Fermi 2
Response to Recommendations from the Duke Power Company Final Assessment of Construction

Detroit
Edison

FERMI 2
RESPONSE TO RECOMMENDATIONS FROM THE DUKE POWER COMPANY FINAL ASSESSMENT OF CONSTRUCTION

DETROIT EDISON
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FINAL ASSESSMENT OF CONSTRUCTION

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1.0 EXECUTIVE SUMMARY

This report provides Detroit Edison's response to the recommendations and conclusions resulting from the Duke Power Company Final Assessment of Construction for Fermi 2.

This construction assessment was accomplished to provide both Detroit Edison and the NRC added assurance that Fermi 2 has been constructed to operate safely and reliably.

Duke Power was selected to perform the construction assessment. The company has had no previous involvement with the project, and the team assembled was highly qualified and experienced in engineering, construction, and inspection.

Duke Power developed an assessment plan for Fermi 2 which was reviewed and approved by both Edison and the NRC. The plan covered, comprehensively and thoroughly, all areas of construction: civil structures, mechanical equipment, piping systems, welding, and electrical equipment, including instrumentation and controls and electrical systems. During the assessment, 19 Duke Power engineers and inspectors expended approximately 4,000 manhours in the planning, performance of assessment and the analysis and reporting of results. The effort began on June 4, 1984, with a 2-day orientation session for Duke assessment team members, conducted by Edison personnel at the Duke headquarters in Charlotte, North Carolina. It was completed on July 31, 1984, with the presentation of the final report to Detroit Edison and the NRC Region III managements. Approximately 4 weeks were required to perform the actual assessment. The Duke team reported 199 findings and concerns which, in turn, led to 24 recommendations.

Worthy of special note is that the NRC provided an observer during the total construction assessment, both in the field and in the conference room. No meetings or discussions of substance were held between Detroit Edison and Duke Power without the full knowledge of the NRC observer.

Detroit Edison is satisfied with the results of the construction assessment for several reasons. First, the findings and concerns were generally not of significance with respect to the safety of the operation of Fermi 2. Second, the company is gratified that Duke Power identified many good characteristics of Fermi 2, which is unique when one considers that Duke was charged with determining if significant deviations from final design disclosures exist. Third, Edison is confident that Duke performed a complete and thorough assessment while maintaining independence. Fourth, the performance of the Duke team was professional, technically competent, and fully met the requirements of the Duke Power work plan. Finally, Edison agrees that the 24 recommendations made by Duke Power are of sufficient importance to warrant further action by Edison, and, when completed, will provide added assurance that Fermi 2 will operate safely and reliably.

It should be noted that although this report only includes the responses to the Duke assessment team recommendations, Edison has also taken action to respond to each of the 199 findings and concerns listed in Appendix 4 of the Duke report. Each response and the corrective action taken, when required, are fully documented. The documentation packages are available at the Fermi 2 site for review by an NRC inspector as each item is completed.

All identified corrective actions resulting from the Duke assessment findings involving hardware and documentation deficiencies, including recommended inspections, evaluations of potential problems and housekeeping will be tracked through completion. Completion of actions in all cases will be commensurate with requirements, i.e., milestones such as fuel load, initial criticality, 5% power, commercial operation, etc.

2.0 INTRODUCTION

Detroit Edison committed to submit to the NRC and Duke Power a report providing responses to each of the 24 recommendations made by the Duke Power Construction Assessment Team (CAT.) These recommendations are found in Part 6 of the Duke Power Company Final Assessment of Construction report. It was subsequently decided that the response should also include any significant points found in the Executive Summary, Part 1 or Hardware Evaluation, Part 3, and which may not have been explicity included in the recommendations. This would assure that Edison has properly responded to all the significant issues reported by CAT.

In Part 1, of the Duke Report, Executive Summary, there is a list of 28 conclusions and significant findings; 16 are identifiable as significant findings. Fifteen (15) of these are also included as subject matter for 16 of the 24 recommendations. Therefore, Edison's responses to the recommendations will automatically address 15 of the 16 significant findings. A separate response is being provided for the sixteenth significant finding.

Part 3 of the Duke report, titled "Hardware Evaluation," is divided into 14 sections, each involving a different category of hardware evaluation. Each section includes results and conclusions. Where findings were made and judged to be of some significance, suggested actions for correction or follow-up are included in the conclusions. These suggestions were incorporated in the recommendations of Part 6 of the report. Therefore, the Edison responses to the recommendations will also address those portions of the conclusions that suggest corrective or follow-up actions.

Detroit Edison's responses are provided in the following format:

- Recommendation identified by number from the Duke Power Fermi 2 Final Assessment of Construction report, Pages 206-209
- Statement of recommendation from Part 6 of the Duke report, Pages 206-209
- Associated Significant Finding(s) from Section 1.5 of the Duke report, Pages 2-4

- Associated Conclusion(s) or Results from Part 3 of the Duke report, Pages 11-196. In many cases, the statements of conclusions or results from the Duke report are not reprinted in their entirety; only those portions that are applicable to the recommendation are reprinted.

- Edison response, which contains the following:

  a. Discussion and background information
  b. Actions taken or to be taken
  c. Resolution of Duke recommendation

This report also responds to a significant finding (Significant Finding No. 20) which is identified on the Duke report but which does not correspond with any of the 24 recommendations.

Within this document, parenthetical references to "sections" correspond to portions of the Duke Final Assessment of Construction report.

3.0 EDISON RESPONSE TO DUKE RECOMMENDATIONS

3.1 RECOMMENDATION NO. 1

3.1.1 Duke Recommendation No. 1, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke final Assessment of Construction report.

a. Recommendation No. 1

Provide an understandable method for determining what changes have been made in the design drawings of cable tray hangers. (Ref. Section 3.1.2.)

b. Significant Finding

None

c. Conclusion (Section 3.1.2.5)

Cable tray and conduit supports are acceptable and will serve their intended function. Detroit Edison needs to provide an understandable method for determining what changes have been made in design drawings for the individual cable tray supports.

3.1.2 Edison Response to Recommendation No. 1

a. Discussion

The electrical cable tray support drawings and specifications given to Duke were difficult and cumbersome to read at the time of the CAT assessment. There were several reasons for this and these are being addressed. The following text is a summary of the methods of showing the design, how the hanger modifications are shown, the status at the time of the CAT assessment, the planned final status, and further actions to be taken.

1. Original Documents

Tray supports are located on plan drawings and given a hanger number. Reference is made to a table drawing that lists the dimensions of a particular hanger and references where the general arrangement of the hanger

is to be found. For standard hangers, this is in the electrical specification; for unique hangers, the reference is to a drawing. Both of these documents, in turn, refer to the location of details and connections. If standard connections are utilized, they are as shown in the specification; if the connections are unique, they are shown in the hanger drawing. (This drawing process is illustrated in Figure 1-1.)

Some tray supports were modified two or three times as their loading changed due to:

- Increased cable loads
- New fire wrap loads
- Attached conduit, etc., on the hangers

These changes are shown on design change documents. Under the Fermi 2 program for design and document control, the design change documents or design change packages (DCPs) can also be revised. These change documents were used primarily for construction. They were written for ease of construction and not necessarily for ease of incorporation into final drawings. In accordance with project procedures, the design change documents are routinely incorporated in the original design documents.

2. Status at Time of CAT Assessment

The cable tray support drawings and specifications had change paper partially incorporated at the time of the construction assessment. Because of this, some skill and patience is required to establish the final design configuration. The construction and inspection activities did not encounter this problem because work packages that included all applicable design change documents were used. During the construction assessment, the work packages were also used to establish the final design configuration.

b. Action

The project's objective is to have tray support design change documents incorporated in the original drawings and specifications at the time of turnover of design documents to Nuclear Production. All change paper, including design change packages with the associated interim design change documents, will be incorporated in these base design documents. When design change documents are all incorporated into the base design documents, there should be no difficulty determining the final design configuration of the supports.

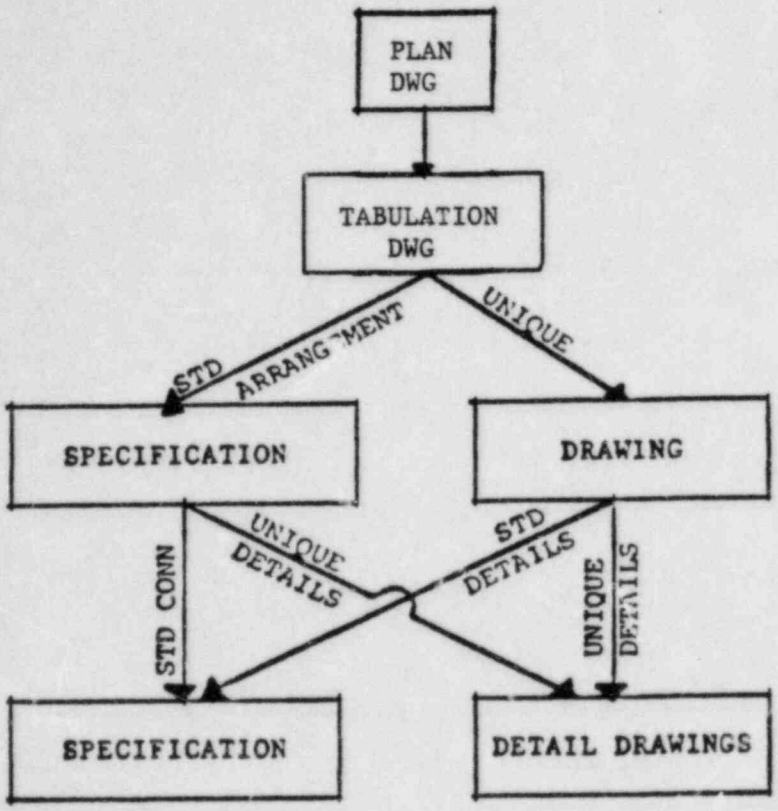
The design group is currently preparing a design document package to provide a "roadmap" through the design calculations for tray hangers. As an added measure, Edison will also add appropriate details to this package to include a "roadmap" through the related drawings and specifications. This package will include directions for obtaining additional records, work packages, etc., and will provide additional detail and information on the as-built configuration of the hangers.

c. Resolution

The completion of the above actions will provide a clear method of determining what changes have been made to the design drawings/specifications for the cable tray supports as well as determining the final configuration. These actions will completely respond to Recommendation No. 1.

FIGURE 1-1

DRAWING SEQUENCE



3.2 RECOMMENDATION NO. 2

3.2.1 Duke Recommendation No. 2, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 2

Based on the results of this evaluation, the team recommends that additional inspections of critical HVAC supports be performed. This inspection should cover 1) a review of drawings for conflicting details, 2) a walkdown of as-erected supports checking for missing members or members added which are not shown on current design documents. If no additional problems are discovered, HVAC supports should be judged acceptable. (Ref. Section 3.1.3.)

b. Significant Finding No. 2

The assessment of the supports for the HVAC systems have some deviations that need to be investigated for possible corrective action.

c. Conclusion (Section 3.1.3.5)

Based on this evaluation, it is recommended that an additional random sample of HVAC supports be inspected for as-built/as-designed adequacy. The sample plan should be concentrated in the areas of 1) drawing(s) reviewed for conflicting details, 2) missing numbers on as-erected supports and 3) members added which are not shown on current design documents. If no significant deviations are found, the HVAC supports are considered acceptable.

In addition, it is suggested that the items identified on CAT forms 85, 88, 91, 93 and 94 be reviewed by Detroit Edison Engineering and accepted as erected or corrected to match the existing design documents.

3.2.2 Edison Response to Recommendation No. 2

a. Discussion

The heating, ventilating, and air conditioning (HVAC) supports inspected exhibited discrepancies that may be divided into two groups. Some supports had drawings with conflicting details while other supports had missing and/or added members. Supports with conflicting drawings were found in the drywell while those with missing/added members were found in the control center HVAC system. The cause of the deviation and resolution are different for each and are discussed separately below.

The drywell HVAC supports and supporting structural steel were both designed by the Sargent and Lundy (S&L) structural group in Chicago. The original supports were shown on mechanical drawings, whereas the supporting structural steel was shown on civil drawings. Further details of the supports were shown on the erector's vendor drawings. It became necessary to remove and slightly rework the HVAC supports during the drywell steel modification program. The modifications were all designed by the S&L structural engineers as was the original HVAC duct support designs. Inadvertently, some of these support modifications were shown on the civil drawings with the rest of the structural steel and not updated on the corresponding mechanical and vendor drawings. The design changes that the engineer intended were properly constructed from work packages but the drawing discrepancies between the different types of drawings remained.

The control center HVAC supports were designed by the contractor. The contractor design drawings were under the contractor's control while construction was in progress and afterward, during preparation of the as-built drawing of the configuration. After the assessment, Edison realized that the series of drawings given the Duke assessors were of an earlier revision and did not reflect the as-built conditions. The latest revisions of the drawings were found in the Edison quality records center; they had not yet been processed through Document Control. This later series of drawings was the result of the contractor's as-built program and correctly shows the missing and/or added members observed during the assessment.

b. Action

The drywell HVAC support drawings will be compared to the civil engineering drawings, and any support modifications shown on the civil drawings will be added to the mechanical and contractor drawings. Items identified on CAT forms 88 and 94 are covered by this action. Items 85 and 93, which were written against supports in the drywell, have been reviewed and accepted "as is."

The control center HVAC supports have been compared to the latest drawings and found to be in agreement. Item 91 was verified in this manner. An additional group of supports on two ducts was also reviewed to confirm the drawing accuracy.

c. Resolution

Edison has identified the cause of the original discrepancies. The drywell HVAC supports were acceptable and a complete review of the drawings will remove remaining drawing problems, if any. The additional Engineering walkdown of control center HVAC supports has confirmed that the latest drawings properly reflect the as-built condition and the supports are acceptable.

3.3 RECOMMENDATION NO. 3

3.3.1 Duke Recommendation No. 3, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 3

Perform an engineering analysis of pipe whip restraints to determine if 1/2" fillet welds are acceptable for GE supplied restraints which are required to have full-penetration welds. Walkdown the systems containing pipe whip restraints to verify all of those which have been removed for construction purposes have been replaced. (Ref. Section 3.1.4.)

Significant Finding No. 3

The pipe whip restraints were constructed as designed with no significant deviations. Two significant findings involved some vendor welds that did not meet design documents and the removal of some restraints for later construction work without replacing them.

c. Conclusion (Section 3.1.4.5)

On the basis of this evaluation, the following recommendations are provided:

(1) Perform an engineering analysis to determine if 1/2" fillet welds are acceptable for GE-supplied whip restraints which were required to have full-penetration welds.

(2) Walkdown systems containing pipe whip restraints to verify field locations versus drawing locations and observe completeness of installation (i.e., no disconnected or missing parts).

Contingent upon satisfactory completion of these recommendations, pipe whip restraints appear to conform to the design requirements.

3.3.2 Edison Response to Recommendation No. 3

a. Discussion

Figure 3-1 shows the pipe whip restraint frame structure and, typically, the weld areas in question.

General Electric Company (GE) is the designer and supplier of this component. The GE design drawing indicates that all welds on the pipe whip restraint were to be full-penetration welds. However, upon ultrasonic examination during the construction assessment, the panel welds were determined to be 1/2-inch fillet welds. The fabricator's shop drawing, in apparent contradiction to the GE drawing, shows these welds as 1/2-inch fillet welds and all other welds as full-penetration welds.

The second part of this recommendation involves disassembly and reassembly of parts of pipe whip restraints as final construction activities in the drywell are being completed, such as the application of the insulation around the piping systems.

In addition, the associated conclusion included a recommendation that the systems be walked down to verify that whip restraints have been installed on locations as shown on drawings. During the assessment, one case was found where the location of two whip restraints was different from that shown on the drawing.

b. Action

On July 9, 1984, Edison reported the apparent discrepant welding of the pipe whip restraints as a potential 10CFR50.55(e) deficiency and documented it with a nonconformance report.

GE was informed of the detail in which the pipe whip restraint structure does not appear to conform to the GE drawing. After a thorough investigation, GE responded that the nonconformance does not affect the required structural capacity of the restraint. GE indicated that the restraint can withstand loads higher than the Fermi 2 design loads. GE concluded, therefore, that the 1/2-inch fillet welds are adequate and that an engineering change notice would be issued indicating that either 1/2-inch fillet welds or full-penetration welds are acceptable in the manufacture of the pipe whip restraints.

With regard to the disassembled whip restraints, engineering personnel, at the completion of all construction in the drywell, will walk down the drywell to assure the proper installation of pipe whip restraints. This activity will be documented.

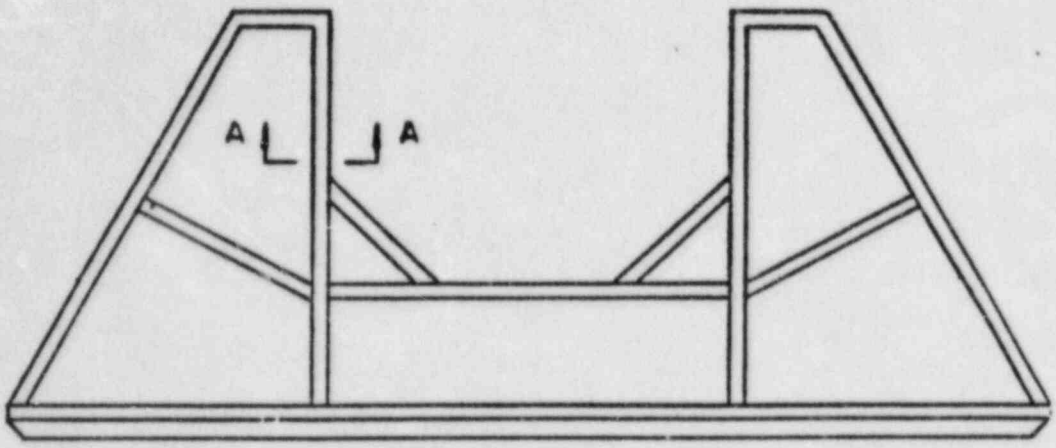
The apparent discrepancy in the location of two whip restraints was found to be due to a drafting error on entering the information on a drawing. The physical location was correct; the drawing was revised.

c. Resolution

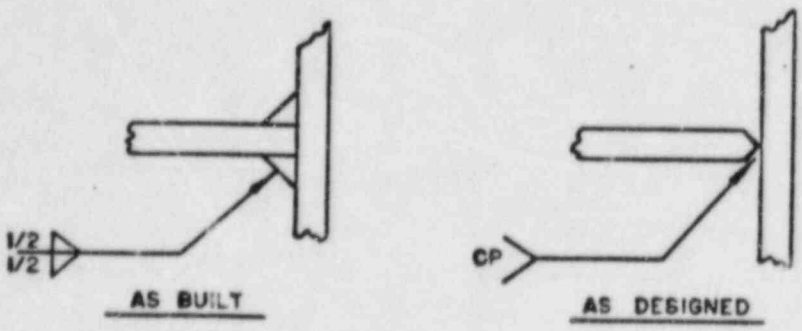
Actions taken or to be taken fully respond to Recommendation No. 3 and therefore satisfy Significant Finding No. 3 and the Conclusion of Subsection 3.1.4.

FIGURE 3-1

RECIRCULATION SYSTEM RESTRAINT



RESTRAINT FRAME



SECTION "A-A"

3.4 RECOMMENDATION NO. 4

3.4.1 Duke Recommendation No. 4, Associated Significant Finding, and Associated Conclusion

The following are taken rom applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 4

Review the several sets of revisions to the torus support drawings to determine that the as-built condition meets design requirements. (Ref. Section 3.2.1.)

b. Significant Finding No. 5

The torus supports have some welds that are smaller than the design documents indicate. Other than this deviation, the torus supports were found to conform to the design documents.

c. Conclusion (Section 3.2.1.5)

The original installation of these supports has seen two major modifications. Three different sets of drawings have to be used when inspecting the supports.

Due to the difficulties encountered during this evaluation and potential difficulties on modifications to these supports after operation, it is recommended that Detroit Edison review the several sets of revisions to the torus support drawings to determine that the as-built condition meets design requirements.

3.4.2 Edison Response to Recommendation No. 4

a. Discussion

The multiple sets of drawings on the torus support system are a result of the torus construction history. The torus was originally designed by Chicago Bridge and Iron (CBI) in 1970 and 1971. Torus construction took place in 1972 by CBI based on CBI fabrication drawings.

In 1977, the torus was reanalyzed by Nutech for a new series of blowdown load combinations. Major modifications to the torus support system were designed by Nutech and described in a series of Nutech design drawings.

Separate torus modifications were constructed in 1977 and 1978 by Reactor Controls, Incorporated (RCI) according to RCI-prepared fabrication drawings. During the torus modification design process, several design changes were made, such as deleting the torus column stabilizers, adding support saddles, and deleting lateral stabilizers. Some of the items that were deleted or voided on the Nutech design drawings and not constructed were not removed from the RCI fabrication drawings.

The original configuration of the torus support and its configuration after modifications are shown in Figures 4-1 and 4-2, respectively.

b. Action

To resolve the confusion due to the several sets of drawings, Edison plans to incorporate all design change documents posted against the Nutech design drawings. Edison will also revise the CBI drawings and Nutech drawings to add cross-references to the torus drawings.

Edison will also measure the weld sizes at the interface of the first and second modifications to verify that the designer's intent was constructed. Any undersize welds will be reported on nonconformance reports for Engineering disposition.

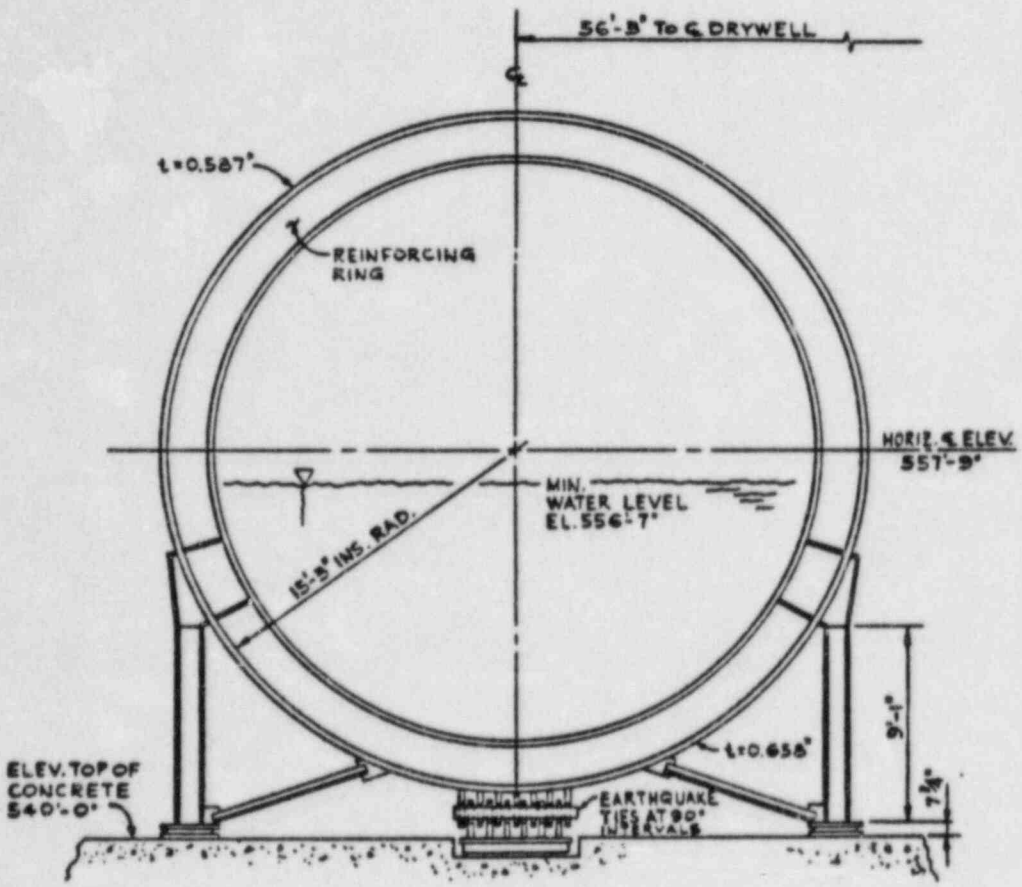
c. Resolution

The torus supports as constructed reflect the intent of the designer. The original design and two subsequent modifications were constructed and inspected from work packages that contained only the work to be done at that time. Within each package there are no substantial conflicts. It is only in retrospect that the drawings are difficult to read. Completion of the above action will provide a set of understandable design drawings consistent with the design intent. Welds will also be measured as indicated in the above action.

This response satisfactorily answers Recommendation No. 4.

FIGURE 4-1

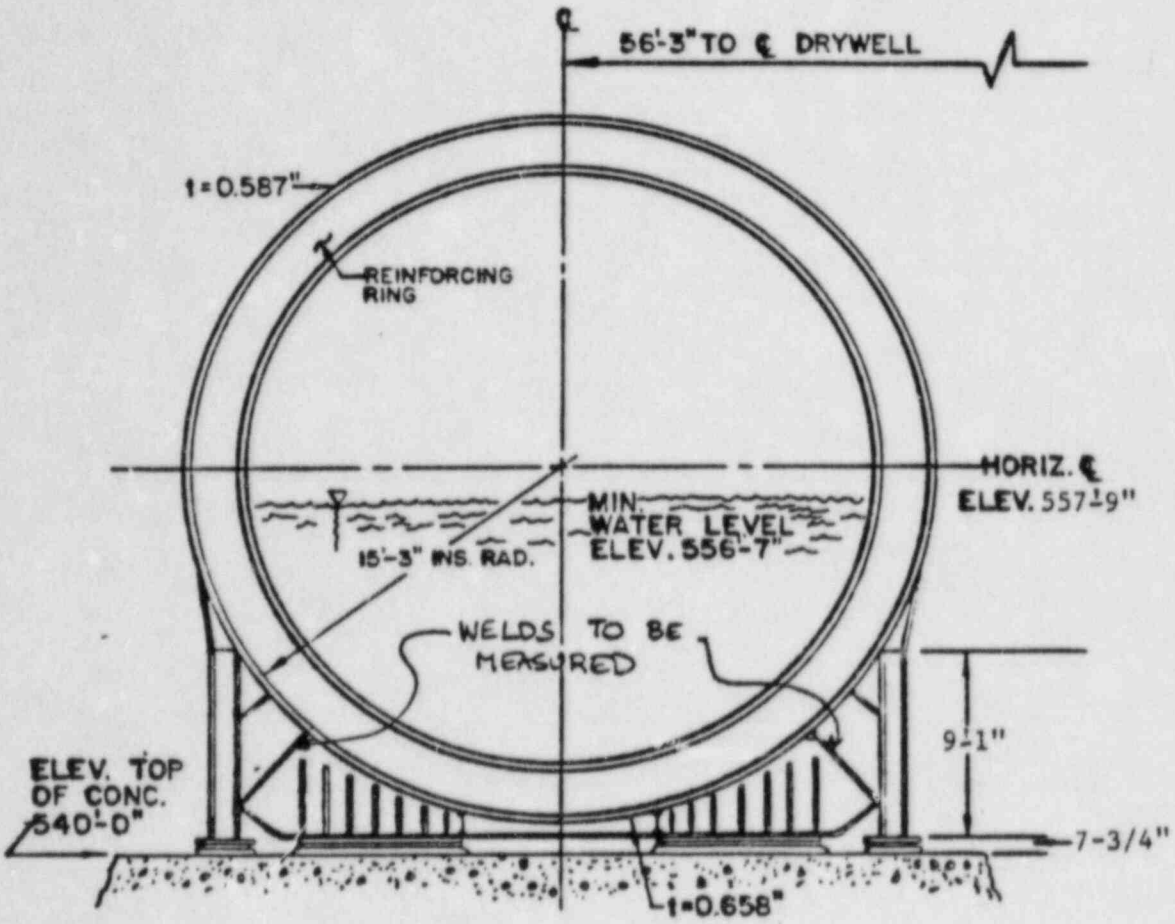
TORUS SUPPORT (ORIGINAL CONFIGURATION)



ELEVATION VIEW

FIGURE 4-2

TORUS SUPPORT (AS MODIFIED)



ELEVATION VIEW

NO SCALE

3.5 RECOMMENDATION NO. 5

3.5.1 Duke Recommendation No. 5, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 5

Tighten the originally installed bolted connections in the Slab-Over-Torus area to the required values or provide an analysis for the acceptance of the connections as presently installed. (Ref. Section 3.2.2.)

b. Significant Finding No. 6

The structural steel inspected conformed to the drawing with no significant deviations. In one area, however, the bolts were not tight enough for a friction connection.

c. Conclusion (Section 3.2.2.5) (applicable portion only)

The structural steel erected in the Slab-Over-Torus was determined to be erected to the latest design disclosure documents except for the original high-strength bolted connections. These connections were not tensioned sufficiently to obtain a friction type connection (see CAT Item 194).

Originally installed bolted connections in the Slab-Over-Torus area should be analyzed in their as-built condition versus as-designed condition and corrected accordingly.

3.5.2 Edison Response to Recommendation No. 5

a. Discussion

The slab-over-torus (SOT) consists of a steel frame partially embedded in concrete. This structure spans from the drywell pedestal to the exterior walls of the torus room over the torus at the first-floor level. The steel structure is the main structural system with the concrete spanning between steel beams. This steel was the first structural steel erected on site and was erected by a contractor in 1972-73.

The two other major structural steel structures (drywell structural steel and reactor building superstructure) were erected later in the project by different contractors, as were some smaller platforms and equipment supports.

The CAT found improperly tightened bolts in the SOT but not in other areas. Edison also has inspection records verifying bolt tightening on these other areas, including areas not sampled by the CAT.

b. Action

The connections found by the CAT assessors to have loose bolts were analyzed and determined to be acceptable for the lower allowable bolt loads of bearing connections versus the original friction connections. These connections would not have presented a safety problem if left undetected. Rather than complete an extensive sampling program and technical analysis to determine that all bolts were adequately tightened, it was determined, from a prudent management viewpoint, that the best option would be to retighten all bolts.

All accessible bolts on the SOT connections were checked. Approximately 80% of the bolts were found to be properly torqued; the remaining bolts were torqued to design values. The few bolts that are not accessible are being evaluated by the designer.

c. Resolution

This problem was confined to the SOT. Edison has verified that the loose bolts identified by the CAT assessor did not pose a safety problem; however, all bolts that had not been properly torqued were retightened or are being evaluated. This fulfills the recommended actions and responds fully to Recommendation No. 5.

3.6 RECOMMENDATION NO. 6

3.6.1 Duke Recommendation No. 6, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 6

Obtain an engineering evaluation to determine if the lower-than-specified top of the barrier has any significance to the barrier's intended function. Establish additional points on the slope of the barrier and incorporate them into the annual surveys. This would give assurance that the barrier is not sliding down the slope. The location of the points should be determined by the engineer who designed the barrier. (Ref. Section 3.2.4.)

b. Significant Finding No. 8

An inspection of the shore barrier indicated that parts of it are significantly below design elevation. A review of the settlement records indicated that virtually no settlement or lateral movement has taken place since it was constructed.

c. Conclusion (Section 3.2.4.5)

On the basis of the above observations it is recommended that Detroit Edison take the following actions:

1) Obtain an engineering evaluation to determine if the lower-than-specified top of the barrier has any significance to the barrier's intended function.

2) Establish additional points on the slope of the barrier and incorporate them into the annual surveys. This would give assurance that the barrier is not sliding down the slope. The location of the points should be determined by the engineer who designed the barrier.

3.6.2 Edison Response to Recommendation No. 6

a. Discussion

The shore barrier is a rock structure along the shore designed to prevent the site fill from eroding during the probable maximum meteorological event. As such, the top of

the barrier was designed to be at grade level (El 593') and the toe at approximately the lake level (El 572'). (See Figures 6-1 and 6-2.) The top surface of the barrier is a layer of 3 to 5 ton cap stones.

After the barrier construction, it was noted that the profile at the south end of the barrier did not match the design. Surveys at 100-foot intervals were taken and a deviation disposition request issued. It was dispositioned by Engineering to use-as-is and to add the as-built elevations to the design drawing.

During the construction assessment, this same low area was resurveyed. The survey results indicated elevations lower than the previous surveys had shown. This was attributed to the fact that the CAT survey profiles were taken at locations between the previous 100-foot intervals where the original elevations were taken in 1983. Based on this new data, a nonconformance report was issued and dispositioned. Selected points on the barrier have also been monitored recently to identify if any settlement and/or storm damage has occurred since construction. Results of this effort indicate that there has been virtually no movement since construction.

b. Action

The as-built condition of the shore barrier was inspected on July 10, 1984, by the shore barrier design engineer, Mr. R. M. Noble of R. M. Noble and Associates. Mr. Noble visually examined the cap stone elevations along the entire 1,000-foot length of the barrier. He also reviewed documents recording the as-built elevations.

Mr. Noble evaluated the as-built elevations with respect to the design conditions and has determined that the shore barrier is capable of withstanding the probable maximum meteorological event. The observed and surveyed low areas of shore barrier cap stone will not adversely affect the shore barrier's ability to maintain the integrity of the plant site at El 583'.

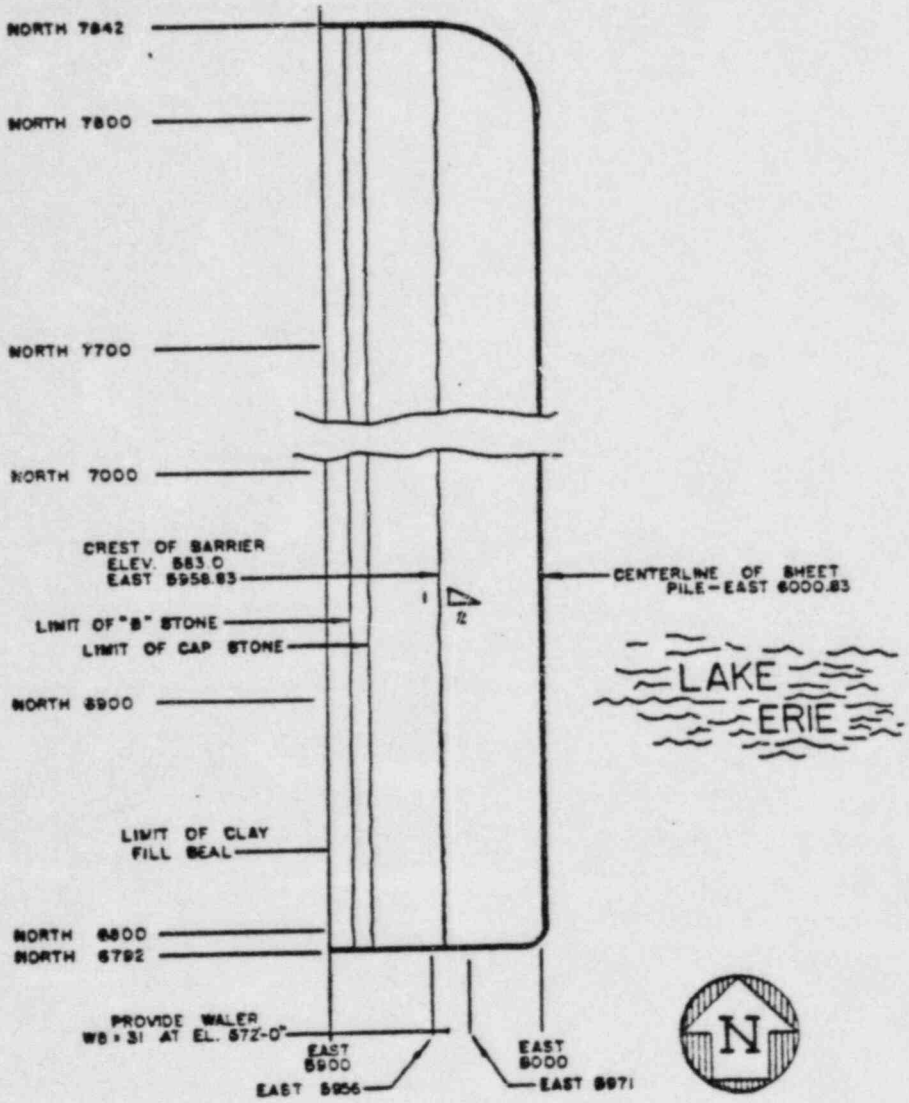
Edison will add six new monitoring points on the slope of the shore barrier. The points will be located at approximately the same north-south grid as the existing 12 monitoring points. The east-west location will be at approximately grid line E5975, which is in the lower third of the slope. Six of the existing monitoring points are on the upper third of the slope. These twelve monitoring points will provide adequate information to monitor the stability of the shore barrier slope. Mr. Noble concurs with the location of these points.

c. Resolution

Because the shore barrier has shown no sign of movement and the as-built condition has been reviewed and accepted by the designer, the shore barrier will fulfill its intended function. With the establishment of the additional monitoring points, all recommendations have been implemented. This fully responds to Recommendation No. 6.

FIGURE 6-1

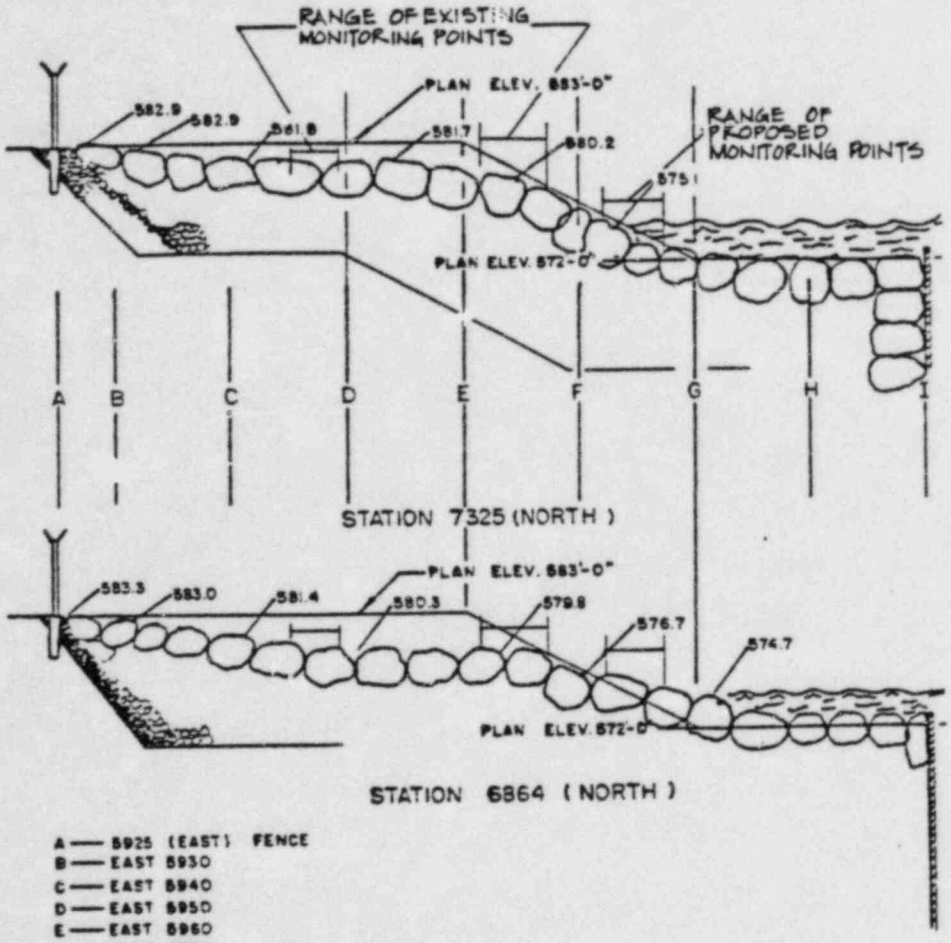
SHORE BARRIER PLAN



SCALE 1" = 50'-0"

FIGURE 6-2

SHORE BARRIER PROFILE (AS-BUILT SURVEY)



A — 8925 (EAST) FENCE
B — EAST 8930
C — EAST 8940
D — EAST 8950
E — EAST 8960
F — EAST 8970
G — EAST 8980 — EDGE OF WATER
H — EAST 8990
I — EAST 8000.83 CENTERLINE OF SHEET PILING

3.7 RECOMMENDATION NO. 7

3.7.1 Duke Recommendation No. 7, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 7

Inspect all watertight doors for conformance to the desigr drawings. (Ref. Section 3.2.5.)

b. Significant Finding No. 9

The fire/security doors were erected with no significant deviations. The watertight doors had some significant deviations such as missing hardware and improperly installed closing mechanism.

c. Conclusion (Section 3.2.5.5)

Based on the results of the two watertight doors examined, the installations were not acceptable. The doors had not been previously inspected for proper installation. All watertight door installations need to be inspected for conformance to design drawings.

Although minor hardware deviations were identified on the three fire/security doors inspected, these type doors should function properly.

3.7.2 Edison Response to Recommendation No. 7

a. Discussion

Watertight doors R-1-11 and R-1-8 were found to have loose and missing hardware. Door R-1-8 would not properly close because the locking sleeves were not installed properly. Door R-1-11 would not properly lock because the locking pins would not fully engage. Both watertight doors had missing welds that were specified by the door manufacturer.

b. Action

Following completion of repairs, all watertight and fire doors will be inspected for conformance with design requirements. In addition:

1. For door R-1-11 the following actions have been taken:

   a) Punchlist cards have been generated for the loose/missing hardware and to correct the locking pin engagement.

   b) The disposition of NCR 84-0952 written for door R-1-11 accepts the absence of the seal welds at the mitered corners because the 16-gage retainers are secured to the doors with 1/4-20 bolts spaced 9 inches on center. As-built Drawing ABC-020, Rev 0 documents the as-installed condition.

2. For door R-1-8 the following actions have been taken:

   a) Punchlist cards have been generated for the repair or replacement of the loose/missing hardware, lubrication of the locking assembly and correction of incorrectly installed locking sleeves.

   b) Design Change Request C-790, Rev B has been revised to delete the 1/4" x 1"(on three sides) fillet weld for the hinge to embedment shown on Overlay Drawing 2 (DECO File B6-129), Section 2.

c. Resolution

The actions taken or to be taken fully meet the recommendations of the CAT and fully respond to Recommendation No. 7.

3.8 RECOMMENDATION NO. 8

3.8.1 Duke Recommendation No. 8, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 8

Inspect the exterior surfaces of the wetwell and the interior surface to the drywell to assure that construction damages have not violated containment integrity. (Ref. Section 3.3.)

b. Significant Finding No. 10 (applicable portion)

The containment system meets requirements except in two areas. There is considerable construction-induced damage on the exterior of the torus and the interior of the drywell and some of the welds requiring magnetic particle testing do not meet code requirements.

c. Conclusion (Section 3.3.5) (applicable portion)

Based on the construction-induced damage (arc strikes and gouges identified on the exterior of the wetwell (torus) and the interior of the drywell), it is recommended that a complete walkdown of these areas be performed to ensure that the containment integrity has not been violated. Additionally, procedures need to be instituted which prohibit erection of scaffolds against the containment vessel.

3.8.2 Edison Response to Recommendation No. 8

a. Discussion

CAT observed damage to the exterior and interior surfaces of the drywell in the form of arc strikes and gouges. The gouges have apparently been caused by erection of scaffolds in contact with containment surfaces and, probably, during handling of materials in the vicinity of the surfaces.

b. Action

Nonconformance Report 84-1018 was written to address the arc strikes and surface damage to the interior of the drywell shell. The disposition of the nonconformance report requires the surface to be inspected for damage; any damaged areas are to be identified on individual nonconformance reports. In order to implement this disposition, Civil Work Procedure CWP-09 has been approved. This procedure establishes the necessary responsibilities, accept/reject criteria, and documentation requirements to assure that the drywell surface is properly inspected for damage and corrections made as required.

Nonconformance Report 84-0923 has been written to address damage to the exterior surface of the torus. The final disposition of the nonconformance report requires the surface to be inspected for damage. This action will also be implemented through the use of Civil Work Procedure CWP-09. Individual nonconformance reports shall be issued for defects requiring repair.

Nonconformance Report 84-0923 also addresses possible damage from temporary scaffolding erected against the torus. Disposition of this section of the nonconformance report requires the scaffolding to be removed, relocated, or padded. This has been done. Long-term corrective action involves notifying the responsible contractor manager of the scaffold problem and requesting a written response stating the steps that will be taken to eliminate the recurrence of this problem. This is in process. In addition, a Nuclear Operations procedure will be written for the site, which will forbid all organizations from erecting scaffolding directly against primary containment.

c. Resolution

Actions taken or to be taken fully respond to Recommendation No. 8.

3.9 RECOMMENDATION NO. 9

3.9.1 Duke Recommendation No. 9, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 9

Monitor the quality of radiographic film in storage and perform some additional MT on containment welds not requiring radiography. (Ref. Section 3.3.)

b. Significant Finding No. 10 (applicable portion)

The containment system meets requirements except in two areas...and some of the welds requiring magnetic particle testing do not meet code requirements.

c. Conclusion (Section 3.3.5) (applicable portion)

Based on the radiographic review and the visual inspections, the welds on the containment are acceptable. Based on the concern identified with storage, the team recommends that Detroit Edison monitor the quality of radiographs in storage. The number of rejects identified by MT, 3 out of 26, is an area where additional tests should be performed. It is recommended that a sample be selected on welds not requiring RT for additional MT tests.

3.9.2 Edison Response to Recommendation No. 9

a. Discussion

1. During construction, radiographic film was temporarily stored by the responsible contractors until it was turned over to Edison along with other quality records. The film in question, involving primary containment, was turned over to Edison in 1974. The CAT found a few radiographs that had developed discoloration marks.

   These marks may have been caused by a reaction with the colored inner leaf paper during exposure to high humidity or accidentally to some water. These marks apparently occurred some time after the radiographs had been reviewed and accepted and while they were in contractor storage. They do not affect the readability of the film.

Edison recognizes the importance of proper storage of quality records such as radiographs. Nuclear Operations Interfacing Procedure 11.000.49, Document Control and Records Management, has been in effect for some time. Section 7.0 of the procedure specifically addresses radiographs and other nonreproducible records. The procedure states:

> Quality Assurance (Q.A.) records which cannot be reduced to microform (such as radiographs, photographs, negatives, microfilm and refilmable materials) shall be stored in a facility which complies with the requirements of Reference 3.1.3 (with respect to condensation, security, fire, and other perils) as modified, and in accordance with the instruction of the manufacturer of the storage medium.

2. Three out of 26 containment welds that were magnetic particle examined showed minor discontinuities. The longest indication was 5/8 inch and the smallest 1/16 inch. The total length of apparent weld discontinuities was 2-1/2 inches out of 125 linear feet of weld examined; in other words, the CAT found that approximately 99.8% of the linear feet of welds examined were acceptable.

b. Action

1. Radiographs are being stored in the Nuclear Operation support center vault, which has been designed to protect the records from condensation, fire, flooding, tornadoes, insects, rodents, and excessive variations in temperature and humidity. Furthermore, Procedure 11.000.49 requires that all future quality assurance records such as radiographs be maintained by the holder of the document and protected from condensation, fire, flooding, tornadoes, insects, rodents, and excessive variations in temperature and humidity (reference Procedure 11.000.49, Section 7.2.1).

2. After Engineering reviewed the orientation, shape, and size of the indications, it was concluded that the indications were nonrelevant as defined by the ASME Code. They were apparently caused by poor weld surface profile and improper slag removal. Because the Code requires that indications judged to be nonrelevant be proven to be nonrelevant, the following course of action was taken and results obtained:

   a) The poor weld surface profiles and slag were corrected by blending.

   b) Ten additional cope hole areas on the torus support to torus weld were cleaned of paint and visually inspected. These areas were acceptable.

   c) The containment to penetration areas which were blended to correct the surface profiles and slag were magnetic particle examined. A relevant indication was detected in only one area. This area has been repaired.

c. Resolution

1. Because all radiographic film is now stored in environmentally controlled repositories and because any film made in the future will be stored and maintained according to Edison procedures, which will ensure no film degradation, the problem observed by the CAT should not recur.

2. Four additional penetration to containment shell welds have been selected to be magnetic particle examined. Further corrective action will be based on evaluation of the examination results.

3.10 RECOMMENDATION NO. 10

3.10.1 Duke Recommendation No. 10, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 10

A final inspection should be made to ensure that the damages to the coatings inside the drywell have been repaired as required. Clarify the commitments concerning coatings within the drywell. (Ref. Section 3.4.)

b. Significant Finding No. 11

The coatings which are in place inside the drywell meet specified requirements. There are, however, damaged areas and items which have not been coated.

c. Conclusion (Section 3.4.5)

Based on the areas examined on the containment plate and the concrete surfaces inside the drywell, the coatings applied were acceptable with the exception of minor damage. The team recommends that a final inspection be performed to ensure that the damages have been repaired as required by the specifications.

Based on unclear commitments, the team could not assess the other areas inside the drywell (i.e., miscellaneous steel and coatings to equipment). It is recommended that Detroit Edison clarify its position on these coating requirements.

3.10.2 Edison Response to Recommendation No. 10

a. Discussion

Various coating requirements were documented at the time of the assessment. Edison requirements for coating the interior surfaces of the drywell and torus are technically acceptable. Edison recognizes that requirements for coating or not coating surfaces within the drywell must be documented in a precise manner.

b. Action

Edison will more clearly document requirements for the coatings applied to the interior surfaces of primary containment. In addition, a report is being prepared for NRR review wherein Edison identifies all coatings that have been applied to surfaces within containment (e.g., miscellaneous steel and equipment). Some of these coatings are qualified; others are not qualified but are acceptable. Also, it is intended for some surfaces to remain uncoated. The report will provide justification for the acceptability of the primary containment coatings.

After NRR concurrence on coatings, Edison will complete the work of coating those surfaces requiring coating and will complete the inspection and repair of containment surface coatings that have been damaged during construction. The latter has been an ongoing program.

c. Resolution

The completion of the above actions will assure that coatings within the drywell and torus will be acceptable and that the work will be completed as intended. These actions will fulfill the intent of Recommendation No. 10.

3.11 RECOMMENDATION NO. 11

3.11.1 Duke Recommendation No. 11, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 11

All piping and penetration should be checked for capping of 1/2" connection and bolting of protective bellow covers. (Ref. Section 3.6.1.5.)

b. Significant Finding

None

c. Conclusion (Section 3.6.1.5) (applicable portion)

General observation around the penetrations did indicate a number of 1/2" connections not piped up or capped off and the protective bellows covers not properly secured. It is recommended that a walkdown be made of the penetrations to check these two items.

3.11.2 Edison Response to Recommendation No. 11

a. Discussion

Mechanical penetrations were supplied and installed in the drywell with small diameter connections for draining and blowing out the larger penetration piping. Figure 11-1 illustrates the drywell penetrations. The small diameter connections to the penetration must be plugged before the integrated leak rate test is performed; otherwise, primary containment will not hold pressure as is required by the test.

Also, some of the mechanical penetrations of the drywell have expansion bellows to allow for movement of attached piping relative to the connected primary containment shell. Expansion bellows type containment penetration is shown in Figure 11-2. Figure 11-2 shows a protective covering over the bellows section of the penetration assembly. Because local leak rate testing is presently being done to prepare

the drywell for the final integrated leak rate test, the protective covers were not all installed and finally bolted up. During the local leak rate testing (a prerequisite to the integrated leak rate test), each penetration is individually inspected and tested for leakage and thus requires the covers to be taken off and replaced perhaps several times. Therefore, covers are not finally installed and bolted up until the testing is completed.

b. Action

In June 1984, all penetrations were visually inspected for completeness by the System Completion Organization. Several punchlist cards were written to plug all open small connections on the drywell penetrations. A reverification that all penetration small connections have been plugged was performed in July 1984. Furthermore, the integrated leak rate test of primary containment will provide final assurance that all openings have been closed. Upon completion of local leak rate testing and the successful completion of the integrated leak rate test, all protective covers for the bellows type penetrations will be finally installed and bolted up. This activity has been made a punchlist item to provide added assurance this item will be resolved and the covers properly installed.

c. Resolution

Because mechanical penetrations have been inspected and the small connections plugged and because leaks will be identified during the final drywell integrated leak rate test, this item is considered resolved and satisfactorily closed.

Having established a punchlist item to inspect, install, and finally bolt up all bellows seal protective covers after the completion of the drywell integrated leak rate test, this item is determined to be satisfactorily resolved.

This response fully addresses Recommendation No. 11.

FIGURE 11-1

DRYWELL PENETRATION

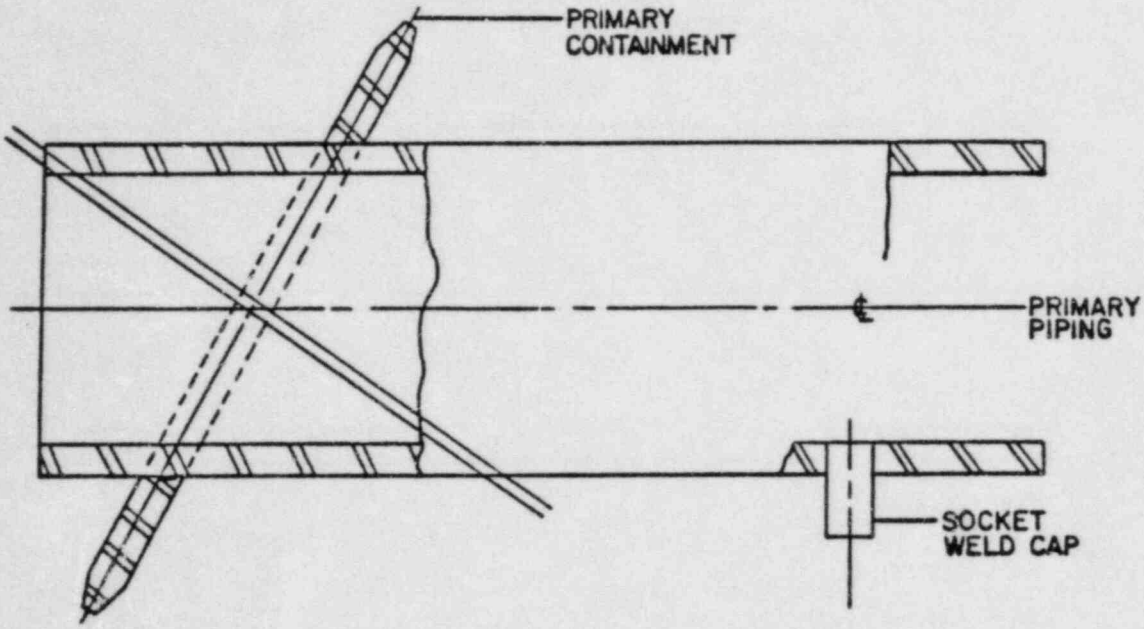
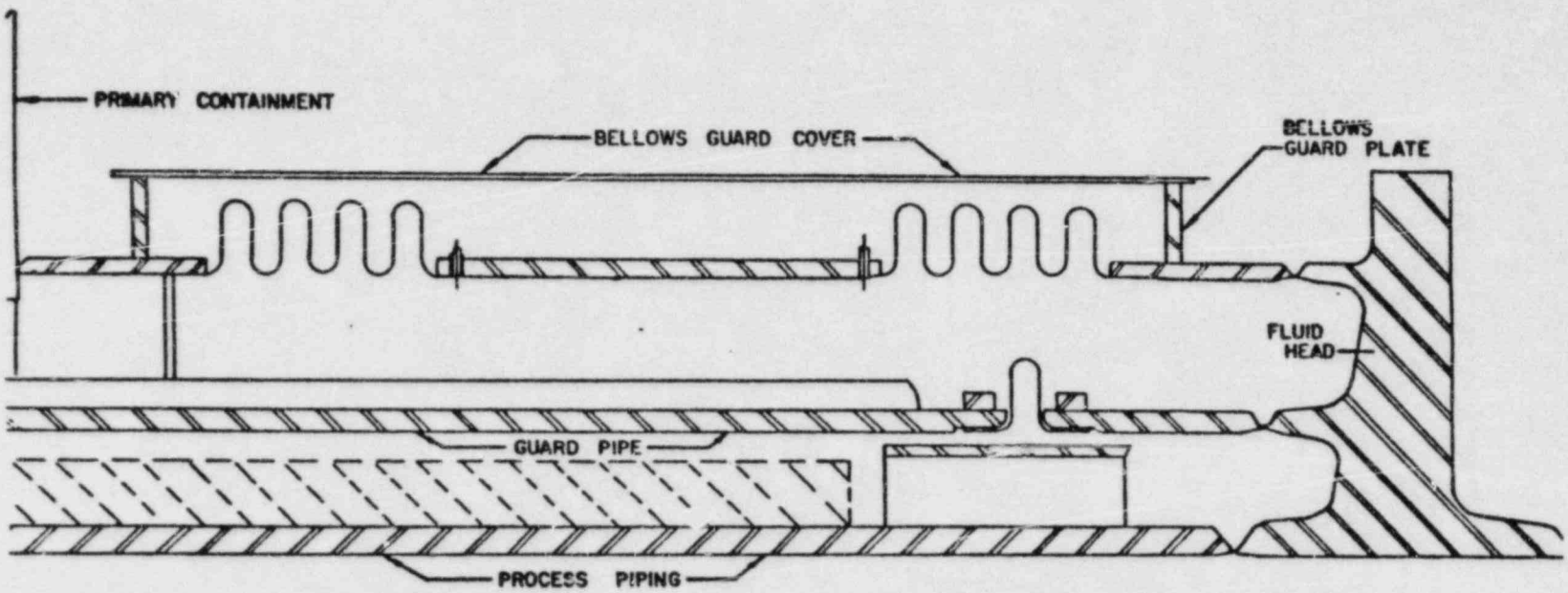


FIGURE 11-2

DRYWELL PENETRATION - EXPANSION BELLOWS
TYPE CONTAINMENT PENETRATION



3.12 RECOMMENDATION NO. 12

3.12.1 Duke Recommendation No. 12, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 12

Evaluate the areas below minimum wall thickness in the HPCI system to determine if they are acceptable for the applicable design conditions. (Ref. Section 3.6.2.5 and Figure 3.6.6 of this [Duke] report).

b. Significant Finding

None

c. Conclusion (Section 3.6.2.5)

On the basis of the above results, the welds and piping examined meet the requirements of the applicable procedures, specifications and codes except as follows. One rejectable PT indication was identified, but this appears to be an isolated case that is not indicative of a generic problem. The two low UT readings identified appear to be an isolated case and not a generic problem. It is recommended that the areas identified on Figure 3.6.6 be evaluated to determine if they are acceptable for the applicable design conditions.

3.12.2 Response to Recommendation No. 12

a. Discussion

The two low minimum-wall UT readings were found in the 12-inch crossover line from the HPCI booster pump to the main pump. The line was furnished by the pump manufacturer through GE and was supplied as 12-inch, ST 40S weight, ASTM A106, Grade B, which is 0.375-inch wall thickness, carbon steel pipe. During installation it was found that the furnished pipe was 1/4 inch short. The final disposition was to cut the straight portion between the two elbows, leaving 2 inches of the original pipe beyond each shop weld. The replacement piece was specified to be a straight piece of Schedule 40 wall pipe (0.406-inch wall thickness), cut to fit and beveled to match the 0.375-inch standard wall pipe internal diameter.

The UT technician who measured the wall thickness reported the two low readings for a portion of the pipe he believed to be Schedule 40 and did not realize that his readings were taken on the 2-inch remaining portion of the original standard wall pipe. The two "low" readings in question are within tolerances for standard wall pipe.

b. Action

For the reasons given above, no action is required. Project documentation properly documents the situation as described.

c. Resolution

Recommendation No. 12 requires no action. The CAT assessors were not provided the complete information at the time of the assessment.

3.13 RECOMMENDATION NO. 13

3.13.1 Duke Recommendation No. 13, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 13

Inspect additional pumps for torquing of pressure boundary bolting and full thread engagement on nuts. Further action will depend on the results of this inspection. (Ref. Section 3.7.1.5.)

b. Significant Finding

None

c. Conclusion (Section 3.7.1.5) (applicable portion)

As a result of these inspections, there is sufficient reason to believe that lack of full thread engagement and proper torquing of pressure boundary bolting may be a generic concern. It is recommended that Detroit Edison conduct an inspection of pressure boundary bolting for proper torquing and full thread engagement on a sample of additional QA Level I pumps. Based upon the results of this further testing, a decision should be made as to whether all QA Level I pumps should be inspected.

3.13.2 Edison Response to Recommendation No. 13

a. Discussion

1. Torquing of Pressure Boundary Bolting

The ASME Code, Section III, Appendix XII, 1983 Edition, "Design Considerations for Bolted Flange Connections," outlines considerations that should be taken in the design and proper installation of bolted, pressure-retaining connections. Subparagraph (d) states, "The first important consideration is the need for the joint to be tight in the hydrostatic test." Indication of undertorque some time after initial joint bolt-up is due to relaxation (creep) of the bolt,

gasket, and flange. Subparagraph (e) indicates that relaxation may be the cause of leakage during hydrostatic testing where it may suffice to merely retighten the bolts. The subparagraph also states that when leakage occurs, "it is common practice to retighten the bolts, and sometimes a single such operation or perhaps several repeated at long intervals is sufficient to correct the condition." The Code identifies that the main objective of initial bolt stress is to maintain a tight joint during hydrostatic testing and system operation.

Recommended torque values are given for initial bolt installations and, due to relaxation of the materials involved, these values may decrease. However, as long as the joint does not leak, the existing torque (stress) value is acceptable. If the joint leaks, a simple retightening is required.

Overtorquing of mechanical pressure-retaining joints is not a concern. If the bolt is overtorqued and did not fail during installation, chances are that it will never fail. This is due to the fact that the bolt in question will see the highest stress during installation, with relaxation occurring afterward. Also, the majority of gaskets at Fermi 2 have metal stops which prevent them from being crushed. Again, the emphasis should be on the function of the joint as opposed to the recommended prestress.

Article XII - 100 (m) of ASME Code, Section III also states, "Ordinarily, simple wrenching without verification of actual bolt stress meets all practical needs, and measured control of the stress is employed only when there is some special or important reason for doing so." Most torque values are only given as a reference value; as long as the joint serves its function, the torque value of the bolt is insignificant.

It is worth noting that Fermi 2 was designed and has been constructed with a minimum number of flanged joints of pressure-retaining systems to minimize the potential problem of leaking joint connections.

2. Thread Engagement

Common practice is to allow one full thread to show above the nut in a bolt/nut threaded connection to ensure that there is adequate thread engagement. This practice, though desirable, is not always followed. It is, of course, necessary that there be adequate contact between the threads of the bolt and the nuts to provide sufficient stress area to develop adequate tensile strength in the bolts to support the bolt loads. Heavy hex nuts are generally used in applications where the individual bolt loads are high. Generally, however, the individual bolt stress is nominal. Equipment is frequently supplied with the tops of bolts flush with the top of the nut with only a partial thread or no extra thread showing. Engineering has made an analysis to demonstrate these conditions are satisfactory.

b. Action

1. Bolt Torquing

The CAT reported varying degrees of undertorqued pressure-boundary bolts. Engineering believes that the findings require no immediate action. The intent of initial torque value is to prestress bolts to maintain a tight joint during hydrostatic testing and operation. As long as these joints do not leak, the obtained torque values of the bolts are acceptable.

Visual observations have been made during hydrostatic testing and initial operation of the systems to detect leakage. Periodic observations will be made as the plant begins to operate and during operations; any leaking joints will be retorqued according to the guidance provided in the ASME Code, Section III.

2. Thread Engagement

A nonconformance report was written to correct thread engagement problems reported on two of the pumps inspected. Engineering has undertaken a survey of additional pumps and other mechanical equipment flanged joints and determined that there is adequate thread engagement of flange bolts.

c. Resolution

The rationale provided on bolt torquing and the actions to be taken on the thread engagement issue fully respond to Recommendation No. 13.

3.14 RECOMMENDATION NO. 14

3.14.1 Duke Recommendation No. 14, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 14

Compare the design conditions on nameplate, master list and vendor drawings for some additional valves to check for further discrepancies. Further action will depend on the results of this inspection. (Ref. Section 3.7.3.5.)

b. Significant Finding

None

c. Conclusion (Section 3.7.3.5)

The overall condition and installation of the valves inspected were acceptable with the exception of two potential findings relating to nameplate design conditions. Based on the sample of valves inspected, there is sufficient reason to believe that mismatch of nameplate design conditions with design disclosure documents may be a generic problem. It is recommended that Detroit Edison conduct a comparison of design conditions on the valve nameplate versus the design conditions given on the master valve list plus the applicable vendor drawing for a sample of additional, randomly selected, QA Level I valves to determine if deviations exist. Based upon the results of this comparison, a decision should be made as to whether all QA Level I valves should be inspected.

3.14.2 Edison Response to Recommendation No. 14

a. Discussion

During the initial design of the various piping systems for Fermi 2, the system design temperatures and pressures were established. On the basis of this preliminary design data, valves for the systems were ordered according to standard ANSI pressure-temperature ratings of 150, 300, 450, 600, and 900 pounds. Generally speaking, valves are ordered and supplied to these standard ANSI ratings, although the actual pressure and temperature requirements of the systems the

valves are installed in are significantly lower. As the design of the Fermi 2 systems was finalized, some system design pressures and temperatures were changed. The valves that had been ordered to the initial temperature and pressure conditions were still acceptable for the application because the changes in the design pressure and temperature conditions were well within the pressure and temperature ratings of the valves. The valves were ordered with Code nameplates bearing the initial design pressure and temperature values rather than just the standard ANSI rating. The nameplates were not changed to reflect the changed pressure and temperature conditions. However, the Master Valve List, the controlling engineering document, was revised to show the new design pressure and temperature values for each valve.

The ASME Code does not require that valve nameplates be changed to account for changes in system pressure and temperature. The only stipulation is that a valve continue to be used within the limits specified by its ANSI rating.

b. Action

Edison Engineering has reviewed the ASME Code assisted by a Code consultant, and has contacted the valve manufacturer.

It has been determined that neither the valve nameplate nor the stress reports require change. The applicable design specification for the valves refers to the Master Valve List for obtaining the current correct valve temperature and pressure design conditions. The Master Valve List provides two sets of design requirements: 1) the individual valve pressure rating (ANSI pressure-temperature ratings) given in 150-, 300-, 400-, 600-, and 900-pound ratings, and 2) the individual system design pressures and temperatures. Because the design pressure and temperature of the system the valve is installed in do not exceed the respective valve ANSI ratings, the valve is qualified for that service.

A design change notice will be written to revise the valve specification to add a note that specific system design pressure and temperature information for a valve be obtained from the Master Valve List and not from the valve nameplate. In the event that a valve needs to be replaced, the only pertinent information is the valve's ANSI rating and not the specific pressure and temperature values of its application.

c. Resolution

There are no problems with QA Level I valves relating to discrepancies in documentation; the action of adding clarifying notes to engineering documents will assist user's understanding.

These actions satisfactorily resolve CAT Recommendation No. 14.

3.15 RECOMMENDATION NO. 15

3.15.1 Duke Recommendation No. 15, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 15

All QA-1 cooling units not covered by this review should be inspected for dirty or damaged coils, external damage or missing parts and incorrect or missing tags on associated instruments and valves. (Ref. Section 3.8.2.5.)

b. Significant Finding

None

c. Conclusion (Section 3.8.2.5)

As a result of the inspections, seven of the nine cooling units were observed to have some type of identifiable concern. Due to these findings, it is recommended that all additional cooling units be inspected for dirty or damaged cooling coils, damaged instrumentation, incorrect or missing tags on associated instruments and valves, external damage and missing pieces.

3.15.2 Edison Response to Recommendation No. 15

a. Discussion

An inspection of QA Level I cooling units for proper cleanliness, damaged coils, external damage, missing parts and missing or incorrect tags on associated instruments and valves is currently in progress. A total of 34 cooling units have been identified for this inspection. The inspection and correction of any identified deficiencies will be corrected prior to fuel load. The cooling units are currently included in the preventive maintenance program and will receive continuing inspections on an annual basis.

b. Action

The actions planned are discussed above.

c. Resolution

Actions being taken fully meet the recommendations of the CAT.

3.16 RECOMMENDATION NO. 16

3.16.1 Duke Recommendation No. 16, Associated Significant Findings, and Associated Conclusions

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 16

The quality of housekeeping needs to be improved. A complete cleaning and sealing of equipment at this time is recommended to ensure proper equipment operation. All associated work activities (tightening and repair of conduit fittings; removal of dirt, dust and debris from electrical equipment, sealing of penetration, terminal box covers, etc.) should be identified in the Project Punch list as work to be completed prior to fuel load. (Ref. Sections 3.10.1.5, 3.10.2.5, 3.11.3.5, 3.13.2.5, 3.14.1.5 and 3.14.2.5 of this report.)

b. Significant Findings

1. Significant Finding No. 18

The 4160V switchgear has been installed to the design requirement. Some of the components have not been kept clean internally and this could affect the operability of this equipment.

2. Significant Finding No. 19 (applicable portion)

The 480 volt motor control centers have not been kept clean.

3. Significant Finding No. 23

The electrical penetrations had no significant deviations. However, there were a number of minor deviations and this number is cause for concern.

c. Conclusions

1. Conclusion (Section 3.10.1.5) (applicable portion)

The quality of housekeeping needs to be improved to prevent recurrence of the debris and foreign material found in some of the switchgear. Dirty electrical components could impair the operation of the equipment. A complete cleaning and sealing of the 4KV switchgear at this time is recommended to ensure proper equipment operation.

2. Conclusion (Section 3.10.2.5) (applicable portion)

Housekeeping was noted as a concern in two of the four MCC's checked. This seems to continue as a trend from the 4KV switchgear reviews. It was noted, however, that the equipment in the RHR complex was much cleaner and free of debris. A complete cleaning and sealing as required of the motor control centers is recommended.

3. Conclusion (Section 3.11.3.5) (applicable portion)

Instances of missing bolts and screws from the terminal box covers were encountered at every penetration reviewed. Environment cable seals were not properly installed. It is recommended that all penetration terminal boxes and cable seals be reviewed to verify that all seals, gaskets, and bolts are installed properly to provide an environmental seal.

4. Conclusion (Section 3.13.2.5) (applicable portion)

Conduit fittings and equipment covers should be installed such that an adequate environment seal is provided as dictated by the equipment location. It is recommended that equipment located in hazardous locations have a final inspection prior to plant operation to assure all conduit fittings and equipment covers are installed properly.

5. Conclusion (Section 3.14.1.5, Items 4 and 5) (applicable portion)

The tightening and checking of bolts (on control boards and panels) was not an identified activity on the project punchlist. However, the review indicated large quantities of bolts and nuts were found damaged or

missing. Because of these findings, it is recommended that the checking of bolts and nuts be identified in a comprehensive listing in the project punchlist to assure they are completed by the system turnover-to-Operations date.

Detroit Edison should inspect all control panels and terminal cabinets to eliminate the buildup of miscellaneous hardware, potential fire hazards, and debris.

6. Conclusion (Section 3.14.2.5) (applicable portion)

The foreign materials and debris found within the cabinets and panels represent insufficient attention to housekeeping. It is recommended that Detroit Edison inspect all panels and terminal cabinets to remove all dust, dirt, foreign materials, and debris. Also, provide an adequate method of sealing those panels and cabinets to prevent future repeat of this problem.

3.16.2 Edison Response to Recommendation No. 16

a. Discussion

The electrical equipment housekeeping deficiencies noted by the CAT are the result of construction activities associated with the equipment and construction activities in the vicinity of the equipment. A comprehensive program for cleaning this equipment, which includes motor control centers, 4160V switchgear, combined operating panels and cabinets, is currently in progress. This program will establish an appropriate level of cleanliness for the equipment. Administrative and preventive maintenance programs will maintain acceptable electrical equipment cleanliness levels following the initial cleaning. A second concern related to electrical equipment housekeeping is the scheduling and completion of sealing activities. Electrical equipment sealing has been evaluated by Project Engineering and a specification to address this was written. Sealing in conformance with this specification is being provided.

The integrity of electrical equipment covers, fasteners, gaskets and conduits is also identified as a concern. Actions are currently in progress to correct deficiencies identified by the CAT, to further evaluate the extent of the concern, and to provide a comprehensive inspection of these items for safety-related equipment located in harsh environments.

b. Actions

1. Housekeeping

Cleaning of motor control centers, switchgear, distribution cabinets, and combined operating panels is currently in progress. All control room combined operating panels and relay room cabinets have been cleaned. Currently, a total of 83 switchgear and motor control centers, 42 of which contain safety-related equipment, have been or are scheduled for inspection and cleaning. Inspection and cleaning of distribution cabinets, other than the relay room cabinets, is being scheduled. All electrical equipment cleaning activities will be completed prior to fuel load.

Following the initial cleaning of the electrical equipment, housekeeping controls and preventative maintenance activities will be implemented to prevent significant degradation of cleanliness levels. The preventative maintenance program includes requirements for periodic cleaning of breakers and motor control centers. The preventative maintenance program is being modified to include periodic inspections of switchgear and motor control centers for evaluating the need for electrical shutdown and cleaning.

2. Electrical Penetration

Electrical penetrations are currently being inspected. All identified deficiencies (loose/missing bolts, damaged gaskets, etc.) are being corrected. A total of 48 penetrations have been identified for this inspection. This activity appears on the project master list and will be completed prior to fuel load.

3. Combined Operating Panels

The control room combined operating panels have been inspected for improper bolting of combined operating panel inserts. Missing bolts have been replaced and all bolts will be torqued before fuel load.

4. Conduits and Covers

An inspection of conduits and electrical covers associated with the control rod hydraulic control units and correction of identified deficiencies is currently

scheduled. This activity will be completed prior to fuel load. A representative sample inspection will be performed on the residual heat removal and reactor core isolation cooling systems to ensure that conduit and electrical covers in harsh environments are installed correctly. If the sample inspections show a significant rate of rejectable installations, a 100% inspection will be performed on components in the harsh environment. This activity will be completed prior to fuel load.

In addition, an Area Turnover Inspection Task Force walks down each area prior to turnover of the area to Nuclear Production. Deficiencies found during the walk-down are punchlisted and will be tracked to assure completion by appropriate milestone. Included in the Task Force's checklist are terminal/junction box covers, flexible conduit fittings, and presence of sealant material where specified. This activity provides additional assurance on the condition of the plant for some of the items of concern expressed by the Duke assessors in Recommendation No. 16.

c. Resolution

The housekeeping actions being taken fully meet the cleanliness and housekeeping recommendations of the CAT. Electrical equipment sealing has been evaluated by Edison Project Engineering and will be completed in conformance with project specifications.

Actions being taken with regard to electrical penetrations, conduits, terminal box covers, etc. address the specific concerns of the CAT.

This response addresses all parts of Recommendation No. 16.

3.17 RECOMMENDATION NO. 17

3.17.1 Duke Recommendation No. 17, Associated Significant Finding, and Associated Conclusions

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 17

This report has identified six areas where drawing updates or technical accuracies of the drawing are inadequate. The most significant of the six was the parts list drawings for the the COP (combined operating panel) and vendor-supplied relay cabinets that either were not controlled documents or did not reflect the as-built installation. The remaining five deficiencies (fuse sizing, minor as-built discrepancies, drawing/specification discrepancies) as well as the panel and cabinet parts lists should be resolved prior to fuel load. (Ref. Sections 3.10.2, 3.12.1.5, 3.12.2.5, 3.14.1.5, and 3.14.2.5 of this report.)

b. Significant Finding No. 19 (applicable portion)

...Some of the fusing does not meet design requirements.

c. Conclusions (applicable portions only)

1. Conclusion (Section 3.10.2.5)

In addition, a review of all MCC frontal, schematic, and connection drawings is recommended to determine consistency between drawings.

2. Conclusion (Section 3.12.1.5)

The incidence of the cable connection to the motor being contradictory to the drawing is not significant. To alleviate similar instances and prevent excessive paperwork, a note could be added to future motor connection drawings permitting the rolling of wires to attain proper rotation.

3. Conclusion (Section 3.12.2.5)

The results of the construction assessment indicate the EMOV's (electric motor-operated valves) have been installed in accordance with the specified design requirements with the following exceptions:

1) The conductors on valve E1150-F022 motor terminals were rolled to achieve proper motor rotation. Proper rotation was verified through valve operation. This item is not considered to be of major significance; however, the installation drawing should be revised to reflect the as-built installation.

2) The electrical brake on valve E2150-F005B is not considered to be of major significance since the "Electrical Equipment for Harsh Environment Report" states that the valve will be changed out in 1985 to meet NUREG 0588; however, the drawing should be revised to reflect the as-built installation.

3) DCN 10,588 had not been effectively implemented, demonstrating a deficiency in the QC inspection. Had the deficiency remained undetected, the electrical penetration may not have been adequately protected. Information provided for valve E1150-F009 indicated that the power cable, fuses and electrical penetrations for the 19.2 horsepower motor had been sized under the assumption that the motor was 12.8 horsepower, therefore, these items should be evaluated to determine if they are adequate for the greater load requirement. Since no additional horsepower discrepancies were found in the 13 additional EMOV motors that were inspected, this is considered an isolated incident. However, the final design drawings should reflect the presence of the installed 19.2 horsepower motor.

4. Conclusion (Section 3.14.1.5, Item 3)

The traceability of the materials and control components on the COP and interface cabinets is inadequate.

Vendor drawings on all components should be obtained such that they are available through Document Control as controlled drawings. Additionally, Parts Lists drawings that are available should be kept current with the as-built installation. Where Vendor drawings may not be available or are inadequate, Detroit Edison should generate controlled documents containing all pertinent information necessary for maintaining or replacing the equipment.

5. Conclusion (Section 3.14.2.5)

The nametag and ground bar deviations on panel 898B are not considered significant. The as-built installation is adequate; however, it is not in compliance with the design documents. The drawings should be revised to reflect the as-built condition....

The 20-gauge wiring in terminal box H11-P602B511 is consistent with Edison's wiring practice for the type of indicating light; however, it is a deviation from the drawings and the drawing will be revised to reflect the as-built condition. Additionally, the spare conductors in cable 214546-1C in panel H21-P100/C35-P001 are installed contrary to the design drawings and the drawings will be revised to reflect the as-built installation.

3.17.2 Edison Response to Recommendation No. 17

a. Discussion

All of the CAT concerns involving drawing discrepancies have been addressed as a result of an in-depth review of each situation by a special Engineering task force. Based on the recommendations of the task force, each of the drawings in question was revised or superseded.

It is not the purpose of this discussion to cover each specific drawing discrepancy problem and its specific resolution. Rather, the intent is to present an overview of the entire corrective action program that was prompted by Engineering's investigation into the CAT-identified problems. Engineering's investigation prompted corrective action--both immediate and long-range--that was more extensive and encompassing than the corrective action suggested during the CAT assessment. Engineering has developed a long-range plan to improve and enhance all of the Engineering documentation, and the changeover from documentation needed to construct the plant to documentation needed to operate the plant.

b. Actions

1. Corrective Action Immediately Taken

In quick response to the CAT assessment, Engineering assigned a task force to evaluate and resolve each of the identified drawing discrepancies. The task force did not classify any of the concerns as safety-related.

The task force did determine that the most significant problems involved missing parts drawings and inaccurate parts lists, fusing discrepancies, and vendor drawing problems that surfaced in relation to motor-operated valves.

The task force reviewed and responded to each individual CAT concern. To confirm its recommendations, the task force initiated additional in-depth reviews and audits in these areas of concern. The following is a brief overview of the additional corrective action steps that resulted from these special reviews and audits.

i) Parts List Review and Walkdown

The CAT assessment showed missing GE parts drawings for panel-mounted instruments and inaccurate parts lists. The task force assured that the parts drawings for the control panels were obtained from GE and filed in Document Control. During its review, the task force confirmed that, in some cases, the parts lists for the relay cabinets were inaccurate and did not adequately reflect the as-built installation. To correct this problem, the 26 termination cabinets in the relay room were walked down by Engineering personnel. Discrepancies were identified between the Edison parts list drawing and the GE parts list drawings on file. The Edison drawings for the termination cabinets were revised to show the as-built installation. The task force also recommended that all of the remaining GE parts list drawings on file be superseded by Edison drawings. Edison has had a policy of <u>not</u> revising vendor drawings. As Edison drawings, these drawings will be updated as required to reflect the as-built installation. The vendor drawings will be retained on file, but their status will be changed to "information only." This additional corrective action was taken as a result of the task force investigation.

ii) Fuse Review

The CAT assessment found a discrepancy in fuse sizes between the schematic diagram and frontal view drawing for a MCC. In response, the task force initiated the audit of a 50% sampling of the schematics and related drawings for other MCCs. During this audit,

Engineering did not find another discrepancy in fuse sizing. It was decided that for MCCs this problem represented an isolated case, rather than a generic situation. However, Engineering did discover a generic problem in relation to the horsepower designation for motors on motor-operated valves. Therefore, Engineering conducted an extensive review of all of the schematics involving motor-operated valves. The horsepower discrepancies have all been identified and corrected.

NOTE: The broader issue of proper fuse sizing and control of fusing on a plant-wide basis for safety-related equipment is dealt with in the response to Recommendation No. 19.

iii) Vendor Drawing Review

The CAT assessment showed conflicting information on vendor drawings, notably in the size of limitorque operators. The problem was confirmed by Engineering's task force during its audit of vendor documents related to motor-operated valves. It was decided that the problem was due to the fact that many of the vendor documents on file were out-of-date and had not been appropriately superseded. To solve the problem, Engineering has initiated a program to update the vendor file on all motor-operated valves. In addition, there is a long-range plan to examine and purge the entire vendor document file.

2. Long-Range Plans to Improve Documentation

Both Engineering and Nuclear Operations recognize the importance of having accurate and updated drawings to support an operating plant. As noted earlier, Engineering has already started to update the vendor file on motor-operated valves. Similarly, the functional system descriptions and the functional operating sketches are being updated. (A functional system description is a detailed explanation of the system and how it was designed; a functional operating sketch is a system diagram that is modified to show the additional information needed by the plant operating personnel.)

As a result of Engineering's investigation into the CAT concerns, it was determined that a long-range documentation plan was also needed. The objective of this long-range plan is to modify or supersede the design documents prepared for the construction of the plant with a complete set of documents having the specific type of information needed to support an operating plant. This long-range plan will address document control for both Edison drawings and vendor drawings.

In the long-range plan, Edison drawings will be addressed first. The key steps in this phase of the program are as follows:

a) Define which Edison drawings are essential to the operation of the plant.

b) Define the "required information" for a particular type of drawing.

c) Revise all drawings that are defined as essential drawings to show only the required information.

During the second phase of the long-range plan to improve the engineering documentation, vendor drawings will be addressed. The key steps in the vendor drawing program are as follows:

a) Define which vendor drawings are essential to the operation of the plant.

b) Determine which vendor drawings have been, or should be, made into Edison drawings.

c) Purge the file of all outdated and unnecessary vendor drawings.

The overall objective of this long-range program is to assure that all documents needed to support the operation and modification of the plant will be correct and up-to-date.

c. Resolution

All actions being taken or to be taken, as outlined, meet the intent of the CAT recommendations and conclusions.

3.18 RECOMMENDATION NO. 18

3.18.1 Duke Recommendation No. 18, Associated Significant Finding, and Associated Conclusions

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 18

It is recommended that the deviations found in the internal wiring of the remote shutdown panel (H21-P100/C35-P001) and the alignment of the scram valve limit switch on hydraulic control unit 46-07 be corrected. Since portions of the preoperational test on these units had been completed, it is recommended that those tests be completely redone for this equipment to verify system adequacy. It is further recommended that the preoperational test program should be reviewed to determine why the above deviations were not identified during the original tests and, if there were generic breakdowns in the preoperational test program, further preoperational tests be repeated as required. (Ref. Sections 3.13.2.5 and 3.14.2.5.)

b. Significant Finding

None

c. Conclusions (applicable portions only)

1. Conclusion (Section 3.13.2.5, Item 2)

The scram valve had been preoperationally tested and the deviation relative to the limit switches had not been identified. The cause of this should be investigated to determine if a deviation exists in the preoperational test program, or if this is an isolated incident. If the preoperational testing program is found to be deficient, the deviation should be resolved and the preoperational testing on other systems be repeated as required. The preoperational test on the AOV's should be repeated.

2. Conclusion (Section 3.14.2.5)

The incorrect wires identified in Panel H21-P100/C35-P001 represented a significant breakdown in the plant preoperational testing program. This panel had recently completed its preoperational testing and the

deviations had not been identified. Due to the critical nature of this type of deviation, Detroit Edison should investigate the cause and determine if it could be of a generic nature to all the preoperational tests. If the cause is generic, it should be resolved and preoperational tests should be repeated on other systems as required. It is recommended that the testing of the systems within the panel be completely redone.

3.18.2 Edison Response to Recommendation No. 18

a. Discussion

1. Scram Valve Limit Switches

The problem of the scram valve limit switches, its cause, and corrective actions taken or to be taken are discussed in the response to Recommendation No. 20.

The recommendation to redo the preoperational test sections associated with the scram valve limit switches is not necessary. The misalignment of the limit switch observed by the assessor and the subsequent realignment by the instrument shop do not negate the vadility of the preoperational testing previously performed. Preoperational Test PRET.C1150.001, Rev 1, Section 6.4, Supplemental Test Form No. 4, performed on May 21, 1984, verified that the limit switches were in alignment at the time of the test and the system logic and control room display on the panels were also verified. The subsequent misalignment of the limit switches due to the rotation of the displaced scram valve diaphragms seeking their normal (neutral loading) position after repeated scram valve operation does not change the system logic. The system logic remains unchanged because there were no wiring changes made to it. Realignment of the scram valve limit switches in accordance with approved procedure also does not change the system logic. It is therefore not necessary to redo the preoperational test.

The preoperational test program has been reviewed to determine why the deviation was not identified during the original program. Checkout and initial operation testing is performed before the preoperational test phase. During checkout and initial operation testing, the scram valve limit switch striker plates were aligned with the scram valve limit switches.

Preoperational Test PRET. C1150.001, Rev. 1, Section 6.4.2 is the section that describes how the scram valves and indicating light logic were tested. For each of the 185 control rod drive hydraulic units there are two scram valves identified as the "126" and "127" valves. The preoperational test in part required observation of the control room panel H11-P603 full core display blue scram valve status light and local observation of the 126 and 127 valves during the "stroke open" of the scram valves. Data Sheet 6.4, Initial Valve Tests, documents the verification that there was proper operation of the scram valves and the associated logic. This testing was satisfactorily performed on Supplemental Test Form No. 4 in May 1984 following the scram valve rework program.

Nonconformance Report 84-0989 describes spring adjustments that were made to the scram valves and a torsional displacement of the scram valve diaphragms. While the diaphragms were held by the adjustment mechanism in a slightly twisted position, the switch actuators were realigned with the limit switches. This resulted in a torsional loading on the scram valve stems. Operation of the scram valves resulted in scram valve stem rotation due to the torsional displacement of the scram valve diaphragms. This valve stem rotation results in limit switch actuator and limit switch misalignment. It is believed that during PRET.C1150.001, Rev 1, the limited scram valve operation did not allow the valve stems to rotate sufficiently to cause a misalignment of the limit switch actuator with respect to the limit switch. Subsequent to PRET.C1150.001, Rev 1 testing, the scram valves were stroked numerous times during other preoperational testing. It has been concluded that misalignment occurred during the subsequent scram valve operations.

The consequences of the limit switch actuator and limit switch misalignment would be improper operation of the control room panel H11-603 full core display blue scram status light. This is not a safety-related indicator light. The limit switches for the "126" and "127" valves are series connected and held in the open position by the limit switch actuator when the scram valves are closed. If both limit switch actuators were misaligned they would allow both limit switches to close and the blue scram indicating light would be

energized when, in reality, the scram valves were actually closed and the control rod was not scrammed. Positive indication of control rod position is provided to the operator in the control room by independent instrumentation on the 4 rod display.

2. Incorrect Wiring - Panel 21-P100/C35-P001

The problem identified with the internal wiring of the panel (remote shutdown panel) is associated with valve E1150-M0-F009. The startup test documentation was reviewed to determine if valve E1150-M0-F009 had been tested from the remote shutdown panel. Preoperational Test Procedure PRET.E1100.001, Rev 2 documents the closure of valve E1150-M0-F009 from the remote shutdown panel on September 22, 1983. This was prior to the work performed in the implementation of Field Modification Request 3871. The technical review committee chairman withdrew approval for Procedure PRET.E1100.001, Rev 2 on December 19, 1983, because of major modifications made to the E1100 system. Preoperational Test Procedure PRET.E1100.001, Rev 3 was released for use on July 9, 1984. Valve E1150-M0-F009 will be tested as part of PRET.E1100.001, Rev 3, Section 6.1.4.5.

The deviations found in the internal wiring of remote shutdown panel H21-P100 were reported on Nonconformance Report 84-0904. This nonconformance report describes the problem as, "During CAT inspection of H21-P100 it was noticed that wires AA-50/BP-INO and AA-56/BP-INO were incorrectly installed, i.e., AA-50/BR-INO and AA-56/BP-INO." Startup meeting notes SU-84-1129 and SU-84-1131 document a fact-finding meeting attended by representatives from Bechtel, Field Engineering, Nuclear Quality Assurance, Startup and the System Completion Organization. The meeting notes document that Field Modification Requests 3871 and 4584 had been issued for work on the remote shutdown panel. The work involved panel modifications which required the removal of backlighted pushbuttons in order to perform the panel modifications. Pushbuttons 100C7 and 100C8 for valve E1150-M0-F009 were two of the pushbuttons that had to be removed from the panel. These pushbuttons are two-part, mechanically connected devices consisting of a backlighted pushbutton and switch block. The work was performed by mechanically separating the backlighted pushbutton from the switch blocks rather than making wiring de-terminations. When the panel work was completed, pushbuttons 100C7 and 100C8 were

improperly reassembled. There was an interchanging of the switch blocks between backlighted pushbuttons 100C7 and 100C8. This improper reassembly resulted in the wiring discrepancies described in the CAT finding and Nonconformance Report 84-0904. Meeting notes SU-84-1129 and SU-84-1131 describe the probable cause for the wiring error as human error. Corrective action to prevent recurrence has been identified and has been or is being implemented.

As a part of the Nonconformance Report 84-0904 disposition, all other pushbuttons on panel H21-P100 were verified for proper wiring. A total of 30 pushbuttons were verified. One other isolated case was found in which pushbuttons 100C9 and 100C10 were also incorrectly reassembled. These pushbuttons are associated with valve E1150-M0-F008.

All deviations found in the internal wiring of the remote shutdown panel (H21-P100) were corrected by work performed under PN-21 No. 973497 and its corresponding Attachment A on June 22, 1984. Attachment A describes the work performed as:

a. Flop contact blocks on pushbuttons 100C7 and 100C8 to agree with configuration shown on schematic 6I721-2793-2, Rev. G.

b. Provide visual verification and document inspection by Q.C. to the proper configuration of other units reworked under FMR 3871 to clear NCR 84-0904.

c. Flop contact blocks on pushbuttons 100C9 and 100C10 to agree with configuration shown on wiring Diagram 6I721-2793-1, Rev. G.

Further, this case was compared to similar modifications performed in the control room to identify if a generic problem existed. In all cases the field modification request requirements were clear in specifying quality control inspection and point-to-point continuity testing. The work was done using a traveler requiring review and approval by Field Engineering, Startup and Quality Contol. Functional testing of valves from the main control room on various systems confirms that no such problem exists in the main control room.

b. Action

1. Scram Valve Limit Switches

This item is addressed in the detailed response to Recommendation No. 20 of this report. All scram valve limit switches were inspected for proper alignment. An analysis has been made to determine if the problem has invalidated any previous preoperational testing.

2. Incorrect Wiring - Panel H21-P100

The problem was analyzed to determine cause and to prevent its recurrence. A review was made to determine that there were no other instances of miswiring where a problem similar to that on valve E1150-M0-F009 may have been created. In addition, the impact of this problem relative to acceptability of any associated preoperational testing was evaluated.

c. Resolution

The problem of the misalignment of scram valve limit switches has been fully addressed. It has been determined that its occurrence has not negated the results of the preoperational testing.

The wiring deviations found in the remote shutdown panel were a result of human error and corrective action has been taken to prevent recurrence, i.e., mechanical disassembly of a switch is equivalent to de-terminating wires and, therefore, requires testing to verify proper function. From the checks and reviews that have been made, it has been determined that there was no generic breakdown in the preoperational test program.

This response fully addresses the concerns stated as part of Recommendation No. 18, especially the rather significant issue of the validity of the preoperational testing program. It is concluded that there is no evidence of a breakdown in the program.

3.19 RECOMMENDATION NO. 19

3.19.1 Duke Recommendation No. 19, Associated Significant Finding, and Associated Conclusions

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 19

An inspection of a sample of additional penetration circuits should be conducted to determine if proper fuse coordination has been applied. If there is evidence of a generic problem in applying this protection, then the inspection should be extended to include all penetration circuits. (Ref. Section 3.10.2.5, 3.12.2.5 and 4.1.3.3.)

b. Significant Finding No. 19 (applicable portion)

Some of the [480 V MCC] fusing does not meet design requirements.

c. Conclusions

1. Conclusion (Section 3.10.2.5) (applicable portion)

In addition, MCC (72F-4A) had fuses installed which may have been contrary to the intended design. This item is particularly significant because, had the deviation gone undetected, the electrical penetration may not have had adequate protection. It is recommended an additional sample of penetration circuits be inspected to determine if the proper fuse protection has been installed. If there is evidence of a generic problem, the sample should be extended to all penetration circuits with fuse protection.

2. Concusion (Section 3.12.2.5, Item 3) (applicable portion)

DCN-10588 had not been effectively implemented, demonstrating a deficiency in the QC inspection. Had the deficiency remained undetected, the electrical penetration may not have been adequately protected. Information provided for valve E1150-F009 indicated that the power cable, fuses and electrical penetrations for the 19.2-horsepower motor had been sized under the assumption that the motor was 12.8 horsepower, therefore, they should be evaluated to determine if they are adequate for the greater load requirement.

3. Conclusion (Section 4.1.3.3) (applicable portion)

...[DCR SUE-427] revised the fuse size and overload size in MCC 72C-3A position 8A as shown on Drawing 5SD721-2512-18, Rev G. The DCR changed the fuse size from 30 amps to 25 amps and the overload size to G30T44. The revised Drawing (Rev H) showed the fuse size as 30 amps and the overload size as G30T44A. A check of the field status showed 30 amp fuses and G30T44A overloads in place.

3.19.2 Edison Response to Recommendation No. 19

a. Discussion

During the construction phase testing, several fuses that are similar in physical size but of different electrical rating were incorrectly installed or replaced.

A comprehensive program for verifying proper fusing in QA Level I electrical equipment is currently in progress. This program will ensure that proper fusing is installed and will provide a means of maintaining proper fusing by tagging the fuse locations with labels that provide the fuse type and rating.

b. Action

An initial walkdown inspection of fuses in QA Level I equipment has been completed. The inspection was performed by comparing the fuse ratings as specified on wiring and schematic diagrams with the ratings of the fuses installed. Fuses were replaced as necessary to agree with existing documentation. A list was compiled for fuses where no rating documentation could be found. The list was forwarded to Project Engineering for review and evaluation.

In response, Project Engineering is adding a new section to Installation Specification 30[illegible]8, which will provide in one document the required fusing for all QA Level I electrical and instrumentation and controls equipment. Specification Section EJ will be the "lead" document, taking precedence over all related design drawings. In time, fuse size and type for each QA Level I application will be eliminated from other engineering documents. The presence of a fuse will continue to be shown on a drawing, and a note will be provided instructing the user to obtain fuse size and type information from Section EJ of the specification.

Upon issuance of Section EJ, a final walkdown inspection of fuses in QA Level I equipment will be performed by Nuclear Operations to ensure the fuses installed agree with the specifications. Any remaining discrepancies will be corrected at this time.

To maintain proper fusing, all fuse locations in QA Level I equipment are being tagged with labels containing the fuse rating and type. These labels will be corrected as necessary during the final walkdown inspection to agree with Section EJ of Specification 3071-128.

c. Resolution

Section EJ of Installation Specification 3071-128 will provide a comprehensive list of fuse type and rating supported by proper calculations and documentation. Additionally, a program has been developed to verify the installation of proper fusing and to tag fuse locations with labels containing fuse type and rating information. The development of the mentioned specification section, combined with a program of verification, ensure that proper fusing is installed in all QA Level I electrical equipment and fully addresses Recommendation No. 19.

3.20 RECOMMENDATION NO. 20

3.20.1 Duke Recommendation No. 20, Associated Significant Finding, and Associated Conclusions

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 20

A comprehensive review should be conducted of the operability and calibration of all QAI air-operated valves, limit switches, and process instrumentation loops to ensure their proper operation. (Ref. Sections 3.13.1.5 - 3.13.2.5.)

b. Significant Finding No. 26

Electrical instrumentation had several findings due to incomplete work. A final inspection of these items should be done.

c. Conclusions

1. Conclusion (Section 3.13.1.5)

Of the five instruments and their associated electrical loops assessed, only one assessment (Core Spray) was completed without findings. Of the remaining four instruments, two were not completed sufficiently to permit an assessment of the complete loop. The remaining instruments (reactor level and pressure) were completed but both a problem and an assessor concern were found (calibration and grounding).

The problem of the required calibration accuracy for the reactor level and pressure instruments should be resolved prior to preoperational testing of the system.

The concern of instrument ground connected to the station ground in the Testability Cabinet is not necessarily contrary to the specified requirements. This was addressed as an assessor concern as the result of the induced voltages that were identified in the COP/relay room area. (Ref. Sections 3.14.1.4 and 3.14.1.5).

The results of this review indicate that a significant portion of the instrumentation loops have been physically installed but may not be completely operable.

A comprehensive operability verification of all instrument loops should be completed by Detroit Edison prior to fuel loading.

2. Conclusion (Section 3.13.2.5) (applicable portion)

The assessment of the five AOV's selected for inspection resulted in two significant deviations. They are as follows:

1) The limit switches on two valves, E21-F006A and B, and a third valve (scram valve C11-F117-117 on HCU 46-07) not initially included in the survey, were not properly calibrated to provide the required indication. The results of this assessment indicate a possible significant inadequacy in the overall calibration program of AOV limit switches. It is recommended that essential AOV's be inspected to assure all their limit switches are calibrated and will perform according to the design requirements.

2) The scram valve had been preoperationally tested and the deviation relative to the limit switches had not been identified. The cause of this should be investigated to determine if a deviation exists in the preoperational test program, or if this is an isolated incident. If the preoperational testing program is found to be deficient, the deviation should be resolved and the preoperational testing on other systems be repeated as required. The preoperational test on the AOV's assessed should be repeated.

3.20.2 Edison Response to Recommendation No. 20

a. Discussion

1. Air-Operated Valves

Valves E21-F006A, B and C41-F007 have two sets of two limit switches each: two to indicate open, intermediate, and closed position on the pneumatic actuator and two to indicate open, intermediate, and closed position of the valve disk. The actuator limit switches on all three valves were properly set to indicate the appropriate positions; however, the disk limit switches on valves E21-F006A and B did not provide the correct indication. Valve E21-F006A disk

limit switches did not indicate intermediate position and the limit switch actuating mechanism on valve E21-F006B was loose and could be manually rotated. During the inspection on the scram valves on HCU 30-03, it was noted that the adjacent HCU (46-07) limit switch actuating plate was not properly aligned to actuate the limit switch when the valve was operated. The limit switch, therefore, would not provide an indication of valve operation during a reactor scram. This deviation was identified on valve C11-F117 only.

The pilot solenoid valve E/V-C41-F400 for AOV C41-F007 stuck in the open position during testing of the valve operation. Although the AOV operated properly, the pilot solenoid malfunctioned.

NOTE:	The following is a correction to information contained in the Duke report: The identification number of the scram valve on HCU 46-07 with the misaligned limit switch should have been C11-F126. Valve C11-F117 is actually one of the two scram pilot solenoid valves for HCU 46-07, not the scram inlet valve itself. The identification number of the AOV C41-F007 pilot solenoid valve E/V C41-F400 is actually the pilot solenoid valve for AOV C41-F006, the outboard testable check valve for the standby liquid control system.

2. Process Instrument Loops

a) Instruments B21-N091C and B21-N094 - These instruments provided reactor level and pressure indications. A check of the wiring associated with these instruments revealed that the ground for the instrumentation in cabinet H21-P082 was connected to station ground. A review of the instrumentation calibration records showed that the instruments were calibrated to an accuracy level of 0.5%. However, the Fermi 2 Instrument List showed a required calibration accuracy of 0.25%.

b) Instrument T50-N412A - This instrument provides temperature monitoring for the drywell. A complete check of the wiring associated with this instrument was not possible because the

terminations to the recorder were not complete. A check of the wiring from the thermocouple to the recorder was made. Construction was in the process of replacing the thermocouple during the assessment. A CAT assessor observed the changeout and the calibration of the new thermocouple and wiring to the recorder.

Instrument E21-N003A - This instrument is a GE flow transmitter used to monitor flow in the core spray system. A check of the wiring associated with this instrument resulted in no deviations. This instrument went through a complete calibration check during the CAT assessment. It was observed that a 4% accuracy was required and 1.4% accuracy was attained.

d) Instrument D11-N006A - This instrument provides radiation monitoring for main steam line isolation. Some confusion existed initially regarding the availability of this instrument for review. The cables to the instrument had been severed. It was determined that the assessment would continue after the cables had been repaired. During the first stages of the assessment it was noted that the operability of the instrument and wiring loop was approximately 50% complete. Because of this determination, a check of the wiring, calibration, and separation requirements for the instrument was not made.

b. Action

1. Air-Operated Valves

The Startup Organization had identified the need for calibration of disk limit switches on valves E21-F006A and F006B prior to the construction assessment and had initiated 7.8 Nos. 20140I and 20462I on May 25 and June 3, 1984, respectively, to calibrate these limit switches. However, due to difficulty in maintaining the calibration on these limit switches, FMR 3254, Rev F was issued to implement a new cam arm design which provides for more positive actuation of the disk limit switches. 7.8 Nos. 20140I and 20462I were not released for testing until the new cam arm design was installed in accordance with FMR 3254, Rev F. Limit switch calibration under these 7.8s is currently complete and under review. Similar new cam arm designs have also

been installed on testable check valves E11-F050A and F050B (in accordance with FMR S-7280), B21-F076A and F076B (in accordance with FMR S-7316) and G33-F120 and F121 (in accordance with FMR S-7368). A review of the disk limit switch installation on the seven remaining testable check valves not yet modified in accordance with the above FMRs will be performed to evaluate the reliability of operation on a case-by-case basis and, if warranted by the inability to maintain the calibration of the limit switches, the disk cam actuators will be modified accordingly.

Misalignment of the limit switch actuating plate on scram inlet valve C11-F126 for HCU 46-07 was documented on NCR 84-0989. In addition, instances of limit switch misalignment found during a follow-up inspection of all the HCUs are also documented on NCR 84-0989. A total of 129 limit switches on 94 HCUs were identified on NCR 84-0989 as being misaligned. However, based on a review of these limit switches by the Edison instrument shop, and Engineering's concurrence, 89 of these 129 limit switches were dispositioned "use-as-is." The criteria used by Engineering is that at least one third of the head of the limit switch adjustment bolt, which is mounted on the actuating plate, should extend over the microswitch actuating plunger. The remaining 40 limit switches were dispositioned by NCR 84-0989 to be realigned by the instrument shop. This work was completed.

The cause of the limit switch misalignment appears to be torsional displacement of the scram valve diaphragms resulting from spring adjustments on these valves. Apparently, when spring adjustments were performed as part of the calibration of the scram valves, some scram valves experienced a torsional displacement of the diaphragm, causing the valve stem and limit switch actuator plate to rotate out of position. While the diaphragms were held by the adjustment mechanism in this slightly twisted position, the switch actuator plate was realigned with the position switches. The displaced diaphragms returned to their normal (neutral) position after the scram valves were operated a number of times. This scram valve operation occured following the completion of preoperational testing of the scram valve limit switch circuits. The resulting stem rotation caused the misalignment of the limit switch actuator plate with respect to the microswitch actuating plunger.

Maintenance Instruction MI-IC-3008, Hydraulic Control Unit Scram Inlet and Outlet Valves, will be revised include functional testing of the limit switch by stroking the scram valve several times while monitoring the limit switch controls with a test meter, following scram valve spring adjustments. MI-IC-3008 already adequately addresses the alignment of the limit switch actuator plate with the switch. Also, Surveillance Procedure 54.000.03, Control Rod Scram Insert Time Test, will be revised to include a verification of the appropriate blue scram light on the full core display. This function has no impact on the scram capability of the HCU. The limit switches for the scram inlet (C11-126) valves and scram outlet (C11-127) valves are series connected and held in the open position by the limit switch actuator when the scram valves are closed. If both limit switch actuators were misaligned and both limit switches were allowed to close, the blue scram indicating light would be energized when the scram valves were actually closed and the control rod was not scrammed.

The incomplete disc movement of pilot solenoid valve E/V-C41-F401 (for testable check valve C41-F007) was documented on NCR 84-0991 by Field Engineering. The malfunction of this pilot solenoid valve did not prevent the successful stroking of valve C41-F007, but did result in air leakage to the containment atmosphere during the test stroke. NCR 84-0991 was dispositioned to disassemble solenoid valve C41-F401 and clean internals in accordance with manufacturer's recommendations. Internals shall be inspected for foreign material, which may cause incomplete operation. After cleaning, the solenoid will be reassembled and tested for proper operation. If the valve operates properly it will be dispositioned "use-as-is"; if the valve continues to malfunction, it will be replaced. In addition, the Startup group committed to test or retest approximately 50% of the solenoid valves asociated with the testable check valves. The scope of this testing has now been extended to 100% of these solenoid valves. Deficiencies identified during this testing will be reported via an NCR, to be evaluated and dispositioned by Engineering. Testing of these solenoid valves is currently in progress.

2. Process Instrument Loops

The discrepancy between manufacturer's stated accuracy of 0.25% and actual calibration accuracy of 0.5% for

Rosemount pressure differential transmitters was identified by Edison prior to the construction assessment in memorandum EF2-67,345 dated March 12, 1984. This memorandum directs Nuclear Production to maintain manufacturer's stated accuracies for QA Level I Rosemount pressure differential transmitters (i.e., 0.25%). Memorandum NP-84-749, dated May 31, 1984, states that the technical I&C group is taking the following actions:

a) A review is being conducted of all QA Level I and Technical Specification-related instruments.

Those QA Level I or Technical Specification instruments which have not been calibrated to the manufacturer's stated accuracy will be identified and punchlisted. Where feasible, the instrument(s) will be recalibrated to the manufacturer's stated accuracy. Where it is not feasible to calibrate to manufacturer's stated accuracy, written Engineering review/approval will be requested (via an Engineering Evaluation Request or Startup Field Report).

The problem of severed cables to D11-N006 instruments (main steam line radiation monitors) was documented on NCR 84-0962. The NCR was dispositioned to reterminate cables 231562-E2 and 231567-F2 in accordance with Edison Specification 3071-33, Appendix C. This work was completed under PN-21 No. 556716 and the cables were retested under 7.8 No. 20,443I. In addition, cables 231568-E1, 231569-E1, 231574-E2 and 231575-E2 were retested under 7.8 No. 20,449I, as directed by disposition of NCR 84-0962. The cause of the damage to cables 231562-E2 and 231567-F2 was indeterminate. NCR 84-0962 was closed August 11, 1984.

c. Resolution

1. The actions taken or to be taken with regard to AOV limit switches will assure their proper calibration and operability. The actions fully respond to the intent of Recommendation No. 20 regarding limit switch problems.

2. Corrective actions have been taken or will be taken to correct problems identified with process instrumentation loops. In addition, both the Startup Test and Surveillance Test Programs have identified and will continue to identify any problems with instrumentation loops. The Surveillance Test Program will provide assurance that instrumentation loops are operable, in compliance with Technical Specification requirements.

3.21 RECOMMENDATION NO. 21

3.21.1 Duke Recommendation No. 21, Associated Significant Findings, and Associated Conclusions

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation

Conduct a cable tray and conduit inspection on a sample of cables similar to the inspection performed by the CAT team. This inspection should include separation, tray fill, cable installation techniques including cable supports, sealing and installation of pull box covers. The results of the CAT team assessment should then be analyzed to determine if corrective actions are required. (Ref. Section 3.11.1.5 and 3.11.2.5.)

b. Significant Findings

1. Significant Finding No. 21

Electrical cables and their routing are in agreement with the design with no significant deviations. Two items do not appear to meet design, i.e., cable separation inside the cabinets and lack of grip type connections at cabinets. They appear to be acceptable but do not meet design documents.

2. Significant Finding No. 22

There was some significant deviation of the cable in the trays. This is fully described in Section 3.11.2.4.

c. Conclusions

1. Conclusion (Section 3.14.1.5) (applicable portion)

The entire COP should be reviewed to assure that all areas requiring the 1" minimum separation between cable and conduit have been identified and corrected as necessary to meet the specified separation criteria.

2. Conclusion (Section 3.11.1.5) (applicable portion)

The cable support problems identified in the relay room represented a deviation from the specification.

Subsequent discussions with Detroit Edison personnel indicated that engineering evaluations have been completed justifying the lack of grip type supports. It is recommended that the Specification 3071-33 be revised to reflect the fact that deviations are permissible with Design Engineering analysis.

3. Conclusion (Section 3.11.2.5)

Of the ten deviations, two (items 5 and 6) can be combined. These two were directly related to separation violations. The remaining items covered areas including tray overfill, cable not secured to tray, cable installation techniques, damaged conduits, spare conduits sealing, and pullbox covers. While each item may be an isolated case, combined they indicate a lack of compliance with the project final design documents.

This assessment was made on a small sample (28 cables) as compared to the total cables on the complete project. It is therefore recommended that Detroit Edison select a sample of cables and perform an inspection similar to the one performed by the team. The results of this inspection and the results of the CAT evaluation should then be analyzed by the Detroit Edison engineers to determine the need for any possible corrective actions.

3.21.2 Edison Response to Recommendation No. 21

a. Discussion

Cable separation inside cabinets has been discussed at length with NRC Region III regarding the Fermi 2 FSAR and SER commitments and how individual circuits are protected by fuses. Adequate protection of circuits exists and the touching of opposite division conduit and cable inside a cabinet does not violate separation requirements when the circuits are protected by individual fuses and/or breakers.

The potential divisional separation discrepancies identified by the CAT assessors (i.e., cable separation in cabinets and divisional separation of conduits and trays) were determined by Engineering to be acceptable installations without further work required.

The installation specification also includes requirements for proper support of cables to prevent overstressing of connectors or terminal blocks. The manner of support is

specified as Kellems Division Supports and Riser Grips or Minerallac clamps or equivalent. The installation drawings show the manner of support to be used. Engineering has determined that, for the example identified by Duke Power, the use of tie-wraps in lieu of Kellem grips meets the intent of the specification; the example reported by the CAT is an acceptable installation.

The CAT assessors identified a case where a vertical cable tray run contained cables not attached to the tray at an 8-foot interval. A nonconformance report was dispositioned to attach tie-wraps at a minimum of 8-foot centers. Similar cases will be identified and corrected during walkdowns.

The cable trays were identified with cables installed over the side rails. The installation specification permits 1 inch of overfill per foot of tray width. A top hat is installed to correct the overfill condition, if the overfill cannot be reduced by retraining to less than 2 inches above the side rail.

Although some cables identified by the CAT assessors were not neatly trained in the cable tray, retraining of the cables at this point in construction is complicated by the presence of fire wrapping installed on cable trays adjacent to this tray section. Retraining is unnecessary due to the fact that the purpose of the specification was to prevent physical overfilling of the trays prior to the tray loading limits being reached. Since most of the cables are currently pulled and the cables in the cable tray are normally not over the line of sight of the side rails of the cable tray, the situation, as it exists, is acceptable.

The CAT assessors found a coiled cable hanging from a tray. This cable had been installed as a "spare" cable. Past procedures dispositioned deleted, damaged, and spare cables by coiling the cable at the nearest tray. Since this could interfere with tray covers, fire wrapping or tray and hanger weight limits (and as part of the general housecleaning program) it was determined to disposition these cables as explained in two Engineering memoranda. After all coiled cables have been identified and punchlisted by the Systems Completion Organization, coiled cables hanging from the raceway system will be eliminated.

A damaged flex conduit was found during the walkdown and is to be replaced in accordance with the disposition of a nonconformance report.

Spare conduits were not capped or plugged, which is apparently a generic condition. A nonconformance report was issued and dispositioned to correct the generic condition. In accordance with the nonconformance report, the conduit design group will develop a list of spare and empty conduits. SCO will then be responsible for assuring that all are capped or plugged as required.

Assuring that pullbox covers are properly installed is included as an item in the site housekeeping program. (See Recommendation No. 16.) For the example found by Duke Power, a punchlist card had been generated 2 weeks before the CAT assessment.

b. Action

The cable separation and support concerns of the CAT do not require any corrective actions because the as-found conditions reported by CAT are acceptable.

The installation of tie-wraps on vertical cable tray runs will be corrected by initiating a walkdown of all areas for this condition.

The cable tray overfill problem will be corrected as stated above. Additional discrepancies will be identified during walkdowns.

Neatly trained cable concerns do not require any corrective actions because the as-found conditions reported by the CAT are acceptable.

The coiled cable concern will be corrected as stated above.

The damaged flex conduit will be corrected as stated above. Additional discrepancies will be identified during a walkdown of all areas for this problem.

The spare conduit concern will be corrected as stated above as an ongoing problem.

The installation of pullbox covers is being performed as part of the housekeeping program, and will also be verfied during the joint area walkdowns required for turnover to Nuclear Operations.

c. Resolution

The actions taken or to be taken on cable tray overfill, pullbox covers and spare conduits and the dispositions on the cable separation and support concerns fully address the subject of Recommendation No. 21.

3.22 RECOMMENDATION NO. 22

3.22.1 Duke Recommendation No. 22, Associated Significant Finding, and Associated Conclusions

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 22

Due to the number of loose wiring terminations found during the assessment, an inspection of a comprehensive sample of safety system terminations in all types of electrical equipment installations should be undertaken to determine the degree of what appears to be a generic problem and the action required for correction. (Ref. Sections 3.10.2.5, 3.12.1.5, 3.13.2.5, 3.14.1.5 and 3.14.2.5.)

b. Significant Finding No. 25

There were a number of terminations of electrical cable that are not securely fastened.

c. Conclusions

1. Conclusion (Section 3.10.2.5) (applicable portion)

. . . the two loose terminations identified in MCC 72B-3A should be corrected.

2. Conclusion (Section 3.12.1.5) (applicable portion)

The loose terminations on Core Spray Pump Motor C and the broken termination on valve E1150 F008 could present future operational problems. These two deviations should be corrected and a sample inspection of other safety system motors and MOV's should be conducted to determine if a generic problem exists.

3. Conclusion (Section 3.13.2.5) (applicable portion)

Out of the five AOV's inspected, two had loose terminations. One of these AOV's was located inside the drywell. Due to the critical nature of these valves, particularly the scram valve which had been preoperationally tested, it is recommended that the instrumentation circuits be inspected for tightness of terminations to assure the adequacy of the electrical connections.

4. Conclusion (Section 3.14.1.5, Item 1) (applicable portion)

Loose termination found in H11-P823 was resolved by Detroit Edison with NCR 84-0889.

5. Conclusion (Section 3.14.2.5) (applicable portion)

One loose termination was identified in termination cabinet H11-P823, one in panel 898B and two in termination cabinet H11-P822. A total of four loose terminations were found out of approximately 400 checked with a 1% ratio. Due to the critical nature of these terminations, all terminations within the panel that are essential to the safe operation of the plant should be inspected and be verified to be sufficiently tight to assure a good electrical connection.

3.22.2 Edison Response to Recommendation No. 22

a. Discussion

Actions were taken to correct all CAT-identified loose connections and to verify, as appropriate, other similar connections.

In addition, a program was undertaken to determine whether a generic loose-termination problem existed. A survey of electrical terminations in the HPCI and core spray systems was initiated. These systems were chosen because they contain a representative cross-section of the electrical equipment to be found in the plant. The following features make them suitable for the survey:

- Core spray is a divisional system, whereas HPCI is a single-unit system.
- Core spray is a low-pressure system, whereas HPCI is a high-pressure system.
- Core spray is a motor-driven system, whereas HPCI is a turbine-driven system.
- Core spray is a turned-over system, whereas HPCI is not turned over.
- Both systems are safety-related systems.

b. Action

The required NCRs and PN-21s were prepared to correct the loose terminations identified by the CAT. Where applicable, the required testing was performed. In addition, all terminations on the HCU termination boxes were checked, and all terminations in diesel sequence panel H11-P898B were checked.

NOTE: The panel identified in the Duke report as 898B is actually panel H11-P898B.

POM Procedure 42.000.22T was generated before beginning the termination survey on the HPCI and core spray systems. The procedure provided for a uniform method of determining termination tightness. Class instruction was provided for test personnel. A total of 11,311 terminations were checked; only 67 were found to be loose. All 67 had retained continuity.

To assure that in the future the possible problem of loose terminations will be prevented, special training sessions have been held for I&C technicians and maitenance personnel to instruct them on how to assure that electrical terminations are securely made.

c. Resolution

Actions were taken to correct the loose termination reported by the CAT.

Survey results indicate that a generic loose-termination problem does not exist. The 67 terminations found loose (0.59% of all terminations checked) retained electrical continuity and the associated components operated satisfactorily. If any of these terminations were too loose to maintain continuity, it would be detected during routine surveillance testing or preventive maintenance activities, or via loss of control room indication.

The actions taken and results obtained fully respond to Recommendation No. 22 and establish that a generic loose-termination problem does not exist at Fermi 2.

3.23 RECOMMENDATION NO. 23

3.23.1 Duke Recommendation No. 23, Associated Significant Finding, and Associated Conclusion

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 23

The environmental protection of MCC-72C-3A from both water spray and seismic interaction should be reviewed and appropriate protective action taken. (Ref. Section 3.10.2.5.)

b. Significant Finding

None

c. Conclusion (Section 3.10.2.5) (applicable portion)

MCC 72C-3A, apparently located in a hazardous environment, requires additional protection for water spray and a review of its seismic qualifications due to possible interaction from stairway landing.

3.23.2 Edison Response to Recommendation No. 23

a. Discussion

1. Environmental Protection (water spray)

Water entry into motor control centers and electrical cabinets has been a long-standing, generic concern of Edison at all Edison power plants. At Fermi 2, MCCs and electrical cabinets that are located in the proximity of water have water stops or seals installed for cables entering on the top or sides of the cabinets. To date, there have been approximately 12,000 such seals installed and the work is just now in the final stages of completion. Edison recognized that, in addition, MCC 72C-3A required additional protection by providing a shield to protect it from potential water spray.

As part of the pipe break (or crack) outside containment evaluation program, Detroit Edison has evaluated the effects of piping leakages and spray on

essential MCCs in the reactor and auxiliary buildings. The results of the pipe break evaluations are reported in Appendix C of the Fermi 2 FSAR. The evaluation included a functional review to determine which plant motors/systems would be adversely affected if an MCC was assumed to be lost due to water leakage or spray from nearby pressurized lines. The functional evaluation also conservatively included a single active failure assumption, in addition to any adverse effects caused by the water leakage or spray. The objective of the evaluation was to ensure that the consequences of water leakage and spray would not prevent a safe shutdown of the plant.

The MCCs which serve essential equipment motors are provided with NEMA 12 cabinet enclosures. NEMA 12 enclosures are classified as drip tight, i.e., the top of the enclosure is equipped with a drip pan which extends beyond the sides of the MCC cabinet. Uniformly distributed spouts are provided in the pan to prevent water accumulation and drainage down the cabinet faces. For a cabinet to be classified as drip tight, no water can enter the enclosure during expected piping leakage. Therefore, for Fermi 2, water leakage would not adversely affect the essential MCCs, and only the effects of direct spray impingement on the control panel faces of the MCCs need to be further evaluated.

A spray impingement evaluation was conducted by identifying the system fluid and operating pressure of the lines near each of the essential MCCs and determining if a postulated crack in any one of the pipes would result in spray impingement on the MCC panel surface. It was assumed that direct spray impingement would functionally disable the MCC. The evaluation concluded that MCCs 72F-4A, 72C-F, 72C-3A and 72F-5A needed protection from the unlikely effects of spray impingement.

2. Seismic Interaction

In areas of the plant where interaction between safety-related and nonsafety-related structures or components could occur during a seismic event, the design made provisions for proper seismic support of the nonsafety-related structures or components to prevent this occurrence. The stairway in question was designed to satisfy Seismic Category II-over-I criteria.

b. Action

1. Water Spray Protection

MCC 72F-4A is located on the second floor near the south wall of the reactor building. The MCC has control panel surfaces on the north and south side of the cabinet. However, only the north panel surface can be affected by spray impingement. The north panel surface will be protected by installing an enclosure. The enclosure will be tall enough to prevent spray impingement from lines which are at elevations above the MCC. Adequate walkway space will be maintained to allow for required surveillance and maintenance activities on the MCC.

MCC 72C-F is located on the second floor near the west wall of the reactor building. The MCC control panel surface is on the east side of the cabinet. The lines which could spray the control panel surface are located essentially above and on the northern side of the MCC. The panel surface will be protected by installing a partial metal enclosure. Adequate lighting and walkway space will be maintained to allow for required surveillance and maintenance activities. A relatively low pressure building heating steam line is also located behind this MCC. The MCC cabinet will be protected to prevent steam impingement in the event of a leak of this line as well.

MCC 72C-3A is located on the second floor near the north wall of the reactor building. The cabinet is oriented in the north-south direction with the control surface on the west side. Pipe lines which could affect the MCC are located directly above and on the west and south sides. To clarify the original CAT observation, Detroit Edison notes that while there are EECW lines in the vicinity nearby MCC 72C-3A, there are no EECW lines directly above it. The two lines which are directly above this MCC are from the demineralized water system and fire protection system. The drip pan on top of the MCC will provide adequate protection from the lines located directly above. Because of airleway space limitations, the control surface of the MCC will be protected by a curtain/screen directly in front of the panel surface.

MCC 72E-5A is located on the first floor near the south wall of the reactor building. The cabinet is oriented in the east-west direction with control panels on both the north and south sides. On the south side of the cabinet, there are only a few lines running in a vertical direction between floors, which could spray the control surface. A partial shield will be installed to appropriately deflect any spray from these lines. The north side of the MCC cabinet could be subjected to spray from a number of lines. The control surface will be protected by an enclosure. The enclosure will be similar to the one described for MCC 72F-4A.

MCC 72B-3A is located on the first floor near the northeast corner of the reactor building. The cabinet is oriented in the east-west direction with control panels on both the north and south sides. Only a small section of the cabinet grouping is used to control essential equipment motors. The lines in this region of the building are at relatively large distances away from the MCC. Adjacent structures and components would also obstruct the spray path. Therefore, it has been concluded that the essential portions of the MCC control surfaces will not be directly sprayed upon and nothing further needs to be done.

NOTE: All enclosures or other protective barriers will be designed to meet seismic requirements.

2. Seismic Interaction

Although the stairway in proximity of MCC 72C-3A has been properly designed for seismic requirements, it was considered prudent to provide some clearance between the stairway and the MCC. A design change has been issued to accomplish this.

c. Resolution

The above actions fully address the subject matter of Recommendation No. 23.

3.24 RECOMMENDATION NO. 24

3.24.1 Duke Recommendatin No. 24, Associated Significant Finding, and Associated Results and Conclusions

The following are taken from applicable portions of the Duke Final Assessment of Construction report.

a. Recommendation No. 24

A comprehensive review of the identification of electrical equipment should be undertaken to assure that proper identification has been provided to all safety-related equipment. As a minimum, an inspection of a sampling of equipment on the order of that covered by the CAT assessment should be undertaken. The results of this inspection plus that of the CAT team should be utilized to determine if this is a generic problem and what action needs to be taken. (Ref. Sections 3.10.1.4, 3.10.1.5, 3.10.2.4, 3.10.3.5, 3.12.1.4, 3.12.1.5, 3.12.2.4 and 3.14.1.4.)

b. Significant Finding

None

c. Results or Conclusions (applicable portions only)

1. Result (Section 3.10.1.4, Item 1)

The installation of nameplates on the switchgear had not been completed. The nameplate for 64C switchgear had been affixed to the rear of the switchgear. The installation of white device nameplates had not been completed on portions of the 64C switchgear.

2. Result (Section 3.10.1.4, Item 2)

Compartment E10 is the power source for Division II Core Spray Pump Motor B as shown on Figure 3.10.1 [of the Duke report].... The switchgear was properly identified with blue nameplates, however, the installation of white device nameplates on each compartment door had not been completed.

3. Conclusion (Section 3.10.1.5)

The 4160V switchgear reviewed were installed as required by the design documents. Various minor deviations were noted including missing/misplaced

nameplates, incorrect resistor wattage, and drawing deviations. However, it is felt that none of the deviations would have prevented proper operation of the equipment.

4. Result (Section 3.10.3.4)

...Other minor deviations included a missing cable tag, missing nameplates on terminal boxes and doors...

5. Result (Section 3.12.1.4, Item 1)

The [Diesel Generator #13 Fuel Transfer Pump B Motor] is located in the RHR complex.... No nameplate was located on the motor lead box. With the exception of the nameplate on the lead box, this motor appeared in excellent condition.

6. Result (Section 3.12.1.4, Item 3)

Both motors [Core Spray Motors B and C (4160V, 800 HP)] had identification deviations. For example, Motor B utilized a black nameplate on the lead box instead of a blue nameplate designating Division 2 and Motor C did not have a nameplate attached (this created confusion and a delay in the assessment since it could not be determined if the motor was A or C). During the assessment, a black nameplate was attached, however, the nameplate should have been orange designating Division I. Other identification deviations noted with Motor C included no tag on the motor heater cable (should have been tagged 201271B-OP), and the conduit containing the main power cables to the motor was not marked with Division 1 markings.

7. Conclusion (Section 3.12.1.5)

Identification was a concern in all four motors assessed. It is recommended that all safety-related motors be inspected to assure that the required identification is provided.

8. Result (Section 3.12.2.3)

Four EMOVs were evaluated for installation adequacy...

Additionally, the valves were checked to determine if

they were adequately tagged for identification and the wiring and cabling at the point of termination was in compliance with the separation requirements. [Cable 214660-B-1P] did not have an identification tag at the valve.

9. Result (Section 3.14.1.4)

A nameplate (item 405) on COP insert H11-P601B511 did not agree with the engraving drawing. The valve number on the nameplate should have an "A" suffix which was not present.

3.24.2 Edison Response to Recommendation No. 24

a. Discussion

Edison has only committed to labeling panels and racks associated with RPS, safe shutdown, and ESF systems. Additionally Edison Specifications 3071-128-EH and 3071-33 also address the identification of these panels and racks.

Although Fermi 2 is only committed to the identification of those panels and racks stated above, Edison understands the importance of equipment labels for use during operation and maintenance activities and has developed a program to ensure that all major pieces of equipment are identified with labels. This program is contained within Plant Order EFP-1066, Identification of Fermi 2 Components. As stated in EFP-1066, prior to commercial operation, "Those components required in the operation of Fermi 2 will either have a proper identification label affixed to it or corrective action will be initiated" to take care of all deficient labels.

b. Action

Actions have been taken to correct the tagging or identification deficiencies identified during the construction assessment. The implementation of Plant Order EFP-1066 will rectify any other deficiencies.

c. Resolution

The actions taken and the program that is in place provide a full response to Recommendation No. 24.

3.25 SIGNIFICANT FINDING NO. 20

3.25.1 Duke Significant Finding No. 20 and Associated Conclusion

The Duke Final Assessment of Construction report contains no recommendations directly related to Significant Finding No. 20. To ensure a complete response to the items identified in the Duke report, Significant Finding No. 20 and its associated conclusion are presented. The Edison response to the finding is provided in Section 3.25.2.

a. Recommendation

None

b. Significant Finding No. 20

The specific gravity has not been maintained at the required level.

c. Conclusion (Section 3.10.3.5)

The high specific gravities should be lowered to within the recommended range specified by the manufacturer.

3.25.2 Edison Response to Significant Finding No. 20

a. Discussion

The batteries in question are the Division I 260/130 VDC batteries. Normally, the specific gravity concentration should be between 1.210-1.220. At the present time, the specific gravity is between 1.240-1.260.

b. Action

The required Engineering Evaluation Request was prepared to resolve the high specific gravities identified by the CAT. A memorandum was sent to the supplier requesting its recommendations. Specific items to be adressed include the effect of high specific gravity on battery life, reliability and service.

c. Resolution

Discussions thus far with people knowledgeable on battery design and performance indicate that direction will be given to continue using the batteries in their present condition. The response fully addresses the subject of Significant Finding No. 20.

4.0 EDISON CONCLUSION

The results of the Fermi 2 Final Construction Assessment have been thoroughly analyzed by Detroit Edison; Edison believes it is effectively responding to the findings, conclusions, and recommendations from the Duke Power Company Final Assessment of Construction Report.

With the past audits, inspections, independent reviews and now the Duke Power Company Final Construction Assessment, Edison concludes that there is adequate confidence that Fermi 2 has been constructed as designed and can be operated safely and reliably.