat shrink tubing - Raychem Corporation. This S.W. was issued as a result of NRC identifying another instance of improperly trained craftsmen.

(3) Training attendance sheets dated May 16, 20, 21 and 22 from classes given to personnel who would perform QA I Raychem installations indicated that these personnel had completed the following training: (a) one and one half (1½) hour film by Raychem consisting of information required to perform the heat-shrink splicing, (b) forty-five minutes "in shop" training by an experienced Raychem instructor. Craftsmen who had not previously installed Raychem were required to perform an actual installation.

Sign in logs indicated that approximately 200 craftsmen and QC personnel attended the training sessions.

The inspector observed one of the trained electricians performing a Raychem heat shrink splice, the splice was rejected at first by the QA inspector who observed the process and had to be redone. No procedural deficiencies were noted by one NRC inspector.

4. Independent Design Verification

a. The inspector reviewed (Field Modification Request) FMR-4914 dated November 17, 1982; FMR-4915 dated February 25, 1983 and FMR-4937 dated January 6, 1983 which required a steam condensing mode modification to the RHR (E11) system eliminating existing instruments, control cables, instrument cables and conduits in the field and deletion from the drawings. This was necessary to eliminate the water hammer potential in the heat exchanger.

The inspector identified the following circuits that had been modified physically in the field, but not deleted from the design drawings.

(1) Drawing 6I721-2261-10 contained jumpers between two motor control centers.

(2) Drawing 6I721-2205-11 contained 120V AC feed circuits to valves E11-F051A&B and E11-F053A&B.

The inspector requested that the licensee review the above drawings for additional discrepancies as identified above. Subsequently the licensee identified twelve additional devices shown on drawings with 120V AC feeds, when in fact they should have been deleted per the FMRs mentioned above.

At the end of the inspection the licensee presented the inspector with record revision document ABI-0676 dated June 1, 1984, initiated to revise the affected drawings.

The licensee indicated that a review will be performed to the identified FMRs to preclude similar errors. This matter remains open pending NRC review of the licensee's actions (341/84-17-02).

5. Followup on Installed Penetration Redundant Protective Fuses

a. On a previous inspection report (341/84-14, Paragraph 7) the inspector identified two fuse circuits that were not sized properly in the MCC and in the fuse panel.

The inspector reviewed the licensee's ongoing effort to identify the circuits that do not conform to the design requirements of the applicable DCP and MCC frontal drawings. The licensee indicated that 15 additional circuits had been identified with incorrect fuse

sizes, either in the MCC or in the fuse panel. The licensee further indicated that either the DCP or MCC frontal drawings would be revised, or discrepant and fuses would be replaced with the appropriate ones.

b. The inspector examined DCP T2301E01 dated June 1, 1983 which is the original DCP initiated to implement the requirements of RG 1.63 which states, that the electrical penetrations shall be designed to withstand without loss of mechanical integrity the maximum possible fault current versus time conditions that could occur given single random failures of circuit overload protection devices.

The inspector identified as part of the DCP four additional circuits containing improperly sized fuses (DCP items 3, 4, 30 and 31) which did not agree with the "continuous motor design evaluation" for valves.

c. The licensee indicated that a design review would be performed on the DCP to verify that correct size fuses had been used. In addition test procedure CAIO.000.059 and CAIO.000.026 would be reviewed to assure that test engineers check all fuses for size and applicability, as required on construction drawings.

The inspector reviewed two DCN's which were written as a result of the review done by the licensee on the previously mentioned DCP (T2301E01) subsequent to the NRC inspector identifying a potential deficiency. DCN 10649 was written to remove existing backup fuses which were not needed, and DCN 10616 was written to add additional backup fuses which were left out in the DCP.

The inspector informed the licensee that the foregoing indicates an inadequate design review and is an example of noncompliance contrary to the requirements of 10 CFR 50, Appendix B, Criterion V (341/84-17-01b).

6. Review of Instrumentation Installation Records

a. The inspector reviewed the following records related to the installation of instrument tubing to reactor pressure vessel (RPV) nozzle B21 L008 as indicated on isometric drawings 6WI-B21-7071-4 and 6WI-B21-7071-1. Wismer and Becker (WB) was the mechanical instrumentation installation contractor. WB form EF-236 lists the various tubing used and the heat numbers.

b. Weld process control sheet 6WI-B21-7071-4 documents the bill of materials, the various operations and inspections performed, the authorized inspector signature where applicable, including the following:

(1) Weld joint identification
(2) Weld procedure used was WPS 508
(3) Weld filler material traceability number
(4) Oxygen purge used
(5) Weld electrode material traceability number

(6) Date when the joint was cleaned and tack welded
(7) Identifies the welder who welded the root pass, fill and cap
(8) Post weld heat treatment report where applicable
(9) Date when the weld was completed
(10) Date when liquid penetrant examination was performed and the report number
(11) Weld repair performed where applicable
(12) Provision for DECo to establish QC hold point to witness any operation

c. Liquid Penetrant Examination Record #24540 dated April 25, 1984 indicated that a PT test was performed on the entire 13" section between Welds 05531 and 35132 of Piece 31 and that all areas tested 360° around the tube were found acceptable.

d. Receipt Inspection Report (RIR) 6298 dated November 4, 1981 indicates that 10,021 feet of Stainless Steel, 3/8" diameter SA-313 type 304 tubing, minimum wall thickness .083" with Heat Number 40436 was received without shipping damage from Guyon Alloys, Wayne, Pennsylvania. WB purchased this material; a copy of specification was attached to this purchase order specifying that the material is to conform to the ASME SA 213, type 304 requirements of ASME Section III, Class 2 of the 1971 edition through the 71 Winter addenda. Teledyne Columbia Summerill Scottsdale, Pennsylvania provided the material certification, indicating that the chemical composition conforms to the requirements of SA 213, type 304 and provided the results of the physical tests including ultimate, strength, yield strength, elongation and the Rockwell hardness number. The tubing successfully withstood a hydrostatic pressure of 1000 psi. Test number EF2-B21-5 indicated that DECo tested the lines to a hydrostatic pressure of 1876 psi after installation. The inspector verified that the pressure gauges identified as WB-188 and 190 had a 0-3000 psi range which is acceptable by the ASME Section III Code requirements.

e. The qualification records of the welders were reviewed. No discrepancies were noted.

f. WB RIR 4385 dated October 11, 1978 indicated that 105 lbs of 1/16" diameter ER 316L type weld rod with heat #11803 was received without visible shipping damage. Teledyne-McKay, the manufacturer of the weld rod provided the chemical analysis and the results of mechanical tests performed on a welded sample. The results indicate that the weld rod meets the requirements of AWS A5.9-77; ASME Section II part C, SFA 5.9 (1977 edition including Winter 9177 addenda).

No discrepancies were noted in any of the above areas reviewed (6.a. thru f.).

Section III

Prepared By: A. Gautam

Reviewed By: C. C. Williams

1. Separation of Class 1E Circuits

During this inspection period, Class 1E cable and raceway separation was reviewed for physical independence and redundancy of Class IE power systems, Class IE protection systems and Class IE equipment. The following review was performed.

a. The inspector reviewed Fermi 2 FSAR commitments for adequate cable separation in conduits, trays, panels, enclosures, floor penetrations and free air. These commitments were also reviewed to verify if commensurate with current industry practices outlined in IEEE 384-1974 and Regulatory Guide 1.75.

It was observed that even though Detroit Edison Company (DECo) is not committed to IEEE 384 and Regulatory Guide 1.75, the licensee does appear to meet the intent of these standards, i.e., to establish criteria for the redundancy of safety systems, with the following exceptions:

(1) Separation of Redundant Class IE Divisional Cables

In this case the FSAR apparently meets the intent of IEEE 384 and Regulatory Guide 1.75, however, the inspector observed that in cases where divisional conduits did not carry safe shutdown circuits (Appendix R-Fire Protection circuits), a lack of separation had been allowed per DECo memo F2S83-5583. The NRC took exception to this allowance and Revision A of this document now requires a minimum of 1" between enclosed divisional raceways. A review is also planned by the licensee to correct any installations in the field where less than 1" was allowed between divisional enclosed raceways. Pending NRC verification of this review, this item remains open. (341/84-17-03)

(2) Separation Between Divisional Cables and Associated Balance of Plant (BOP) Cables

During review of these cables it was observed that the Fermi 2 plant does not uniquely identify or color code 'associated' circuits. Even though the licensee reported that Fermi 2 had no associated BOP circuits, i.e., non-Class 1E circuits which share power supplies, enclosures or raceways with Class 1E circuits, it was observed that FSAR Amendment 1-November 1975, Page E.2.222-5, Section 5 allowed a BOP cable to come in contact with a divisional cable as long as this BOP cable did not cross over to a redundant division. No apparent deficiencies to this criteria were identified during this review.

It was observed that Design Instruction No. 112 - May 12, 1976, page 45 allows a BOP cable to leave a 1E raceway system and enter into a BOP raceway system. This is true even if a BOP conduit, having division associated circuits, is in proximity to other BOP conduits having division associated cables of a redundant division. IEEE 384/74 and Regulatory Guide 1.75 requires a minimum of 1" between BOP conduits carrying division associated BOP circuits. This exception was discussed with the licensee, and the licensee reported that in all such cases, isolation devices in the associated BOP circuits prevent propagation of faults that could cause a loss of redundant systems. Specific cases were evaluated and discussed in Paragraph 1.b of this section. No apparent deficiencies were found.

(3) Separation of "Pure" (Not Associated) BOP Cables and Class 1E Cables

It was observed that separation requirements as outlined in Specification 3071-33, Revision S, Section 5.17.18.18.9 did not require any separation between BOP conduits and Class 1E conduits. Detailed separation requirements have been established for BOP cables running to and from Class 1E trays. However, the inspector was concerned that cases may exist where BOP conduits have been run in the proximity (less than 1") of both redundant divisions. Specific cases found were evaluated and are discussed in Paragraphs 1.b and 1.c of this section. No apparent deficiencies were found.

(4) Separation Between RPS and ESF Cables

The inspector observed that where RPS conduits are of the same scram group, no criteria existed for separation of RPS and ESF conduits. The Fermi 2 FSAR Amendment 12-June 1978, Section 8.3.1.4.1.1, Page 8-3-28, calls for cabling of the RPS, including the neutron monitoring system (NMS), to be routed in separate conduits that contain no other wiring. This criteria does not address the minimum separation required (normally 1" per IEEE 384/74 and Regulatory Guide 1.75) between these RPS conduits and divisional ESF raceways. The concern here is that an RPS conduit may run in the proximity (less than 1") of both divisional conduits, however, no deficiencies in this regard were observed during this review.

b. The inspector performed walkdowns amd evaluations in essential areas of the plant. The following areas were included in this review:

Steam Tunnel, El. 583'6"
Cable Spreading Room, El. 630'6"
Control Room, El. 643'6"
Relay Room, El. 613'6"
Cable Chase Area, El. 613'6"

Switchgears Rooms, El. 613'6"
Drywell, El. 583' through 601'
Reactor Building, El. 503'6"

Thirty-six examples of apparent separation conflicts to Fermi 2 separation criteria were identified in the areas identified above and reviewed for justification.

Fermi 2 separation criteria used for the respective justifications included:

FSAR Section 8.3.1.4.1.1, sheets 8.3-26 through 8.3-29
FSAR Sheet E.2.222-5 (Amendment 1, November 1975)
FSAR Sheet e.2.222-4c (Amendment 3, June 1976)
FSAR Sheet A47 (Amendment 38, July 1981)
FSAR Sheet A48 (Amendment 45, November 1982)
NUREG-0798 (Fermi 2 SER, July 1981)
DECo Specification 3071-33, Revision S
Section 5.15.14 Tray Separation Criteria
Section 5.17.18.18 Conduit Separation Criteria
Section 5.17.18.19 Cable Separation
Design Instruction No. 112, May 12, 1976, Section III A and B, Section V and Section VI regarding separation of systems
DECo Memo F2S83-5583, Revision A, June 1, 1984 from G. K. Sharma on Fire Separation

The thirty-six examples identified inadequate separation as described below:

(1) Lack of separation between divisional redundant conduits as required per DECo Specification 3071-33, Section 5.17.18.18, including examples of less than 1" between redundant divisional conduits (19 examples). All examples were found to have been previously identified and justified per DECo memo F2S83-5583. The NRC inspector took exception to justifications allowing less than 1" between redundant divisional conduits. This item is included in Open Item 341/84-17-02.

(2) Less than 1" separation between divisional conduit and redundant divisional BOP conduit (11 examples). The licensee uses the term divisional BOP conduit in lieu of associated BOP conduit or cable defined in paragraph 1.a.(2). Redundant associated or divisional BOP conduits are conduits associated with redundant divisions. Lack of separation here was justified by the licensee through isolation devices on BOP cables. These examples are discussed in Paragraph 1.c. No apparent deficiencies were found.

(3) Less than 1" separation between divisional conduit and RPS conduit (6 examples): The lack of separation identified here was justified by verifying that there was no conflict between RPS scram groups or divisions, and that RPS circuits identified

were associated with the same division as the divisional conduit. It was also verified that the divisional conduits carried no power circuits. No apparent deficiencies were found.

c. System redundancy was reviewed for cases where BOP circuits were found sharing Class 1E raceways, enclosures and power sources. These BOP circuits were examined by reviewing the wiring drawings to identify isolation devices that would prevent loss of redundant divisions. Details of five examples reviewed are listed in Table I.

It was observed that in panel H11-P611, two redundant divisional cables, 232042-2C and 232035-1C, were touching. This is in conflict with Design Instruction No. 112, Section D, which states, "No single control panel (or local panels or instrument rack) shall include wiring essential to the protective function of two systems...." An NCR is being written to correct this isolated case. Pending review of correction of this deficiency and further review of wiring in panels, this item is open (341/84-17-04).

Table I

Conduits/ Cables	Common 1E Raceway	Common 1E Source	Common 1E Enclosure	Wiring Drawings	Remarks
NA-037-2C NA-032-1C	No	Yes	H110P608 C7100P001A	61721-2145-3/E 61721-2145-4/E 61721-2154-1/F	BOP Divisional Conduits.*
QU-005-1K QU-010-2K MI-129-0C	Yes	No	H11-P920	61721-2009-2/0	BOP and BOP Divisional Conduits Entering Floor Penetration
CSC-028 CSC-005 CSC-029 QU-017-2C	No	No	Floor Penetration Box	61721-2201-19/C 61721-2201-17/C 61721-2201-13/E 61721-2201-5/I	Swing Bus and Division 2 Conduits in Same Floor Penetration
2016731C 255171-2C	No	No	H11-P891	61721-2051-52/G 61721-2611-8/H	Division 1 and BOP Divisional 2 Cables Touching in Panel
232042-2C 232035-1C	No	No	H11-P611	61721-2045-21/J 6I25-2155-10/F 61721-2201-15/F	Division 1 and 2 Cables Touching in Panel

*BOP divisional (associated) conduits contain BOP (associated) cables that have run with Class 1E divisional cables in Class 1E raceways.

2. Class 1E Qualification of Electrical Equipment and Instrumentation

The NRC inspector selected equipment from three suppliers to review the Class IE qualification of the equipment, when operating under normal operating and environmental conditions. Environmental qualifications for postulated accident conditions were excluded from this review and is being reviewed under Bulletin 79-01B. In each case the inspector reviewed qualification requirements imposed on the supplier through procurement documents, licensee supplier quality audits - and documentary evidence assuring Class 1E qualification of the equipment. Class 1E qualification requirements were outlined in DECo Specification 3071-125 April 16, 1973, "Quality Assurance Program - Specification for vendors," for Quality Assurance Level 1 items; equipment specifications; purchase orders; IEEE Class 1E requirements; supplier quality specifications, supplier drawings; supplier in process and final inspection reports and supplier test reports. The following equipment was reviewed:

a. Two Hydrogen Recombiners 72F-5B and 72C-3B supplied by Rockwell International were reviewed for qualification to requirements outlined in DECo Specification 3071-107, April 13, 1972 and Rockwell Specification ST019N320001, Revision D, Section 4.2 Test reports were reviewed for criteria outlined in Rockwell Specifications ST0203NA0071, Revision A and ST0203NA0070, Revision A.

   No apparent deficiencies were found.

b. ITE Imperial Corporation Motor Control Center (MCC) 72C-3A was reviewed for qualification to Class IE requirements imposed via purchase order IE-90235; DECo Specification 3071-45, December 7, 1971; IEEE 308 and IEEE 336. The MCCs were manufactured by Gould, Inc., a subtier supplier of ITE. DECo supplier quality audits of Gould, Inc., conducted on January 10, 1978 (EF2-40.643) and December 27, 1977 (EF2-40.417) were reviewed for implementation of DECo quality requirements.

   QA Level 1 vendor document list EF2-39114I, dated April 18, 1983 was reviewed for receipt of documentation. The following deficiency was observed:

   IEEE 336-1980, Paragraph 3.4 requires a test report to identify as a minimum the procedures or instructions followed in performing the test, date of completion of the test, and an adequate evaluation of the acceptability of the test. 10 CFR 50, Appendix B, Criterion XVII requires test records as a minimum to identify the type of observation, the results and the acceptability of test performed. It was observed that ITE documents reviewed did not meet this criteria and referenced tests only as line items on final inspection reports. The licensee reported that qualified test reports do exist at the manufacturers location and shall be retrieved for NRC review. Pending review of qualified test reports, this is an unresolved item (341/84-17-05).

c. A Class 1E qualification review was performed on two Rosemount Model 1151 pressure and differential pressure transmitters supplied by General Electric (GE). This review was to verify GE implementation of qualification requirements.

The NRC inspector reviewed the GE qualification provisions as outlined in NEDO-11209 (Class 1)-04A, GE purchase specification 249A1945, Revision 1, Section 4.5, GE Quality Control Plan Number 11, Revision 2 and GE purchase part drawing 163C1561, Revision F, Sheets 1 and 2. The inspectors also reviewed DECo's QA audit of GE, dated April 1, 1980 (EF2-48572).

The following exceptions were observed:

Because documentation is unavailable at the site, it was impossible to determine if the Rosemount transmitters were qualified to Class 1E requirements.

The licensee reported that due to a prior contractual agreement with GE, all supporting documentation and records are maintained at GE's San Jose office in California.

No documentation could be provided at the site to indicate that GE monitored its subtier supplier Rosemount to verify that the product was manufactured to Class 1E requirements. The only Rosemount inspection record presented was found 'blank', apparently indicating a lack of in-process inspections. No other inspection or test records (for the Rosemount instruments) could be made available to provide evidence of Class 1E qualification. The DECo supplier quality audit reviewed did not address details of qualification requirements as outlined in the GE purchase specification 225A6635, Sheet 3, Revision 5.

Pending verification of qualifying inspections and tests of GE instrumentation, this is an unresolved matter. (341/84-17-06)

3. Observation of Installed Electrical Equipment

Motor Control Center 72B-3A, El. 583'6" was reviewed for installation to seismic bolting requirements. It was observed that the cabinet was bolted to channel rails with 3/8" anchor bolts. However, no criteria could be identified to verify that the size, spacing and tightness of these bolts were in accordance with the seismic requirements of the equipment. Pending verification of these seismic bolting requirements, this item remains open (341/84-17-07).

Section IV

Prepared By: K. Tani

Reviewed By: C. C. Williams

1. Observation of Installed Instrumentation

The inspector observed the installation of the reactor water level sensing lines required for safe shutdown identified as B21-L006, B21-L007, B21-L008 and B21-L009 and instruments identified as B21-N091A, B, C and D that were mounted on Racks #H21-P004 and H21-P005. The inspector determined the following:

a. The inspector observed that the sensing lines appeared to be adequately installed in accordance with the isometric drawings; location and size of hangers conformed to the applicable drawings; redundant instrument lines also appeared adequately separated and the lines appeared clean and adequately protected.

b. The inspector observed some minor deficiencies on sensing line #B21-L008 hangers such as missing nuts from beam brackets of the hangers, loose bolt on pipe clamps and missing cotter pins on the feedwater pipe whip restraints. NCR #84-0731, 84-0732, 84-0733 and 84-0734 were written by the licensee to control and correct these deficiencies during the course of the inspection.

c. Linear indications were observed by the NRC inspector on sensing line tubing of line #B21-L008 (Heat #464547) of Piece #31. This tubing heat number is the same as that for material which had been previously reported as potentially defective (50.55(e) item). The licensee has conducted a penetrant test on the tubing, and found the tubing for piece #31 to be acceptable. The inspector reviewed the PT test report which appeared adequate.

d. The inspector observed bent tubing between supports #G03 and G04 on line #B21-L009, that resulted in slope distortion on the sensing line. The licensee had previously identified this condition and had written DDR #4706A, 6034, 5972, 5222, 4965A, 4910, 4041A and 4302 to correct the deficiencies.

e. The identification tags on sensing lines identified on the isometric drawing as B21-L006 and B21-L008 were missing. This item will be examined during a subsequent inspection. This matter is considered to be an open item. (341/84-17-08)

2. Review of Instrument Calibration Records

a. The inspector observed that the calibration stickers on instruments documented the date of calibration and the due date of re-calibration. The inspector verified that the calibration data reports supporting the calibration stickers were acceptable relative to date, model numbers and serial numbers.

b. The inspector also determined that the licensee had concluded that a number of instruments had been improperly calibrated. However, procedures were not followed to properly correct this condition. The details are as follows:

(1) The manufacturer's specification and the master instrument list specified a calibration accuracy of .25% for the Reactor Pressure Vessel (RPV) level transmitter B21-N091A, B, C and D.

(2) The instruments were calibrated for an accuracy of .5% instead of the required .25%. The NRC inspector reviewed a letter (#EF2-67-345) dated March 12, 1984, from the Director of Project Design to the Superintendent of Nuclear Production which listed seventy-eight (78) instruments that had been improperly calibrated to an accuracy of .5% instead of the specified .25%. Further, this letter stated that the derating of the calibration accuracy to .5% by the Detroit Edison Technical Group was unacceptable. At the time of this NRC inspection no other documentation or corrective action has been initiated by the licensee to control and correct these deficiencies.

(3) The following instruments are affected:

Model 1151DP	Model 1153DB
(LXE) 2B21N080 A thru D	(LXE) 2B21N091 A thru D
(LXE) 2B21N081 A thru D	(FXE) 2B21N450
(LSE) 2B21N085 A, B	(FXE) 2B21N451
(PDXE) 2b21N086 A thru D	(PXE) 2B21N481
(PDXE) 2B21N087 A thru D	(PXE) 2B21N482
(PDXE) 2B21N088 A thru D	(PDXE) 2B21N484
(PDXE) 2B21N089 A thru D	(PXE) 2B21N485
(PXE) 2B21N094 A thru D	(PXE) 2B21N486
(LXE) 2B21N095 A thru D	(PDXE) 2B21N487
(PXE) 2B21N096 A thru D	(PXE) 2B21N490
	(PXE) 2B21N492
(LXE) 2E41N061 A, B	
(PDXE) 2E41N057 A, B	(FXE) 2T48N164 A, B
	(FXE) 2T48N175 A, B
(PDXE) 2E51N057 A. B	
(PDXE) 2B31N110 A thru D	
(PDXE) 2B31N112 A, B	
(PDXE) 2B31N113 A, B	
(PDXE) 2B31N114 A, B	
(PDXE) 2B31N115 A, B	

(4) Procedural requirements established to require the recalibration of these instruments to the specified accuracy of .25% were not expeditiously followed. A nonconformance report was not written to report the unacceptable calibration accuracy. Neither was the recalibration of instruments put on the open items list (punchlisted).

The inspector informed the licensee that failure to adequately follow procedural requirements to correct inaccurate calibration of instruments is an example of an item of noncompliance, contrary to 10 CFR 50, Appendix B, Criterion V (341/84-17-01c) and EF2-FSAR, Chapter 17.1.12a, c, g, h, and j.

3. Documentation of Valve Replacement Inadequate

As a result of NRC identification of unresolved item 341/84-14-03 regarding inadequate documentation of valves V13-2322 and V13-2396, the licensee investigated this matter. As a result, the licensee issued Noncomformance Reports (NCR) 84-0706 dated May 9, 1984, which identifies discrepancies in the N-5 data package and traveler package for isometric drawing 3WI-1321-7306. The NCR No. 84-0706 reported the following information: Valve (VA) V13-2322 was replaced per Field Modification Request (FMR) S-2729 with Valve No. V13-2396 as a result of Deviation Disposition Request No. 6530A. The DDR was dispositioned on July 21, 1981. The FMR was issued on October 13, 1981. The traveler index indicates that the DDR 2620A and FMR S-2729 were entered into traveler package November 19, 1981. Field Issue Request (FIR) 120010 indicates that the Valve No. V13-2396 was welded on October 21, 1981. Based on the above, the valve was requisitioned and welded one day before the FMR was issued and 39 days before the FMR was entered into the traveler package. At the time of the valve being welded, the fabrication drawing still reflected Valve No. V13-2322, however, the wrong heat number was entered. The correct valve number was entered on November 23, 1981. The traveler package was not in the QA vault, only the "N-5" form was in the vault even though the package appeared to be complete.

Based on the licensee evaluation above, and subsequent NRC review during this inspection, the NRC inspectors informed the licensee that Wismer & Becker did not follow their procedure WD-E-109, Revision 19, in initiating a traveler with the correct valve numbers for the removal and installation of valve numbers V13-2322 & V12-2396. The NRC inspectors informed the licensee that failure to follow established procedures and maintain an adequate record is an example of an item of noncompliance contrary to 10 CFR 50, Appendix B, Criterion V (341/84-17-01d).