DETROIT EDISON COMPANY

FERMI 2

FINAL ASSESSMENT OF CONSTRUCTION

DUKE POWER | MANAGEMENT AND TECHNICAL SERVICES

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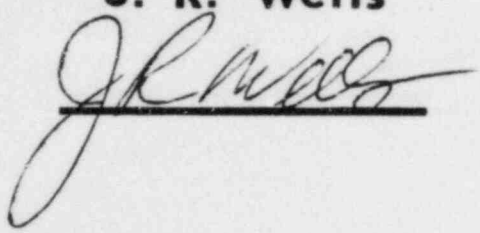
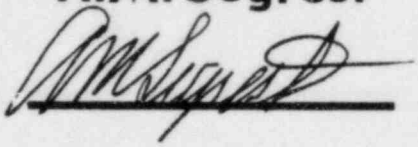
Project Team Leader
J. R. Wells



Project Manager
A.M. Segrest



Assessment Conducted & Report Prepared by

Duke Power Company
Managent and Technical Services
422 South Church Street
Charlotte, N. C.
July 1984

DETROIT EDISON COMPANY

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FINAL ASSESSMENT OF CONSTRUCTION

This is to certify that I, James R Wells, have reviewed the subject recommendations included in the construction assessment report herein and find them to be complete and in conformance with generally accepted industry practice.

(Seal)

Signature: James R Wells

Name: James R. Wells
Registered Professional Engineer

PE Number: North Carolina 2517

Date: 7-27-84

ABSTRACT

This Duke Power Company Construction Assessment Team report presents the results, conclusions and recommendations of the Independent Final Construction Assessment of Fermi 2 Nuclear Power Plant conducted during the period of June 4, 1984 through July 13, 1984. This assessment was primarily on the hardware with a limited review of records in certain defined areas. Independent measurements, inspections, nondestructive tests and other types of physical examinations were utilized in the conduct of this assessment. All critical parts of the plant were covered as described in the assessment plan which was submitted to Detroit Edison and the U.S. Nuclear Regulatory Commission prior to the beginning of the field work.

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1.0 EXECUTIVE SUMMARY

1.1 Introduction

The Fermi 2 plant is being built by Detroit Edison Company and is scheduled for fuel load in late 1984. During the period of construction, the work was under the Detroit Edison Quality Assurance Program. In addition to the oversight provided by the Detroit Edison QA program, there were a number of other audits, inspections, evaluation and assessments made. These include regular NRC inspection, contractor QA and QC audits and inspections, and some third party assessments. Since construction of the plant is virtually complete and the pre-operational testing is well underway, it was deemed advisable to have a Final Assessment of Construction.

1.2 Purpose

The purpose of this Final Assessment of Construction was to:

(1) Make a final walkdown of a sample of the safety related structures, systems and components to determine the final status.

(2) Determine if there are any significant deviations from the final design disclosure documents.

(3) Perform a review of certain quality related records and design change documents

(4) Review certain previous third party assessments to determine their value as part of this final assessment.

(5) Make recommendations, as appropriate, for actions that need to be taken as a result of this assessment.

1.3 Assessment Team

The assessment was conducted at Fermi 2 from June 11, 1984 through July 13, 1984. Preparation for the assessment began on June 1, 1984. The assessment plan was presented to Detroit Edison and NRC representatives on June 11, 1984. The time between July 13 and July 31 was used to prepare the final report which was submitted on July 31, 1984.

The assessment was done by the Management and Technical Services Division of Duke Power Company. The team consisted of engineers, technicians, and inspectors representing all disciplines. The team consisted of members with design, construction and inspection backgrounds.

Detroit Edison provided technical personnel to assist the team in obtaining design documents and the location of system and components in the field. Detroit Edison also provided qualified personnel to

perform some of the tests and inspections. All of this work was, however, under the control of and directed by the assessment team. The team made the decision on what to inspect or test and evaluated the results. None of the team members have had any prior association with the Fermi 2 project.

The NRC had an observer present during the entire period of the evaluation.

1.4 Concepts and Methods

The basic concept of the assessment was to do a walkdown of selected structures, systems, and components using the final design disclosure documents furnished by Detroit Edison. No attempt was made to determine the accuracy of these documents. In addition, selected quality records were reviewed. The walkdown included visual inspections by experienced engineers with both design and construction experience and independent measurements, tests, and examinations by these engineers and certified inspectors. The independent measurements consisted of nondestructive examinations when it was appropriate to employ them. The final assessment at Fermi 2 was essentially a hardware inspection to verify that the product was in conformance with the design document. Minimal reliance was made on the procedural and record aspect of the project. In this way a direct indication of quality and conformance with design was provided.

The Fermi 2 Nuclear Power Plant is composed of various structures, systems and components which were designed and erected over a relatively long period of time by different organizations. The assessment team selected for review a cross-section of items which represented the various phases of construciton, different erection contractors and the several disciplines involved.

The record review and evaluation of other third party assessments was done to supplement the field work and provide some confidence in the records.

1.5 Conclusions and Signficant Findings

The following significant findings and conclusions resulted from this assessment:

(1) The team concluded that supports for piping systems and cable tray are of acceptable quality and there are no significant deviations from the design.

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

(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.

(4) The team concluded that the concrete expansion anchors had no significant deviations from design.

(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.

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

(7) Except for a honeycomb area around a watertight door, the team concluded that the concrete was of acceptable quality. Windsor probe tests indicated strengths considerably above design requirements. A careful visual inspection of 4 different areas identified no significant deviations.

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

(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.

(10) 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.

(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.

(12) Hardness tests performed indicated that the materials installed meet design requirements.

(13) The team concluded that the piping systems are erected with no significant deviations. NDE performed showed no deviations from requirements.

(14) Based on a complete review of sample of welding procedures, it was concluded that welding requirements have been met.

(15) The team concluded that the mechanical equipment was installed and has been maintained in an acceptable manner. While the exterior surfaces are dirty and need some repainting, the

interior of the equipment has not deteriorated during the time of installation.

(16) The HVAC systems were determined to have no significant deviations.

(17) The mechanical instrumentation is of acceptable quality.

(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.

(19) The 480 volt motor control centers have not been kept clean. Some of the fusing does not meet design requirements.

(20) The batteries have been installed as required by the design. The specific gravity has not been maintained at the required level.

(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.

(22) There was some signficant deviation of the cable in the trays. This is fully described in Section 3.11.2.4.

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

(24) The thermal shields meet requirements.

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

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

(27) Review of QA records and design changes did not disclose any signficant deviations except for the retrievability time of records and length of time for outstanding design change paper.

(28) The third party assessment of pipe supports by Stone and Webster and the record review by MAC was found to agree with the team's evaluation. The review of the other third party assessments was inconclusive.

1.6 Recommendations

The recommendations of the team are contained in Section 6.0 of this report.

1.7 Final Conclusion

It is the opinion of the team that when all of the potential findings, as reported on CAT-1 forms are resolved and the recommendations are implemented there will be reasonable assurance that no significant deviations from the final design disclosure documents will exist.

2.0 INTRODUCTION

2.1 General

This report documents the final assessment of construction made for the Fermi 2 plant of Detroit Edison Company. The assessment was made by Duke Power Company during the period June 1, 1984 through July 13, 1984.

Fermi 2 is a 1100 MW Boiling Water Reactor being built by Detroit Edison Company. Construction of the plant is essentially complete and fuel loading is scheduled in 1984. Figure 2.1.1 gives a plot plan of the plant area. Figure 2.1.2 gives a transverse section of the General Plant Layout. The work is being done in accordance with "Specification for Fermi 2 Final Assessment of Construction" Rev. 4, dated May 17, 1984. An assessment plan was developed and presented to Detroit Edison and the NRC on June 11, 1984. This plan was officially submitted to the NRC by Detroit Edison on June 18, 1984.

2.2 Purpose

The purpose of this assessment was to make a final review of safety-related systems and structures in the Reactor, Residual Heat Removal Complex and Auxiliary Buildings to determine if significant deviations from the final design disclosure documents exist that were not detected during previous walkdown assessment, inspection or testing activities. This assessment is to provide reasonable assurance that the plant is constructed in accordance with the final design disclosure documents or recommend necessary action to be taken to gain this assurance. A review of some records were made. In particular a review was made of the core spray system records. Other selected records were reviewed. An evaluation was made of some previous third party assessments to establish their value to the overall assessment of the project.

2.3 Scope

There was an initial agreement made with Detroit Edison Company and the NRC that ASME code piping welds which required radiography would be excluded from this assessment. During the assessment, it was also agreed by all parties to exclude metallographic examination of stainless steel pipe. Based on this agreement none of these welds were reviewed. With these exceptions a sample of all significant safety-related items were evaluated.

2.4 Construction Assessment Team

The team consisted of 19 members either full or part time. Appendix 1 is a listing of the team members. The team members were selected to ensure a broad background of expertise. All are engineers, technicians, or inspectors with significant experience in the design and construction of nuclear power plants. Twelve members of the team are engineers, 3 are technicians, and 4 are ANSI N45.2.6 certified inspectors. Fourteen members have a field construction background and 5 have a design background. All of their

resumes were submitted to Detroit Edison and the NRC observer. The utilization of some Quality Control Inspectors proved to be a very beneficial aspect of the assessment.

Independence of the evaluation was assured because no team member had ever worked on the project in any capacity. There was no prior review by any team member in any of the Fermi 2 work.

2.5 Hardware Evaluation

The assessment plan was developed to focus on the evaluation of the hardware with a minor emphasis on certain records and evaluation of previous third party assessments. Sufficient portions (samples) of safety-related systems, subsystems and components were selected to provide confidence in the parts of the plant not inspected. The items for review were selected by the team with no influence from Detroit Edison or their contractors' personnel. The systems selected included Mechanical, Electrical and I&C Systems and Subsystems, attached structural supports for these systems, and steel structures with emphasis on the drywell locations. The attributes selected to be verified were based on the experience of the team members with input from the NRC observer on significant deficiencies discovered at other construction sites. The methodology selected was dependent on the item being reviewed. As appropriate, checklists were prepared for the inspections and walkdowns. An example of a checklist is shown in Appendix 2. Items for review were selected to represent the total time span of construction, thus ensuring that a number of contractors' work was reviewed. Most of the work selected had a number of design changes associated with it.

2.6 Records Evaluation

The Core Spray System was selected for a detailed record review. These records were reviewed for completeness and accuracy. Soils records for the backfilled trench between the RHR Building and the Reactor Building were selected for review. In addition certain other records were reviewed for work which was also walked down.

2.7 Review of Third Party Assessments

As part of the on-going work, Detroit Edison had some third party assessments done in the past. Some of these were reviewed to establish their validity. A sample of the previous work was re-done by the team to determine how much value could be placed on these assessments by this final assessment. Six of these previous assessments were chosen for review.

2.8 Assumptions

The information presented to for use in this assessment was provided by Detroit Edison Company. It includes design information generated by Detroit Edison Company and its several contractors, A&E firms, and suppliers of hardware. No attempt has been made to verify the accuracy of this information. The final design disclosure documents are defined as those documents that were used to build the plant or the "as-built" docu-

ments that were reviewed and approved by Detroit Edison Company as being adequate.

2.9 Interim Reports to Detroit Edison Company

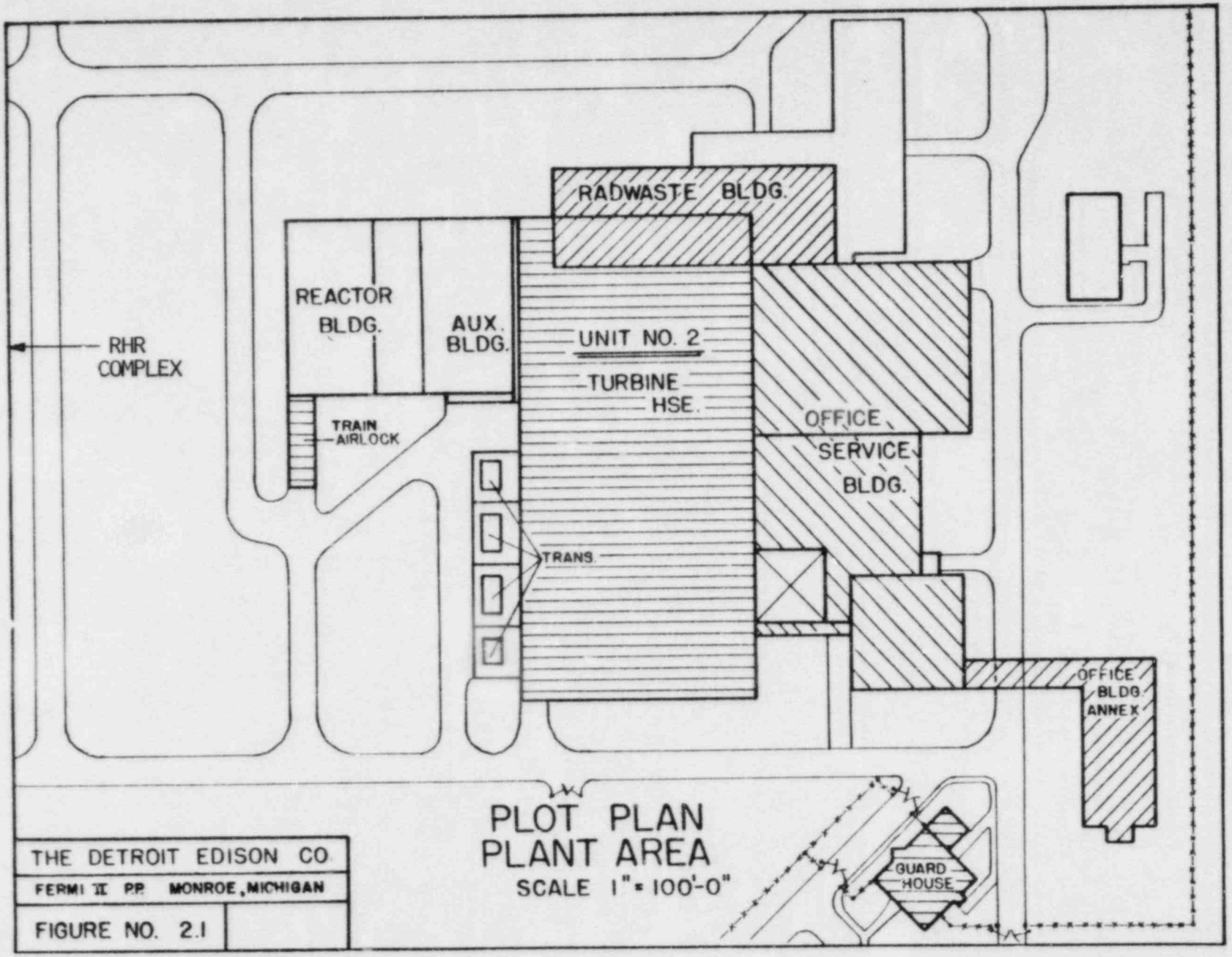
During the assessment, certain items were brought to the attention of Detroit Edison Company. These items were either categorized as potential findings or assessor concerns. The assessment team documented these items on CAT-1 forms. An example is shown in Appendix 3. The potential finding is defined as an item that does not conform to the final design disclosure document. The assessor concern is defined as an item which conforms to the design document but does not appear to be correct in the judgement of an experienced engineer. A listing of these potential findings and assessor concerns is shown in Appendix 4.

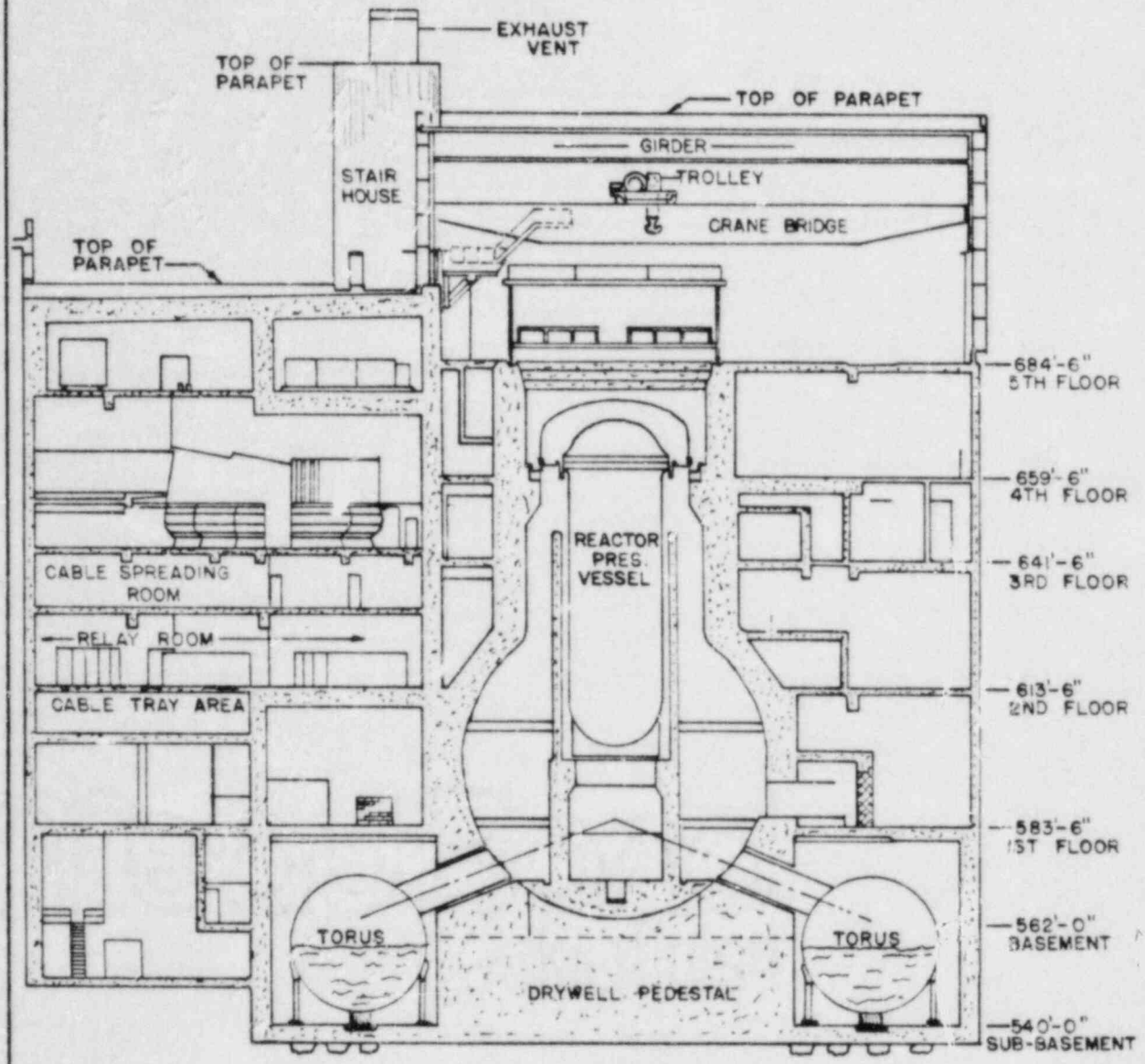
In addition to those two methods of reporting items to Detroit Edison, daily briefings were made to the project management. In all cases, the NRC observer was in attendance at all meetings.

2.10 Documents and Report

This report constitutes the official documentation of the results of this assessment. The Conclusions and Recommendations are summarized in Section 6. More detail is included in the body of this report. No attempt has been made to include all references in the appendices. All references cited are available through libraries, technical societies, or industry publications.

The period of this assessment was from June 1,1984 to the presentation of the final report on July 31, 1984.


RADWASTE BLDG.
REACTOR BLDG.
AUX. BLDG.
UNIT NO. 2
TURBINE HSE.
RHR COMPLEX
TRAIN AIRLOCK
OFFICE SERVICE BLDG.
TRANS.
OFFICE BLDG. ANNEX
GUARD HOUSE
PLOT PLAN
PLANT AREA
SCALE 1" = 100'-0"
THE DETROIT EDISON CO
FERMI II P.P. MONROE, MICHIGAN
FIGURE NO. 2.1



TRANSVERSE SECTION

GENERAL PLANT LAYOUT	THE DETROIT EDISON CO.
	FERMI II P.P. MONROE, MICH.
	SYSTEM COMPLETION ORGANIZATION
	FIGURE NO. 2.1.2

3.0 HARDWARE EVALUATION

3.1 Supports and Restraints

3.1.1 Pipe Supports

3.1.1.1 Purpose

Pipe supports were inspected to assure that the supports were erected in accordance with the latest Design Disclosure Documents.

3.1.1.2 Criteria

(1) Detroit Edison Project Specification 3071-31, Appendix F

(2) Power Piping Catalog for Supports (77)

(3) NPS Catalog, NPSI-81

(4) PSA Catalog, PSA-4

(5) Applicable Supports Sketches

3.1.1.3 Items Evaluated

A total of 51 pipe supports were randomly selected for inspection. The supports included large and small bore piping systems. These supports were given a general inspection for 1) Location, 2) Configuration, 3) Material Conformity, 4) Damage, 5) Expansion Anchors and 6) Quality of Welding. Special components such as variable and constant support springs and mechanical shock suppressors were compared to the design sketch and latest available catalog.

In addition to the above, 8 mechanical and 2 hydraulic shock suppressors were disconnected from their installed position in the field and stroked through their travel range twice (see Photograph 3.1.1).

The review of concrete expansion anchors was limited to size, edge distance, type, baseplate bearing and surrounding concrete. Additional checks on expansion anchors are covered in section 3.1.5 of this report.

Table 3.1.1 provides a summary of the pipe supports evaluated.

Table 3.1.2 provides a summary of the stroking of mechanical and hydraulic shock suppressors.

3.1.1.4 Results

The location of supports relative to pipe and building structure were as specified on the design drawings. No problems were

identified with material conformity, or sizing of special components (i.e. variable and constant springs, shock-suppressors). All mechanical and hydraulic shocks were found to be in an acceptable condition. Several minor configuration problems were identified (see Notes 1-13 in Table 3.1.1). Usage of vendor catalogs to verify standard components was very difficult. Several catalog part dimensions did not match support sketches.

3.1.1.5 Conclusions

On the basis of this evaluation, there were no significant deviations from the design documents for pipe supports. A concern continues to exist with the control of vendor catalogs used to verify standard component parts. The deviations encountered with the vendor catalog were minor in nature and judged insignificant to the structural intregrity of the supports.

3.1.2 Cable Tray Supports

3.1.2.1 Purpose

Cable tray and conduit supports were inspected to assure that the support was erected in accordance with the latest design disclosure documents.

3.1.2.2 Criteria

(1) Detroit Edison Project Specification 3071-128-ED "Electrical Engineering Standards" (Conduit Supports)

(2) Detroit Edison Project Specification 3071-128-EB "Electrical Engineering Standard" (Tray Supports)

(3) Applicable Design Documents

3.1.2.3 Items Evaluated

A total of 56 supports were inspected in this evaluation. Forty-six cable tray supports were randomly selected in nine areas of the plant listed below. Ten conduit supports were randomly selected in six of the areas of the plant.

Area Name	Site Nomenclature
Upper Cable Spread Room	QUEENIE
Lower Cable Spread Room	JADA
Cable Tray Room	RITA
Relay Room	NANCY
Residual Heat Removal Complex	RHR
Reactor Building Basement	BOBO
Reactor Building First Floor	CHARLES
Reactor Building Subbasement	ADAM
Drywell	Drywell

Table 3.1.3 provides a summary of the supports inspected.

3.1.2.4 Results

There were no significant deviations from design documents identified in the 56 supports inspected. Each support was inspected for general location in building, configuration, applicable hardware, quality of tray attachment welds, proper anchorage, structural weld quality, workmanship, damage, and the adequacy of adjacent tray splices. Minor items identified are documented on Table 3.1.3. Although the team found the supports to be in an acceptable condition, the volume of the change paper required to inspect the supports was excessive. Contract personnel from Detroit Edison were familiar with this change paper and provided timely answers to questions which arose during the field inspection.

3.1.2.5 Conclusions

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.

3.1.3 HVAC Supports

3.1.3.1 Purpose

HVAC supports were inspected to assure that the supports were erected in accordance with the latest design disclosure documents.

3.1.3.2 Criteria

(1) Detroit Edison project Specification 3071-174, "Erection of Ventilation and Air Conditioning Systems for Reactor, Turbine Radwaste Buildings, Control Center Complex and RHR Complex"

(2) Applicable Design Drawings

3.1.3.3 Items Evaluated

The scope of this evaluation covered 10 HVAC supports. Eight supports were randomly selected in the drywell and two supports in the control room. The supports were inspected for 1) Quality of Welding, 2) General Condition of Steel, 3) Material Identification, 4) Fabrication/Workmanship, 5) Fit-Up of Members, 6) Size, Orientation and Dimension of Members, 7) Member Location, 8) Location of Support along Duct, and 9) Connections.

Table 3.1.4 is a summary of the supports inspected.

3.1.3.4 Results

During the evaluation several problems were identified. Design drawings which apply to HVAC Support 4134-40 had conflicting details. Drawing 6M721-4385 section F-F does not agree with drawing 5S721-3060 section 4-4.

Several supports which were evaluated either had missing members or members added that were not shown on the support drawing. HVAC Support 4130-73 had a 4"x4"x3/4" angle brace and baseplate missing. This support had four 7/8" dia. bolts, one 12"x6"x3/4" plate and two 3"x3"x1/4" angle stiffeners added that were not shown on sketches. HVAC Support 6M-2819-62 had a 2 1/2" x 2 1/2" piece of angle added that was not shown on drawing and HVAC Support 6M-2850-77A had a 4"x4"x1/8", 12" long piece of angle added not shown on drawing.

In addition, HVAC Support 4130-32 had DCR H889 written against it. This DCR requires a piece of 3"x3"x3/8" angle to be relocated. This work was not performed.

3.1.3.5 Conclusions

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 members 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.

3.1.4 Pipe Whip Restraints

3.1.4.1 Purpose

The purpose of this evaluation was to compare the as-built condition of pipe whip restraints to the latest design disclosure documents.

3.1.4.2 Criteria

(1) FSAR Section 3.6, "Protection Against Dynamic Effects Associated with the Postulated Rupture of Piping Inside Containment"

(2) Wismer & Becker Procedure, WB-C-122

(3) Detroit Edison Project Specification, 3071-227

3.1.4.3 Items Evaluated

This evaluation covered detailed inspections of 6 pipe whip restraints and 2 system walkdowns. One walkdown covered a selected portions of the whip restraints on the Core Spray System. Another walkdown covered a selected portions of the whip restraints on the Reactor Feedwater System.

Pipe whip restraints were inspected for 1) identification quality of welding, 2) general condition of steel, 3) fabrication/workmanship, 4) fit-up of members, 5) size, orientation, dimension of members, 6) member location, and 7) connections. Material for whip restraint, steel is covered in Section 3.5, "Material Testing."

Table 3.1.5 is a summary of the 6 whip restraints inspected along with the 2 walkdowns.

3.1.4.4 Results

While performing this evaluation several pipe whip restraints were found to have missing cotter pins and one whip restraint was disconnected from its structural attachment (see Photograph 3.1.2). Detroit Edison advised that piping insulation was put up after the whip restraints were installed. Some restraints had to be disconnected to insulate the pipe and apparently not all the whip restraints were replaced correctly.

During the evaluation of welding on a General Electric supplied whip restraint, it was discovered that 1/2" fillet welds were installed rather than full penetration welds as required by the GE drawing (see Figure 3.1.1).

In addition to the detail inspection of 6 whip restraints, a walkdown was performed on two systems. During the walkdown of a portion of the Core Spray System, it was discovered that the field location of 2 whip restraints (CSR1AA and CSR18A) did not match the location as shown on drawing (6M721-3053-2).

3.1.4.5 Conclusions

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.

3.1.5 Concrete Expansion Anchors

3.1.5.1 Purpose

The purpose of this review was to evaluate concrete expansion anchor installations to the latest design disclosure documents.

3.1.5.2 Criteria

Detroit Edison Project Specification 3071-226, "Purchase and Installation of Concrete Anchors Enrico Fermi Power Plant."

Detroit Edison Drawings 5C721-2002 and 5C721-2003 "Wedge Anchor Standard Details" and "Special Conditions - Wedge Anchor Installations."

In addition, a length code identification chart was used which was obtained from Detroit Edison Procedure WP-I-01.

3.1.5.3 Items Evaluated

While performing this evaluation, 50 connections were checked that utilized concrete expansion anchors as their primary attachment to the building structure. These anchors were checked for 1) Type, 2) Proper Torque, 3) Size, Spacing and Perpendicularity, 4) Embedment, 5) Full Thread Engagement, 6) Bearing, 7) Surrounding Concrete, 8) Hole Examination, 9) Damage, 10) Ultrasonic Test for stud length. Table 3.1.6 is a breakdown of the areas and number of connections that were inspected.

Within each of these areas, the review covered a variety of structural supports which utilized expansion anchors as their primary connecting device. Table 3.1.7 is a summary of the support installations inspected.

3.1.5.4 Results

During the evaluation of the 50 expansion anchor connections, the team found that several anchors had considerably higher torque values than that shown on the latest revision of Drawing 5C721-2002. From the evaluation, it was determined that the high torque values could be caused by 1) baseplate bearing against anchor, 2) grout seepage in hole of baseplate and in threads of anchor, or 3) high

installation torque values which were allowed by earlier revisions of Drawing 5C721-2002 (see Photographs 3.1.3 and 3.1.4.).

Expansion anchor projection was measured before and after applying torque. Several of the larger anchors showed movement in projection when nut turned, the smaller anchors did not. An evaluation of the baseplate hole and expansion anchor was performed on several anchors when movement was not detected. No problems were identified.

Ultrasonic examination was performed on the 50 expansion anchors to verify length. From the 50 checked there was difficulty verifying the length of some 3/8" diameter anchors. A rough edge on the end of these anchors would not produce an acceptable UT reading. However, the UT results obtained showed the expansion anchor lengths to be acceptable (see Photograph 3.1.5). Subsequent minimum embedment was checked and found to be acceptable.

3.1.5.5 Conclusions

On the basis of the evaluation of 50 expansion anchor connections, no significant deviations from current design disclosure documents were identified. It was concluded that expansion anchor installations conform to the requirements with only minor deviations.

TABLE 3.1.1

Pipe Support Summary

Support Identification System	ISO	Support #		Pipe Size	Comments
E11	3164	G06	*	12"	CAT Form 84, See Note 1
E21	3147	G38	*	12"	
E21	3147	G36	*	12"	
E11	4612	G03	*	6"	
P44	3048	G18	*	4"	
N30	3259	G68		24"	CAT Form 83, See Note 2
N21	3137	G13		24"	
N30	3259	G04		24"	CAT Form 80
N30	3259	G73		32"	CAT Form 81, 82, See Note 4
E11	2179	G14	*	16"	
E11	2179	G13	*	16"	CAT Form 67, See Note 5
E11	2179	G15	*	16"	
E11	2179	G20	*	16"	
E11	2179	G18	*	16"	
E41	3172	G17	*	10"	
E41	3172	G11	*	10"	
E41	3172	G13	*	10"	
E41	3172	G12	*	10"	
E41	2183	G07		24"	
E41	2183	G17		18"	CAT Form 64, See Note 6
E11	2183	G06	*	18"	
E11	2183	G05	*	18"	
E11	2183	G02	*	24"	
E11	2183	G16	*	18"	
E41	3172	G16	*	10"	
E11	3159	G11		12"	
C41	2340	G11	*	1 1/2"	CAT Form 43, See Note 7
E21	3147	G21	*	12"	CAT Form 44, See Note 8
C41	2979	G01		2"	
C11	3240	G11		9"	
E11	4612	G01	*	6"	
E11	3159	G06	*	12"	
E21	3144	G06	*	14"	
C41	2979	G07	*	1"	
E11	4251	G08	*	2 1/2"	CAT Form 46, See Note 8
E11	4239	G01		8"	
E41	2297	G01	*	10"	
B21	2297	G08	*	10"	
WP44	2183	G10		2"	CAT Form 20, See Note 10
E21	3052	G01	*	12"	
E21	3052	G03	*	12"	
E21	3052	G09	*	12"	
C41	3361	G06	*	3"	
C11	3240	G09		9"	
E51	3174	G12	*	4"	

TABLE 3.1.1 (Cont'd)

Pipe Support Summary

Support Identification System	ISO	Support #		Pipe Size	Comments
E21	3144	G08	*	14"	CAT Form 42, See Note 11
N30	3259	G83		24"	CAT Form 51, See Note 12
E11	4251	G18	*	2 1/2"	CAT Form 34, See Note 13
C41	2340	G06	*	1 1/2"	
E11	3519	G10b	*	6"	
E21	3053	G04	*	12"	

*These supports were inspected in the third party assessment by Stone and Webster Michigan, Inc..

B21 Nuclear Boiler System
C11 CRD Manual Control System
C41 Standby Liquid Control System
E11 RHR and LPCI Flush
E21 Core Spray System
E41 High Pressure Coolant Injection
E51 Reactor Core Isolation Coolant
N21 Feedwater System
N30 Turbine Steam
P44 Emergency Equip. Cooling Water

NOTE 1: No revision level given for DECo sketch SK3M2331.

NOTE 2: Dimension of pipe clamp installed varies from 1981 NPS catalog.

NOTE 3: Clamp dimension not as specified by power piping catalog.

NOTE 4: Cold load setting of variable support is less than what is specified on sketch. Clamp spacer is missing also.

NOTE 5: Strut is binding and will not rotate.

NOTE 6: Strut is binding and will not rotate.

NOTE 7: Fillet weld on Mech. Snubber not 3/16" as required.

NOTE 8: Pipe clamp dimension not as specified by NPS catalog.

NOTE 9: Nuts for standard U-bolt not installed per design sketch.

NOTE 10: Field welding of support not performed to design sketch.

NOTE 11: Concrete anchor edge distance not per support sketch.

NOTE 12: Dimensions of pipe clamp do not support sketch.

NOTE 13: Strut rear bracket dimensions do not conform to NPS catalog.

TABLE 3.1.2

Snubber Stroking Summary

Support Identification	Size	Serial No.	Type	Comments
T23-12837-36-G13	PSA 1/4	22429	Mechanical	High Traffic Area
T23-12837-39-G43	PSA 1/4	12696	Mechanical	Remote Area
B21 2593 G03	PSA 10	9006	Mechanical	High Traffic Area
E11 2327 G07	PSA 35	9854	Mechanical	High Traffic Area Shock was protected with a wooden cover
E11 2299 G02	PSA 1/4	33740	Mechanical	Remote Area
C41 2340 G76	PSA 1/2	13164	Mechanical	Remote Area
E11 4611 G14	2" Bore 5" Stroke	810210	Hydraulic	Remote Area
E11 3161 G13	2 1/2" Bore 5" Stroke	830020	Hydraulic	Remote Area
E11 3161 G13	PSA 3	20957	Mechanical	High Traffic Area
E11 3147 G26	PSA 10	12817	Mechanical	Remote Area

TABLE 3.1.3 Cable Tray/Conduit Support Summary

Support #	Location*	Comments
QU 10HV1	UCSR	
QU 70H6	UCSR	
BB 12H1B	RBB	
BB 12H2C	RBB	
NA 13HV1	RR	See Note 1
BB 112H5A	RBB	
BB 112H4A	RBB	
BB 3H9D	RBB	
BB 3H9C	RBB	See Note 2
RI 13H30	CTR	
JA 7HV1A	LCSR	
2H08	DW	
2H07	DW	
2H09	DW	See Note 13
NA 14H8A	SCSR	See Note 3
JA 70H3	LCSR	
JA J0H1	LCSR	
JA 112H5B	LCSR	
JA 112H5A	LCSR	
NA 89H2B	RR	
JA 93HV2	LCSR	See Note 4
NA 33H2C	RR	See Note 5
112H3E	RHR	
112H3F	RHR	
RH 13H1	RHR	
RH 2H1	RHR	
RH 6HV7	RHR	
RH 2HV4B	RHR	See Note 6
RH 2HV5B	RHR	See Note 6
RH 2HV6B	RHR	See Note 6
JA 6HV1A	LCSR	
JA 6HV1B	LCSR	
JA 20H5A	LCSR	See Note 7
JA 20H5B	LCSR	See Note 8
JA 112H4B	LCSR	
JA 13H18	LCSR	See Note 9
JA 13H5A	LCSR	
JA 13H30	LCSR	
QU 115HV01A	UCSR	
QU 115HV01B	UCSR	
QU 70H7	UCSR	
CS NA203	RR	See Note 10
CS NA113	RR	
CS RI163	CTR	
CS RI173	CTR	
CS CC515	RBFF	
CS GG184	DW	
CS GG050	DW	
CS RHR369	RHR	See Note 11
CS AA014	RBSB	See Note 12

TABLE 3.1.3 Cable Tray/Conduit Support Summary (Cont'd)

Support #	Location*	Comments
CS RI3H4	CTR	
CC 40H2B	RBFF	
CC 112HV4A	RBFF	
CC 112HV4B	RBFF	

*LOCATION KEY:

UCSR - Upper Cable Spread Room
LCSR - Lower Cable Spread Room
CTR - Cable Tray Room
RR - Relay Room
RHR - Residual Heat Removal Complex
RBB - Reactor Building Basement
RBFF - Reactor Building First Floor
RBSB - Reactor Building Subbasement
DW - Drywell

NOTE 1: CAT Item #127 - Conduit installed on tray but not shown on drawing. No section "T" on Drawing 6E721-2809-23 but was referenced.

NOTE 2: CAT Item #111 - A 1" balance of plant conduit is located within 1/4" of the top support bracket. This is potential rattlespace problem.

NOTE 3: CAT Item #145 - Ceiling connection detail specifies wedge anchors; one anchor in each connect appears to be a self drill type.

NOTE 4: CAT Items #146, 147, 148 - South wall attachment not specified. Existing concrete wall attachment is a 13"x13"x1/2" plate with 6 - 3/4" concrete anchors. Concrete baseplate detail is not as specified by the drawing. Six anchors were used instead of 8. The detail for east wall attachment is incomplete. The middle plate attaching beam to wall is not detailed.

NOTE 5: CAT Item #141 - Drawing specifies 3/4" concrete wedge anchors, 5/8" self drill anchors appear to have been installed.

NOTE 6: CAT Item #142 - Weld detail for supports not as specified by drawing. Actual weld in place is a flare bevel with reinforcing fillet 1 1/2" at 4 1/2" on the top of the tube steel.

NOTE 7: CAT Item #143 - Floor connection not as specified, angle size is 5"x5"x3/8". Anchor spacing is not as specified by Detail 6 of Drawing 6E721-2809-18.

TABLE 3.1.3 Cable Tray/Conduit Support Summary (Cont'd)

NOTE 8: CAT Item #144 - Floor connection not as specified; angle size is 5"x5"x3/8"; anchor spacing is not as specified by Detail 6 of Drawing 6E721-2809-18.

NOTE 9: CAT Item #126 - Hole size for ceiling anchor is too large. One side of hole had been drypacked.

NOTE 10: CAT Item #158 - Anchor edge distance for support baseplate is 1 1/2"; the anchor in the southeast corner has an east west spacing of 1 3/4".

NOTE 11: CAT Item #160 - Concrete anchor edge distance of bottom 2 anchors is 1 1/4" drawing specifies 1 1/2".

NOTE 12: CAT Item #161 - Concrete anchor edge distance is 1 1/4" for the middle anchor, drawing specifies 1 1/2".

NOTE 13: Support 2H09 was missing sway braces, but further investigation revealed these to be listed on punchlist of work to be performed.

TABLE 3.1.4

HVAC SUPPORT SUMMARY

HVAC Support No.	Location	Comments
IRSAY 4134 #40	Drywell	See Note 1 See CAT Item #85
IRSAY 4134 #56	Drywell	---
IRSAY 4134 #48	Drywell	---
IRSAY 4134 #55	Drywell	---
IRSAY 4134 #30	Drywell	---
IRSAY 4130 #73	Drywell	See Note 2 See CAT Item #88 See CAT Item #94
IRSAY 4130 #32	Drywell	See Note 3 See CAT Item #93
IRSAY 4130 #33	Drywell	---
6M-2849-62	Control Center	See Note 4 See CAT Item #91
6M-2850-77A	Control Center	See Note 5

NOTE 1: Support drawings do not match. Section F-F on Dwg. 6M721-4385 does not match with Section 4-4 on Dwg. 5S721-3060.

NOTE 2: Support had a 4 x 4 x 3/4 angle brace and baseplate missing. In addition, (4) 7/8" dia. bolts, (1) 12" x 6" x 3/4" plate and (2) 3" x 3" x 1/4" angle stiffeners were added to support in field but not shown on sketch.

Member dimensions not as shown on sketch.

NOTE 3: Support had a DCR written against it which had not been incorporated into the building of the support.

NOTE 4: Support Item #6, 2-1/2" x 2-1/2" angle has a piece of angle added to it by welding, which is not shown on sketch.

NOTE 5: Support had an angle 4" x 4" x 1/8", 12" long added but was not shown on sketch. Angle was not welded in center of baseplate and angle was coped without detail on drawing.

TABLE 3.1.5

PIPE WHIP RESTRAINT SUMMARY

System	Pipe Whip Restraint No.	Location	Type of Inspection	Comments
B31 Reactor Recirc-ulation System	B31-RR10A	Drywell Elev. 588'7-15/16" Az. 270°	Detailed	See Note 1 See CAT Item #39
E41 HPCI System	HP G3	Drywell Elev. 586'6-3/4" Az. 4° 24'	Detailed	---
N30 Turbine Steam System	DR-20	Drywell Elev. 587'8-15/16" Az. 330° 36'	Detailed	See Note 2 See CAT Item #3
G33 Reactor Water Clean-Up System	CUR-16	Drywell Elev. 587'10-3/4" Az. 241° 24'	Detailed	---
E51 RCIC Steamline System	RPR3	Drywell Elev. 596'11-3/16" Az. 339° 41'	Detailed	---
E51 RCIC Steamline System	RPR4	Drywell Elev. 596'8" Az. 333° 20'	Detailed	---
N21 Reactor Feedwater System, South	FR1B	Drywell	System Walkdown	See Note 3 See CAT Item #36
N21 Reactor Feedwater System, South	FG3A	Drywell	System Walkdown	---
N21 Reactor Feedwater System, South	FR4A	Drywell	System Walkdown	---
N21 Reactor Feedwater System, South	FR5A	Drywell	System Walkdown	---
E21 Core Spray System, South	CSR1AA	Drywell	System Walkdown	See Note 4 See CAT Item #37
E21 Core Spray System, South	CSR18A	Drywell	System Walkdown	See Note 4 See CAT Item #37

TABLE 3.1.5 (Cont'd)

PIPE WHIP RESTRAINT SUMMARY

System	Pipe Whip Restraint No.	Location	Type of Inspection	Comments
E21 Core Spray System South	CSR2A	Drywell	System Walkdown	See Note 5 See CAT Item #38
E21 Core Spray System South	CSR3A	Drywell	System Walkdown	See Note 5 See CAT Item #38
E21 Core Spray System South	CSR 5A	Drywell	System Walkdown	See Note 5 See CAT Item #38

NOTE 1: GE Drawing B31-G003 requires all welds to be full penetration. Actual welds are 1/2" fillet (see Figure 3.1.1).

NOTE 2: This Whip Restraint had been disconnected. See Photograph 3.1.2.

NOTE 3: Cotter pins were missing on this restraint.

NOTE 4: Whip Restraints field locations and drawing locations do not match (6M721-3053-2, Rev. H).

NOTE 5: Whip Restraints had missing cotter pins.

TABLE 3.1.6

CONCRETE EXPANSION ANCHOR AREAS

Area	Number of Connections
1. Residual Heat Removal Building	
A. Pump Room	7
B. Diesel Room	3
2. Reactor Building	
A. 1st Floor, 583' Elev.	5
B. 2nd Floor, 613' Elev.	5
C. Torus Support Area, 540' Elev.	7
3. Auxiliary Building	
A. High Pressure Coolant Injection Room	7
B. Elev. 551'	3
C. Elev. 583'	3
4. Drywell	
A. Elev. 572'	9
B. Elev. 581'	1
	50 Total

TABLE 3.1.7

CONCRETE EXPANSION ANCHOR SUMMARY

Item	Type of Anchor	Size of Anchor	Comments
Pipe Support G-115	Wedge	3/4"	
Instrumentation Support Between Columns E12 and F12	Wedge	1/2"	Note 1
RHR Electrical Support 074	Wedge	3/4"	
Electrical Conduit Support, 4' South of Col. G-11, Elev. 593'	Wedge	3/8"	
Pipe Support E11-2184-G22	Wedge	3/4"	
RHR 101, Electrical Conduit Support, 10' South of Col. E11	Wedge	3/4"	
Pipe Support E11-2184-G23	Wedge	1"	
Electrical Conduit Support JB2-RHR-84, 10' East of Col. D9 Elev. 594'-3"	Wedge	3/8"	
RHR 503, 3' East of Col. E9	Wedge	3/8"	
Pipe Support E11-2180-G14	Wedge	1/2"	
Elect. Conduit Support RHR-024	Wedge	5/8"	
Pipe Support E41-3172-G14	Wedge	1"	
Pipe Support E41-3165-G08	Wedge	3/4"	
Pipe Support E41-3167-G08	Wedge	5/8"	
Pipe Support E51-4055-G15	Wedge	5/8"	

TABLE 3.1.7 (Cont'd)

CONCRETE EXPANSION ANCHOR SUMMARY

Item	Type of Anchor	Size of Anchor	Comments
I&C Support E41-7017-G13	Wedge	5/8"	
Elect. Support HP-102	Wedge	5/8"	
Elect. Support HP-22	Self Drilling	5/8"	
Pipe Support P50-3308-G43 and G46	Wedge	5/8"	Note 2
Pipe Support P50-3307-G13	Wedge	3/4"	
Pipe Support 6I721-2400-18-G19	Wedge	7/8"	
Cable Tray Support ID-001-11C	Wedge	3/8"	
Pipe Support E21-3144-G06	Wedge	1"	
Pipe Support P42-3343-G32	Wedge	3/4"	Note 3
Elect. Conduit Support CEI-002	Wedge	3/8"	Note 3
Pipe Support P44-3368-G11	Wedge	1/2"	
Pipe Support P44-3368-G31	Wedge	5/8"	
Pipe Support P44-3368-G35	Wedge	5/8"	
Pipe Support P44-3084-G11A	Wedge	Both 7/8" and 1" on this support	
Pipe Support P44-3084-G20	Wedge	3/4"	
Pipe Support E11-3158-G08	Wedge	1"	

TABLE 3.1.7 (Cont'd)

CONCRETE EXPANSION ANCHOR SUMMARY

Item	Type of Anchor	Size of Anchor	Comments
Elect. Conduit Support B8T-121	Wedge	5/8"	
Pipe Support G51-4056-G19	Wedge	1/2"	
Pipe Support G51-4055-G20	Wedge	3/4"	
Elect. Conduit Support B8-461-2C2TS	Wedge	3/4"	
Elect. Conduit Support B8-401-21C4	Self-Drilling	3/8"	
Pipe Support 6WIB21F194 G18	Wedge	5/8"	
HVAC Support Fan #B043	Wedge	5/8"	Note 4
HVAC Support Fan #B043	Wedge	5/8"	
Pipe Support P44-5334-G06	Wedge	1/2"	
Elect. Conduit Support GG-209-2K-1	Wedge	3/8"	
Elect. Conduit Support GG-07-10-2	Wedge	3/8"	
Equipment Support T47-008 or 008	Wedge	7/8"	
Pipe Support B21-2590-G17	Wedge	1"	
Pipe Support T48-5314-C09	Wedge	5/8"	
Pipe Support T23-1237-39 - G01	Wedge	3/8"	
Pipe Support T23-I-2837-39 - G38	Wedge	Both 5/8" and 1/2" on support	

TABLE 3.1.7 (Cont'd)

CONCRETE EXPANSION ANCHOR SUMMARY

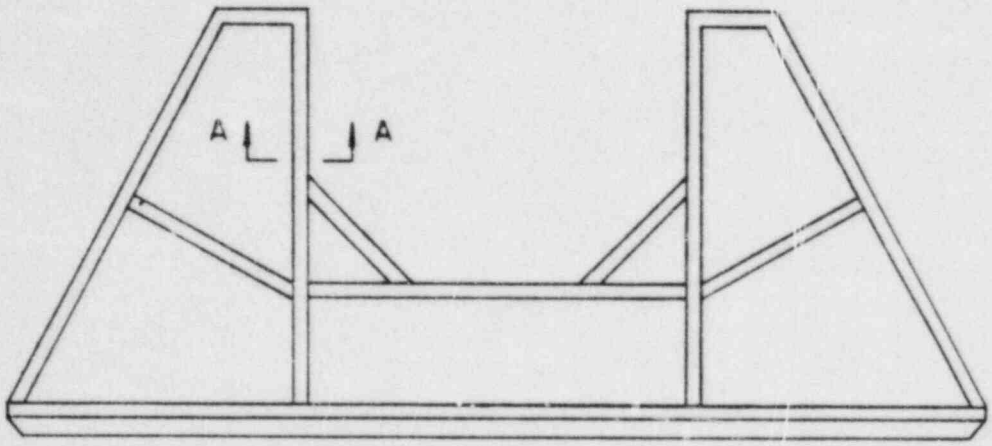
Item	Type of Anchor	Size of Anchor	Comments
Pipe Support T23-2837-39-G06	Wedge	5/8"	
Pipe Support T23-2837-39-G06	Wedge	7/8"	

NOTE 1: Support was removed to observe baseplate and holes due to high torque readings. High torque reading were caused by plate bearing against anchors.

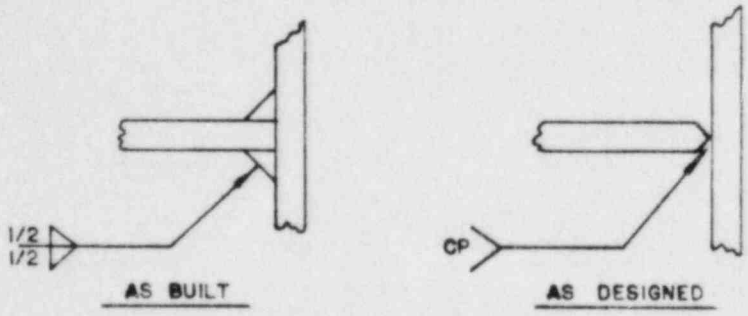
NOTE 2: Support had one missing nut and washer. Problem identified on CAT 1 Form No. 155.

NOTE 3: Spacing violation between these two supports. Problem identified on CAT 1 Form No. 152.

NOTE 4: Support had one anchor which was utilized to hold a suspended motor. Problem identified on CAT 1 Form No. 157.



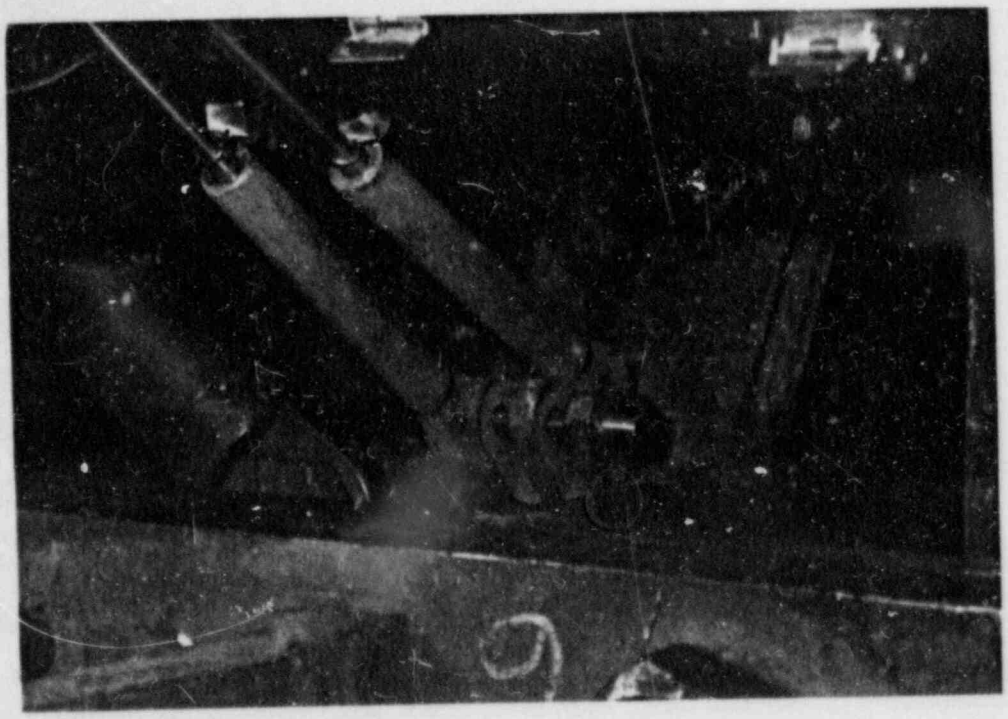
RESTRAINT FRAME



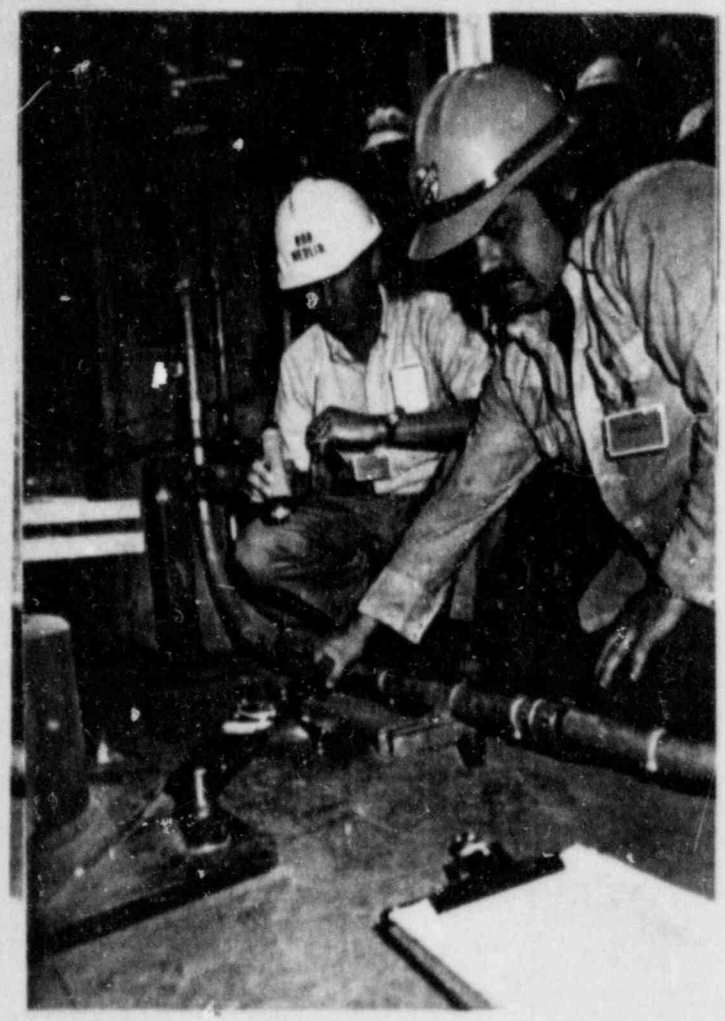
SECTION "A-A"

RECIRCULATION SYSTEM WHIP RESTRAINT B31-RR10A	THE DETROIT EDISON CO.
	FERMI II P.P. MONROE, MICH.
	FIGURE NO. 3.1.1

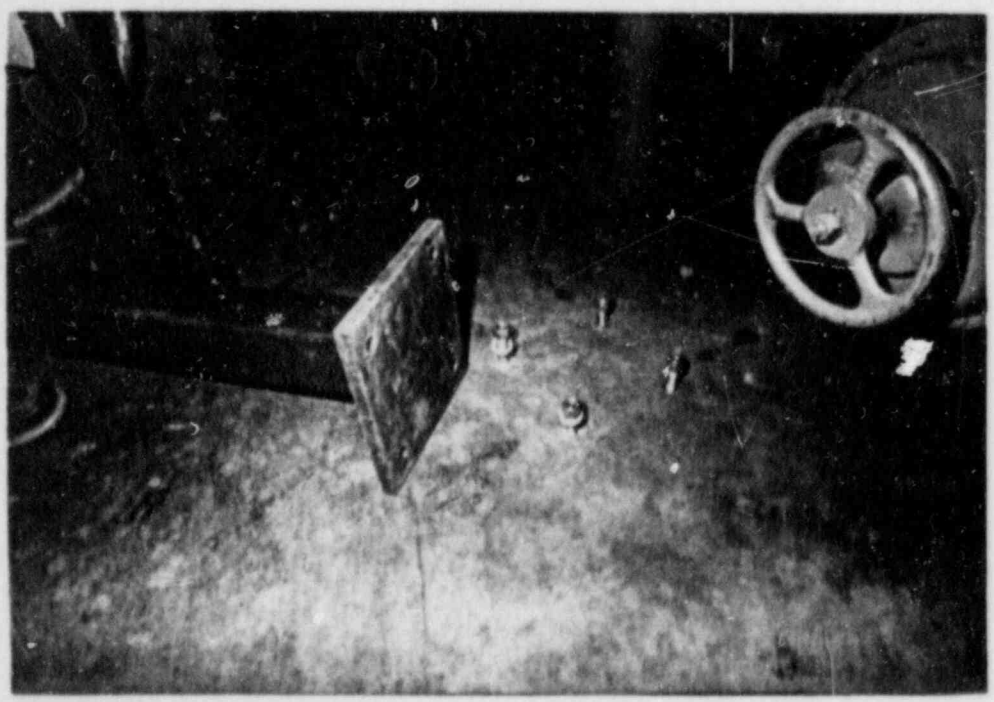
Photograph 3.1.1 Stroking of a mechanical shock suppressor.



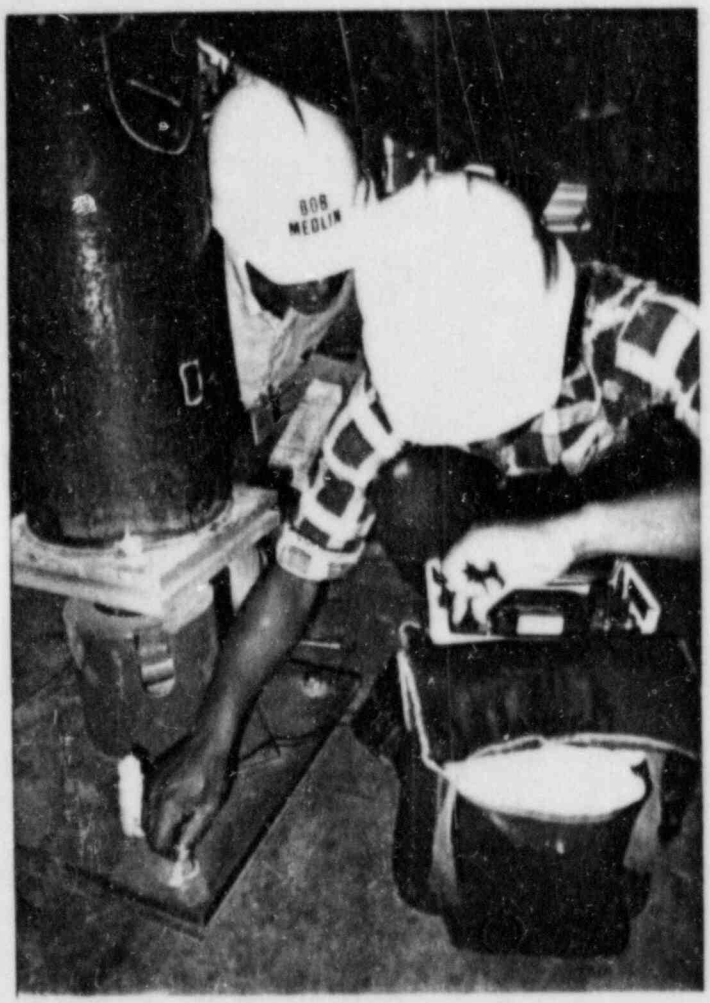
Photograph 3.1.2 Disconnected Pipe Whip Restraint discovered during walk down.



Photograph 3.1.3 Observation of torque applied to expansion anchor.



Photograph 3.1.4 Removal of support due to high torque values. Anchors were binding against side of holes on baseplate.



Photograph 3.1.5 Observation of UT measurements used to determine expansion anchor length.

3.2 Structural Items

3.2.1 Torus Support

3.2.1.1 Purpose

The purpose of this evaluation was to compare the as-built condition of the Torus Supports to the latest design disclosure documents.

3.2.1.2 Criteria

(1) Detroit Edison Specification 3071-171, "Containment Repair Program Torus Modification"

(2) FSAR Section 3.13.2.9.1, "Torus Columns and Column 'Stubs' Design"

(3) Applicable design drawings

3.2.1.3 Items Evaluated

There are a total of 16 supports required for the wetwell torus (see Figure 3.2.1).

During the evaluation, Torus Support Structure #12 was checked in detail along with parts of Supports 11 and 13. These supports were compared to the latest design documents (see Photograph 3.2.1). Inspection activities included 1) Quality of Welding, 2) General Condition of Steel, 3) Fabrication/Workmanship, 4) Fit-Up of Members, 5) Size, Orientation, Dimension of Members, 6) Member location, 7) Connections and 8) NDE of welds. Material identification for torus support steel is covered in Section 3.5, "Material Testing."

Table 3.2.1 provides a summary of the supports reviewed.

TABLE 3.2.1

TORUS SUPPORT SUMMARY

Support	Location	Comments
Support No. 11	Elev. 540' Az. 213° 45'	Inspection concentrated on welding with visual observation of erection.
Support No. 12	Elev. 540' Az. 237° 45'	Detailed Inspection
Support No. 13	Elev. 540' Az. 258° 45'	Inspection concentrated on welding with visual observation of erection.

3.2.1.4 Results

During the evaluation, it was determined that the Torus Supports had been modified twice since their original installation. While performing the evaluation, 3 sets of drawings along with supplemental "Change Paper" had to be used to evaluate as-built/as designed conditions. Problems were identified in the areas of welding, anchor bolt projection above concrete and confusing drawing details. Table 3.2.2 provides a summary of the deviations identified.

TABLE 3.2.2

TORUS SUPPORT DEVIATIONS

Support	Location	Comments
Support 11	Elev. 540' Az. 213° 45'	See Note 1
Support 12	Elev. 540' Az. 237° 45'	See Notes 2 and 3
Support 13	Elev. 540' Az. 258° 43'	See Note 4

NOTE 1: Drawing D4103 pg. 1 of 2, section C-C required weld between side stiffeners and saddle plate to be 1/2" fillet weld. Drawing D4127 pg. 2 of 5 requires weld to 5/8" fillet. Detroit Edison Project Engineers later explained these details adequately. However, an independent assessor would need to know the original construction/modification sequence for explaination to agree with as-built condition. This applies to all torus supports.

NOTE 2: For Torus Support #12, the anchor bolt projection above concrete violated drawing dimensions. Drawing D4127 sheet 2 of 5 and D4127 sheet 3 of 5 show the details.

NOTE 3: The horizontal weld between upper stiffener and torus shell contained porosity and slag.

NOTE 4: The weld between piece mark SCS2 and MK3A is not welded full length. The weld is shown on Drawing D4103 sheet 1 of 2.

3.2.1.5 Conclusions

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.

3.2.2 Structural Steel

3.2.2.1 Purpose

Structural steel fabrication and erection was reviewed for conformance to the latest design disclosure documents.

3.2.2.2 Criteria

(1) Detroit Edison Project Specifications

A. Drywell - 3071-129, 3071-163, 3071-179
B. Slab-Over-Torus - T21-00-0-000-CA-005 (B2-4C)

(2) Chicago Bridge and Iron Procedures

CBI-E-106, "Bolt Tensioning"
IP-2, "Installation Procedure for AWS Beam Modification"

(3) Applicable Design Drawings

3.2.2.3 Items Evaluated

During this evaluation, 10 members in the Drywell and 10 members in the Slab-Over-Torus were selected for inspection. Inspection activities included 1) Quality of Welding, 2) General Condition of Steel, 3) Fabrication/ Workmanship, 4) Fit-Up of Members, 5) Size, Orientation and Dimension of Members, 6) Member Location, and 7) Connections. Table 3.2.3 provides a summary of the items evaluated along with evaluator comments.

3.2.2.4 Results

(1) Drywell Steel

This evaluation covered structural steel beams and associated connections within the Drywell on Elevation 585'3-7/8" between azimuth 189° and 212°. This steel has been modified two times. The review covered the original installation as well as both modifications.

The evaluation found one beam that was square coped, and one connection where the bolts were not centered in slotted connections as required by drawings. However, in general the locations, size, orientation, configuration and workmanship inspected resulted in no deviations.

Welds were checked for length, size, location and quality of weld. These checks indicated acceptable welding.

Bolt tensioning was checked on several connections to torque valves given in Chicago Bridge and Iron Procedure CBI-E-106. No deviations were identified.

(2) Slab-Over-Torus Steel

The evaluation covered structural steel beams and random connections on elevation 583'6" in and around Bays 10 thru 18. This steel had been modified once. The evaluation covered the original installation as well as the modified steel.

The steel was checked for the same criteria as the drywell steel. Bolted connections in this area were checked and most of the original connections did not have sufficient tension to qualify as a friction connection required by specification T21-00-0-000-CA-005 (B2-4C). An installation specifications for this steel was not presented to the team.

Welds were given a visual examination. No deviations were identified.

3.2.2.5 Conclusion

On the basis of this evaluation, the structural steel erected in the Drywell is of an acceptable quality. The deviations identified on CAT forms 182 and 183 should be corrected.

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.

3.2.3 Concrete

3.2.3.1 Purpose

Windsor Probe Testing

The purpose of the Windsor Probe Test Series was to evaluate the in-place compressive strength of the structural concrete.

Concrete Walkdown

The purpose of the concrete walkdown was to evaluate the concrete surface conditions.

Concrete Embedment Verification

The purpose of the concrete embedment verification was to determine if embedded plates were placed at the correct location.

3.2.3.2 Criteria

The Windsor Probe Testing was conducted in accordance with ASTM C803 and the Windsor Probe manufacturer's technical literature.

The concrete walkdown was performed using concrete void categories developed by Sargent & Lundy Engineers. There is no specific in-place procedure or specification addressing concrete surface criteria.

The concrete embedment verification was done using Sargent & Lundy design drawings that showed the specific locations of the items selected.

3.2.3.3 Items Evaluated

Windsor Probe testing evaluated 3 areas in the Reactor Building, 1 area in the Auxiliary Building and 1 area in the Residual Heat Removal Building. A review of the concrete field and laboratory tests was performed for the areas selected.

The concrete walkdown evaluated the exterior of the RHR complex at ground level, the Reactor Building Torus Support area in the subbasement including all accessible quandrant rooms, the Auxiliary Building 1st floor and the Reactor Building Biological Shield wall and interior walls on the 1st floor.

The concrete embedment location verification evaluated five embedded plates in the Reactor Building. The areas reviewed were the Drywell Reactor Support Pedestal and the Residual Heat Removal Heat Exchanger room.

3.2.3.4 Results

The results of Windsor Probe testing are detailed in Table 3.2.4 (see Photographs 3.2.2 and 3.2.3 for a typical Windsor Probe test). The results of the record review of the pours selected did not identify any deviations. Calculation checks were performed by the team for laboratory cylinder tests.

The results of the concrete embedment plate verification are detailed on Table 3.2.5. Each embedment had a welded attachment. An examination of the surrounding concrete was performed and found acceptable.

The results of the concrete walkdown are detailed on Table 3.2.6. See Photograph 3.2.4 for honeycomb identified around watertight door.

The embedded electray in the walls is beginning to rust to some degree on all of the uncoated interior walls reviewed. This rusting action may contribute to significant spalling of the adjacent concrete in the future if the electray is not coated.

3.2.3.5 Conclusions

A review of the compressive strength results indicates that in all areas surveyed, the values exceeded the 4000 psi minimum design requirements by at least 50%. There were no indications that there is any problem with the compressive strength values based on this random survey.

All embedded concrete plates were found to be located in accordance with the applicable Design drawings in the areas surveyed.

The walkdown on the concrete surfaces indicated several items that should be reviewed for possible repair action. All of the items noted were minor in nature and are of no structural significance.

3.2.4 Shore Barrier

3.2.4.1 Purpose

The inspection program described below was undertaken to ensure that the shore barrier was constructed as designed and that no unacceptable settlement or movement has taken place since it was completed. The normal annual settlement and location reading were observed as the work was performed. In addition, two special cross sections were taken and several individual readings were made to verify those normally taken.

3.2.4.2 Criteria

(1) Detroit Edison Drawing Number 6C721-40 - Shore Barrier Plan and Sections

(2) Detroit Edison Drawing Number 6C721-40A - Construction Sequence and Temporary Shoring Details Shore Barrier

(3) Detroit Edison Drawing Number 6C721-43 - Shore Barrier Survey Records

(4) Project Specification Number 3071-176 Rev. B - Shore Barrier Construction

(5) Detroit Edison letter from George W. Flowerday to Russel O'Sullivan dated July 20, 1983 - Subject: Lake Erie Shore Barrier Monitoring (including attachment - 3 pages)

3.2.4.3 Items Evaluated

This evaluation includes a two phase assessment of the Lake Erie Shore Barrier. The first inspection was done to determine if the barrier was constructed in accordance with the design. The second was to determine whether any unacceptable movement, either vertical or horizontal, has taken place since the barrier was constructed.

Figure 3.2.3 is a typical shore barrier section plan and Figure 3.2.4 is a plan view of the barrier. The elevation and horizontal readings are made annually and recorded on Drawing 6C-721-43. As part of this assessment the 1984 survey was observed in process by the team.

From a field observation by a team member, the elevation of parts of the barrier appeared to be lower than specified on drawing 6C721-40. As a result of this observation the Detroit Edison survey team was requested to make two profiles of the barrier at Stations 6864 (North) and 7325 (North). These profiles are shown on Figure 3.2.5. Photograph 3.2.5 is a view of the shore barrier.

It was noted that there are six stations along the barrier where permanent markers have been established to measure vertical and horizontal movement on an annual basis. At each of the six stations there are two markers. Both of these are on the horizontal part of the barrier and none are located on the sloping part. It is therefore not possible to determine if there is movement in this part of the barrier.

3.2.4.4 Results

The specifications for the annual reading require that an engineering analysis be made if any point surveyed has a total movement of one foot or move from its original position. A review of drawing 6C721-43 shows that no point has had this much movement. In fact the movements have not been one-tenth of this amount.

The two profiles made show that the barrier is lower than specified for part of its length. It is lower by about 2 or 3 feet for about 80 ft. of length. It has apparently been this low since it was constructed because the annual reading show virtually no movement.

3.2.4.5 Conclusions

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.

3.2.5 Doors

3.2.5.1 Purpose

The purpose of the door inspections was to insure that QA Level 1 fire doors and watertight doors were installed in accordance with the latest design disclosure documents and that the doors function properly.

3.2.5.2 Criteria

Detroit Edison Design Drawings (see Table 3.2.7 for specific numbers)

3.2.5.3 Item Evaluated

Five QA Level 1 doors were randomly selected from the Detroit Edison Door Schedule Drawings 6A721-2071 and 6A721-NS-2010. Two doors selected were watertight doors and three doors selected were fire doors with security devices. See Table 3.2.7 for a complete listing of doors inspected. Figure 3.2.2 shows a typical watertight door.

3.2.5.4 Results

The results of the inspection of the watertight doors R-1-11 and R-1-8 were unacceptable. Doors were found with loose and missing hardware. Door R-1-8 would not properly close because the locking sleeves were not installed. Door R-1-11 would not properly lock because locking pins would not fully engage. Honeycomb concrete was also found around the frame of Door R-1-8 (see Photograph 3.2.4). Both watertight doors were missing welds that were specified by the door manufacturer. Documentation of the watertight door installation inspection could not be located for these doors.

The installation of the fire and security doors was acceptable with a few minor hardware problems. Door R-2-15 is a double door and had the lockset installed on the wrong leaf but the door would function properly. Door R-3-13 was missing the threshold. All doors had the proper security devices installed. All fire doors properly closed and would serve their intended functions. Doors R-2-15 and R-3-13 were not labeled with a 3 hour tag rating. Drawing B6-210 specified that the doors were manufactured to meet 3 hour requirements, but the doors could not be labeled by UL because the hardware selected, a Brinks 2050 electric deadbolt is not fire listed hardware.

3.2.5.5 Conclusions

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.

TABLE 3.2.3

STRUCTURAL STEEL SUMMARY

(1) Drywell, Elevation 585'3-7/8", Between Az. 189° - 212°

Beams Checked	Torque on Connection Checked	Remarks
104A	Yes	Torque acceptable to CBI-E-106
118A		
122A		
117A	Yes	Note 1, Torque acceptable to CBI-E-106
123A		
120A		Note 2
116A		Note 2
121A	Yes	Torque acceptable to CBI-E-106
115A		Note 3
119A		

NOTE 1: Bolts not centered in slotted connection, CAT Item #182.

NOTE 2: Beams had square cut copes, CAT Item #183.

NOTE 3: Slotted connection not effective. Rigidly connected by pipe support, CAT Item #185.

(2) Slab-Over-Torus, Elevation 583'6", Bays 10 thru 18

Beams Checked	Connection Checked	Remarks
T66	-	
AT26	-	
T114	-	
AT27	-	
T159	-	
T160	-	
T18	-	
T67	-	
T65	-	
AT29	-	
T112	Yes	Only item on these beams checked was torque. Torque unacceptable to CBI-E-106. See CAT Item #194
R15	Yes	
R16	Yes	
AT21	Yes	
R14	Yes	
T111	Yes	
T157	Yes	
T107	Yes	

TABLE 3.2.3 (Cont'd)

STRUCTURAL STEEL SUMMARY

(3) Structural Steel Certified Material Test Reports

Location	Drawing/ Detail	Heat No.	Remarks
Drywell	SF-23 side plate (dy)	6NAP	Checked to 1980 A588 Gr. A
Drywell	SF-454 side plate (eak)	20AP	Checked to 1980 A588 Gr. A
Drywell	SF-481 stiffener angle (eja)	9TAA	Checked to 1980 A588 Gr. A
Reactor Bldg.	6C721-3434 Detail T	432N8431	Checked to 1980 A588 Gr. A
Whip Restraint	G33-3096-CUR-17	70A364	Checked to 1980 A588 Gr. A

NOTE: The above CMTR's were reviewed to ASTM 1980 Edition. No deviations were identified.

TABLE 3.2.4

Windsor Probe Test Data
Tabulated Results

Enrico Fermi 2
Reference Procedure
ASTM C-803
Windsor Driver CPT532CF Serial #9357
Calibrated 6/25/84 by Windsor Products, Hamden, Conn.

Aggregate Type: Limestone
Mohr Hardness: 4.0 Based on Windsor Probe's Aggregate Chart

Test Series	Test Location	Probe Registry Number	Power Setting/ Type	Estimated Compressive Strength (PSI)	Average of All Test Compressive Strength (PSI)
1	Reactor Building Drywell Reactor Pedestal Pour #RPV#2 Pour Release 1999 Design Release 577	216935	Standard/Multiple	7725	7200
		216941	Standard/Multiple	6675	
2	Reactor Building First Floor Biological Shield Pour #RB-100-A1 Design Release 399 Pour Release 2022	216950	Standard/Multiple	6850	6850
		216938	Standard/Multiple	6850	
3	Reactor Building Subbasement Drywell Pedestal Pour Number RB11 Pour Release 140 Design Release 18A	216947	Standard/Multiple	7375	7025
		216948	Standard/Single	6850	
		216948	Standard/Single	6850	
4	Auxiliary Building 1st Floor Column C13.1 and Column Gg Pour Number RB110 Pour Release 1371 Design Release 339	216936	Standard/Single	7750	7383
		216936	Standard/Single	6675	
		216932	Standard/Multiple	7725	

TABLE 3.2.4 (Cont'd)

Windsor Probe Test Data
Tabulated Results

Enrico Fermi 2
Reference Procedure
ASTM C-803
Windsor Driver CPT532CF Serial #9357
Calibrated 6/25/84 by Windsor Products, Hamden, Conn.

Aggregate Type: Limestone
Mohr Hardness: 4.0 Based on Windsor Probe's Aggregate Chart

Test Series	Test Location	Probe Registry Number	Power Setting/ Type	Estimated Compressive Strength (PSI)	Average of All Test Compressive Strength (PSI)
5	Residual Heat Removal Exterior Wall W2-9 along a row from 8' South of column Row 12 to column Row 13 from A Row 70, 10'-8" East of column Line B	216931	Standard/Single	5450	6063
		216931	Standard/Single	6675	
		216933	Standard/Single	5975	
		216933	Standard/Single	6150	
		216939	Standard/Single	5975	
		216939	Standard/Single	6150	

TABLE 3.2.5

Concrete Embedment Plate Verification

AREA	LOCATION	ELEV	AZIMUTH	S&L DRAWINGS	CORRECT LOCATION
1	Reactor Bldg Drywell-Reactor Support Pedestal	578'-9"	210°	B133 B136	Yes
2	Reactor Bldg Drywell-Reactor Support Pedestal	591'-10"	180°	B133 B136	Yes
3	Reactor Bldg Drywell-Reactor Support Pedestal	594'-10"	51° 30'	B133 B136	Yes
4	Reactor Bldg Drywell-Reactor Support Pedestal	589'-0"	36°	B133 B439	Yes
5	Reactor Bldg RHR Heat Exchanger Room	621'-6"	8'-3" off 10 line	B78 B201	Yes

TABLE 3.2.6

Concrete Walkdown Summary

AREA: Auxiliary Building/1st Floor

Item #1

Column G & 11 Elev. 590

Honeycomb adjacent to embedded plate, upper right hand corner, 7/8 inch deep.

Honeycomb just above embedded plate to right.

Item #2

Column H & 16' South of 10 Line Elev. 590.5

Column has honeycomb in edge of the column, North corner.

Item #3

Column 9 and 7 ft off H toward G Elev. 585

Two abandoned anchors adjacent to nonsafety cable tray supports have a large hole excavated around them.

Item #4

Column H & 11 Elev. 590

Honeycomb in column, South face.

Item #5

9 and halfway between G & H Elev. 584 to 592
Door # R1-8

Honeycomb around the interior face of watertight door. See Photograph 3.2.4.

AREA: Reactor Building/Biological Shield Wall

Item #1

Az. 150° Elev. 592 Exterior Face
Penetration X45

TABLE 3.2.6 (Cont'd)

Concrete Walkdown Summary

AREA: Reactor Building/Subbasement

Item #1

SW Quandrant RHR D Pump area
Gateway beneath QA1 Assy #9 Mark #P029

Concrete spalled around elec tray embed
Embed damaged as well. Spalled area 1 ft^2

Concrete spalled over RHR C Pump on access hatch, excessive rusting on frame of hatch opening.

AREA: RHR Exterior Wall

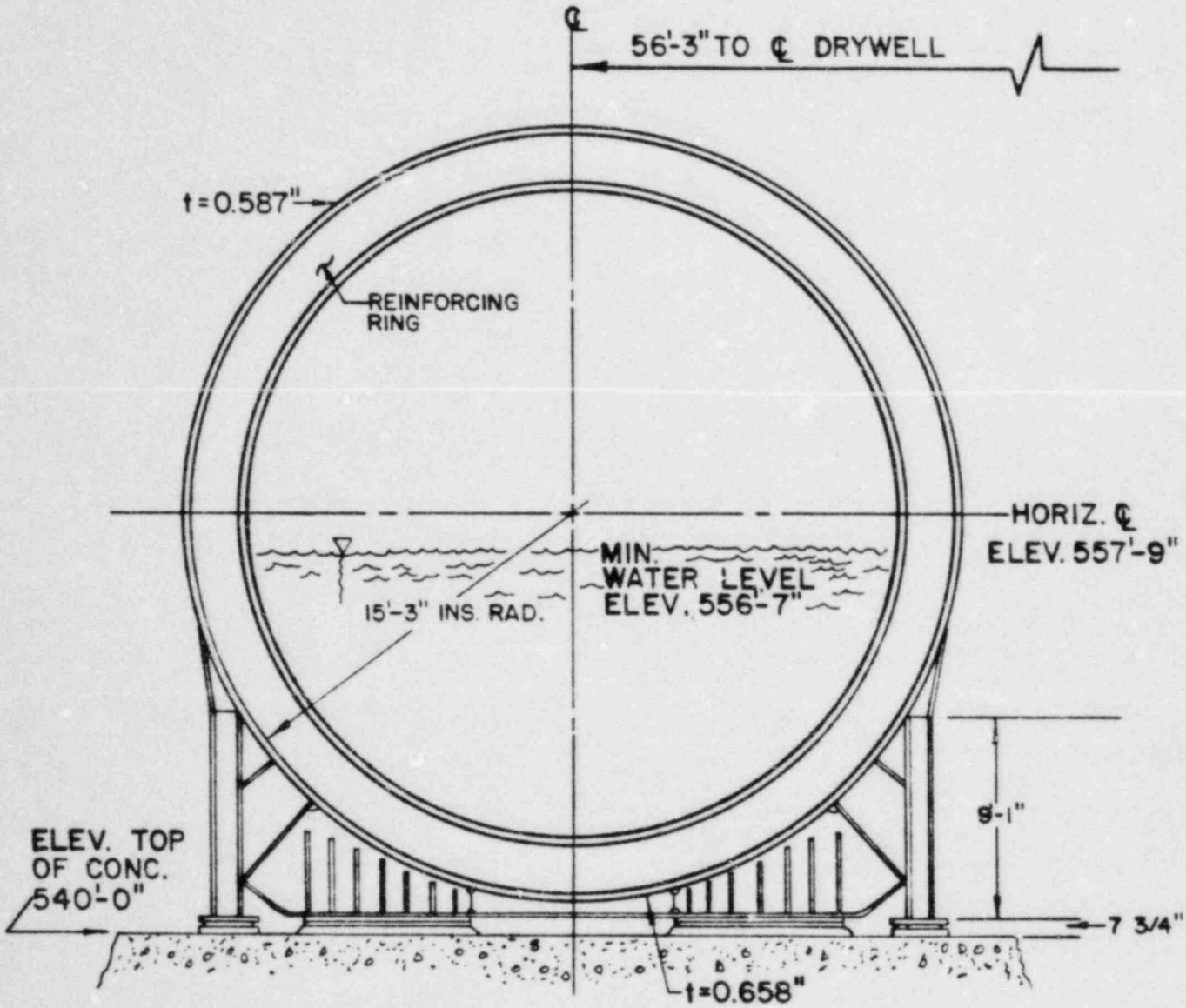
Item #1

Backfill under east wall entrance on south side missing.

TABLE 3.2.7

Door Summary

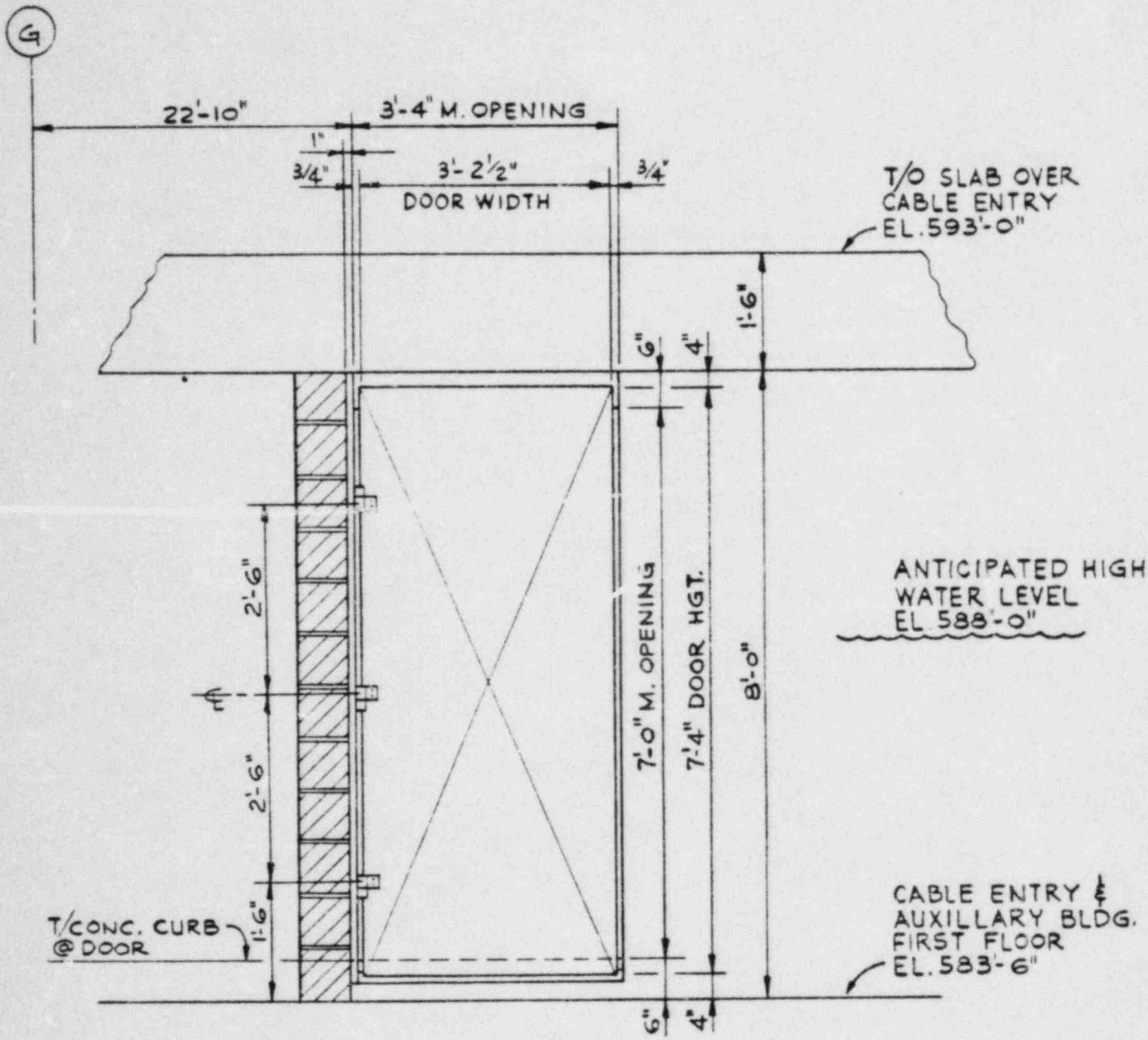
DOOR NUMBER	TYPE	LOCATION	DRAWINGS USED
R-2-15	Fire/Security	Switchgear Room	6A721-NS-2010 6A721-2071 6E721-NS-2980-26 6E721-NS-2992-6
R-2-24	Fire/Security	Cable Spread Room	6AB01-2426 6A721-2071
R-3-13	Fire/Security	Control Room	6A721-NS-2010 6A721-2071 6E721-NS-2980-27 6E721-NS-2992-6
R-1-11	Water tight	Reactor Bldg	6A721-2071 BP 15 BP 16 BP 17 BP 18
R-1-8	Water tight	Auxiliary Bldg	6A721-2071 6A721-2078 5S721-2508 5S721-2509 BP 6 128 thru 136



ELEVATION VIEW

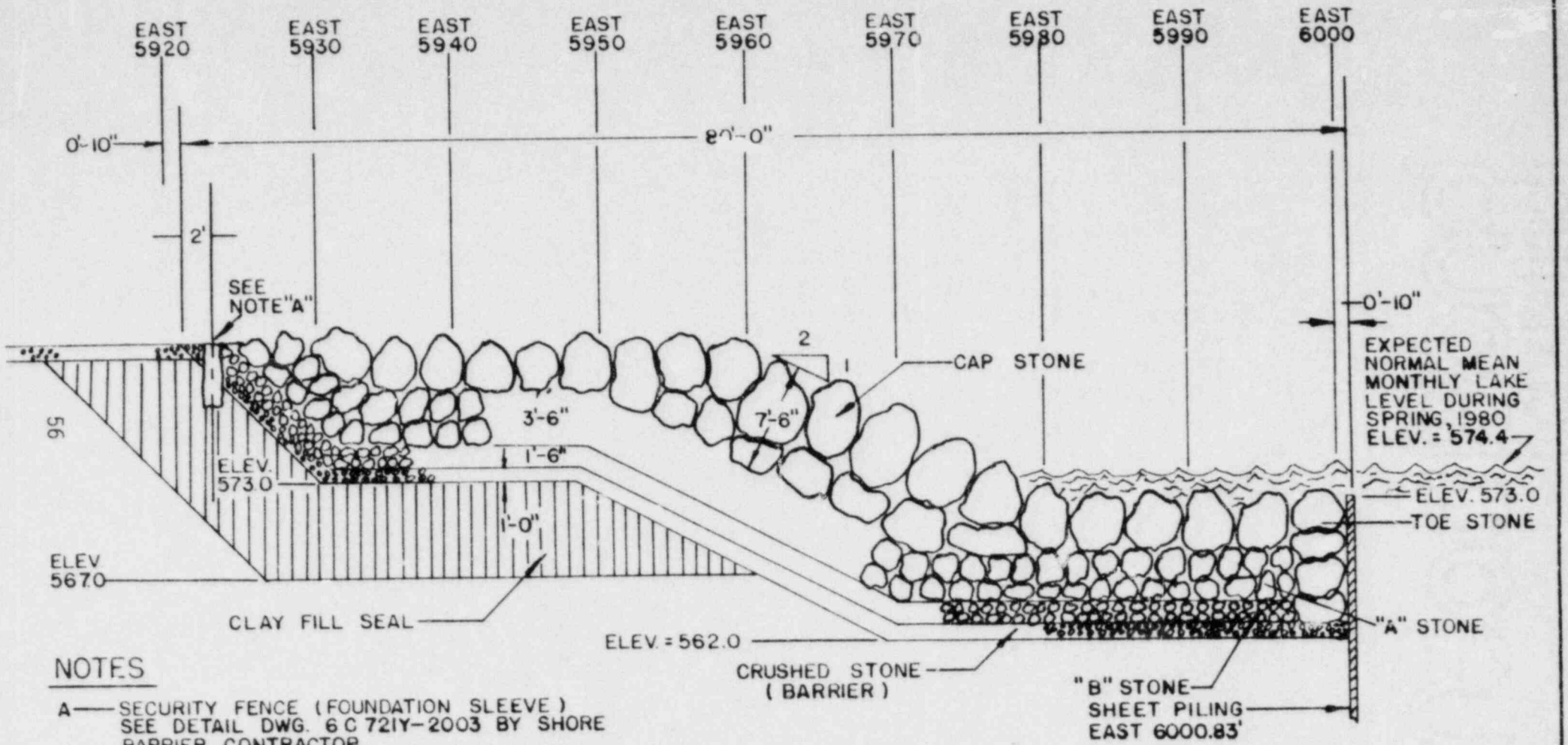
NO SCALE

TORUS SUPPORT	THE DETROIT EDISON CO.
	FERMI II P.P. MONROE, MICHIGAN
	SYSTEM COMPLETION ORGANIZATION
	FIGURE NO. 3.2.1



SOUTH ELEVATION (LOOKING NORTH)
WATER-TIGHT DOOR/FRAME R1-8

FIGURE NO. 3.2.2



NOTES

A — SECURITY FENCE (FOUNDATION SLEEVE) SEE DETAIL DWG. 6C721Y-2003 BY SHORE BARRIER CONTRACTOR

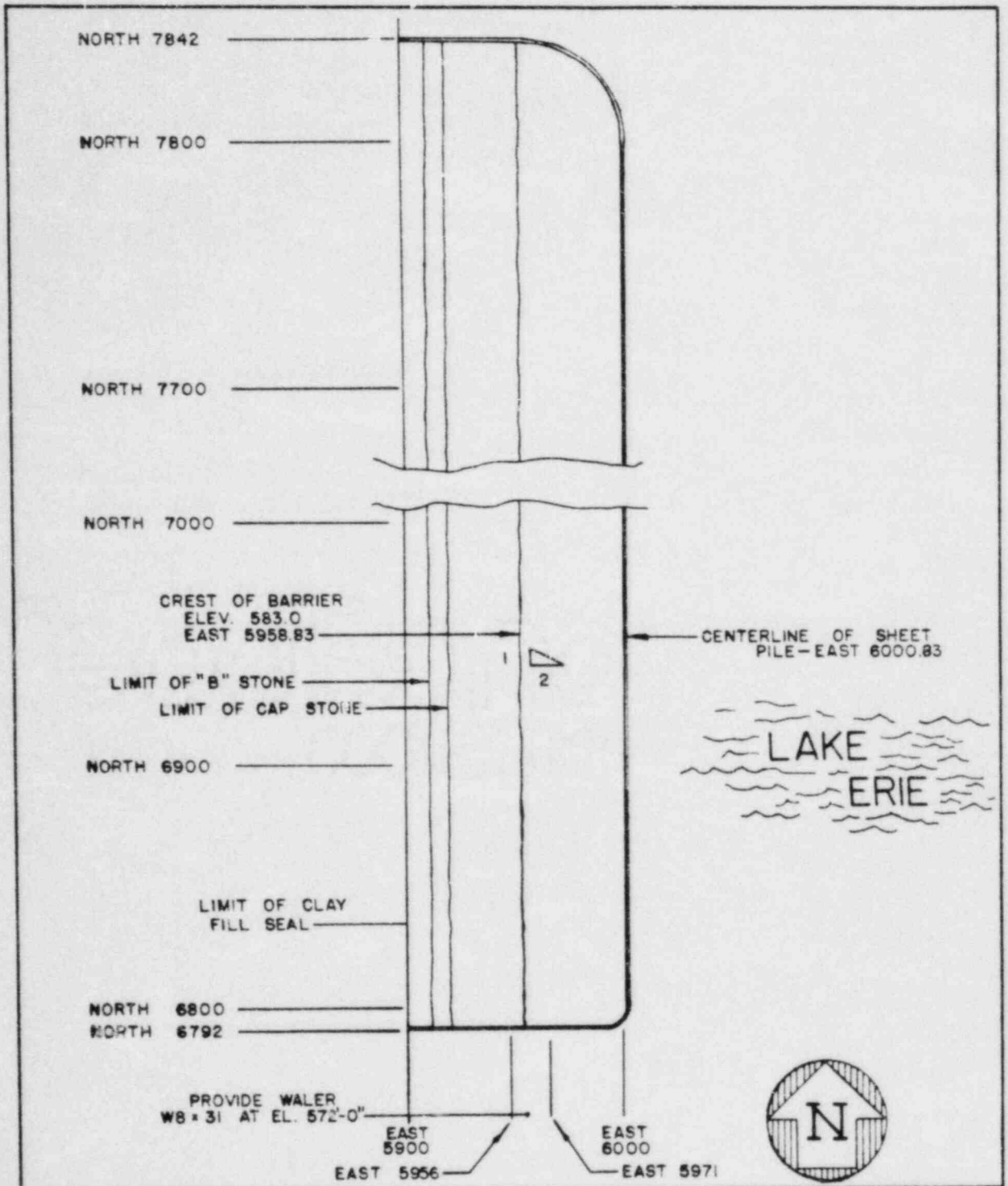
TYPICAL SHORE BARRIER SECTION — PLAN

THE DETROIT EDISON CO.

FERMI II P.P. MONROE, MICHIGAN

SCALE 1" = 10'-0"

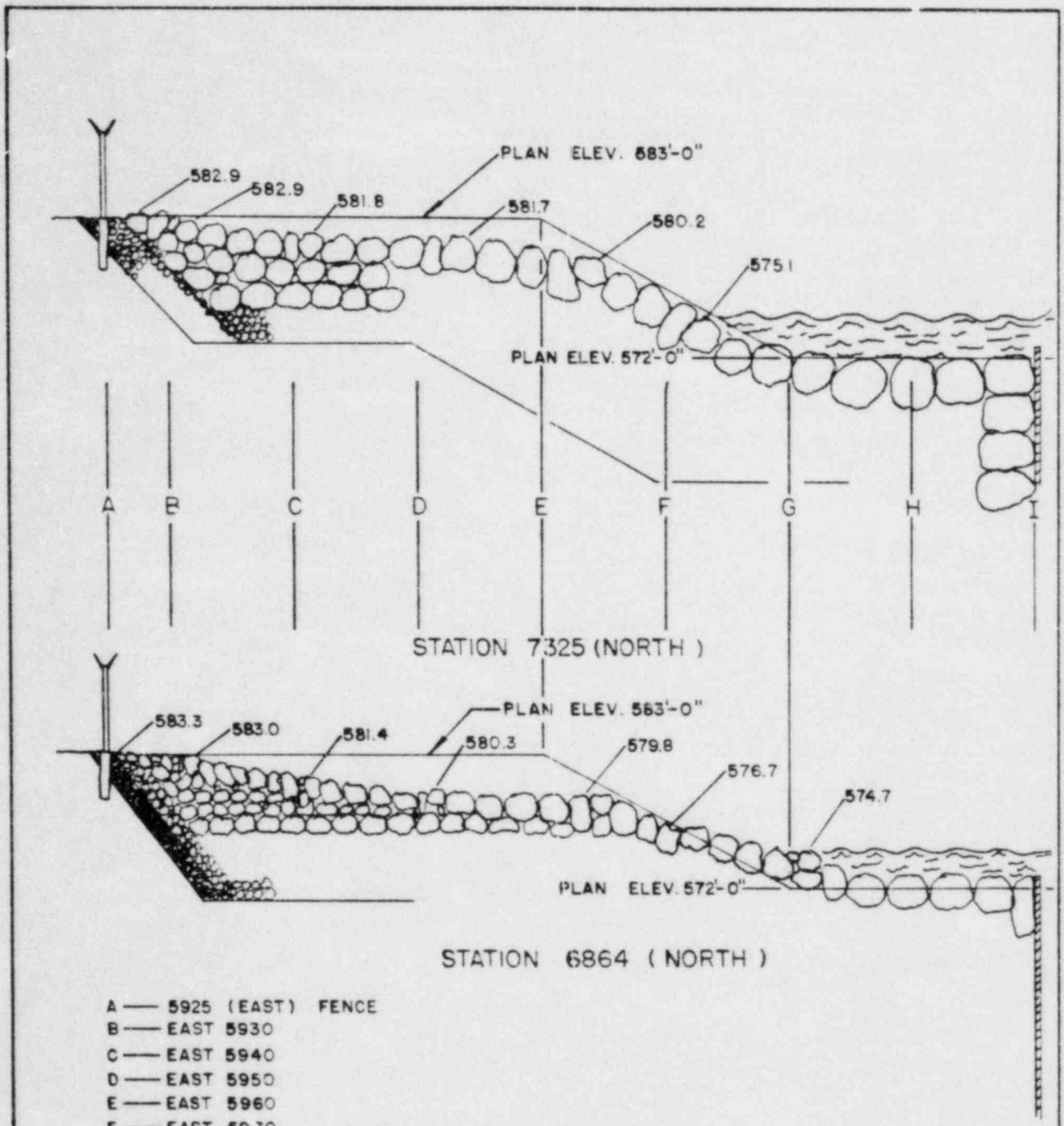
FIGURE NO. 3.2.3



SHORE BARRIER PLAN
SCALE 1" = 50'-0"

THE DETROIT EDISON CO.
FERMI II P.P. MONROE, MICHIGAN

FIGURE NO. 3.2.4

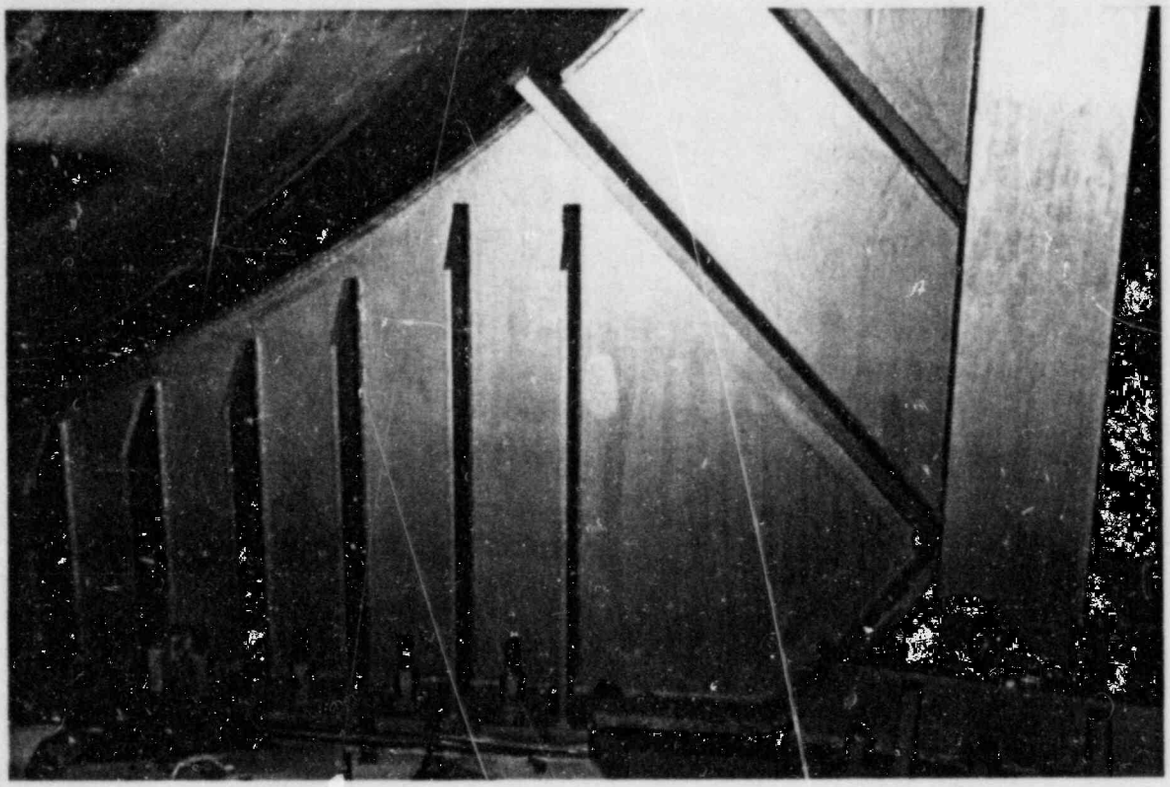


A — 5925 (EAST) FENCE
B — EAST 5930
C — EAST 5940
D — EAST 5950
E — EAST 5960
F — EAST 5970
G — EAST 5980 — EDGE OF WATER
H — EAST 5990
I — EAST 6000.83 CENTERLINE OF SHEET PILING

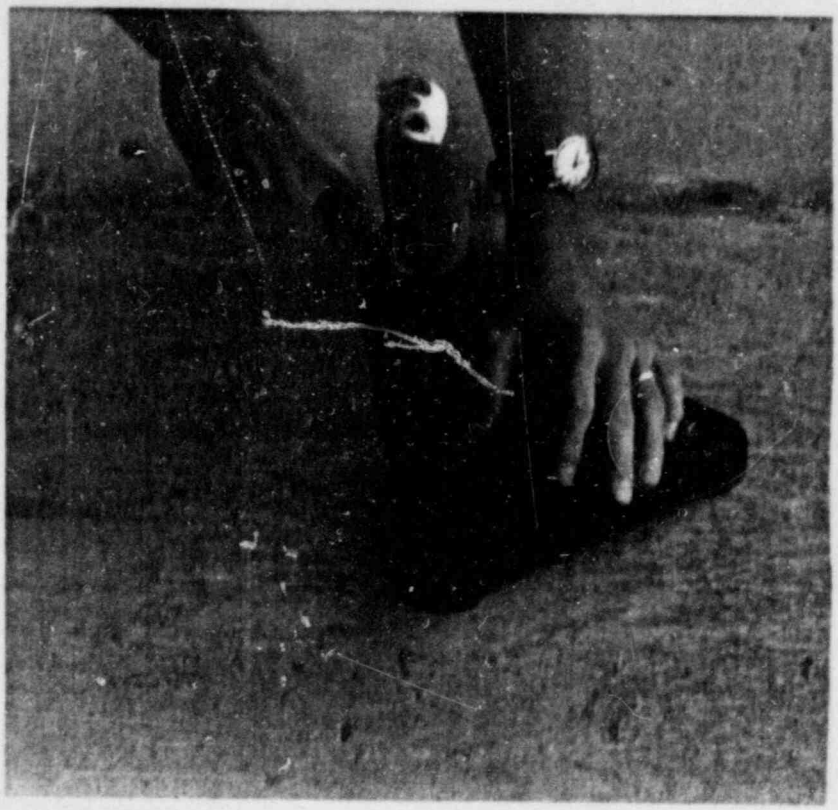
SHORE BARRIER PROFILE
AS-BUILT SURVEY

THE DETROIT EDISON CO.
FERMI II P.P. MONROE, MICH.

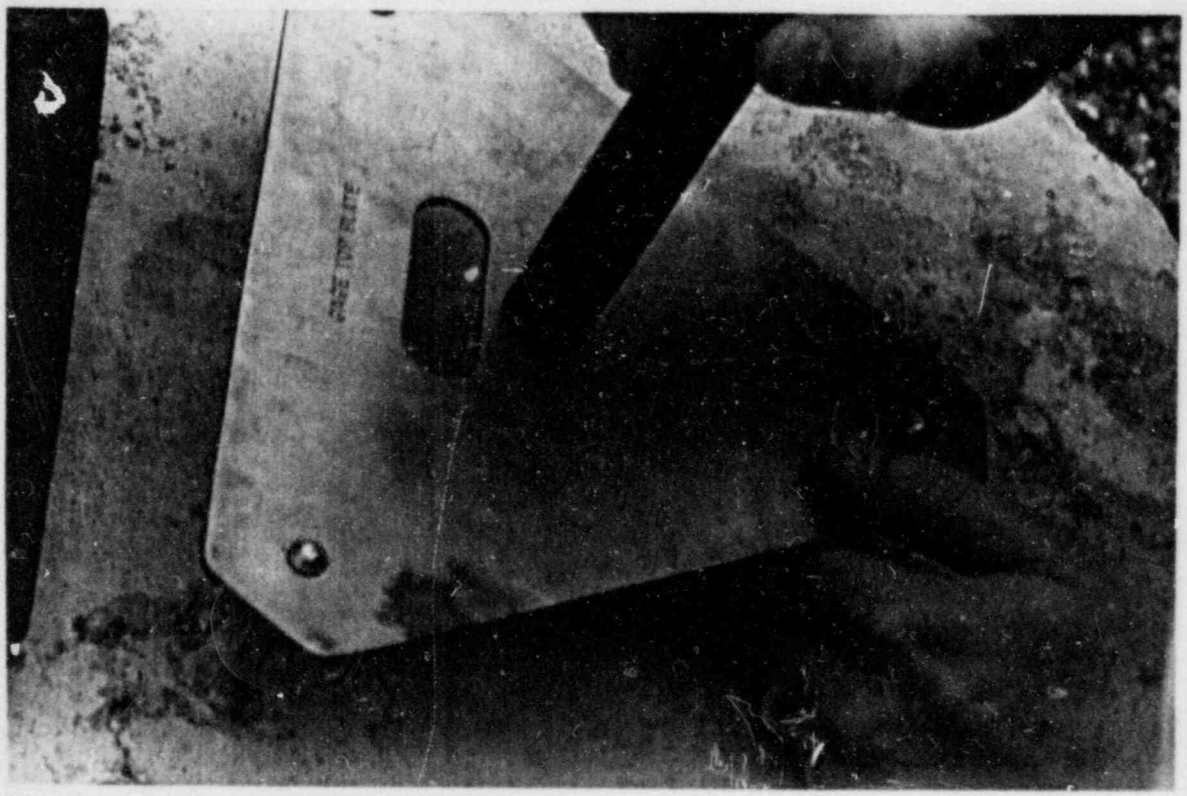
DATE JUNE 28, 1984 | FIGURE NO. 3.2.5



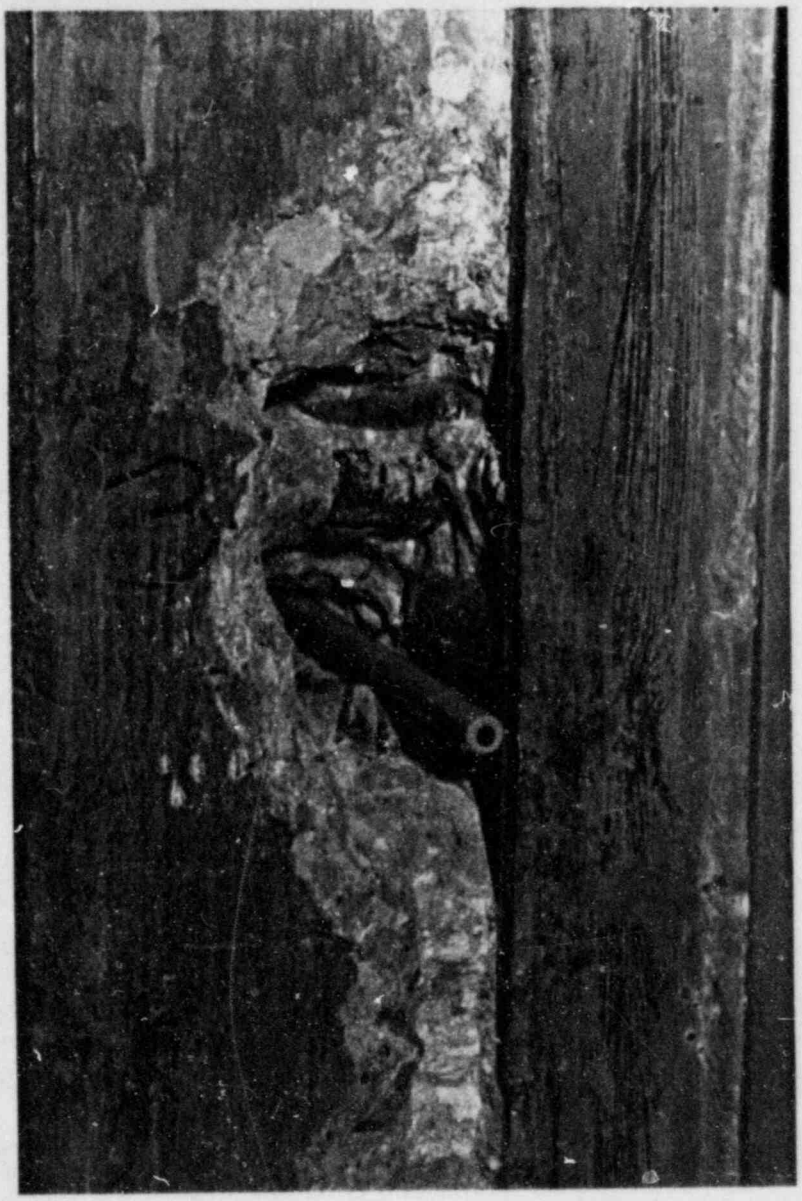
Photograph 3.2.1 Torus support structure on elevation 540 ft.



Photograph 3.2.2 Setting windsor probes in triangular pattern with test gun.



Photograph 3.2.3 Measurement of windsor probe height using standard gage plate.



Photograph 3.2.4 Honeycomb concrete around a watertight door frame.

Photograph 3.2.5 Physical survey of shore barrier.

3.3 Containment

3.3.1 Purpose

The purpose of the containment review was to inspect welding, review radiographs, perform NDE and review mill test reports for conformance to specified code requirements and the latest design disclosure documents.

3.3.2 Criteria

(1) Detroit Edison Project Specification 3071-9 "Containment Vessels"

(2) ASME Code Section II, III, VIII and IX thru Summer 69 addenda.

(3) Chicago Bridge and Iron Quality Control Procedures MTP-12 and MT-1N.

3.3.3 Items Evaluated

For the purpose of this report the containment is divided into four zones (see Figure 3.3.1). Zone 1 is the wetwell and Zone 2 - 4 are the drywell areas. Table 3.3.1 outlines the welds which were selected for this review including the NDE performed. The scope of the radiographic review was increased from 50 to 100 due to a concern relating to improper film storage. While selecting the initial sample of 50, a box of radiographs was discovered with a discoloration on the film. It appeared that the interleaf sheets had become moist and had caused minor watermarks/discoloration on the film. The team decided at this point to increase the sample size to 100 radiographys and examine film which did not have a storage concern. The film with the discoloration/watermarks was readable.

Fifty-eight welds were selected for a visual inspection to the originally specified inspection criteria. Twenty-six of the those welds selected were magnetic particle tested to the original procedure specified. The MTs were performed by certified Detroit Edison contract personnel.

Five containment plates were randomly selected for a review of their certified Mill Test Reports. Table 3.3.2 outlines the containment plates which were selected for a detailed documentation review.

A visual inspection of the containment plate was made at random locations for construction induced damage (i.e., arc strikes and gouges).

3.3.4 Results

The review of 103 radiographs by a Level III RT inspector resulted in no deviations. A concern relating to improper storage of radiographs was identified on one box of film. Although this film is readable at this time, precautions should be employed to monitor the film quality of these radiographs. The visual inspection of the 58 welds selected did not identify any major deviations. One weld on penetration X-25 had a 1/8" deep gouge 1" long. This gouge appears to be construction induced damaged because the gouge had occured after the weld was coated.

The 26 welds which were magnetic particle tested resulted in 3 welds which contained rejectable indications in accordance with the originally specified criteria. Paint was removed from these welds to insure that a proper MT test could be performed.

Certified Mill Test Reports identified in Table 3.3.2 were reviewed for compliance with the ASME Code Sections II and III thru Summer 1969 addendum and ASTM A516 (1970 edition). All CMTRs contained values which were in compliance with the code requirements.

The exterior of the wetwell and the interior of the drywell has not been properly protected from construction induced damage. Arc strikes were identified in both areas which were not repaired. Additionally, metal construction scaffolds were found erected in direct contact with the containment plate. These areas have scratched the coatings and in some areas gouged the containment plates.

3.3.5 Conclusions

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.

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.

TABLE 3.3.1

Containment Weld Summary

Weld Number	Interval	Zone	Visual	MT	Review RT	Comments
2R	11-12	2			X	
2M	16-17	2			X	
2M	10-11	2			X	
2H	19-20	2			X	
2H	14-15	2			X	
2H	9-10	2			X	
2D	19-20	2			X	
2D	16-17	2			X	
2D	9-10	2			X	
2D	5-6	2			X	
2L	6-7	2			X	
2L	1-2	2			X	
2K	15-16	2			X	
2J	0-1	2			X	
2H	0-15	2			X	
2H	13-14	2			X	
2H	12-13	2			X	
2H	6-7	2			X	
2H	0-1	2			X	
2K	4-5	2			X	
3F	8-9	3			X	
3F	12-13	3			X	
3F	17-18	3			X	
3H	5-6	3			X	
3H	18-19	3			X	
3H	14-15	3			X	
3H	22-23	3			X	
3H	27-28	3			X	
3J	0-1	3			X	
3J	9-10	3			X	
6D	0-1	4			X	
6C	4-5	4			X	
6B	3-4	4			X	
6A	5-6	4			X	
6A	1-2	4			X	
5D	5-6	4			X	
5C	1-2	4			X	
5C	2-3	4			X	
5A	4-5	4			X	
1A	21-22	2			X	
C9	17-18	1			X	
C9	16-17	1			X	
C9	12-13	1			X	
C9	0-1	1			X	
C8	15-16	1			X	
C8	8-9	1			X	
C8	3-4	1			X	
C4	19-20	1			X	

TABLE 3.3.1 (Cont'd)

Containment Weld Summary

Weld Number	Interval	Zone	Visual	MT	Review RT	Comments
C4	18-19	1			X	
C3	20-21	1			X	
11-12	49-50	4			X	
11-12	44-45	4			X	
11-12	25-26	4			X	
11-12	11-12	4			X	
12A	11-12	4			X	
12A	7-8	4			X	
21GG		4			X	
21GF		4			X	
21GE		4			X	
21EA		4			X	
D37	8-9	1			X	
D37	15-16	1			X	
D40	19-20	1			X	
D40	14-15	1			X	
D40	6-7	1			X	
D39	13-14	1			X	
D37	18-19	1			X	
D37	11-12	1			X	
D36	16-17	1			X	
D36	7-8	1			X	
D9	6-7	1			X	
D9	12-13	1			X	
D9	17-18	1			X	
D10	7-8	1			X	
D10	12-13	1			X	
D10	14-15	1			X	
D10	20-21	1			X	
D21	2-3	1			X	
D21	5-6	1			X	
D21	11-12	1			X	
D21	19-20	1			X	
D22	4-5	1			X	
D22	5-6	1			X	
A1	2-3	1			X	
A1	6-7	1			X	
A1	10-11	1			X	
A48	1-2	1			X	
A48	6-7	1			X	
A48	13-14	1			X	
A48	20-21	1			X	
A6	5-6	1			X	
A6	9-10	1			X	
A6	16-17	1			X	
B21	6-7	1			X	
B21	7-8	1			X	
B21	14-15	1			X	

TABLE 3.3.1 (Cont'd)

Containment Weld Summary

Weld Number	Interval	Zone	Visual	MT	Review RT	Comments
B21	19-20	1			X	
D3	6-7	1			X	
D3	11-12	1			X	
D4	2-3	1			X	
D4	11-12	1			X	
D4	18-19	1			X	
D15	1-2	1			X	
36-3		3	X			
46		3	X			
73		3	X			
42		3	X			
367		3	X			
36-2		3	X			
173		3	X			
381		3	X			
333		3	X			
345		3	X			
101		3	X			
106		3	X			
X-54B		4	X	X		
X-7A		2	X	X		
X-11		2	X	X		
X-8		2	X	X		
X-9B		2	X	X		See Note 1
X-45		2	X	X		See Note 2
X-55B		4	X	X		See Note 3
X-17		4	X			
X-31B		2	X			
X-13A		2	X			
X-25		4	X			See Note 4
A18		1	X			
QA104-A		3	X			
QA104-B		3	X			
QA104-C		3	X			
QA104-D		3	X			
QA104-J		3	X			
Torus Support No. 12-1		1	X	X		
Torus Support No. 12-2		1	X	X		
Torus Support No. 12-3		1	X	X		
Torus Support No. 12-4		1	X	X		
Torus Support No. 12-5		1	X	X		
Torus Support No. 12-6		1	X	X		
Torus Support No. 12-7		1	X	X		
Torus Support No. 12-8		1	X	X		
Torus Support No. 12-9		1	X	X		See Note 5
Elev. 569'5"-576' Az. 145°		2	X			Plate to plate welds
Elev. 586'6" Az. 135°-150°		2	X			Plate to plate welds

TABLE 3.3.1 (Cont'd)

Containment Weld Summary

Weld Number	Interval	Zone	Visual	MT	Review RT	Comments
Elev. 581'-584' Az. 152°		2	X			Plate to plate welds
Elev. 644'7" Az. 135°-180°		4	X			Plate to plate welds
Elev. 652'-659' Az. 90°		4	X			Plate to plate welds
Elev. 654'-659' Az. 210°		4	X			Plate to plate welds
Elev. 586'6" Az. 201°-215°		2	X			Plate to plate welds
Elev. 592'6"-595'-6"/ Az. 70°-90°		2	X			Plate to plate welds
Elev. 623' Az. 36°-65°		3	X			Plate to plate welds
Elev. 623'-627' Az. 47°		3	X			Plate to plate welds
Torus Penetration Pads X-213A15		1	X	X		
Torus Penetration Pads X-213A-19		1	X	X		
Torus Penetration Pads X-213A-8		1	X	X		
Torus Penetration Pads X-213A-4		1	X	X		
Torus Penetration Pads 206F weld P		1	X	X		
Torus Penetration Pads 206F weld Q		1	X	X		
Torus Penetration Pads 206F weld N		1	X	X		
Torus Penetration Pads X-231		1	X	X		
Torus Penetration Pads X-206C		1	X	X		
Torus Penetration Pads X-206E		1	X	X		

NOTE 1: CAT Item #63 - Rejectable linear indication in penetration weld.

NOTE 2: CAT Item #54 - Lack of fusion and slag holes identified in penetration weld.

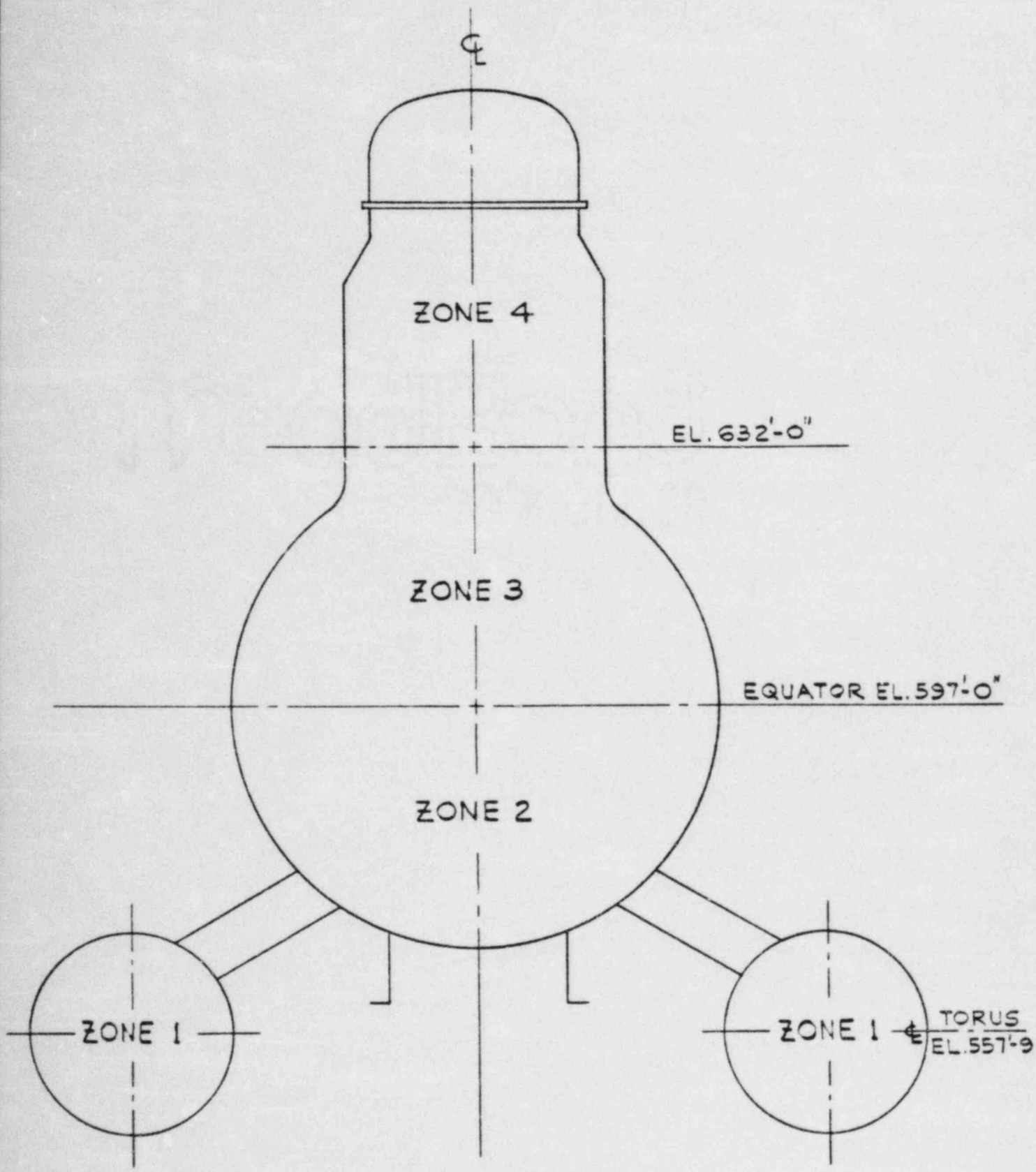
NOTE 3: CAT Item #53 - Lamination identified in wall plate.

NOTE 4: CAT Item #124 - Gouged area in weld approximately 1/8" deep by 1" long at approximately 8:00 o'clock. Gouge area occured after penetration was painted.

NOTE 5: CAT Item #21 - Rejectable weld with porosity, slag and cold lap.

TABLE 3.3.2 Containment: CMTR Review

Containment Piece MK #	Serial #	Zone	Heat Number
10 - 5	6	2	517A1289
10 - 6	11	3	517A1598
11 - 1	1	4	801A04399
11 - 3	5	4	802A03100
13 - 2	6	3	802A06240



ELEVATION VIEW
DRYWELL

FIGURE NO. 3.3.1

3.4 Coatings

3.4.1 Purpose

Coatings were examined for conformance to Design Specifications and industry practices.

3.4.2 Criteria

(1) Detroit Edison Specification 3071-9 "Containment Vessels"

(2) Detroit Edison Specification 3071-316 "Field Painting - Level I Steel Containment Coating Inside Drywell"

(3) Detroit Edison Specification 3071-55 "Painting"

(4) Detroit Edison Specification 3071-317 "Field Coating Inside Drywell"

(5) ANSI N512-1974 "Protective Coatings (Paints) for the Nuclear Industry"

(6) Detroit Edison Quality Control Instruction C4.0 "Positector 2000 Calibration"

3.4.3 Items Evaluated

Areas were randomly selected on steel surfaces and on the concrete reactor vessel support pedestal. Twenty-two areas were selected for a visual inspection and dry film thickness check on the interior of the drywell. See Table 3.4.1 for location and summarized results.

Twenty areas were randomly selected on steel surfaces other than containment (i.e., tubular supports for hangers, equipment and structural steel) for a visual inspection and dry film thickness check. Areas were selected which were considered remote and high traffic. Remote is an area where it is isolated from heavy traffic. High traffic is an area where the components inspected were walked on or climbed on frequently. See Table 3.4.2 for location and summarized results.

Five areas were randomly selected on the concrete reactor vessel support pedestal for a visual inspection and an adhesion test. Areas were selected which had been repair coated and original coated. See Table 3.4.3 for location and summarized results.

3.4.4 Results

In the Drywell locations for steel surfaces (containment and miscellaneous steel supports) the majority of the areas inspected had some form of coatings damage. The most frequently occuring damage was

scratches to the CZ-11 Carbo Zinc primer. This was identified on most areas of high traffic and on some remote locations. Refer to Tables 3.4.1 and 3.4.2 for locations. This damage appears to be typical construction induced which results from scaffolding, rigging and handling materials. Detroit Edison had started repairs in the upper locations of the drywell. Areas inspected in this zone had less damage. In most cases where scratches had occured some zinc primer was still intact on the component. Dry film thickness check results and areas selected are outlined in Tables 3.4.1 and 3.4.2. The majority of the areas checked were acceptable. Areas where low readings were observed were areas of high traffic where the coating had been worn down to an unacceptable level. In the areas of the drywell, the acceptable limits per specification are: minimum 1 mil and no upper limit. In the area of miscellaneous steel supports the acceptable limits per specification are minimum 2 mils and maximum of 9 mils. The dry film thickness gage used was calibrated to Detroit Edison Quality Control Instruction C4.0. See Photographs 3.4.1 and 3.4.2.

Adhesion tests were performed using an Elcometer Adhesion Tester Model 106/A. These tests were performed by Detroit Edison contract personnel and observed by the team. The results of these tests are documented in Table 3.4.3. See Figure 3.4.1 for Elcometer calibration data. All areas examined were within the recommended acceptable limits provided in ANSI N512-1974. Areas were selected on originally coated surfaces and areas which had been recently repaired. See Photographs 3.4.3 and 3.4.4.

3.4.5 Conclusions

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 their position on these coating requirements.

TABLE 3.4.1
Coatings Summary - Steel Surfaces: Containment

Area #	Location * Elev	Azimuth	Average DFT (mils)	Comments
1	654	210°	4.5	Repaired Area
2	652	210°	7.6	Coating Scratched
3	654	330°	6.7	Coating Scratched
4	649	315°	10.6	Penetration Plate - Coating Scratched
5	649	315°	10.3	Penetration Plate - Coating Scratched
6	618	150°	15.5	Coating Scratched Overhead Paint Application with Sags & Runs
7	618	150°	11.6	Coating Scratched Overhead Paint Application with Sags & Runs
8	615	60°	17.2	Repaired Area
9	615	61°	12.2	
10	610	120°	10.8	Coating damaged by welder's arc strikes
11	610	170°	9.8	Weld Pad - Coating Scratched
12	604	190°	4.7	
13	601	196°	14.5	Penetration Plate - Coating Scratched
14	595	262°	12.0	
15	598	240°	11.7	
16	588	210°	5.5	
17	589	175°	5.3	Personnel Access Hatch Coatings Scratched
18	590	120°	6.4	Equipment Hatch Collar Coatings Scratched
19	589	110°	4.5	
20	574	145°	3.9	
21	579	160°	6.7	Penetration Plate
22	573	190°	17.3	Area Top Coated - Needs Repair

TABLE 3.4.2
Coatings Summary - Steel Surfaces: Misc. Steel

Area #	Location * Elev	Azimuth	Average DFT (mils)	Comments
1	577	210°	6.0	Pipe Support - Coatings Scratched
2	579	100°	3.2	HVAC Support - Welds not coated
3	585	114°	2.5	Pipe Support - Coatings Scratched
4	587	61°	3.4	Pipe Support - One member not coated
5	590	62°	4.4	Pipe Support - Welds not coated
6	597	0°	1.2	Pipe Support - Strut, high traffic area
7	597	10°	5.3	Pipe Support Clamp
8	617	240°	5.2	Struct. Steel
9	617	240°	3.5	HVAC Support - Coatings Scratched
10	630	225°	6.7	Door on Scaf. Shield Wall
11	628	240°	2.4	Pipe Support Clamp - Welds not coated
12	609	230°	4.5	HVAC Support
13	603	195°	3.4	Pipe Support - Shock Suppressor
14	605	194°	5.0	Struct. Steel - Welds not coated
15	605	200°	5.3	Pipe Support - Spring Can
16	603	19[illegible]°	2.2	Elec. Penetration Cover - Coatings Scratched
17	603	20[illegible]°	3.6	Elec. Penetration Cover - Coatings Scratched
18	585	200°	5.4	Struct. Steel - Coatings Scratched
19	590	140°	5.1	Steel Embedment in Concrete Wall
20	585	152°	.7	Pipe Support - High Traffic Area - Low Mils due to Location

TABLE 3.4.3

Coatings Summary: Concrete Surfaces

Test Id. No.	Location		Test Value	Value (lbs)	Type or Surface Break*
	Elev	Azimuth			
A	575	100°	3.5	250	100% Concrete
B	577	210°	8.0	710	100% Surfacer
C	596	114°	4.5	350	60% Surfacer, 40% Concrete
D	590	53°	3.5	250	70% Surfacer, 30% Concrete
E	592	113°	5.0	400	95% Concrete, 5% Surfacer

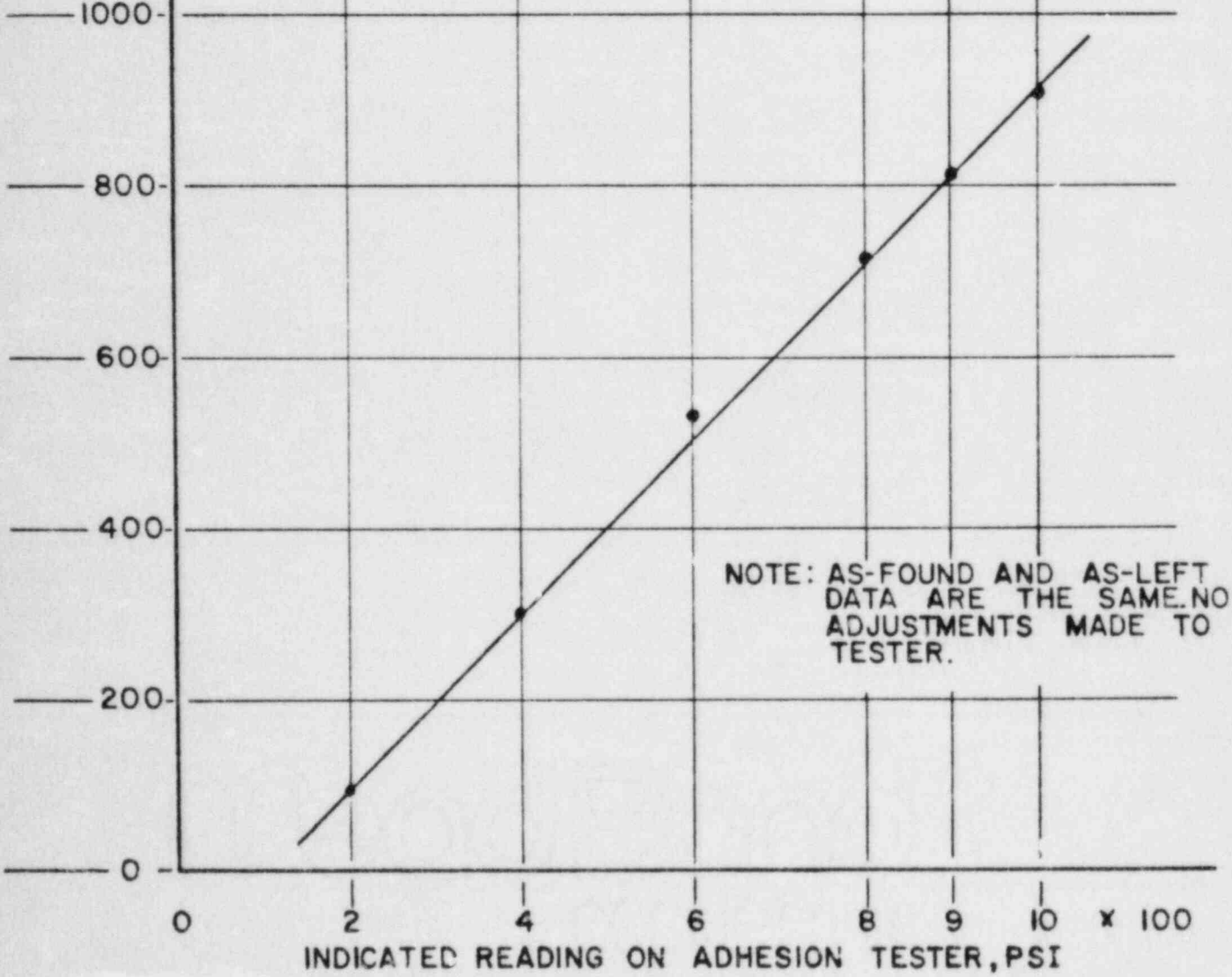
*Refer to Photograph 3.4.4 for types of surface breaks.

CALIBRATION CURVE FOR ELCOMETER

ADHESION TESTER MODEL 106/2, S/N 18713
CALIBRATION DATE 6-25-84
ENGINEERING RESEARCH REPORT 84C50-29

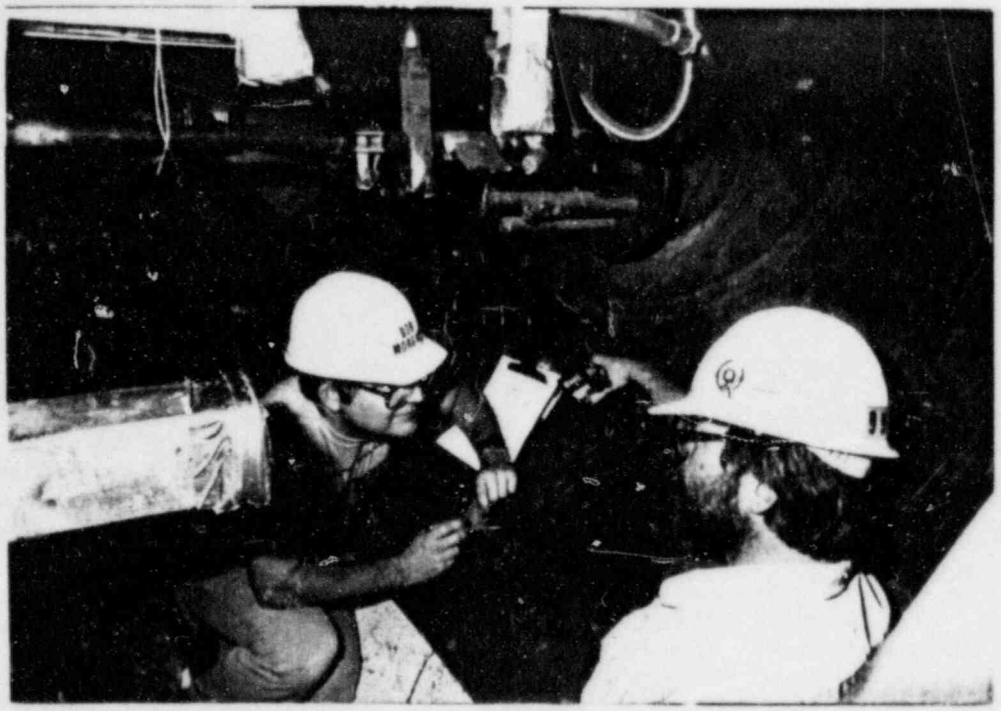
INDICATED READING PSI	TEST STD. LB.	TEST STD., PSI
0	0	0
2	45	90
4	150	300
6	265	530
8	355	710
9	405	810
10	455	910

TEST STD. WAS A RIEHLE TESTING MACHINE, ER 0007. NEXT CAL. DATE: JUNE 1985

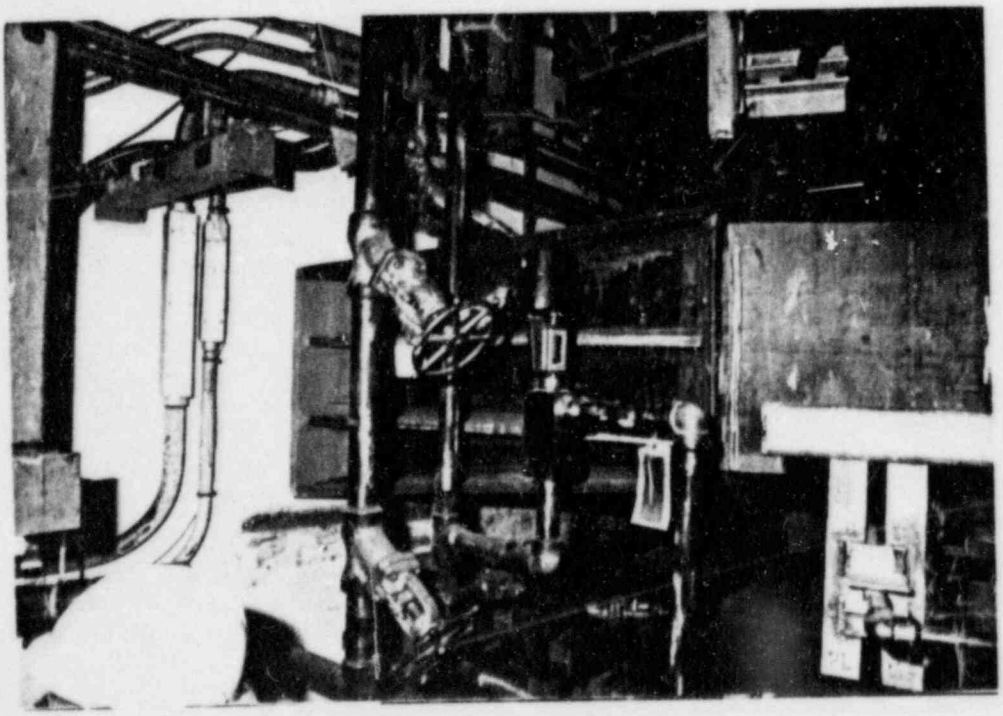


NOTE: AS-FOUND AND AS-LEFT DATA ARE THE SAME. NO ADJUSTMENTS MADE TO TESTER.

FIGURE NO. 3.4.1

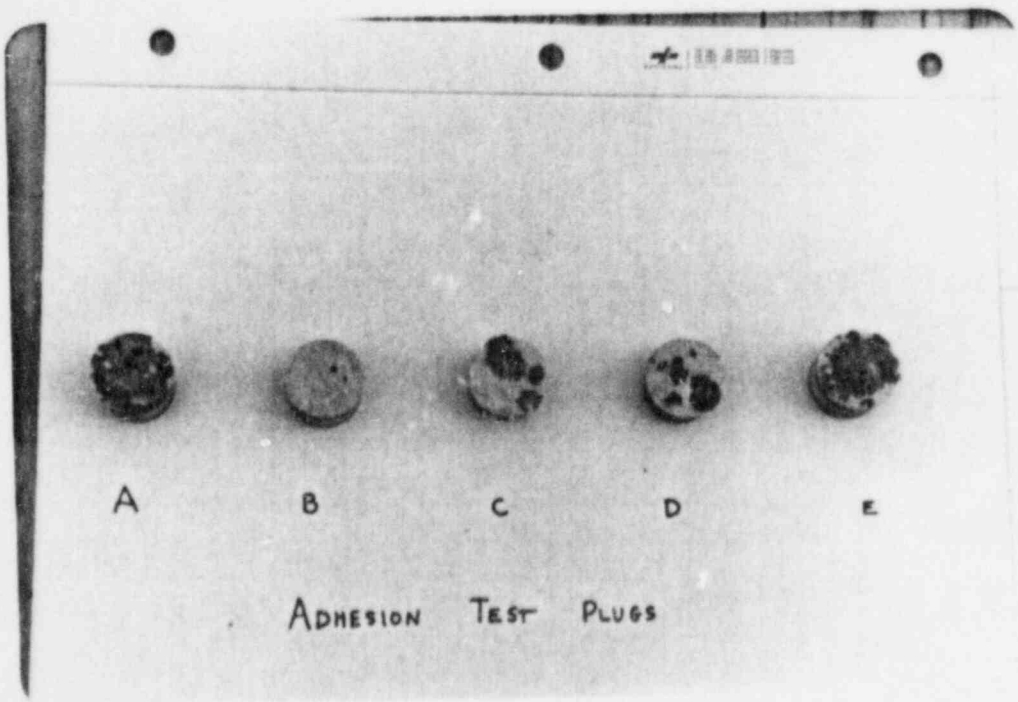


Photograph 3.4.1 Typical dry film thickness check on the containment plate.



Photograph 3.4.2 Typical condition of Drywell area. The concrete wall in this area had been repaired. The restraint located in the center of this picture is not coated. The small support shown in the lower right hand corner has been properly coated, but the welds were not coated.

Photograph 3.4.3 Elcometer adhesion testing of coating to concrete.



Photograph 3.4.4 Surface breaks for test plugs.

3.5 Materials Testing

3.5.1 Purpose

The purpose of these tests were to determine material identification of as-built structural components. A Telebrineller hardness tester was used to sample steel hardness in order to obtain an approximation of material tensile strengths.

3.5.2 Criteria

(1) Material Test Reports from Suppliers

(2) Telebrineller's - Manufacturers Instruction Sheet

(3) Applicable ASTM Specification

3.5.3 Items Evaluated

Eight different items were tested from four categories of steel (see Photographs 3.5.1 and 3.5.2). Table 3.5.1 summarizes the items tested and location.

The items were evaluated by taking three material impressions performed for each of the materials and averaged to obtain an overall hardness value. Hardness was calculated from a dial which computes material hardness given bar hardness, material impression diameter, and bar impression diameter. An industry chart was used to correlate Brinell hardness to tensile strength. The chart is only acceptable for tensile values above 70000 psi. For the three tests values below 70000 psi, a graph was developed to approximate tensile values.

3.5.4 Results

While performing the hardness test on the Torus Support Steel and Drywell Containment Plate, problems were encountered. In both cases one test came up low on tensile strength. However, an average of the three tests performed results in tensile strengths well above the required values for A588 and A516 Gr. 70 respectively.

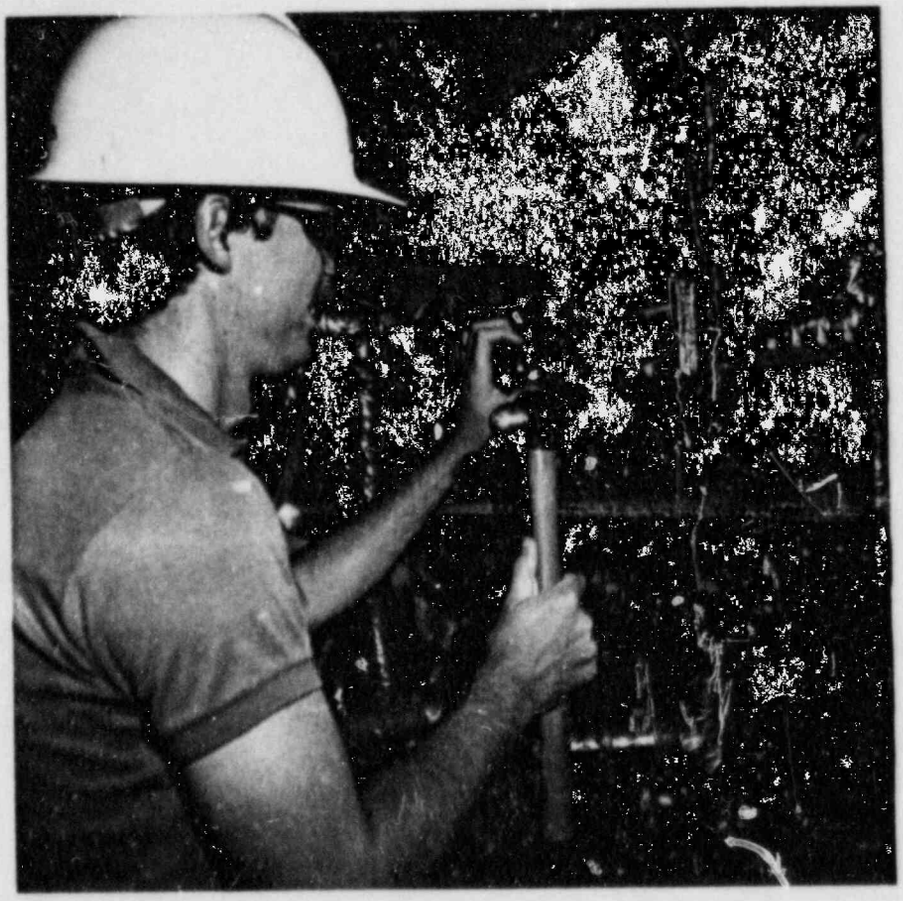
3.5.5 Conclusions

On the basis of this evaluation, the team concludes that material grades specified by design documents were installed correctly.

TABLE 3.5.1

Hardness Testing Summary

Test No.	Description of Item Tested	Location	Material Identification
1	Torus Support No. 10	Elev. 540' Az. 200° Bay 9 side	A588
2	Torus Support No. 9	Elev. 540' Az. 170° Bay 8 side	A588
3	Pipe Whip Restraint Support Steel B31-RR-10A	Elev. 587' Az. 270°	A588
4	Pipe Whip Restraint Support Steel G33-3096-CUR-27	Elev. 587' Az. 240°	A588
5	Drywell Containment Plate No. 10-6-2	Elev. 588' Between 215° and 220°	A516 Gr. 70
6	Drywell Containment Plate No. 10-4-2	Elev. 578' Between 180° and 190°	Bad test due to primer on steel.
7	Retest of Test 6	Elev. 578' Between 180° and 190°	A516 Gr. 70
8	Pipe Support Tube Steel, B31-5269-G17	Elev. 577' Az. 190° Drywell	A500 Gr. B
9	Electrical Conduit Support Tube Steel, QU-241	Aux Bldg Elev. 640' 10' south of Col. G-15	A500 Gr. B



Photograph 3.5.1 Brinell hardness test on Pipe Whip Restraint Steel.

Photograph 3.5.2 Examining Brinell Hardness test results.

3.6 Piping Systems

3.6.1 Piping Walkdown

3.6.1.1 Purpose

Selected portions of piping systems were examined to determine if they had been installed in accordance with the Piping Drawings and Specifications

3.6.1.2 Criteria

(1) Detroit Edison Company Specification 3071-31 - Pipe Erection

(2) Detroit Edison Company Specification 3071-525 - Design Specification for Nuclear Class 2 and 3 Small Piping and Instrument and Control Piping and Tubing

(3) Detroit Eidson Company Piping Drawings as listed in Table 3.6.5

3.6.1.3 Items Evaluated

The systems for which portions were selected for walkdown were Core Spray, Residual Heat Removal, High Pressure Coolant Injection and Reactor Core Isolation Cooling. These systems are shown diagramatically in Figures 3.6.1 through 3.6.5. The piping was examined for size, material type, marking, dimensional configuration, branch and instrument connections, valve orientation, bolting, and state of completion. Selected flanged joints were checked for proper bolt torque. Also, a check was made for the installation of the proper valves and equipment.

(1) Core Spray System (Figure 3.6.1)

The South loop of the Core Spray System was selected for walkdown. This loop was examined from the connection at the Suppression Pool (Torus) through Pumps B & D and on to the nozzle on the Reactor Vessel.

(2) RHR System (Figure 3.6.2)

The portion of the RHR System selected for walkdown starts at Heat Exchanger A and continues through valve V8-2187. It also includes the branch to Drywell Penetration X-13B.

(3) HPCI System (Figure 3.6.3)

The portion of the HPCI System selected for walkdown starts at the pump discharge and continues to the tie into the Feedwater System.

(4) RCIC System (Figures 3.6.4 & 3.6.5)

The portion of the RCIC System selected for walkdown consisted of the Vacuum Pump Discharge and associated small bore piping around the Barometric Condenser.

3.6.1.4 Results

No major deviations were identified. The portions of the systems examined are considered to conform to the design drawings and specifications. The noted exceptions are listed below. Due to the large amount of insulation in place, it was not possible to examine all materials for identification and marking. The portion that was visible did have the required marking and identification.

(1) Core Spray System

Where the riser passed through the floor sleeve at Elevation 613'-6", there was only 1/2" clearance on one side. On valve V8-2034, the operator was turned down 30° instead of being on the horizontal. The drain point at Elevation 622'-2" had a hose adapter still in place rather than a pipe cap. Valve V23-2031 was tagged V8-4004. On Restricting Orifice RO-D001B, 4 of 8 bolts did not have full thread engagement.

(2) RHR System

The 2" Vent Line shown on small bore piping drawing 6wME11-5305-1 is not shown on the main piping isometric. Penetration X-12 had minor damage to the bellows. The 1/2" piping connection on this penetration had not been capped on the outside while some did have caps.

(3) HPCI System

A 1" branch connection was found which did not show on Isometric 6M721-3167-1. Two of the four studs on the inlet flange of relief valve V22-2044 were undertorqued by approximately 15%.

(4) RCIC System

Instrument TWT-E51-L426 was not installed. Five out of eight studs on flanges for Restricting Orifice RO-D009 were undertorqued approximately 30%. On Restricting Orifice RO-D005, half of the studs were undertorqued by 40% to 50%. On Flow Orifice FE-N001 half of the studs were undertorqued 10% to 30%.

3.6.1.5 Conclusions

On the basis of the above results, the piping examined meets the requirements of the specifications and drawings except as follows. Some bolts on flanged joints appeared to be undertorqued. This is

to be expected due to relaxation of gaskets and stress cycling during hydrotesting and preoperational testing. The primary reasons for torquing bolts to some established value during installation are to seat the gasket, provide enough preload stress in the joint to counteract hydrotest stresses, and to protect the flanges and bolting from yielding due to excessive torque. In the event that any leakage occurs due to torque relaxation, it may be eliminated by retorquing the bolts. From this standpoint, the low bolt torques found are not considered to be a significant problem. This philosophy is established by Appendix XII of ASME Section III. 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.

3.6.2 Nondestructive Examination (NDE)

3.6.2.1 Purpose

Selected welds were subjected to PT or Visual Examination, as appropriate, to demonstrate acceptable quality. Also selected points in various piping systems were examined by UT to measure pipe wall thickness.

3.6.2.2 Criteria

(1) Wismer and Becker Liquid Penetrant Procedure WB-Q-102

(2) Wismer and Becker Ultrasonic Thickness Measurement Procedure WB-Q-105

(3) Wismer and Becker Final Visual Weld Examination Procedure WB-Q-103

3.6.2.3 Items Evaluated

PT - 33 ASME Section III Class 1 and Class 2 socket welds were selected for PT. These are listed in Table 3.6.4.

Visual Examination - 22 ASME Section III Class 3 socket welds were selected for examination. These are listed in Table 3.6.2. Also, 24 ASME Section III Class 3 butt welds were selected for examination. These are listed in Table 3.6.3.

UT - 20 areas on the piping were selected for wall thickness checks. These were in the Core Spray, RHR, HPCI and RCIC Systems. These are listed in Table 3.6.1.

3.6.2.4 Results

No major deviations were identified. The welds and piping examined conform to the requirements of the applicable procedures. The noted exceptions are listed below.

PT - In some instances, acceptable rounded indications were identified. Also the as forged surface of the socket weld fittings showed acceptable indications. See Photograph 3.6.1 for a typical example. Several minor arc strikes were detected as noted in Table 3.6.4. Also, one rejectable indication was identified on a fitting as noted in Table 3.6.4.

UT - In one area of the HPCI piping, two UT readings were found to be below minimum required wall thickness. See Table 3.6.1 and Figure 3.6.6.

3.6.2.5 Conclusions

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.

3.6.3 Welding

3.6.3.1 Purpose

Two welding procedures were selected for review, one for stainless steel and one for carbon steel with impact property requirements. The review was made to determine if the procedures were written and qualified in accordance with ASME Section IX and if they would produce welds with the desired properties. Also, two welds were selected to verify compliance with the procedures.

3.6.3.2 Criteria

(1) ASME Section IX-1971 Edition through Winter 1972 Addenda

(2) Wismer & Becker WPS-103, GTAW and/or SMAW of P1 Materials Groove Welding 2 1/2" NPS and larger - Socket Welding all NPS

(3) Wismer & Becker WPS-805, Combination GTAW and SMAW with a Consumable Insert for Recirculation System Stainless Steel Piping (G.E.)

3.6.3.3 Items Evaluated

The selected welding procedures were reviewed for compliance with ASME Section IX with respect to format, content and procedural qualification. A weld made with each of these procedures was selected for review. These were weld A-1 on G.E. drawing 761-E-214 (Reactor Recirculation System) and weld 1WO on Detroit Edison Co. drawing 6M721-3053-1 (Core Spray System). The process control sheets for these welds were reviewed for compliance with the welding

procedures. The qualification papers for the welders involved were also reviewed.

3.6.3.4 Results

No major deviations were identified. The procedures are in com pliance with ASME Section IX and have been properly qualified. The welds reviewed were in compliance with the procedures and the welders were properly certified. One deviation was noted on weld 1WO. This weld joined P1 Group 1 material to P1 Group 2 material. The applicable procedure (WPS-103) only covered P1 Group 1 material. A subsequent revision (No. 16) incorporates P1 Group 2 materials but does not address welds joining the different materials. This item is documented on CAT-1 Number 125.

3.6.3.5 Conclusions

On the basis of the above findings, the procedures have been properly qualified and should produce welds of the required quality.

TABLE 3.6.1

UT Results

System Dwg. Number Location	Size	Nominal Wall Thickness	Results	
RCIC				
Dwg. 6M721-3175-1				
At Field Weld	6"	.432"	.424"	.396"
FW E51-3175-0W1			.417"	.432"
Riser through Basement	6"	.432"	.416"	.430"
Floor at El. 555'±			.436"	.424"
At Field Weld	6"	.432"	.399"	.410"
FW E51-3175-0361			.446"	.424"
At Field Weld	6"	.432"	.415"	.425"
FW E51-3175-2W0			.396"	.410"
RHR				
Dwg. 6M721-2297-1				
At Field Weld	24"	1.218"	1.243"	1.194"
FW E11-2297-0WR2			1.165"	1.212"
Dwg. 6M721-2298-1				
At Field Weld	24"	1.218"	1.213"	1.175"
FW E11-2298-0W2			1.202"	1.238"
Dwg. 6M721-3177-1				
At Field Weld	20"	.594"	.596"	.602"
FW E11-3177-1W0			.570"	.569"
Dwg. 6M721-3152-1				
At Field Weld	20"	.375"	.370"	.360"
FW E11-3152-11W0			.368"	.363"
HPCI				
Dwg. 6M721-6163-1				
Between Field Welds	16"	.375"	.368"	.357"
FW E41-6163-0W7 & 7W0			.356"	.364"
Cross-over between HPCI	12"	.406"	.387"	.404"
Booster Pump & Main Pump			.337"(1)	.352"(1)

(1) Reading below required minimum wall thickness. See Figure 3.6.6.

TABLE 3.6.1 (Cont'd)

UT Results

System Dwg. Number Location	Size	Nominal Wall Thickness	Results	
HPCI (cont'd)				
Dwg. 6M721-3167-1 Between Field Welds FW E41-3167-0W1 & 1WF1	10"	.844"	.813" .868"	.853" .859"
Between Field Welds FW E41-3167-0W4 & 4W0	14"	.750"	.725" .696"	.718" .713"
CORE SPRAY				
Dwg. 6M721-3147-1 Between Field Welds E21-3147-5WF1 & 5WF2	14"	.438"	.441" .432"	.425" .473"
Between Field Welds E21-3147-11W0C1 & 11WF1	3"	.216"	.224"	.216"
Above Field Weld E21-3147-15W16R4	14"	.438"	.431" .437"	.452" .443"
Below Field Weld E21-3147-15W16R4	14"	.438"	.409" .430"	.432" .432"
Dwg. 6M721-3053-1 Horizontal Run Spool Piece E21-3053-2	12"	.844"	.793" .842"	.855" .836"
Below Field Weld E21-3053-2W0	12"	.844"	.798" .831"	.820" .822"
Dwg. 6M721-3149-1 Next to Field Weld E21-3149-6WF2	16"	.500"	.486" .482"	.460" .467"
Downstream of Valve V8-2010 10" from Outlet of Tee	16"	.375"	.380" .361"	.381" .371"
Dwg. 6M721-3148-1 Downstream of Valve V8-2011 Above Tee	16"	.375"	.388" .326"	.382" .366"

TABLE 3.6.2

Visual Inspection - Class 3 Socket Welds

Weld No.	Size	Results
4001-G	3/4"	Acceptable
4001-3&4	3/4"	Acceptable
4001-4&5	3/4"	Acceptable
4001-5&6	3/4"	Acceptable
4001-11	3/4"	Acceptable
4001-D	3/4"	Acceptable
4001-22&23	3/4"	Acceptable
4001-23&24	3/4"	Acceptable
4001-46&47	3/4"	Acceptable
4001-47&48	3/4"	Acceptable
4001-48&49	3/4"	Acceptable
4001-49&50	3/4"	Acceptable
5218-A	3/4"	Acceptable
5218-70&71	3/4"	Acceptable
5218-71&72	3/4"	Acceptable
5218-72&73	3/4"	Acceptable
5218-T	3/4"	Acceptable
5218-U	3/4"	Acceptable
5218-77&78	3/4"	Acceptable
5218-B	3/4"	Acceptable
5218-54&55	3/4"	Acceptable
5218-55&56	3/4"	Acceptable

TABLE 3.6.3

Visual Inspection - Class 3 Butt Welds

Weld No.	Size	Results
FW-P44-3084-5WF6	8"	Acceptable
FW-P44-3084-5W2	8"	Acceptable
FW-P44-3084-5WF1	8"	Acceptable
FW-P44-3084-5WF3	8"	Acceptable
FW-P44-3084-5WF4	8"	Acceptable
FW-P44-3084-2W02	8"	Acceptable
FW-P44-3084-0W3	8"	Acceptable
FW-P44-3084-3WF1	8"	Acceptable
FW-P44-3084-3WF3	8"	Acceptable
FW-P44-3084-4WF1 (C1)	8"	Acceptable
FW-P44-3368-02W6	6"	Acceptable
FW-P44-3368-01W6	8"	Acceptable
FW-P44-3368-5W0	8"	Acceptable
FW-P44-3368-0W5	6"	Acceptable
FW-P44-3368-4W0	6"	Acceptable
FW-P44-3368-2WF2	8"	Acceptable
FW-P44-3368-2WF1	8"	Acceptable
FW-P44-3368-0WF1	8"	Acceptable
FW-P44-3368-0W2	8"	Acceptable
FW-P44-3368-0WV1	8"	Acceptable
FW-P44-3368-0WF1	8"	Acceptable
FW-P44-3368-0WF2	8"	Acceptable
FW-P44-3368-2W3	8"	Acceptable
FW-P44-3368-1W0	8"	Acceptable

TABLE 3.6.4

P T of Class 1 and 2 Socket Welds

Weld No.	Size	Results
3027-I6A	3/4"	Acceptable
5827-I4B	3/4"	Acceptable
5218-34 & 35	1"	Acceptable
5218-35 & 36	1"	Acceptable
5218-36 & 37C2	1"	Acceptable
5218-37 & 38	1"	Acceptable
5218-38 & 39	1"	Rejected (3)
5218-40 & 41	1"	Acceptable
5218-41 & 42	1"	Acceptable
5218-39 & 40C1	3/4"	Acceptable
7212-9 & 10	1"	Acceptable
7212-10 & 11	1"	Acceptable
7212-27 & 28	1"	Acceptable
7214-24 & X33A	1"	Acceptable
7214-44 & X33A	1"	Acceptable
7214-41 & 42	1"	Acceptable
7214-18 & 19	1"	Acceptable
7214-38 & 39	1"	Acceptable
7214-21 & 22	1"	Acceptable
7214-41 & 42	1"	Acceptable
7214-23 & 24	1"	Acceptable
7217-38 & 39	3/4"	Acceptable
7217-39 & 40	3/4"	Acceptable
7220-47 & 48	3/4"	Acceptable (1)
7220-57 & 58	3/4"	Acceptable (1)
7220-11 & 12	3/4"	Acceptable
7220-A	3/4"	Acceptable
7220-C	3/4"	Acceptable
7269-48 & 49	1"	Acceptable (2)
7269-49 & 5	1"	Acceptable
3150-IWSI	3/4"	Acceptable
3147-8WSI	2"	Acceptable
3147-B	2"	Acceptable
2016-4 & 5	2"	Acceptable

(1) Arc strike noted on 90° elbow.
(2) Noted 1/16" rounded indication - acceptable.
(3) Linear indication picked up on fitting which runs into weld.

TABLE 3.6.5

Piping Drawings for Walkdown

CORE SPRAY

6M721-3147-1	Rev. S
6M721-2199-1	Rev. L
6M721-3053-1	Rev. U
6M721-3148-1	Rev. Y
6M721-3149-1	Rev. P
6M721-2034-1	Rev. P
6WM-E21-2188-1	Rev. E
6WM-E21-3150-1	Rev. P
BOM R4-14M	Rev. E

RHR

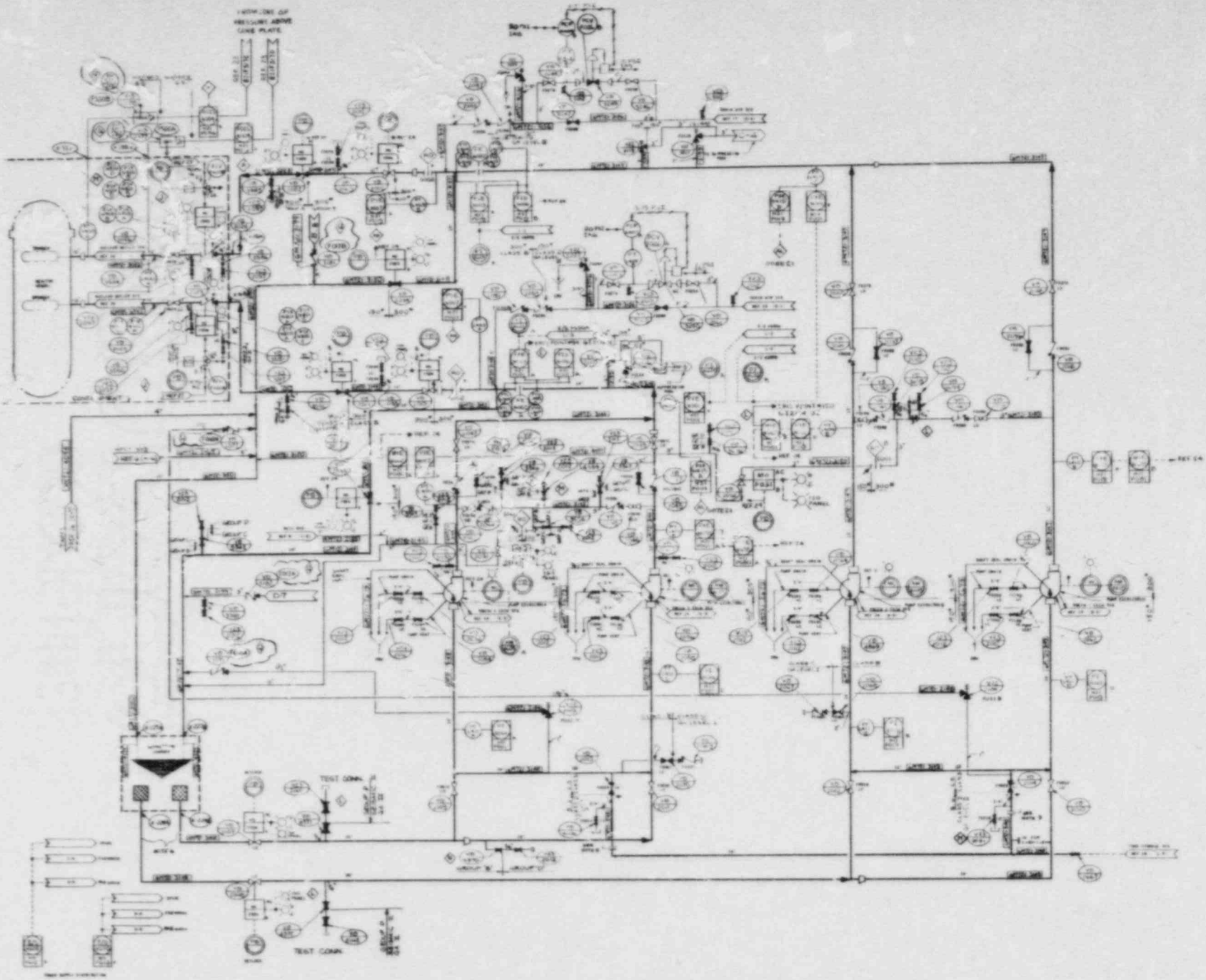
6M721-3164-1	Rev. O
6M721-2083-1	Rev. Q
6WM-E11-5305-1	Rev. B

PCI

6M721-3167-1	Rev. M
6M721-2336	Rev. V
6M721-2035	Rev. Q
6M721-2043	Rev. K

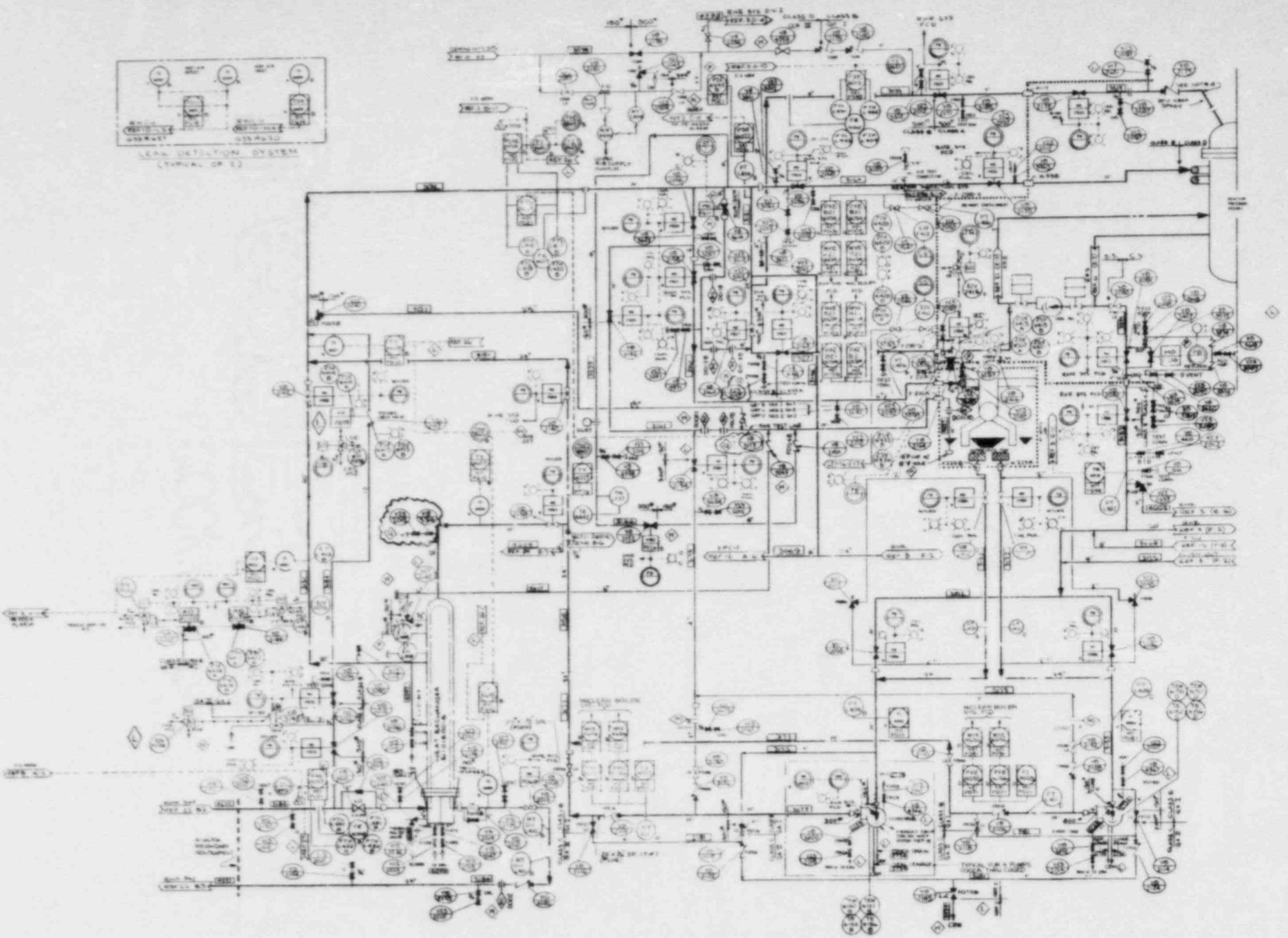
RCIC

6M721-2045	Rev. M
6WM-E51-3709-1	Rev. E
6WM-E51-5126-1	Rev. D
6WM-E51-5168-1	Rev. B
6WM-E51-5163-1	Rev. D



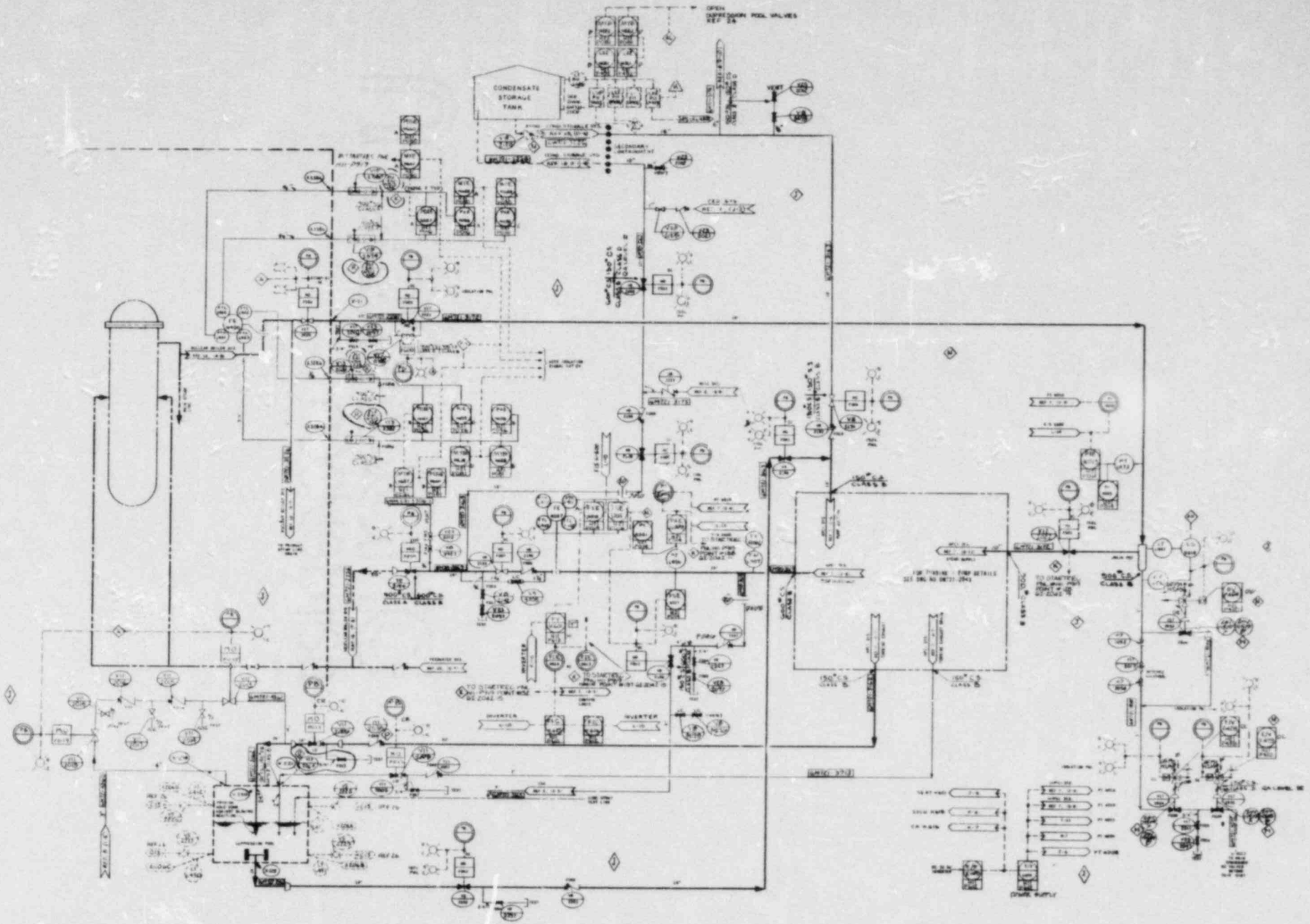
CORE SPRAY SYSTEM (CSS) - REACTOR BUILDING

FIGURE 3.6.1



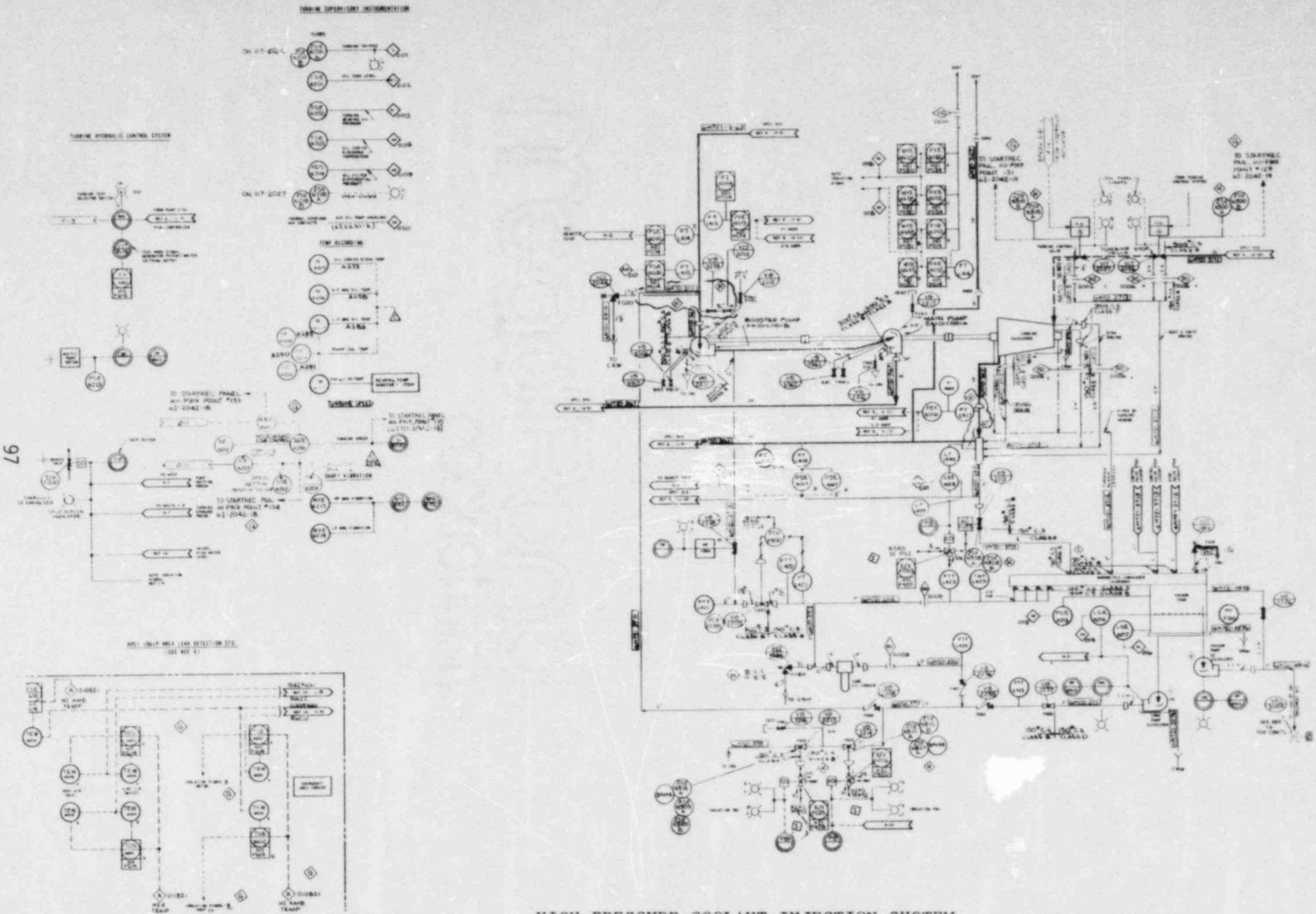
RESIDUAL HEAT REMOVAL (RHR) - DIVISION II

FIGURE 3.6.2



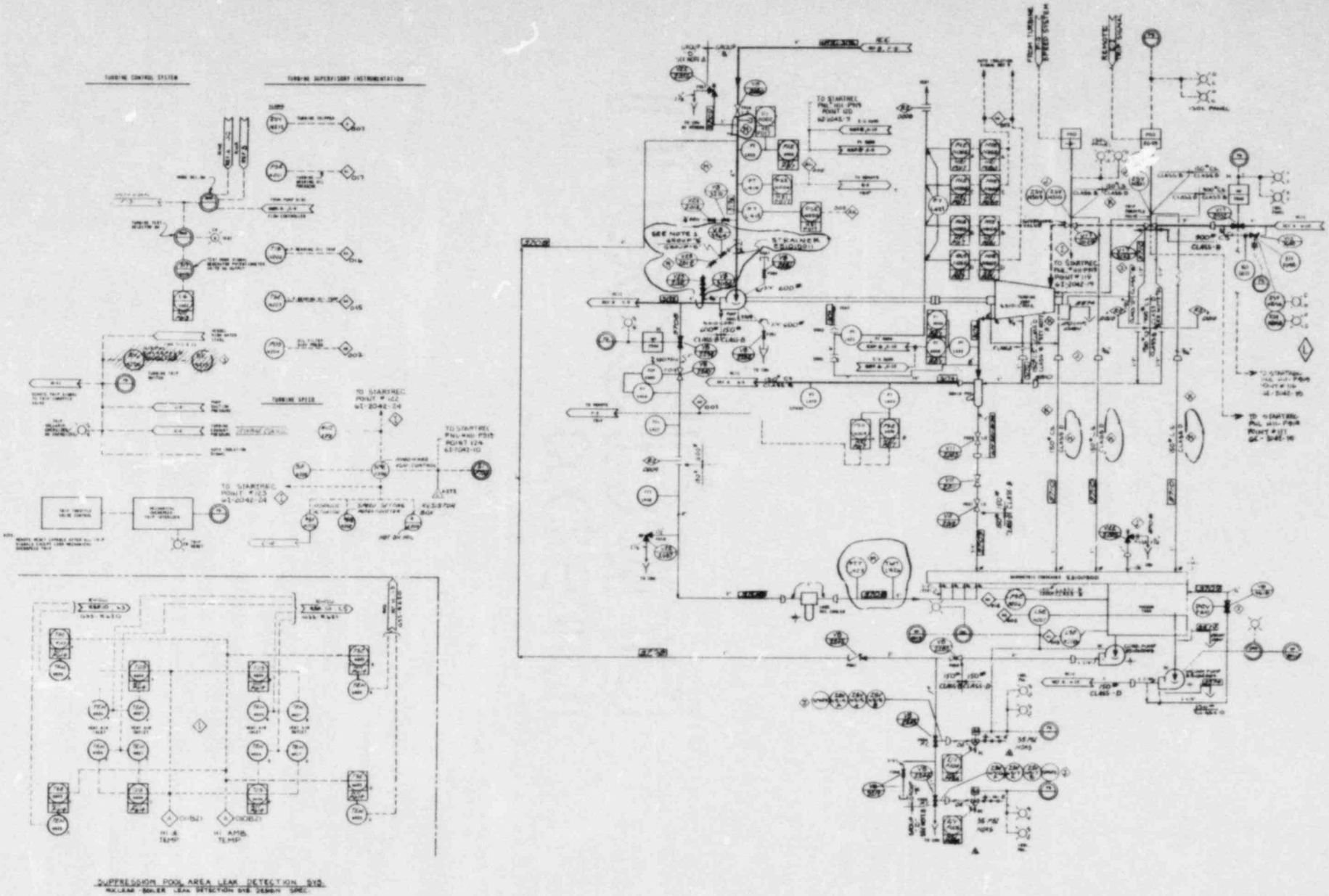
HIGH PRESSURE COOLANT INJECTION SYSTEM (HPCI) - REACTOR BUILDING

FIGURE 3.6.3



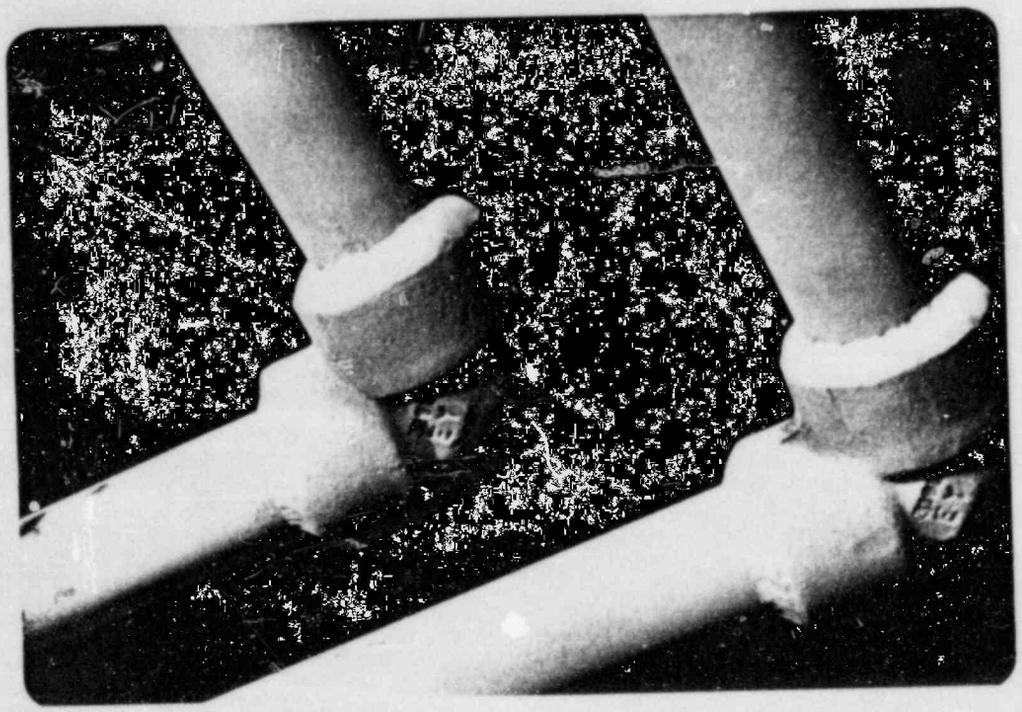
HIGH PRESSURE COOLANT INJECTION SYSTEM
BAROMETRIC CONDENSER (HPC1) - REACTOR BUILDING

FIGURE 3.6.4

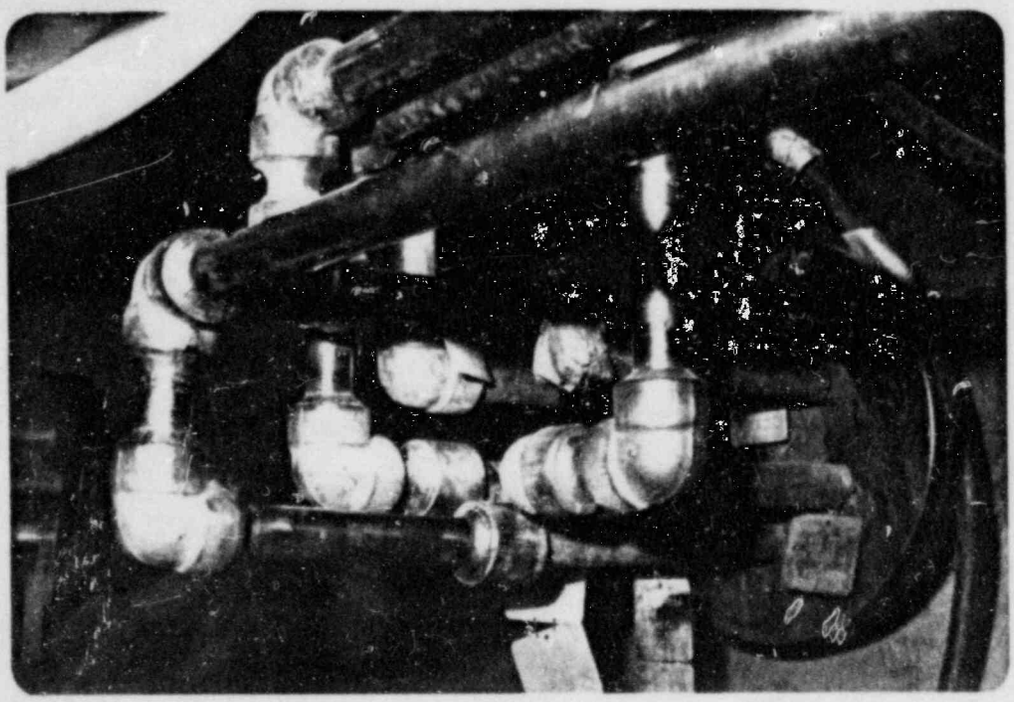


REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) - BAROMETRIC CONDENSER

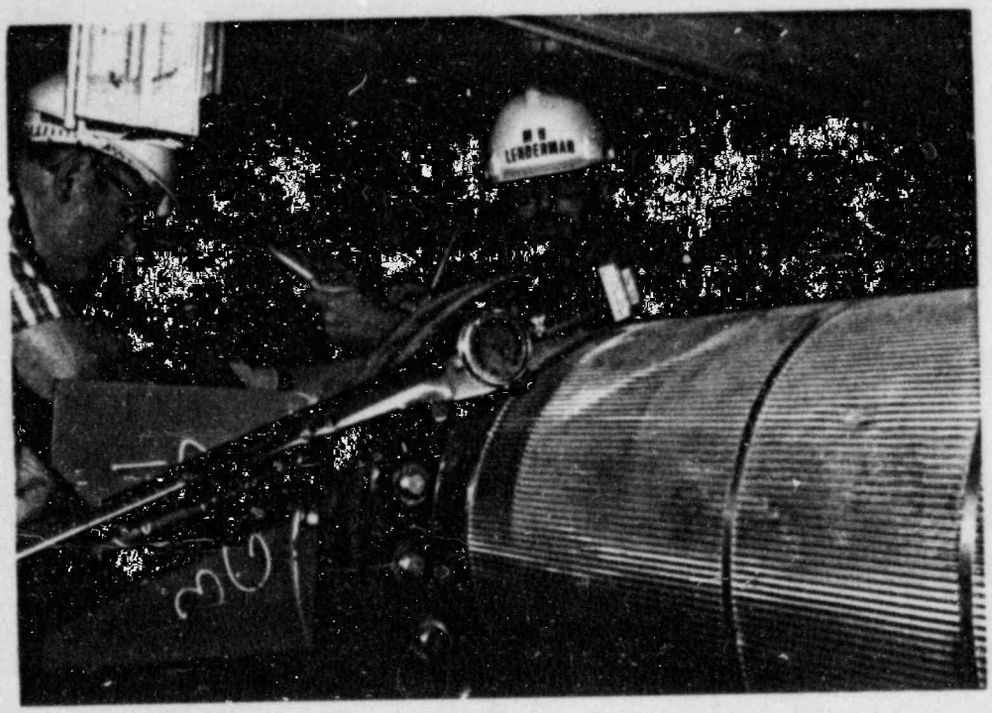
FIGURE 3.6.5



Photograph 3.6.1 Typical penetrant test on stainless steel socket welds. Shows acceptable rounded indications and as-forged surface on the fittings.



Photograph 3.6.2 Instrumentation penetration X-33A. One line covered over with tape. Should be capped off or piped up.



Photograph 3.6.3 Bolt torque check on flange in core spray system.

3.7 Mechanical Equipment

3.7.1 Pumps

3.7.1.1 Purpose

A representative grouping of QA Level 1 pumps was inspected to determine conformance with the applicable design disclosure documents (e.g. vendor drawings and manuals, design drawings, procurement specifications, etc.) and to determine overall acceptability of the installation and physical condition of each component inspected.

3.7.1.2 Criteria

Each pump selected was evaluated against a standard set of inspection items that included overall condition, installation, anchoring, instrumentation, piping connections, driver-to-component coupling, pressure boundary bolting, support/restraints (if applicable), and accessibility. A number of checks were required to be completed for each inspection item to form the basis for acceptance or rejection. The following is an example:

Overall Condition

- Damage
- Cleanliness
- Lubrication
- Condition of External Coating
- Severe Corrosion
- Missing Parts
- Arc Strikes

The applicable design disclosure documents were assembled by Detroit Edison for each pump inspected. A listing of the documents utilized is given in Table 3.7.1 on a pump-by-pump basis. The installation configuration was compared to these documents and any findings and concerns reported.

3.7.1.3 Items Evaluated

A listing of the pumps that were inspected is given in Table 3.7.1. The tabulation also identifies which pumps had pressure boundary bolting checks performed or were disassembled for internal inspection.

3.7.1.4 Results

Evaluation results can be basically broken down into three categories as identified in the following text.

Overall Evaluation of Installation

Unless identified below, there were no significant deviations on the pumps that were inspected.

(1) RHR Pump A - General cleanliness of the pump was poor. External surfaces were dirty, there was standing water inside the motor support stand on the pump casing, and miscellaneous trash was present. In addition, the outlet line from the seal water heat exchanger appeared to be bent to enable connection to the seal water piping, there was evidence of rust scaling on the seal water heat exchanger main cover to casing bolt head, and the coupling guards were missing. These concerns were identified by CAT Item #60.

(2) RHR Service Water Pumps - Excessive amount of lubricant was present around the motor shafts indicating possible over packing of the grease lubricated lower motor ball bearings.

(3) HPCI Main Pump and Booster Pump - The seal water piping on both pumps has evidence of deep scoring of piping O.D. by pipe wrench. Photograph 3.7.1 shows one section of the piping that has been scored. This concern was identified by CAT Item #95.

(4) EECW Pump (Div. I and II) - The condition of the exterior of the pump and its baseplate did not appear to be acceptable. Large areas had coating missing or damaged and the surface was dirty. See Photograph 3.7.3.

(5) Reactor Recirculation Pumps - There were no identification numbers present for either Pump A or the motor drive. This concern was identified by CAT Item #195. The 4 inch drain line tap on the suction side of both pumps has PVC pipe installed as temporary piping. It appears that a blind flange should be installed. This potential finding was identified by CAT Item #193.

(6) Control Center HVAC Chilled Water Pumps - Leakage was noticed coming from the discharge and suction connections during operation of the Division II pumps. This concern was identified by CAT Item #198. The nameplates on both pumps indicated class 3 design and manufacture but did not have the N stamp symbol on the nameplate. This potential finding was identified by CAT Item #197. Also, there was considerable rusting present on the carbon steel flanges and bolting of the connecting suction and discharge piping of both pumps.

Pressure Boundary Bolting Condition and Torque Tests

Casing pressure boundary bolting torque was checked on a sample of the pumps inspected. The pumps tested are listed below along with the applicable results.

(1) Core Spray Pump D - The torque was checked on five of the casing studs. All of the studs checked were torqued to at

least 375 ft.-lbs. which exceeds the 360 ft.-lbs. required by the pump instruction manual.

(2) RHR Pump A - The torque was checked on five of the casing studs. Although breakaway torques were below the required torque, all match marks realigned exactly when the casing studs were retorqued to the value required by the instruction manual of 1100 ft.-lbs. Twelve of the sixteen studs did not have sufficient thread engagement. This potential finding was identified by CAT Item #70.

(3) EECW Pump (DIV. I) - Incomplete thread engagement exists on four of the sixteen casing pressure boundary bolts. This potential finding was identified by CAT Item #151.

(4) EECW Pump (DIV. II) - Four of the sixteen casing pressure boundary bolts were unacceptably torqued. Three of the four bolts were torqued to less than 10 ft.-lbs. 50ft.-lbs. is the required torque value. There was no evidence, however, of leakage from the casing flange. This potential finding was identified by CAT Item #150.

Pump Disassembly

EECW Pump (DIV. II) was disassembled to allow visual inspection of the pump internals. Minor nicks were observed on the outer edge of the impeller but were determined to be of no concern. Overall condition of the impeller was good with no evidence of cavita tion damage or impeller vane cracking. Casing wear rings were in good condition. Mechanical seal face surfaces were in good condition. The pump bearings appeared to be over greased but had no evidence of corrosion or damage. Internal surfaces of the upper and lower half of the pump casing were in good condition. Photographs 3.7.2, 3.7.3, 3.7.4, and 3.7.5 show the overall condition of the casing assembly lower half, bearings and impeller wear surfaces.

3.7.1.5 Conclusions

Overall Evaluation of Installation

The majority of potential findings and concerns identified are varied and not considered to be indicative of any problems that are generic in nature. The group of concerns regarding cleanliness and overall physical condition of the pumps should be resolved acceptably following pre-operational testing and final cleaning and painting of all areas of the plant. No further action is considered to be necessary other than proper resolution of the applicable CAT Items.

Pressure Boundary Bolting Condition and Torque Tests

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 recom-

mended 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 1 pumps should be inspected.

Pump Disassembly

The pump internals and internal surfaces were in good condition overall. Based on this inspection and other similar valve inspections, there is no reason to believe that there is widespread, unacceptable corrosion of piping system or component surfaces exposed to process fluids. No further action is considered necessary.

3.7.2 Turbines

3.7.2.1 Purpose

Both QA Level 1 turbines (i.e. HPCI and RCIC) were inspected to determine conformance with the applicable design disclosure documents (e.g., vendor drawings and manuals, design drawings etc.), and to determine overall acceptability of the installation and physical condition of each turbine.

3.7.2.2 Criteria

The turbines were evaluated against a standard set of inspection items that included overall condition, installation, anchoring, instrumentation, piping connections, driver-to-component coupling, pressure boundary bolting, support/restraints (if applicable), and accessibility. The same checks were required to be completed for each inspection item as were for the pumps to form the basis for acceptance or rejection. The applicable design disclosure documents were assembled for the two turbines by Detroit Edison. A listing of the documents utilized is given in the tabulation contained in Section 3.7.2.3. The final installation was compared to these documents and any deviations reported.

3.7.2.3 Items Evaluated

Component Number	Component Name	Reference Document
E4101-C002	HPCI Turbine	6M721-2043, Rev. K I/M (E41-01-C-002-JA-003)
E5101-C002	RCIC Turbine	6M721-2045, Rev. M I/M (E51-01-C-002-JA-002)

3.7.2.4 Results

HPCI Turbine

The installation and physical condition of the HPCI turbine was found to be acceptable except for two concerns. The bearing cover bolting on the outboard bearing was missing, and there were no tags present indicating the reason. This concern was identified by CAT Item #96. A level sensing instrument (E4100-N018) off of the turbine exhaust steam line drain pot had an unfastened cover that was unsecured and partially off of the gasketed seat. Also, the cool ing fins were badly damaged (see Photograph 3.7.6). This concern was identified by CAT Item #103.

RCIC Turbine

The installation and physical condition of the RCIC turbine was found to be acceptable. The area around the turbine and pump assembly is congested which will make maintenance difficult. It was also noted that (2) four-bolt orifice flanges were uncoupled for hanger modification NCR 84-063.

3.7.2.5 Conclusions

The potential findings and concerns that were identified are not considered to be indicative of any problems that are generic in nature. No further action is considered to be necessary other than proper resolution of the applicable CAT Items.

3.7.3 Valves

3.7.3.1 Purpose

A representative grouping of QA Level I valves was inspected to determine conformance with the applicable design disclosure documents (e.g., vendor drawings and manuals, design drawings, etc.), and to determine overall acceptability of the installation and physical condition of each valve inspected.

3.7.3.2 Criteria

Each valve selected was evaluated against a standard set of inspection items that included overall condition and installation, and pressure boundary bolting. A number of checks were required to be completed for both inspection items to form the basis for acceptance or rejection. The following is an example:

Overall Condition and Installation

- o Valve type, materials and pressure class correct
- o Correct placement and orientation of valve and operator
- o Correct orientation of valve for flow

- o Condition of external portion of valve stem

- o Actuator type, number and location of limit switches, and connection of pneumatic lines.

The applicable design disclosure documents were assembled by Detroit Edison for each valve inspected. A listing of the documents utilized is given in Table 3.7.2 on a valve-by-valve basis. The final installation configuration was compared to these documents and any deviations reported.

3.7.3.3 Items Evaluated

A listing of the valves that were inspected is given in Table 3.7.2. The tabulation also identifies which valves had pressure boundary bolting torque checks performed or were disassembled for internal inspections.

3.7.3.4 Results

Evaluation results can be basically broken down into three categories as identified in the following text.

Overall Evaluation of Installation

Unless identified below, there were no significant deviations on the valves that were inspected.

(1) V8-2091 (E11) - The exposed threads of the Limitorque actuator base to valve yoke bolting were severly burred. This concern was identified by CAT Item #92.

(2) V8-2132 (E11) - Nameplate design conditions do not match the master valve list. This potential finding was identified by CAT Item #110.

(3) V8-2204 (E41) - Nameplate design conditions do not match the master valve list. This potential finding was identified by CAT Item #109.

(4) V17-2024 (E41) - There was evidence of leakage at the valve packing gland resulting in what appears to be rust blistering and scaling of the valve yoke. This concern was identified by CAT Item #102. Photograph 3.7.7 shows the condition of the valve when inspected.

Pressure Boundary Bolting Condition and Torque Tests

Valve body pressure boundary bolting torque was checked on a sample of the valves inspected. The valves tested are listed below.

E11	E41	P44
V8-2091	V8-2193	V8-2410
V8-2132	V8-2204	
V8-2172		

The torque values of all valves tested were found to be acceptable.

Valve Disassembly

A sample of valves were selected for disassembly to allow visual inspection of the valve internals. The valves inspected are identified below along with a summary of the inspection results.

(1) V8-2132 - Valve seating surfaces were in good condition. Valve body internal surfaces were in good condition. Gasket seating surfaces were cleaned and inspected. There was no evidence of severe pitting or through surface scratches.

(2) V8-2204 - Valve seating surfaces were in good condition. Valve body internal surfaces were in good condition with only minor light surface rust present in spots. Gasket seating surfaces were cleaned and inspected. There was no evidence of through surface scratches or severe pitting. Photograph 3.7.8 shows the condition of the valve when inspected.

(3) V8-2410 - Valve disc seats were inspected and found to be in good condition. Internal surfaces of valve were in good condition. Gasket seating surfaces were in good condition. Since the valve could not be completely drained, valve body seats and disc guides were inspected by touch and determined to be in good shape with no nicks, scratches or burrs.

3.7.3.5 Conclusions

Overall Evaluation of Installation

The overall condition and installation of the valves inspected was 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.

Pressure Boundary Bolting Condition and Torque Tests

Since the torque values of all valves tested were found to be acceptable, no further action is considered to be required.

Valve Disassembly

The valve disc and body seating surfaces, and the valve body internal unmachined surfaces were in acceptable overall condition for all three valves inspected. Based on these results and the pump inspection results, there is reason to conclude that the plant piping systems and component surfaces exposed to process fluid are in acceptable condition.

3.7.4 Heat Exchangers

3.7.4.1 Purpose

A sample of five QA Level I heat exchangers were inspected to determine conformance with the applicable design disclosure documents (e.g., vendor drawings and manuals, design drawings, etc.), and to determine acceptability of the installation and physical condition of each heat exchanger.

3.7.4.2 Criteria

The heat exchangers were evaluated against a standard set of inspection items that included overall condition, installation, anchoring, instrumentation, piping connections, pressure boundary bolting and accessibility. The checks required to be completed for each inspection item to form the basis for acceptance or rejection were similar to those required for the pumps and turbines. The applicable design disclosure documents were assembled by Detroit Edison. A listing of the documents and drawings utilized is given in the tabulation contained in Section 3.7.4.3. The final installation was compared to these documents and drawings and any deviations were reported.

3.7.4.3 Items Evaluated

Component Number	Component Name	Reference Document
E1101-B001A	RHR Heat Exchanger A	I/M (E11-01-B-001-SG-002) R1-231, Rev. 4 R4-207, Rev. 1 R4-205, Rev. 2 R4-206, Rev. 1
E1101-B001B	RHR Heat Exchanger B	I/M (E11-01-B-001-SG-002) R1-231,Rev. 4 R4-207, Rev. 1 R4-205, Rev. 2 R4-206, Rev. 1
P4400-B001	EECW Cooling Water Hx. - Div. I	6M721-2196, Rev. F S21-4, Rev. 6
P4400-B002	EECW Cooling Water Hx. - Div. II	6M721-2196, Rev. F S21-4, Rev. 6

3.7.4.4 Results

RHR Heat Exchangers

The installation and physical condition for each RHR Heat Exchanger was found to be acceptable except for the upper key and block guides/supports for Heat Exchanger A. The required radial clearances were not provided during installation of the blocks. This potential finding was reported by CAT Item #199.

EECW Heat Exchangers

The installation and physical condition for each EECW Heat Exchanger was found to be acceptable except the sliding support for the Division I heat exchanger. One of the anchor bolts is positioned in the slotted hole so that there appears to be little if any room for thermal expansion. In all cases, the nuts are tack welded to the anchor bolts on the sliding support end which makes verification of clearances difficult. This concern was identified by CAT Item #149. Photograph 3.7.9 shows the position of the anchor bolt in the slotted hole. It was also observed that the relief valve at the end of each heat exchanger had a discharge pipe that was rigidly supported. Assuming that full thermal growth occurs over the 32'-6" span from the fixed support to the valve connection, unacceptable stresses may be induced in the discharge piping, safety relief valve body, and heat exchanger nozzle. This concern was identified by CAT Item #201.

Diesel Generator Oil Cooler

The installation and physical condition for this heat exchanger was found to be acceptable.

3.7.4.5 Conclusions

It is recommended that each support on both RHR Heat Exchangers and both EECW Heat Exchangers should be re-examined by Detroit Edison to assure that all clearances required for proper installation of the sliding supports and guides are met. The applicable design disclosure documents and engineering judgement should be utilized.

3.7.5 Vessels and Tanks

3.7.5.1 Purpose

A sample of five QA Level I tanks were inspected to determine conformance with the applicable design disclosure documents (e.g. vendor drawings and manuals, design drawings, etc.), and to determine acceptability of the installation and overall physical condition of each tank.

3.7.5.2 Criteria

The same criteria was used for inspection of tanks as was used for inspection of heat exchangers (see Section 3.7.4.2). A listing of the documents and drawings utilized for the tank inspections is given in the tabulation contained in Section 3.7.5.3. The final installation was compared to these documents and drawings and any deviations were reported.

3.7.5.3 Items Evaluated

Component Number	Component Name	Reference Number
P4400-A001	EECW Makeup Water Surge Tank - Div. I	6M721-2196, Rev. F S20-16, Rev. II 6M721-5444, Rev. B 6M721-5357, Rev. C
P4400-A002	EECW Makeup Water Surge Tank - Div. II	6M721-2196, Rev. F S20-16, Rev. II 6M721-5444, Rev. B 6M721-5357, Rev. C
B2103-A001A	Prim. Cont. Pneumatic Accumulator Tank 1A	6M721-5007, Rev. B 6M721-2089, Rev. J D74-370, Rev. 3 3071-31, Rev. J

Component Number	Component Name	Reference Number
B2103-A001B	Prim. Cont. Pneumatic Accumulator Tank 1B	6M721-5007, Rev. B 6M721-2089, Rev. J D74-370, Rev. 3 3071-31, Rev. J
B2103-A001D	Prim. Cont. Pneumatic Accumulator Tank 1D	6M721-5007, Rev. B 6M721-2089, Rev. J D74-370, Rev. 3 3071-31, Rev. J

3.7.5.4 Results

The installation and physical condition for each tank inspected was found to be acceptable.

3.7.5.5 Conclusions

Based upon the above results, no further inspections are recommended.

3.7.6 Miscellaneous Mechanical System Components

3.7.6.1 Purpose

A sample of various QA Level I components that do not fit under one of the previously listed generic categories were chosen for inspection. These items were composed of strainers, restricting orifices, and compressed air system equipment. Each item was inspected to determine conformance with the applicable design disclosure documents, and to determine acceptability of the installation and overall physical condition.

3.7.6.2 Criteria

Each component selected was evaluated against a standard set of inspection items that were similar or identical to the inspection items used for the previously identified generic categories. The applicable design disclosure documents were assembled for each component inspected by Detroit Edison. A listing of the documents utilized is given in the tabulation contained in Section 3.7.6.3. The installation was compared to these documents and drawings, and any deviations were reported.

3.7.6.3 Items Evaluated

Component Number	Component Name	Reference Document
R3001-D027	Fuel Pump Strainer	6M721N-2048 T1-2740
R3001-D028	Fuel Pump Strainer	6M721N-2048 T1-2740
Component Number	**Component Name**	**Reference Document**
R3001-D026	Fuel Oil Transfer Pump Strainer	6M721N-2048 T1-2740
E5100-D011	RCIC Condensate Pump Suction Strainer	P1-2414, Rev. 3
E1150-D001A	RHR Sys. Restricting Orifice Plate	6M721-3178-1 B6-107
E4150-D005	HPCI Sys. Restricting Orifice Plate	6M721-3165-1 B6-107
E2150-D001B	Core Spray Sys. Restricting Orifice Plate	6M721-3150-1 R4-14M, Rev. E

P5002-D012	Control Air Sys. Air Dryer	6M721-2015, Rev. 0 6M721-5462 6M721-5437, Rev. 0 3071-520, Rev. A
P5002-D013	Control Air Sys. Air Dryer	6M721-2015, Rev. 0 6M721-5462 6M721-5437, Rev. 0 3071-520, Rev. A
P5002-D016	Control Air Sys. After Filter	6M721-2015, Rev. 0 PDC1000AF8, Rev. D 3071-520, Rev. A
P5002-D017	Control Air Sys. After Filter	6M721-2015, Rev. 0 PDC1000AF8, Rev. D 3071-520, Rev. A
P5002-D001	North Control Air Compressor	6M721-2015, Rev. 0 S2190-2C S2366-1 3071-520, Rev. A
P5002-D002	South Control Air Compressor	6M721-2015, Rev. 0 S2190-2C S2366-1 3071-520, Rev. A
P5002-A001	Control Air Receiver Tank-1	6M721-2015, Rev. 0 L2946, Rev. 5 K4375, Rev. 0 3071-520, Rev. A
Component Number	Component Name	Reference Number
P5002-A002	Control Air Receiver Tank-2	6M721-2015, Rev. 0 L2946, Rev. 5 K4375, Rev. 0 3071-520, Rev. A
R3001-A012	Diesel Starting Air Receiver	6M721N-2046, Rev. 0 T1-2529, Rev. 1

3.7.6.4 Results

Evaluation results are presented in a generic category format as follows:

Strainers

The installation and physical condition for each strainer inspected was found to be acceptable. During inspection of strainer R3001-D028, it was observed that drain valve V8-3937 was tagged with one tag calling for V8-3947 and another tag calling for V8-3936. Similarly, strainer R3001-D027 drain valve V8-3936 was tagged correctly with a yellow tag but the attached metal tag identified the valve as V8-3937.

Restricting Orifice Plate

The installation and physical condition of all three orifice plates inspected was found to be acceptable. Flanged joint bolting was checked for proper torque and full thread engagement for each of the orifice plates. In all three cases, the bolting torque values were below the torque requirements of the applicable maintenance procedure MI-M055. Indications of no or minimal leakage were also observed. Full thread engagement was not achieved on four of the eight bolts of the flanged joint for orifice E2150-D001B. This potential finding was identified by CAT Item #68.

Air Dryers

The applicable design drawing for the air dryers requires that the dryer clamp support plates be welded on both sides to the 3x2x1/4 angle. It was observed that the plates were welded only on one side for both dryers. This potential finding was identified by CAT Item #162.

Compressors, Air Filters and Air Receivers

The installation and physical condition for each component inspected was found to be acceptable.

3.7.6.5 Conclusions

Strainers

Based upon the above results, no further inspections are recommended.

Restricting Orifice Plates

The lower than required torque values, per procedure MI-M055 acceptance criteria, for the flanged joint bolting is considered to be a common occurence for small bore piping. Although the bolt torque readings were below the torque required to be applied during installation, ASME Section III, Appendix XII recognizes the fact

that bolt stress may decrease over a period of time after initial tightening for various reasons. The bolt torquing of the three joints checked is, therefore, considered to be acceptable. Further discussion of flanged joint bolt torquing to substantiate this conclusion is presented in Section 3.6.1.5 of this report.

The lack of complete thread engagement for the flanged joint bolting associated with E2150-D001B is not considered to be indicative of a generic problem. This conclusion is based on the fact that this flanged joint was the only joint exhibiting lack of thread engagement not only of the flanged joints that were specifically identified as being inspected in this report, but also of the flanged joints inspected during the various piping system walkdowns and component inspections.

No further action is recommended other than the proper resolution of the applicable CAT items.

Air Dryers

The improper welding of the dryer clamp support plates is not considered to be indicative of a generic problem. No further action is recommended other than the proper resolution of the CAT Item.

Compressors, Air Filters and Air Receivers

Based upon the above results, no further action is recommended.

TABLE 3.7.1

Pumps Inspected

Component No.	Component Name	Reference Doc.	Notes
E2101-C001A	Core Spray Pump A	6M721-2679, Rev. F R4-116, Rev. D I/M (E21-01-C-00-DA-002) Spec. (21A9243AU, Rev. 2)	
E2101-C001B	Core Spray Pump B	6M721-2679, Rev. F R4-116, Rev. D I/M (E21-01-C-00-DA-002) Spec. (21A9243AU, Rev. 2)	
E2101-C001C	Core Spray Pump C	6M721-2679, Rev. F R4-116, Rev. D I/M (E21-01-C-00-DA-002) Spec. (21A9243AU, Rev. 2)	
E2101-C001D	Core Spray Pump D	6M721-2679, Rev. F R4-116, Rev. D I/M (E21-01-C-00-DA-002) Spec. (21A9243AU, Rev. 2)	(1)
E1102-C002A	RHR Pump A	6M721-2734, Rev. K I/M (E11-02-C-002-JA-003) R4-331	(1)
E1102-C002D	RHR Pump D	6M721-2734, Rev. K I/M (E11-02-C-002-JA-003) R4-331	
E1151-C001A	RHR Serv. Water Pump A	I/M (E11-51-C-001A-SG-002)	
E1151-C001B	RHR Serv. Water Pump B	I/M (E11-51-C-001A-SG-002)	
E1151-C001C	RHR Serv. Water Pump C	I/M (E11-51-C-001A-SG-002)	
E1151-C001D	RHR Serv. Water Pump D	I/M (E11-51-C-001A-SG-002)	
E5101-C002	RCIC Pump	D11743X, Rev. 4 D14128 D11810, Rev. D D12414, Rev. 3	

TABLE 3.7.1 (Cont'd)

Pumps Inspected

Component No.	Component Name	Reference Doc.	Notes
E4101-C001A	HPCI Main Pump	R4-148, Rev. 0 I/M (E41-01-C-001-SC-001) 6M721-2043, Rev. Q	
E4101-C001B	HPCI Booster Pump	R4-148, Rev. 0 I/M (E41-01-C-001-SC-001) 6M721-2043, Rev. Q	
E4101-C005	HPCI Turbine Aux. Oil Pump	I/M (E41-01-C-002-JA-003)	
R3001-C002	Diesel Fuel Transfer Pump	6M721N-2048, Rev. S I/M (R3000-S-900-SG-020)	
R3001-C007	D. G. Serv. Water Pump	6M721N-2053, Rev. S I/M (R30-01-C-900-DA-001)	
R3000-C003	Fuel Oil Transfer Pump	6M721N-2048, Rev. S I/M (R30-01-0-900-0A-004)	
P4400-C001A	EECW Pump - Div. I	6M721-2196, Rev. F S24-108	
P4400-C001B	EECW Pump - Div. II	6M721-2196, Rev. F S24-108	(2)
B3101-C001A	Reactor Recirc. Pump A	6M721-2833, Rev. J T-120, Rev. 4 6WM-B31-4002-1, Rev. E T-205 6WM-B31-5251-1, Rev. E R1-174	
B3101-C001B	Reactor Recirc. Pump B	6M721-2833, Rev. J T-120, Rev. 4 6WM-B31-4002-1, Rev. E T-205 6WM-B31-5251-1, Rev. E R1-174	
T4100-C040	Control Center HVAC Chilled Water Pump Div. II	B9-646, Rev. 3 B9-649 I/M (T41-00-C-040-JR-003)	
T4100-C041	Control Center HVAC Chilled Water Pump Div. I	B9-646, Rev. 3 B9-649 I/M (t41-00-C-040-JR-003)	

NOTES: (1) Bolt Torque Test
(2) Bolt Torque Test and Disassembly

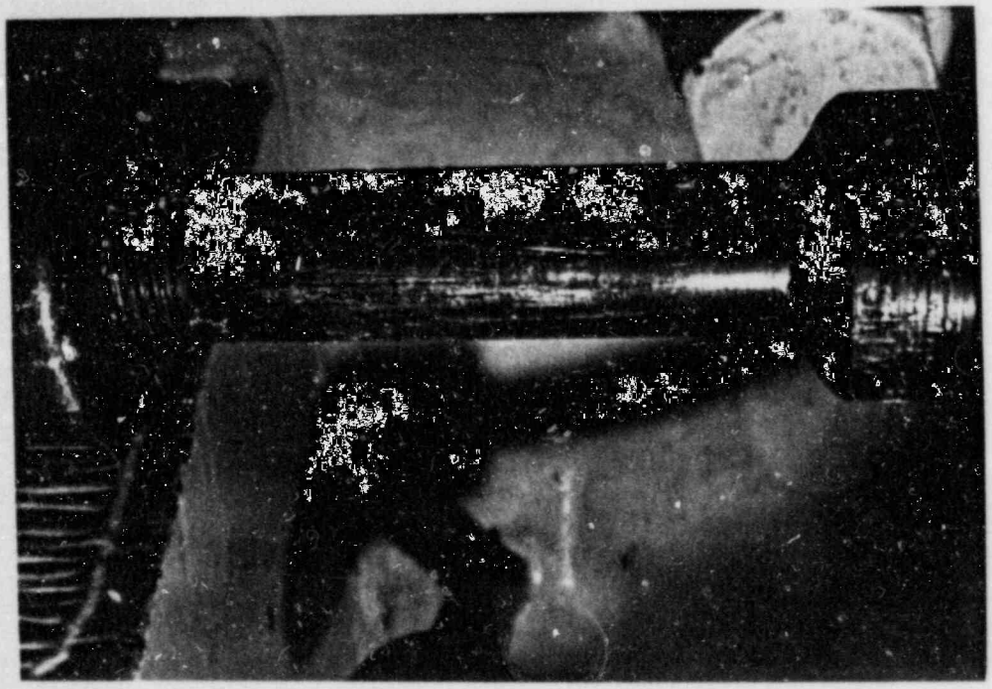
TABLE 3.7.2

VALVES INSPECTED

System	Valve Number	Actuator	Manual	Reference Documents	Notes
E21	V8-2022	F005B		6M721-2871, Rev. L P1-158, Rev. 6 P1-208	
Core Spray	V8-2021	F005A		6M721-2871, Rev. L P1-158, Rev. 6 P1-208	
	V8-2023	F006A		6M721-2871, Rev. L P1-515, Rev. F	
	V8-2024	F006B		6M721-2871, Rev. L P1-515, Rev. F	
E11	V8-2091	F009		6M721-2874 P1-3356 P1-3350 P1-2670	(1)
RHR & RHR Service Water	V8-2132		X	P1-919, Rev. 2 6M721-2875, Rev. L P1-10632, Rev. H	(2)
	V8-2164	F050B			
	V8-2172	F022		6M721-2876, Rev. R P1-155, Rev. 6 P1-2106, Rev. 6	(1)
	V15-2069	F400		C1-1218, Rev. B	
	V15-2080		X	P1-1705	
E41	V11-2006	F021		6M721-2908, Rev. M P1-5055, Rev. 4 P1-5202	
	V17-2024	F028		6M721-2933, Rev. M P1-3384	
HPCI	V17-2022	F001		6M721-2933, Rev. M P1-943	
	V8-2191	F004		6M721-2877, Rev. P P1-225 P1-136	
	V8-2193	F007		6M721-2877, Rev. P P1-130	(1)
	V8-2204	F041		6M721-2877, Rev. P P1-128	(2)
P44	V8-2410		X	6M721-2898, Rev. H P1-955, Rev. 4	(2)
EECW	V8-2482	F403A		6M721-2901, Rev. G C1-2251, Rev. B C1-2252, Rev. B C1-2293, Rev. A	
	V8-2484	F606B		6M721-2901, Rev. G P1-1203, Rev. 6	

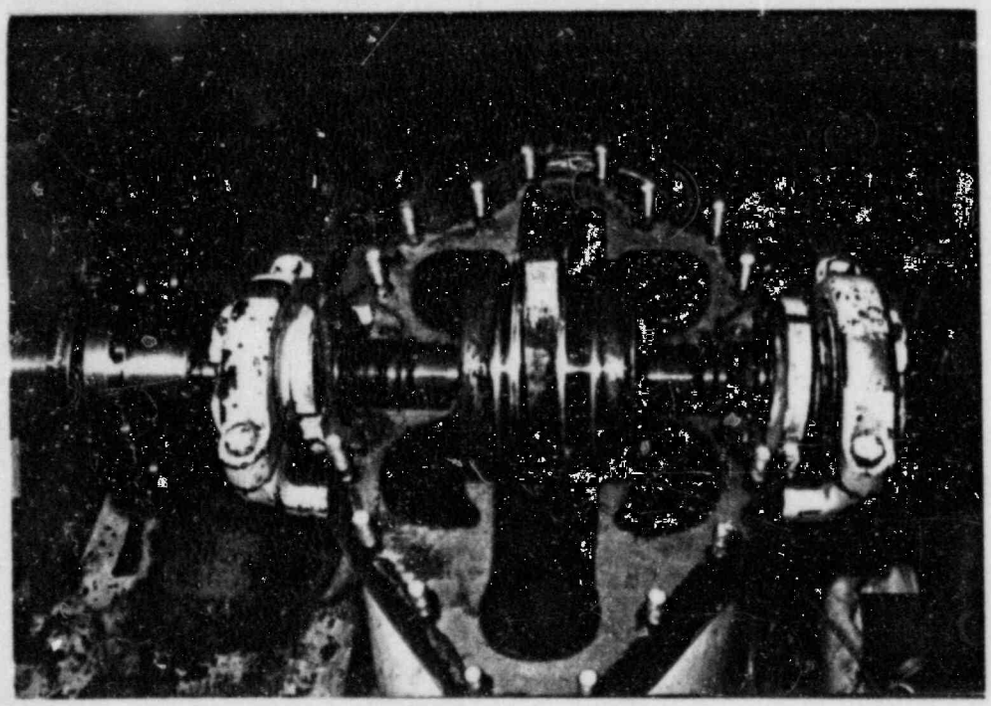
NOTES: (1) Bolting Torque Test Conducted

(2) Bolting Torque Test Conducted and Valve Disassembled



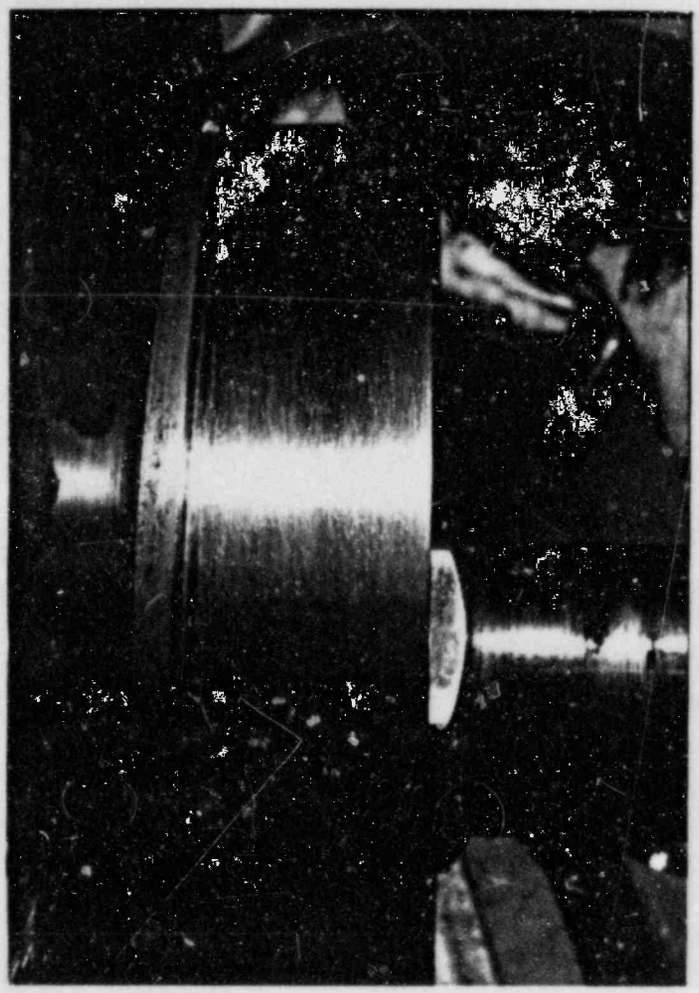
Photograph 3.7.1 Seal piping to HPCI Main Pump. Piping shows severe scoring by pipe wrench during assembly and/or disassembly.

Photograph 3.7.2 EECW Pump (Div. II)-Pump Disassembly. Lower half of pump casing assembly with internals removed showing condition of internal surfaces.

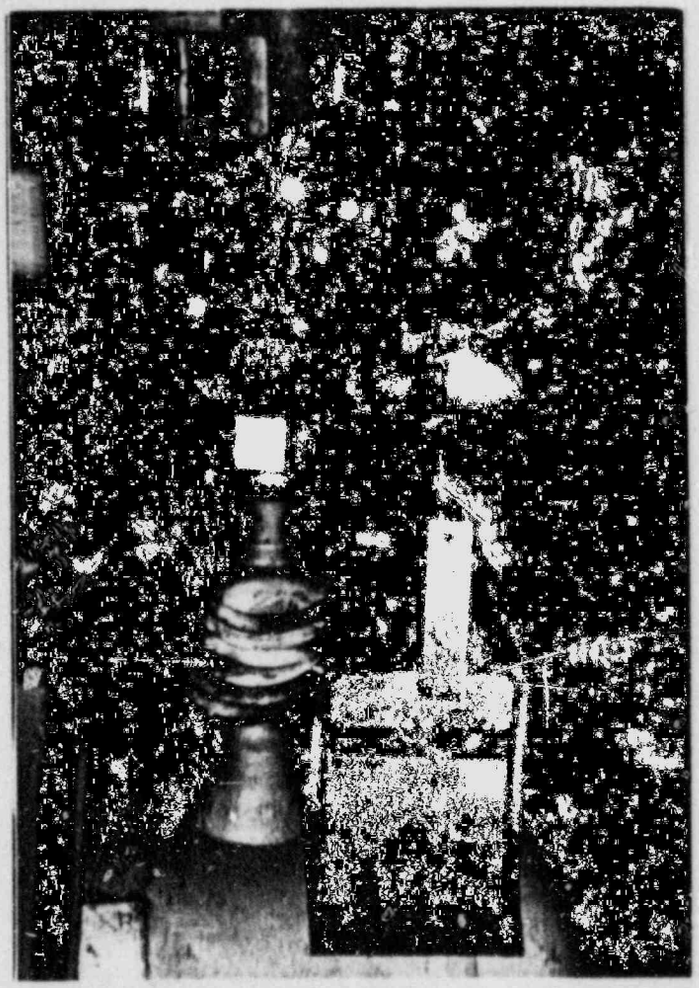


Photograph 3.7.3 EECW Pump (Div. II)-Pump disassembly. Lower half of pump casing assembly showing condition of internal surfaces as well as poor condition of coating on external surfaces.

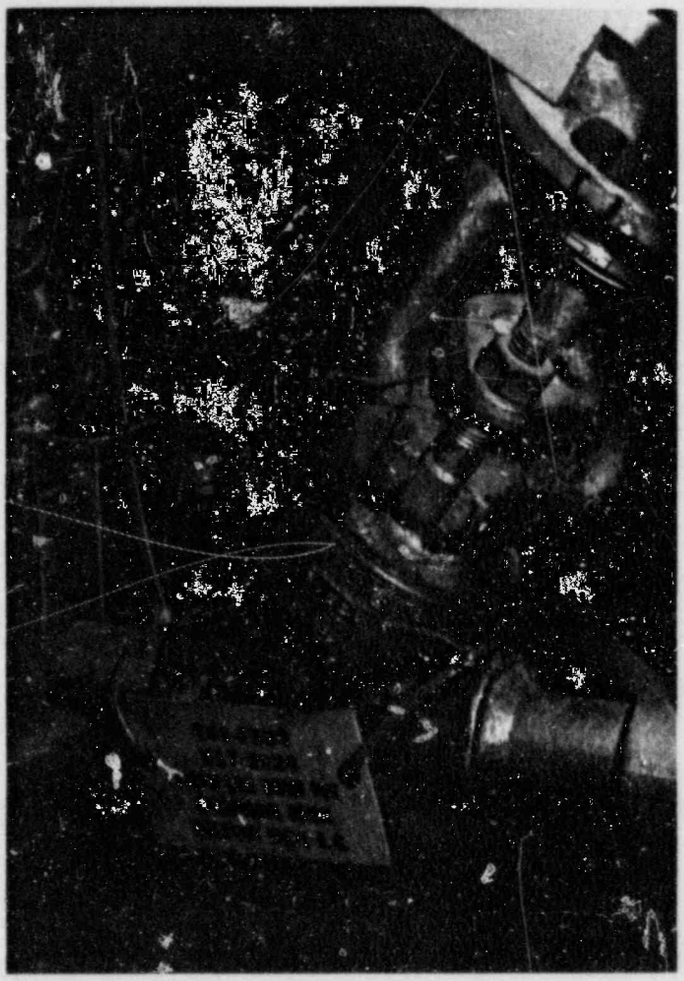
Photograph 3.7.4 EECW Pump (Div. II)-Pump Disassembly. Inside of pump bearing housing shown. No evidence of corrosion or damage. Bearings in very good overall condition.



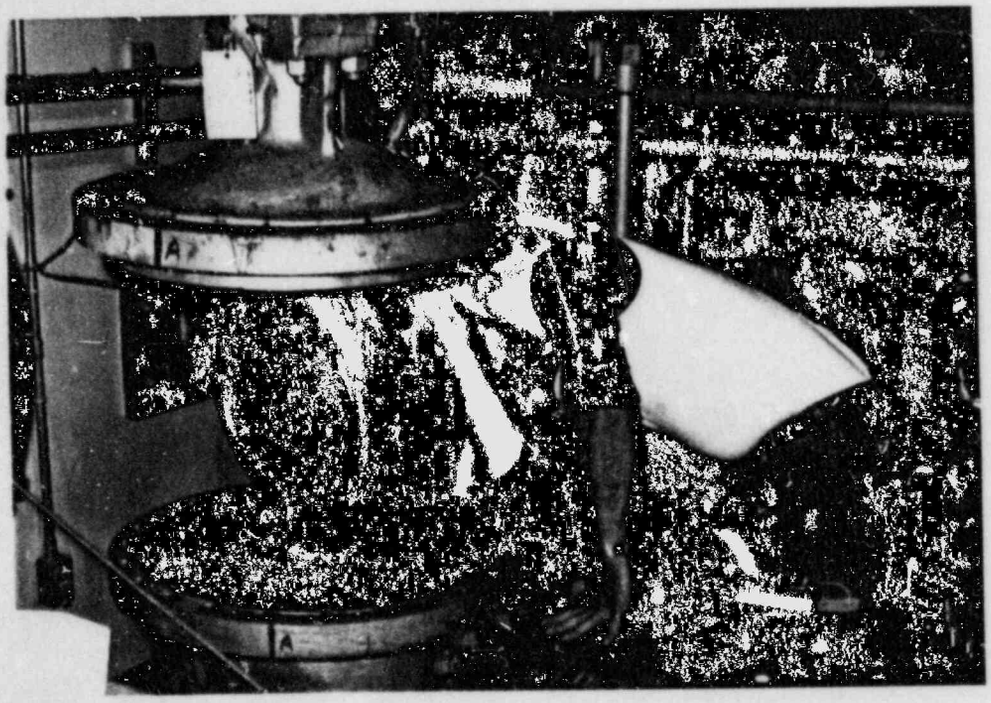
Photograph 3.7.5 EECW Pump (Div. II)-Pump Disassembly. Wear surface on one side of the double suction pump impeller shown. Wear surfaces of the casing wear rings and impeller were in very good condition.



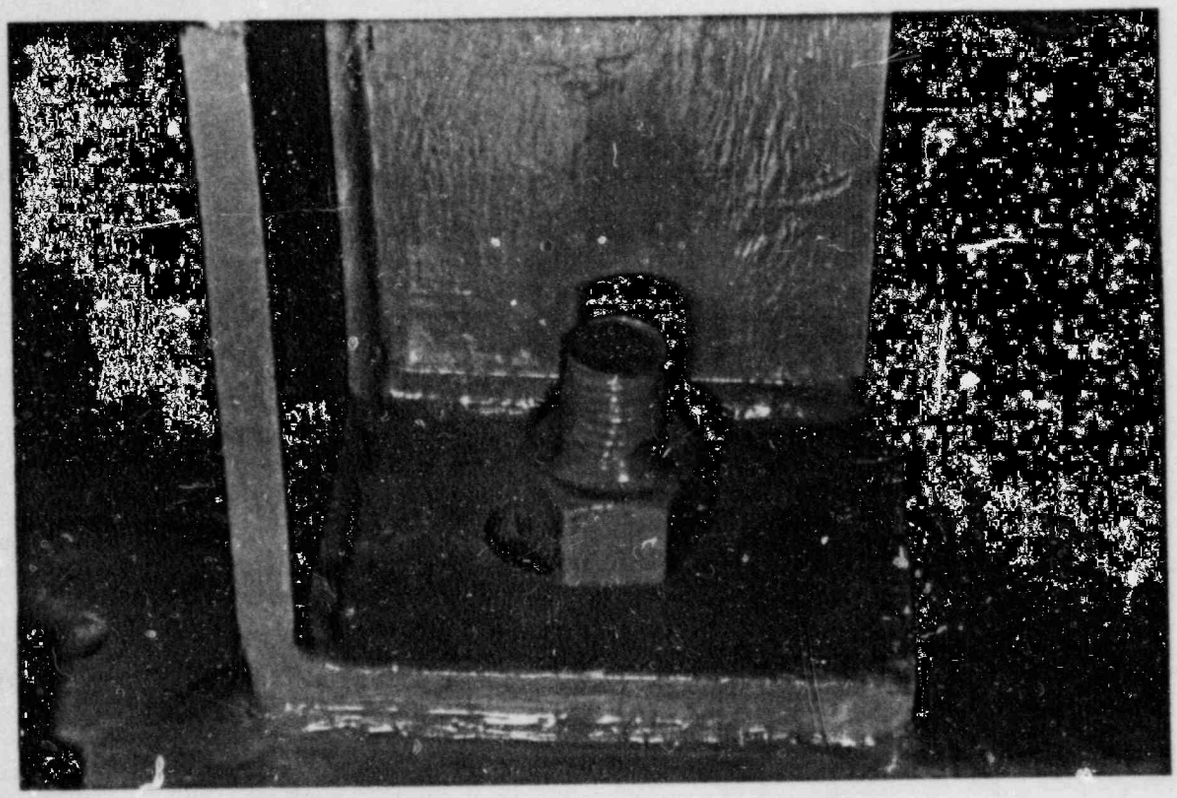
Photograph 3.7.6 HPCI Turbine Exhaust Steam Line Drain Pot Level Sensing Instrument (E4100-N018). This instrument controls a Class B valve (V8-2212) and is QA Level 1. The instrument cover was not secured and the cooling fins were badly damaged. No tags indicating that this problem had been formally reported were present.



Photograph 3.7.7 Severe Corrosion of HPCI System Valve V17-2024 Yolk.



Photograph 3.7.8 HPCI System Valve V8-2204 disassembly and inspection of internal surfaces.



Photograph 3.7.9 EECW heat exchanger-sliding support slotted anchor bolt hole. Potential lack of clearance for thermal expansion shown.

3.8 Heating, Ventilating and Air Conditioning (HVAC)

3.8.1 Fire Dampers

3.8.1.1 Purpose

A sample of QA Level I fire dampers were inspected to determine conformance with the applicable design disclosure documents, and to determine acceptability of the installation and overall physical condition of each damper.

3.8.1.2 Criteria

The fire dampers were evaluated against a standard set of inspection items to determine conformance with installation requirements and acceptable overall physical condition. The applicable design disclosure documents were assembled by Detroit Edison. A listing of the documents and drawings utilized is given in the tabulation contained in Section 3.8.1.3. The final installation was compared to these documents and drawings, and any deviations were reported.

3.8.1.3 Items Evaluated

Fire Damper Number	Reference Document
T4100-F095	6M721-2849, Rev. R 6M721-2751, Rev. G
T4100-F096	6M721-4317, Rev. D
T4100-F098	6M721-4317, Rev. D
T4100-F097	6M721-4317, Rev. D
T4100-F099	R1C0-2848-2, Rev. 3
T4100-F102	R1C0-2848-2, Rev. 3

3.8.1.4 Results

The installation and physical condition of each fire damper inspected was found to be acceptable. Two of the six dampers were tripped and functioned properly. All fusible links and hooks were in place with no visible damage.

3.8.1.5 Conclusions

Based upon the above results, no further inspections are recommended.

3.8.2 Equipment

3.8.2.1 Purpose

A sample of various QA Level I HVAC components were selected for inspection. These items were composed of chillers, cooling units, air filters, and fans. Each item was inspected to determine

conformance with the applicable design disclosure documents, and to determine acceptability of the installation and overall physical condition.

3.8.2.2 Criteria

Each component selected was evaluated against a standard set of inspection items that were similar to the inspection items used for the previously identified generic categories. The applicable design disclosure documents were assembled by Detroit Edison. A listing of the documents utilized is given in Table 3.8.1. The final installation was compared to these documents and drawings, and any deviations were reported.

3.8.2.3 Items Evaluated

A listing of the HVAC components that were inspected is given in Table 3.8.1.

3.8.2.4 Results

Evaluation results are presented in a generic category format as Cooling Units

Installation and physical condition for each of the cooling units inspected was found to be acceptable except for the following findings, concerns or observations:

(1) HPCI Emergency Equipment Cooling Unit - Incomplete thread engagement was observed on one of the eyebolt nuts that are used to adjust drive belt tension. This condition was due to the eyebolt in question being shorter than the other eyebolt. This concern was identified by CAT Item #191.

(2) Core Spray Pump Room Cooler - All sheet metal screws were missing from the left side access panel. This concern was identified by CAT Item #189. The internal cooling coils were dirty and unprotected from debris (see item 3 below).

(3) Control Air Compressor Room North Cooling Unit - The internal cooling coils were dirty and unprotected from blinding by debris. The design does not call for filters or trash screens, however, it is felt that blinding of large coil areas or unacceptable degradation of thermal performance could occur. This concern was identified by CAT Item #190. This concern also applies to cooling units T4100-B037, T4100-B020, T4100-B022, and T4100-B018.

(4) Drywell Cooling Horizontal Cooling Unit - Instrument TE-N004B is not labeled. This concern was identified by CAT Item #172.

(5) Drywell Cooling Vertical Cooling Unit (B001) - Instruments TE-N012A and TEW-N002A are not tagged. This concern was identified by CAT Item #172. Valve V8-3723 had no identifi-

cation or national board tag. This concern was identified by CAT Item #173. Valve V8-3724 was tagged V8-3723.

(6) Drywell Cooling Vertical Cooling Unit (B003) - North and South access panels are missing some of the nuts and one bolt on each panel is broken off. This concern was identified by CAT Item #176. In addition, instrument TE-N012C is damaged and missing parts. Outlet isolation valves are switched. V8-3752 is labeled V8-3751 and V8-3751 is labeled V8-3752.

(7) Drywell Cooling Vertical Cooling Unit (B004) - One access panel is damaged and has one bolt broken off. The other access panel has loose (not torqued) hold down bolt nuts. This concern was identified by CAT Item #179. Instrument TEW-N003D is not tagged. This concern was identified by CAT Item #172.

Chillers

The installation and physical condition for both of the chillers was found to be acceptable.

Air Filter Units

The installation and physical condition for each of the air filter units inspected was found to be acceptable.

Fans

The installation and physical condition for each of the fans inspected was found to be acceptable except for the following concern:

(1) Drywell Cooling Horizontal Cooling Fan - The auxiliary conduit box cover is missing. This concern was identified by CAT Item #175.

3.8.2.5 Conclusions

Cooling Units

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.

Chillers

Based upon the above results, no further inspections are recommended.

Air Filter Units

Based upon the above results, no further inspections are recommended.

Fans

Based upon the above results, no further inspections are recommended other than the proper resolution of the identified CAT Item.

TABLE 3.8.1

HVAC EQUIPMENT INSPECTED

Component No.	Component Name	Reference Document
T4100-B008	Control Area HVAC Chiller - Div. I	6M721-4325, Rev. K B9-585, Rev. F B9-644, Rev. D I/M (T41-00-B-008-JA-005)
T4100-B009	Control Area HVAC Chiller - Div. II	6M721-4325, Rev. K B9-585, Rev. F B9-644, Rev. D I/M (T41-00-B-008-JA-005)
T4100-B022	HPCI Emerg. Equip. Cooling Unit	B9-234, Rev. 3
T4100-B018	RHR Emerg. Equip. North Cooling Unit	B9-235, Rev. 3
T4100-B020	Core Spray Pump Room Cooling Unit	B9-233 6M721-4148, Rev. F
T4100-B029	Control Air Compressor Room North Cooling Unit	B9-659, Rev. H
T4100-B037	Thermal Recombiner Room East Cooling Unit	B9-659, Rev. H
T4700-B001	Drywell Cooling Unit	6M721-4127, Rev. J 6M721-3922, Rev. A 26170, Rev. J
T4700-B003	Drywell Cooling Unit	6M721-4127, Rev. J 6M721-3922, Rev. A 26170, Rev. J
T4700-B004	Drywell Cooling Unit	6M721-4127, Rev. J 6M721-3922, Rev. A 26170 Rev. J
T4700-B002	Drywell Cooling Unit	6M721-4127, Rev. J 6M721-3923, Rev. A 6M721-3924, Rev. B 26169 (Shts 1 - 3)
T4600-D002	SGT Filter Unit - Div. II	6M721-2649-1, Rev. E 6M721-2268, Rev. R
T4600-C004	SGT Exhaust Air Filter Unit	6I721-2649-1, Rev. E 73-725

TABLE 3.8.1 (Cont'd)

HVAC EQUIPMENT INSPECTED

Component No.	Component Name	Reference Document
T4100-C053	Control Center Cooling Fan	B9-1860
T4100-C008	East Battery Room West Essential Exhaust Fan	B9-197 B9-198
T4100-C010	West Battery Room West Essential Exhaust Fan	B9-197 B9-198
T4100-C047	Emergency Make-Up Air Fan	B9-692, Rev. D B9-1115 I/M (T41-00-D-016-JA-002)
T4700-C001	Drywell Cooling Fan	6M721-4127, Rev. J 6M721-3924, Rev. B 6M721-3925, Rev. B FF-15421, Rev. I 26168, Rev. G
T4700-C002	Drywell Cooling Fan	6M721-4127, Rev. J 6M721-3924, Rev. B 6M721-3925, Rev. B FF-15421, Rev. I 26168, Rev. G
T4600-C001	SGT Cooling Fan - Div. I	6I721-2649-1, Rev. E 6M721-2268, Rev. R R3-731 R3-732
T4600-C002	SGT Cooling Fan - Div. II	6I721-2649-1, Rev. E 6M721-2268, Rev. R R3-731 R3-732
T4600-C003	SGT Exhaust Fan - Div. I	6I721-2649-1, Rev. E R3-712

3.9 Mechanical Instrumentation

3.9.1 Loop Walkdown

3.9.1.1 Purpose

Selected Instrument Loops were examined to determine if they had been installed in accordance with the Instrumentation Drawings and Specifications.

3.9.1.2 Criteria

(1) Detroit Edison Company Specification 3071-525 Rev. D, "Design Specification for Nuclear Class 2 and 3 Small Piping and Instrument and Control Tubing"

(2) Detroit Edison Company Drawings as listed in Table 3.9.1

3.9.1.3 Items Evaluated

The instruments, piping and tubing as listed below were selected for walkdown.

Core Spray	-	PT-E21-L403B
		FE-E21-N002B
RHR	-	PT-E11-L411B
		FE-E11-L417B
HPCI	-	FE-E41-N007
Main Steam	-	FTH-B21-L002

Examination was made for proper materials, configuration, connections and evidence of damage.

3.9.1.4 Results

No major significant deviations were identified. The items examined are considered to conform to the design drawings and specifications. The noted exceptions are listed below.

1) On the piping for PT-E11-L411B, the valve had yellow tag 3153 instead of 3152 as shown on the drawing.

(2) Two loose and leaking tubing connections were noted incidentally on Instrument Loop E11-N007B.

(3) Instrumentation Penetration X-33A had one connection which was taped up - no pipe or cap. See Photograph 3.9.1.

(4) Instrumentation Penetration X-55B had four connections which were not piped up or capped.

(5) Tape and tape residue were noted on surface of pipe between welds P and 58 & 59 on piping for instrument FTH-B21-L002A.

3.9.1.5 Conclusions

On the basis of the above results, the Instrumentation examined meets the requirements of the specifications and drawings. It is recommended, however, that a check be made to ensure that all unused connections in Instrument Penetrations are sealed.

TABLE 3.9.1

MECHANICAL INSTRUMENTATION REFERENCE DRAWINGS

Instrument Number & Drawing Numbers	Revision
Instrument FE-E41-N007	
6WI-E41-7015-1	B
6I721-2281-13	B
0A-FE-E41-N007	E
6M721-3167-1	M
Instrument FTH-B21-L002A	
6WI-B21-7422-1	C
6I721-2281-22	C
6D1-B21-7248-1	C
731E 756 (G.E. Dwg.)	C
Instrument PT-E21-L403B	
6WI-E21-7122-1	B
6I721-2281-18	D
12-PT-E21-L403B	C
6M721-3147-1	S
Instrument FE-E21-N002B	
6WI-E21-7001-1	D
6I721-2281-18	D
09-FE-E21-N002B	E
6M721-3147-1	S
Instrument PT-E11-L411B	
6WI-E11-7010-1	E
6I721-2281-19	I
06-PT-E11-L411B	C
6M721-3177-1	M
Instrument FE-E11-L417B	
6WI-E11-7014-1	E
6I721-2281-19	I
06-FE-E11-N014B	E
6M721-3151-1	V

3.10 Electrical Distribution System

3.10.1 4160V Switchgear

3.10.1.1 Purpose

A sample of safety-related electrical 4KV switchgear consisting of three switchgear and four compartments was selected to assess the conformance of their installation to the final design documents. Attributes evaluated included installation, identification, separation, proper components, cable terminations and environmental integrity.

3.10.1.2 Criteria

(1) Detroit Edison Electrical Engineering Standard Specification 3071-128.

(2) Detroit Edison Electrical Installation Specification 3071-33.

(3) Detroit Edison Drawing 5E721-2992-1 - Mounting details for 4KV switchgear.

(4) Detroit Edison Schematic and Connection Drawings referenced herein.

3.10.1.3 Items Evaluated

(1) Switchgear 64C compartment C10 - Core Spray Pump C

(2) Switchgear 64C compartment C11 - Transformer 72C

(3) Switchgear 13EC compartment EC5 - Transformer 72EC

(4) Switchgear 65E compartment E10 - Core Spray Pump B

3.10.1.4 Results

(1) Switchgear 64C compartment C10 and C11

Compartment C10 of the 64C switchgear as shown on Figure 3.10.1 is the power source for Core Spray Pump Motor C. Compartment C11 provided the power source for the 4160/480V transformer 72C and motor control center 72C-3A. Seven cables entered and terminated in compartment C10 and four cables entered and terminated in compartment C11. The cables were checked for tightness and compliance with the connection and schematic drawings. No deviations were identified. The compartments were anchored to embedded channels utilizing plug welds at manufacturer's supplied mounting holes. No deviations from the mounting drawings were noted. A comparision of the devices in each cabinet to the equipment drawings resulted in one minor deviations. The drawings indicated a 85 watt resistor for

device LC in each compartment, however a 100 watt resistor was installed. When the rear of the compartments were opened, large quantities of dust, dirt, cigarette butts, and nails were found on the bottom of the compartments. This item was brought to the attention of Detroit Edison personnel. The compartments were cleaned at that time. 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) Switchgear 65E compartment E10

Compartment E10 is the power source for Division II Core Spray Pump Motor B as shown on Figure 3.10.1. Seven cables entered from the bottom and terminated in this compartment. The cable entrances were sealed. The cables were checked for tightness and compliance with connection and schematic drawings. Cable tags 220088-2C and 220081-2C were attached to the same cable. One cable in the compartment was not tagged. Apparently, the cable tag for cable 220088-2C had fallen off and was re-attached to cable 220081-2C in error. The untagged cable in the compartment was terminated as shown for cable 220088-2C on the drawings. A check of devices located in the compartment revealed the same minor deviation with device LC (resistor) as found in switchgear 64C compartments C10 and C11. No other device deviations were noted. The switchgear was properly identified with blue nameplates, however, the installation of white device nameplates on each compartment door had not been completed. Dust and dirt was also found in this compartment. The compartment was cleaned during the review.

(3) Switchgear 13EC compartment EC5

Switchgear 13EC as shown on Figure 3.10.2 is located in the RHR complex. Compartment EC5 is the power source for the Division II 4160/480V transformer 72EC, which provides support power for various diesel systems. Four cables entered compartment EC5 from the top and terminated in the cabinet. These cable entrances were not sealed. The cables were checked for tightness and compliance with connection and schematic drawings. No deviations were noted. A check of the mounting of the equipment to its base indicated some confusion in the reference design drawings. Drawing 5E721-2992-1 had been revised by DCN 10287 to reference drawing 6E721N-37 for mounting all RHR complex switchgear. However, drawing 6E721N-37 referenced 5E721-2992-1 for the mounting of the equipment. The switchgear had been mounted utilizing the detail shown on 5E721-2992-1. Detroit Edison personnel indicated the mountings were correct. They also indicated a design change would be made to the note on drawing 5E721-2992-1 to indicate mounting the RHR switchgear by that drawing.

3.10.1.5 Conclusions

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. The quality of housekeeping needs to be improved to prevent recurrance 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.

3.10.2 480 Volt Motor Control Centers (MCC)

3.10.2.1 Purpose

A sample of the safety-related electrical 480V motor control center compartments from four separate MCC's was selected to assess the conformance of their installation to the final design documents. The sample consisted of a cross section of MCC's supporting Core Spray, RHR, and Diesel Support systems (see Figures 3.10.1, 3.10.2, and 3.10.3). Attributes evaluated included installation, identification, wiring connections, fuse coordination, overload rating, proper components, separation and environmental integrity.

3.10.2.2 Criteria

(1) Detroit Edison Electrical Installation Specification 3071-33.

(2) Detroit Edison Electrical Engineering Standard Specification 3071-128.

(3) Detroit Edison Drawing 5E721-2992-3 - Standard for typical MCC mounting.

(4) Detroit Edison documents, schematic and connection drawings as referenced herein.

3.10.2.3 Items Evaluated

(1) MCC 72C-3A compartment 8B - Core Spray

(2) MCC 72EC-2C compartment 1C - Diesel Generator #13

(3) MCC 72B-3A compartment 3AR - RHR

(4) MCC 72F-4A compartment 4C - Core Spray

3.10.2.4 Results

(1) MCC 72C-3A compartment 8B

This compartment provided power to Division I Core Spray Valve #E2150F005A/V82021 (Inboard Valve A). Two cables entered and terminated in compartment 8B. The cables were checked for tightness and compliance with schematic and connection drawings. No deviations were noted. A check of the internal wiring was made. No deviations were found. It was noted during the assessment that EECW System piping was routed immediately overhead (see Photograph 3.10.1). Detroit Edison letter EF2-68.571, dated 5/31/84, confirmed the need for water spray protection. Potential for damage to the MCC exists until the protection is provided. Also noted during the assessment was the direct contact of steel channel from an adjacent stair landing with the MCC. There was no evidence the stairs in contact with the MCC was considered in the MCC seismic evaluation (see Photograph 3.10.1). The housekeeping within the motor control center was poor. The bottom section of the MCC was covered with heavy dust, cigarettes, and other foreign material.

(2) MCC 72EC-2C compartment 1C

MCC 72EC-2C is located in the RHR complex. Compartment 1C provides power to Division II Diesel Generator #13 Fuel Transfer Pump B. Two cables entered and terminated in this compartment. A review of the cable terminations and internal wiring for tightness and compliance with wiring drawings was completed with no deviations noted. A check of the MCC including attachment to the base, grounding, compartment identification, and housekeeping resulted in no deviations.

(3) MCC 72B-3A compartment 3AR

Compartment 3AR provides power to Division I Residual Heat Removal Valve E1150F004A/V8-2099 (Suction Pump 2A Valve A). Four cables entered and terminated in the compartment. Cable 214231-1C entered the MCC from the bottom as indicated by the cable routing sheet (CR-7). Drawing 5SD721-2512-16B indicated top entry. This is considered a minor deviation in this instance but appears to be a generic problem. The bus connection for the number 1 conductor of the main feeder cable (200565-1P) was found loose and the wire located on terminal #12 of the interface block in compartment 3AR was also loose. The motor control center was dirty. The section of the MCC containing compartment 3AR had an accumulation of dust, dirt, trash and cigarette butts located inside. Efforts were made by Detroit Edison to immediately begin cleaning the MCC.

(4) MCC 72F-4A compartment 4C

Compartment 4C provides power to the Division II Core Spray Valve E2150F005B/V8-2022 (Inboard Isolation Valve B). Two cables entered and terminated in this compartment. An assessment of MCC grounding, base attachment, cable terminations, internal wiring, and housekeeping resulted in no deviations. An assessment of the fuses located in the compartment indicated a deviation between drawings. Drawing 5SD721-2512-19A indicated 25 amp fuses on the main switch, while drawing 6I721-2211-7 indicated 30 amp fuses were required. Thirty (30) amp fuses were installed in the field. This is a penetration circuit and may compromise penetration protection.

3.10.2.5 Conclusion

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 recom mended.

MCC 72C-3A, apparently located in a hazardous environment, requires additional protection for water spray and a review of its siesmic qualifications due to possible interaction from stairway landing. In addition, MCC (72F-4A) had fuses installed which may have been contrary to the intended design. This item is particulary 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. In addition, a review of all motor control center frontal, schematic, and connection drawings is recommended to determine consistency between drawings and the two loose terminations identified in MCC 72B-3A should be corrected.

3.10.3 Batteries

3.10.3.1 Purpose

One of the safety-related 260/130 VDC batteries was selected to assess the conformance of the battery installation to the final design documents. Six cells of this battery were inspected. Attributes evaluated included battery rack installation, identification, cable terminations, battery parameters, ventilation, cleanliness and damage.

3.10.3.2 Criteria

(1) Detroit Edison Installation Specification 3071-128.

(2) Detroit Edison Installation Specification 3071-128.

(3) C & D Installation and Operation Instruction Manual for Stationary Batteries.

(4) Detroit Edison Electrical Schematic and Connection Drawings as referenced herein.

3.10.3.3 Items Evaluated

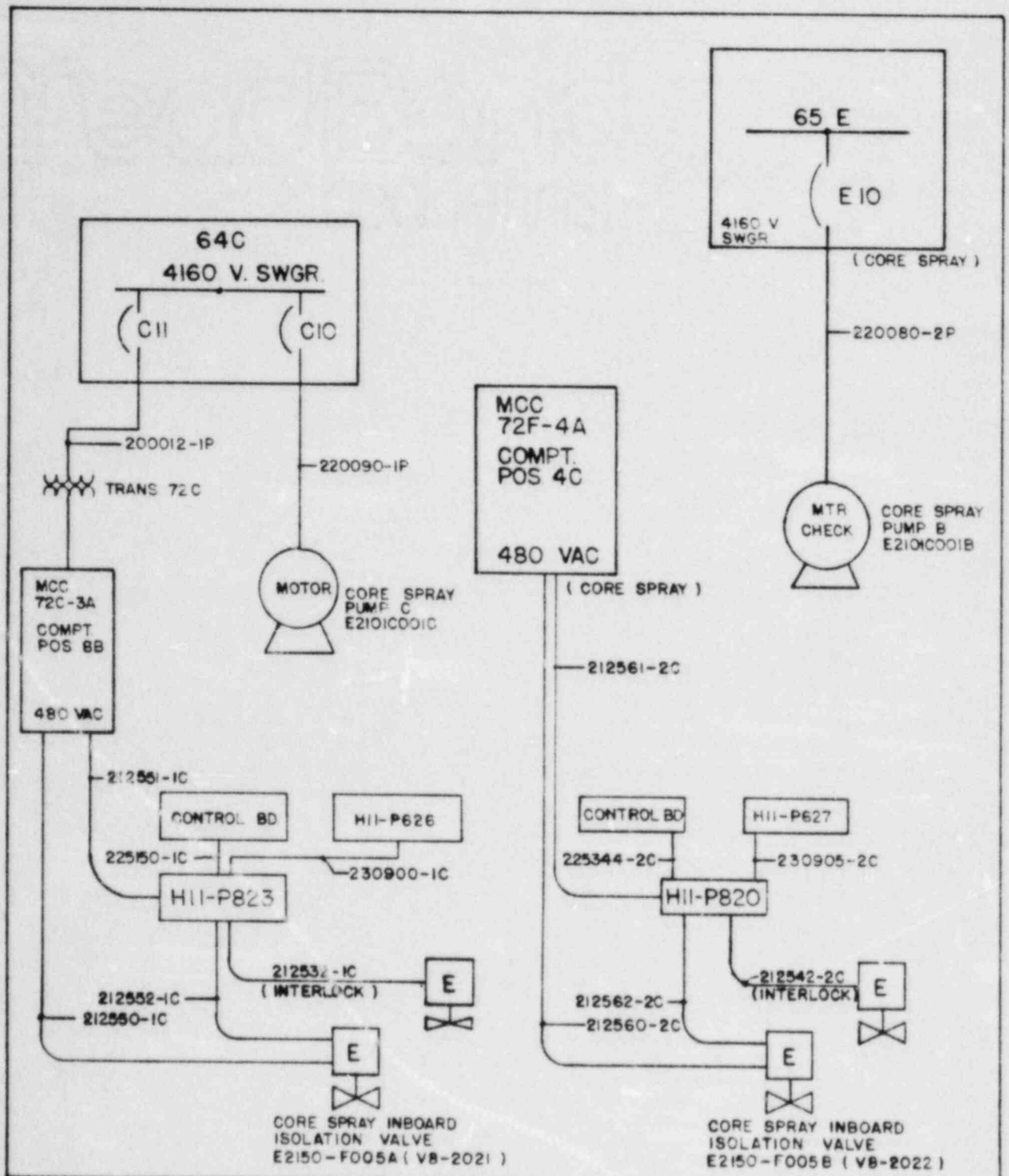
(1) Battery 2B-1, cell numbers 5, 9, 16, 30, 45, and 60 (Division 2).

3.10.3.4 Results

The battery room for 2B-1 battery was clean and adequately ventilated. The battery had recently been cleaned. No corrosion was evident on the terminal posts or connecting bars. It was noted however, that the cleaning of the posts and bars had removed some of the lead protective coating. While this may not affect the operability of the battery, it would eventually increase maintenance time. A check of the specific gravities resulted in high readings. Readings ranged from 1.255 to 1.265 specific gravity. A normal reading would have been in the range of 1.210 to 1.220. A review of the battery maintenance record indicated low specific gravity readings. Apparently, acid has been added to raise the specific gravity levels. All cell voltages checked were good. Other minor deviations included a missing cable tag, missing nameplates on terminal boxes and doors, and a deviation between the battery connection box fabrication drawing and the schematic drawing for the fuse locations. The fuse was located by the schematic drawing.

3.10.3.5 Conclusions

The high specific gravities should be lowered to within the recommended range specified by the manufacturer. Based on the evaluation, the batteries were installed as specified.

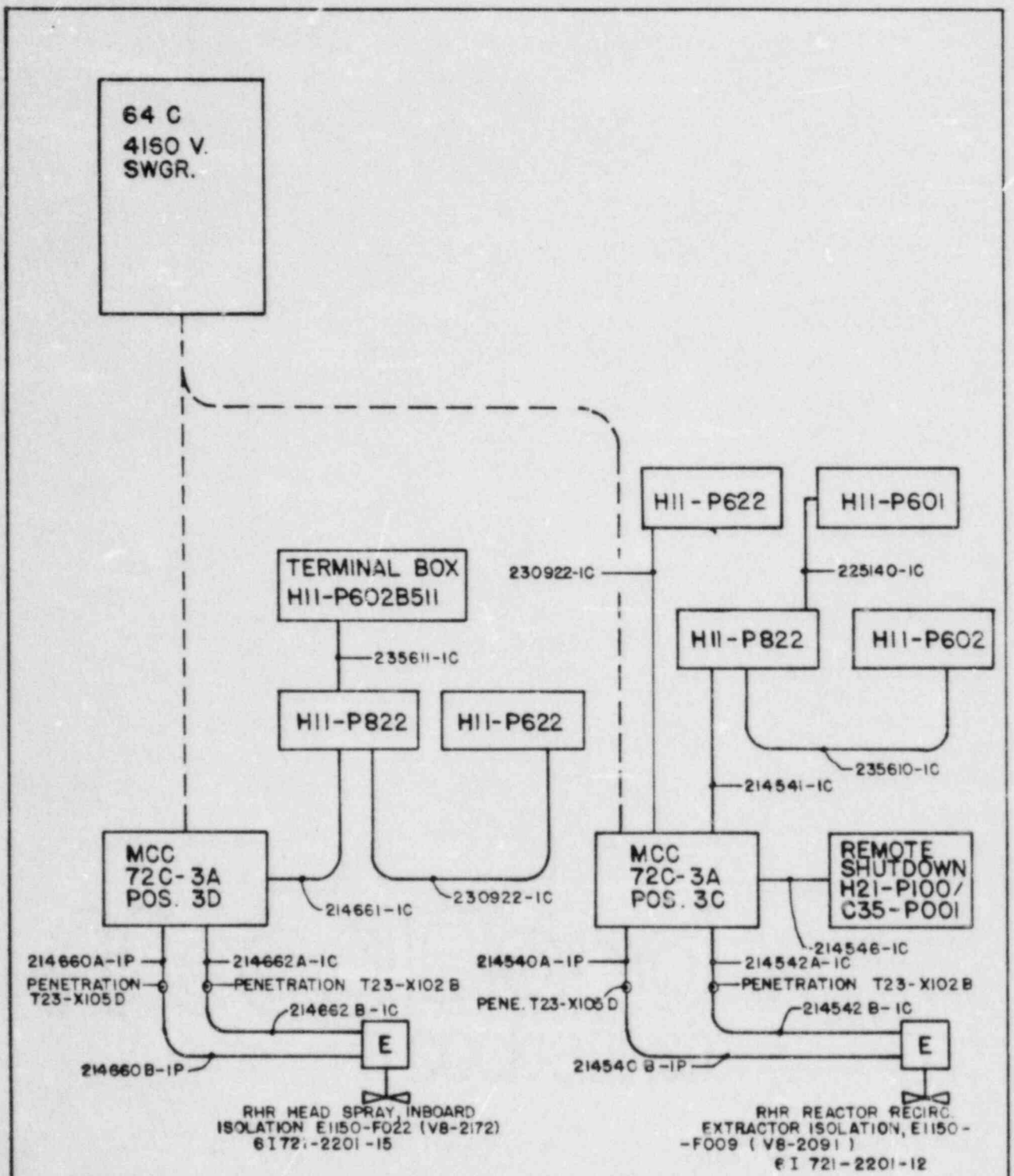


ELECTRICAL— CORE SPRAY

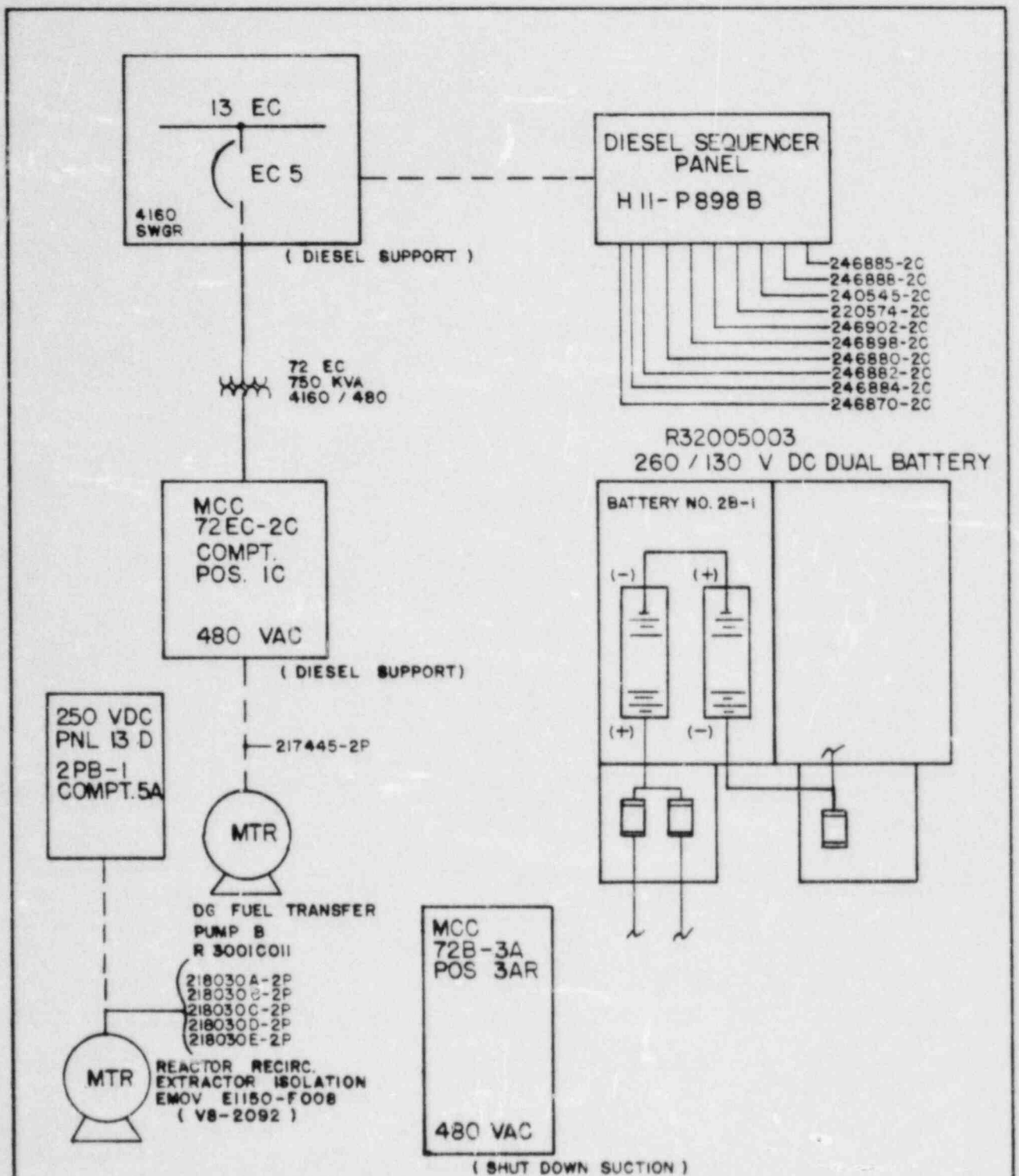
THE DETROIT EDISON CO.

FERMI II P.P. MONROE, MICH

FIGURE NO. 3.10.1



ELECTRICAL – RHR HEAD SPRAY AND SHUTDOWN SUCTION	THE DETROIT EDISON CO. FERMI II P.P. MONROE, MICH. FIGURE NO. 3.10.2

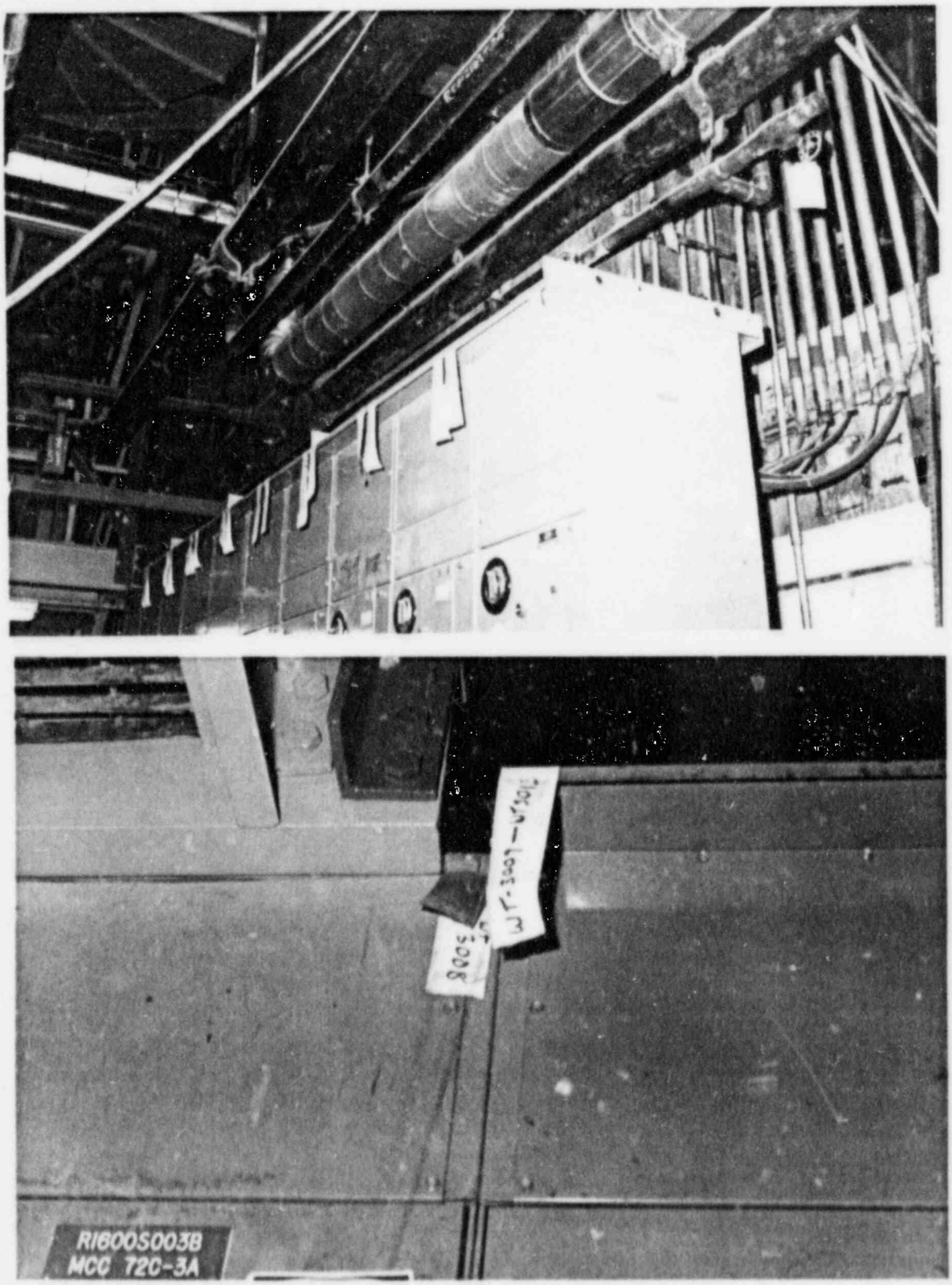


ELECTRICAL—BATTERIES—DIESEL GENERATOR SUPPORT AND MISC.

THE DETROIT EDISON CO.

FERMI II P.P. MONROE, MICH

FIGURE NO. 3.10.3



Photograph 3.10.1 MCC 72C-3A with EECW piping overhead and stair landing in direct contact.

3.11 Electrical Cable System

3.11.1 Cable

3.11.1.1 Purpose

The purpose of this review was to assess the installation of electrical cables in the plant for their compliance with Detroit Edison specifications and drawings. Attributes evaluated included routing, identification, separation during routes and at entrances to equipment, damage during installation, grounding, and environmental protection. A sample of cables was selected with primary emphasis on the Core Spray and Residual Heat Removal systems.

3.11.1.2 Criteria

(1) Detroit Edison Specification 3071-33

(2) Detroit Edison Specification 3071-128

(3) Cable routing sheets (CR-7) as applicable for each cable reveiwed.

(4) Detroit Edison Electrical Connection and Schematic Drawings as referenced herein.

3.11.1.3 Items Evaluated

Table 3.11.1 lists the cables reviewed in this assessment. A total of 56 cables were evaluated. All were reviewed at the terminating ends for separation and support. Twenty percent of the cables were inspected over their complete route and fifty percent were inspected only for tray/conduit separation along their route.

3.11.1.4 Results

Of the 56 cables reviewed, the following cables had separation, routing, or support deviations.

(1) Tray 1C-140 was not shown on route sheets for cables 235803-1C, 214662B-1C, and 214542B-1C.

(2) Cables entering cabinets in the relay room lack a grip type support required by specification 3071-33. Example: Cable 240105-2K leaves tray 2K-012 and enters cabinet H11-P817. Cable is unsupported for approximately 8 feet. (See Photograph 3.11.1 for example.)

(3) Cable routing sheets for cables 220090-1P, 254316-1K, and 231561-E1 do not indicate cables to be run in conduit. The cables were installed in conduit during parts of the route.

3.11.1.5 Conclusions

The routing of the cables through point 1C-140 and the use of conduit not shown on the routing sheets does not constitute a significant deviation from the design documents, since the cables maintained their divisional integrity. It is recommended that routing sheets should be reveiwed and updated to reflect the 'as-built' condition.

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 permissable with Design Engineering analysis.

3.11.2 Tray and Conduit

3.11.2.1 Purpose

The purpose of this review is to assess the installation of cable tray and electrical conduit for compliance with Detroit Edison Specifications and drawings. This review was performed in conjunction with the cable review described in section 3.11.1. Attributes reviewed included tray and conduit installation, identification, grounding, cable tray fill, separation, fire stops, housekeeping, and damage.

3.11.2.2 Criteria

(1) Detroit Edison Specification 3071-33

(2) Detroit Edison Specification 3071-128

(3) Detroit Edison Cable Tray Drawings as referenced herein

(4) Detroit Edison Conduit Drawings as referenced herein

3.11.2.3 Items Evaluated

The selection of cable trays and conduits evaluated in this section were based on the cable routes selected in Section 3.11.1 of this report.

3.11.2.4 Results

The following is a tabulation of the findings resulting from this review:

1) Vertical cable tray 2P-003 contained cables not attached to the tray for a vertical distance in excess of 15 feet. Specification requires attachment to the tray at 8 foot intervals. (See Photograph 3.11.2.)

2) Cable tray 2C-062 and 0K-116 have cables installed above the side-rails creating an over-fill condition. (See Photograph 3.11.3)

3) Cables in tray 2C-062 located in cable tunnel adjacent to Relay Room are not installed in a "neatly trained manner." (See Photograph 3.11.4.) An example of neatly trained is shown in Photograph 3.11.5.

4) A cable, assumed to be abandoned, was coiled up and left in tray 2P-525 (RHR Complex).

5) Orange tray #1K-015 and blue conduit BB-021-2K do not meet the required 3'/5' separation criteria. Location G-17 at elevation 562'.

6) Orange conduit (AA-050-10) violates 3' separation criteria with blue conduits (BB-007-2C and BB-008-2C). Location G17, elevation 562'.

7) Flex conduit, containing Cable 228252A-1K, is pulled apart at device exposing cable.

8) Spare conduits in the Relay Room have not been plugged or capped (loc: G-9, El. 631' next to tray 2C-054 and G-17, El. 631').

9) Division II pullbox did not have cover installed. No cover was observed in area. No other identification was available. Approximate location: Column F17, El. 562'.

10) BOP cable was observed installed outside of cable tray (see Photograph 3.11.6).

3.11.2.5 Conclusion

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.

3.11.3 Electrical Penetrations

3.11.3.1 Purpose

The purpose of this review is to sample the installed electrical penetrations to determine if installation is as specified by the design drawings and specifications. Attributes reviewed included damage, environmental sealing, cable terminations, identification, and circuit protection. The sample included one power penetration, two control penetrations, and one instrumentation penetration. These penetrations are included in Figures 3.10.1 through 3.10.5.

3.11.3.2 Criteria

(1) Conax Installation Manual for electrical penetrations.

(2) Detroit Edison Specification 3071-33.
(3) Detroit Edison Specification 3071-128.

(4) Detroit Edison connection and outline drawings as referenced herein.

3.11.3.3 Items Evaluated

(1) Penetration T23-X-105D - Power - RHR Head Spray

(2) Penetration T23-X-102A - Control - Core Spray

(3) Penetration T23-X-102B - Control - RHR Shutdown Suction

(4) Penetration T23-X-103B - Instrumentation - Core Spray

3.11.3.4 Results

(1) Penetration T23-X-105D - A check for loose bolts was made prior to removing the covers to the penetration. Three loose bolts were found on the outboard side and numerous bolts and screws were missing from the inboard covers. A check of cable 214660A-1P for continuity through the penetration revealed no problems. It was noted that a Raychem seal had been partially installed at the cable entrance to the outboard side of the penetration. Drawings 6E721-2839-30 and 6E721-2839-21 showed the Raychem seals. Heat had not been applied to the Raychem to provide the environmental seal. Also noted during the assessment was a wiring change incorporating redundant penetration fuse protection made by DCP No. T2301E01. This DCP had been originated in October 1982, however, had not been incorporated into the drawing. The change had been incorporated in the field. The gas pressure gauge indicated 20 psig.

(2) Penetration T23-X-102A - A check for loose bolts and screws was made prior to any attempt to remove the covers. Numerous bolts and screws were missing on the inboard and outboard side of the

penetration. A review of the wiring on the outboard terminal blocks was severely hampered by the supports added for the RPS terminal boxes attached to the front of the penetration (6E721-2808-7). Removal of the top half of the cover was impossible. Consequently, future work and maintenance at this penetration will be extremely difficult. The circuit for cable 235208-2C through the penetration was checked for continuity. No deviations were encountered. Gas pressure gauge indicated 18 psig.

(3) Penetration T23-X-102B - Prior to removing the covers, a check for proper sealing of the covers revealed numerous missing screws and bolts. A continuity check of the circuit for cable 235803-1C through the penetration did not indicate any problems. Heat shrink material had been installed on the cables as indicted by drawing 6E721-2839-21, however, no heat had been applied to environmentally seal the opening. The gas pressure gauge indicated 16 psig. Congestion at the inboard side of the penetration made the assessment extremely difficult.

(4) Penetration T23-X-103B - A check of the bolts and screws in the covers prior to removal indicated none were present on the outboard side and numerous bolts were missing on the inboard side. The covers were locked close with key locks to prevent unauthorized entrance. However, there was no environmental seal attained on the outboard side of the penetration. A check of the gas pressure gauge indicated 30 psig. The Conax manual recommended 15 psig. A continuity check of cable 254316B-1K through the penetration indicated no problems. Also noted during the termination check was that cable 251462-1K was severed at the inboard termination.

3.11.3.5 Conclusions

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.

One example of a broken instrument cable was found. This example was an isolated case.

A disparity in gas pressure readings for the penetrations was noted. The manufacturer recommends 15 psig during operation. The range encountered varied from 16 psig to 30 psig. It is recommended that all penetrations be inspected for proper gas pressure and that proper gas pressure be maintained. It is also recommended that a generic repair procedure be developed and implemented, prior to fuel loading, requiring periodic checks of penetrations for gas pressure fluctuations and damage.

The inaccessability of one of the penetrations inspected and the inability to remove the top half of the terminal box cover indicates a need for engineering to review the penetration installations to provide accessability for future maintenance and modifications.

3.11.4 Thermal Shields

3.11.4.1 Purpose

The purpose of the review was to determine if thermal shields were installed as required by Detroit Edison Engineering Specifications and drawings. Attributes inspected included separation, materials and methods of securing and location.

3.11.4.2 Criteria

(1) Detroit Edison Specification 3071-33
(2) Detroit Edison Specification 3071-51

(3) Mirror Insulation Dwg. 590001047C shts. 1 & 2

(4) Mirror Insulation Dwg. 590001043C shts. 1 & 2

(5) Detroit Edison DCN #E-4845 Rev. 0

(6) Detroit Edison DCN #E-4854 Rev. 0

(7) Detroit Edison DCN #E-4708 Rev. B

(8) Detroit Edison FMR #S-7118 Rev. 0

(9) Detroit Edison FMR #S-6980 Rev. 0

3.11.4.3 Items Evaluated

(1) Conduit GG007-1C Az. 189° Elev. 572'

(2) Conduit GG001-0P Az. 330° Elev. 607'

(3) Conduit GG-219-2K Az. 225° Elev. 620'

(4) Reactor Recirculation Piping Loop - Hanger B21-HC3

(5) Feedwater Manifold Loop B - Hanger N21-3536-G24

3.11.4.4 Results

The thermal shielding was checked at five locations. Three of the shielded locations covered electrical conduit and two locations covered mechanical piping hangers shielded to protect electrical equipment. Mechanical hanger B21-HCB was shielded to protect pullbox GG-571 (Div. 1) and electrical penetration T23-X-101F. Mechanical hanger N21-3536-G24 was shielded to protect conduit

GG-093-2C (Div. II). A review of the material utilized and of the compliance with Design documents resulted in no deviations.

3.11.4.5 Conclusion

The evaluation indicated that the installations had not been completed in accordance with current design documents. However, it was observed that all five locations of thermal shielding were installed utilizing field initiated design change documents. The earliest of these five documents was originated in March 1984 and the most current was originated in June 1984. From this observation, it was concluded that the thermal shielding program is still in its preliminary stages. There are no recommendations for further action.

ABLE 3.11.1

Cable List

Cable No.	Color	Fr.	To		
220080-2P	BL	65E-E10	Core Spray Pump B	Div. 2	Note 1
212533-0C	BLK	H11-P823	H11-P832	BOP	Note 1
212542-2C	BL	H11-P820	E2150F004B/V8-2020	Div. 2	Note 1
212560-2C	BL	72F-4A-4C	E2215F005B/V8-2022	Div. 2	Note 1
212562-2C	BL	H11-P820	E2150F005B/V8-2022	Div. 2	Note 1
225101-1C	OR	H11-P626	H11-P601	Div. 1	Note 1
225150-1C	OR	H11-P823	H11-P601	Div. 1	Note 1
225344-2C	BL	H11-P820	H11-P602	Div. 2	Note 1
230900-1C	OR	H11-P626	H11-P823	Div. 1	Note 1
254316B-1K	SS	PEN X103B	T5000N412A	Div. 1	Note 1
225123-1K	OR	H11-P613	H11-P601	Div. 1	Note 1
232700-1K	OR	H11-P613	H2100P001	Div. 1	Note 1
214540A-1P	OR	72C-3A	PEN X105D	Div. 1	Note 2
214542A-1C	OR	72C-3A	PEN X102B	Div. 1	Note 2
217446-2C	BL	72EC-2C	H11-P862	Div. 2	Note 2
214662A-1C	OR	72C-3A	PEN X102B	Div. 1	Note 2
220090-1P	OR	64C-C10	Core Spy Pump C	Div. 1	Note 2
225140-1C	OR	H11-P822	H11-P601	Div. 1	Note 2
*228821Y-0C	BLK	Crossover	H11-P828	BOP	Note 2
*228821Y-2C	BLK	Dsl Oil Tnk Lev Sw.	Crossover	BOP-BL	Note 2
230905-2C	BL	H11-P627	H11-P820	Div. 2	Note 2
231561-E1	MAG	H11-P606	D1100N006A	RPS-E1	Note 2
232047-A1	BLK	H11-P606	H11-P609	RPS-A1	Note 2
235209-2C	BL	PEN X102A	E1103F050B/V8-2164	Div. 2	Note 2
235217-0C	BLK	H11-P820	H11-P832	BOP	Note 2
235611-1C	OR	H11-P822	H11-P602	Div. 1	Note 2
245753-1K	OR	H21-P082	H21-P004	Div. 1	Note 2
254316-1K	BL	PEN X103B	H11-P601	Div. 1	Note 2
256445-2C	BL	72EC-2C	Cont Pnl EDG 13	Div. 2	Note 2
212550-1C	OR	72C-3A	E2150F005A/V8-2021	Div. 1	Note 3
212543-0C	BLK	H11-P820	H11-P832	BOP	Note 3
214660B-1P	OR	PEN X105D	E1150F022/V8-2172	Div. 1	Note 3
214640B-1P	OR	PEN X105D	E1150F009/V8-2091	Div. 1	Note 3
235205-2C	BL	PEN X102A	E2100F006B/VA/2024	Div. 2	Note 3
235610-1C	OR	H11-P822	H11-P602	Div. 1	Note 3
212552-1C	OR	H11-P823	E2150F005A/V8-2021	Div. 1	Note 3
245757-1K	OR	H21-P080	H21-P009	Div. 1	Note 3
245751-1K	OR	H21-P082	H21-P004	Div. 1	Note 3
232901-2K	BL	E5100N026B	H11-P614	Div. 2	Note 3
232878-1K	BLK	E5100N021A	H11-P614	Div. 1	Note 3
261530-0K	YEL	PEN X103A	H11-P921	BOP	Note 3

TABLE 3.11.1 (Cont'd)

Cable List

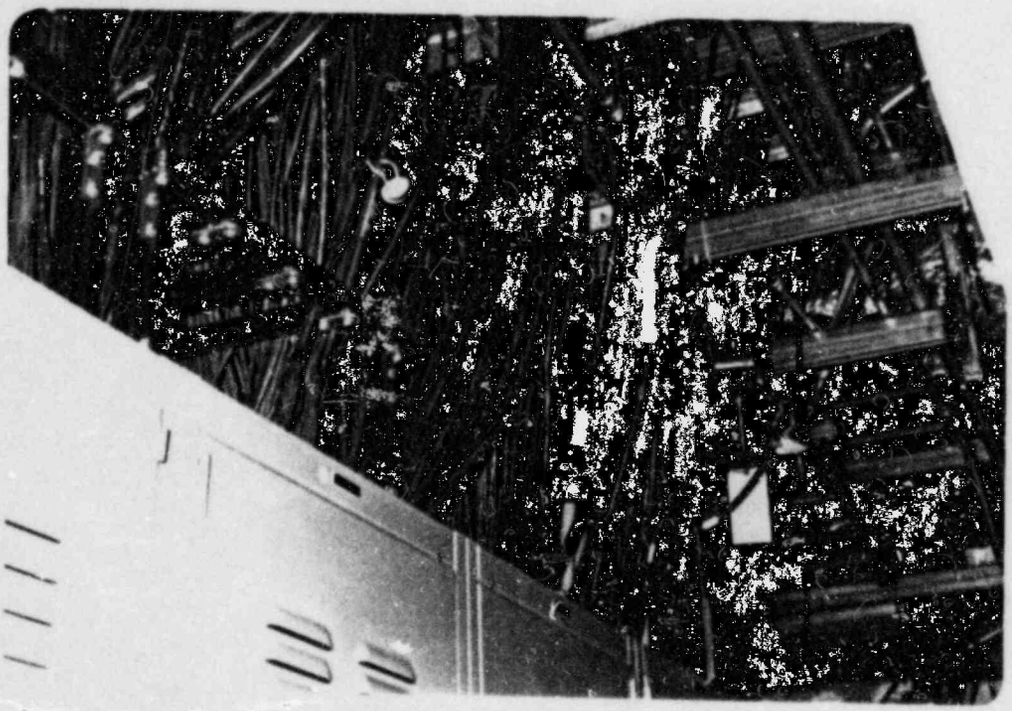
Cable No.	Color	Fr.	To		
228276A-2K	BL	H21-P584I	P4400N401B	Div. 2	Note 3
228252A-1K	BLK	H21-P584G	P4400N401A	Div. 1	Note 3
231561-E1	MAG	H11-P606	D1100N006A	RPS-E1	Note 3
214661-1C	OR	72C-3A	H11-P822	Div. 1	Note 3
234752-2C	BL	H11-P623	H11-P820	Div. 2	Note 3
214546-1C	OR	72C-3A	H21-P100	Div. 1	Note 3
235803-1C	OR	PEN X102B	E2150F006A	Div. 1	Note 3
214542B-1C	OR	PEN X102B	E1150F009/V8-2091	Div. 1	Note 3
214662B-1C	OR	PEN X102B	E1150F022/V8-2172	Div. 1	Note 3
225301-2C	BL	H11-P627	H11-P602	Div. 2	Note 3
212532-1C	OR	H11-P823	E2150F004A/V8-2019	Div. 1	Note 3
234754-2C	BL	H11-P623	H21-P021	Div. 2	Note 3
234759-2C	BL	H11-P623	H21-P021	Div. 2	Note 3
225347-2C	BL	H11-P820	H11-P602	Div. 2	Note 3
230922-1C	OR	H11-P622	H11-P822	Div. 1	Note 3
230939-2C	BL	H11-P618	H11-P820	Div. 2	Note 3

NOTE 1: These cables were checked for proper routing, separation and termination over their complete route. This review was made utilizing a detailed hand over hand check through the tray systems.

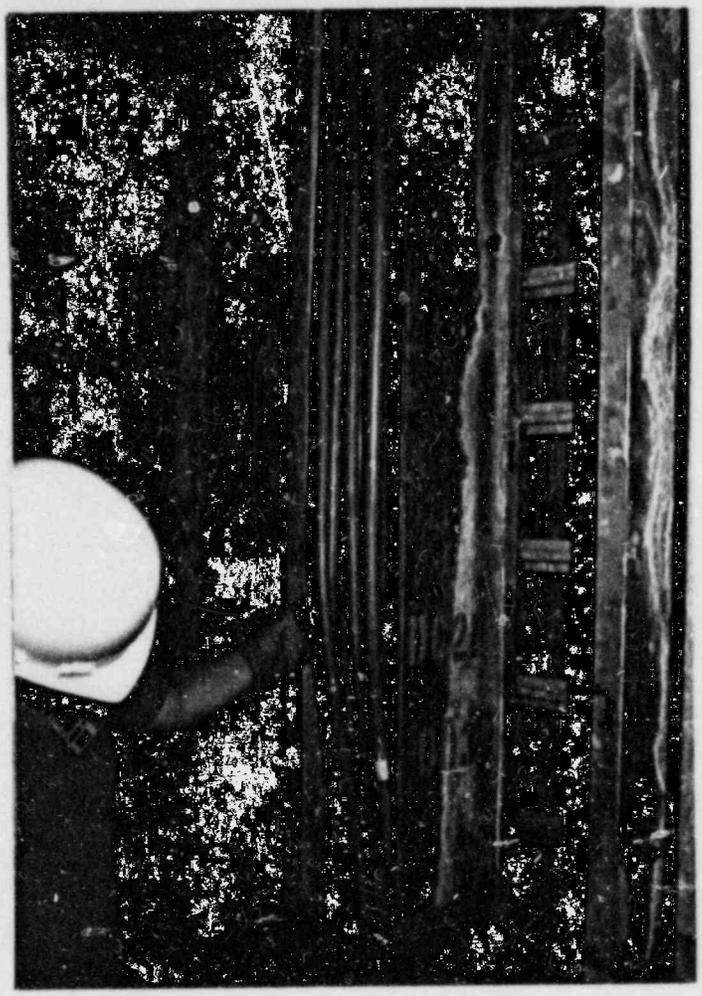
NOTE 2: These cables were reviewed for tray separation and termination through their complete route. A hand over hand check of the routes was not done.

NOTE 3: These cables not included in note 1 and 2 were checked for separation and support at the terminating ends only.

*Designates BOP cable with partial route in Divisional tray.

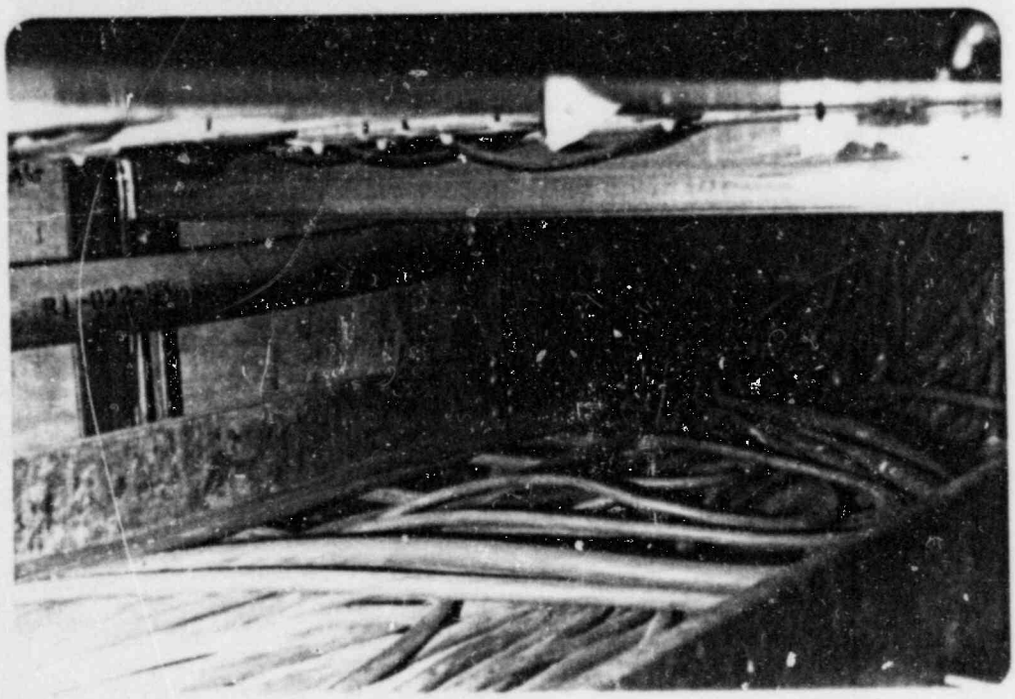


Photograph 3.11.1 Example of cables entering cabinets from above without specified grip supports.

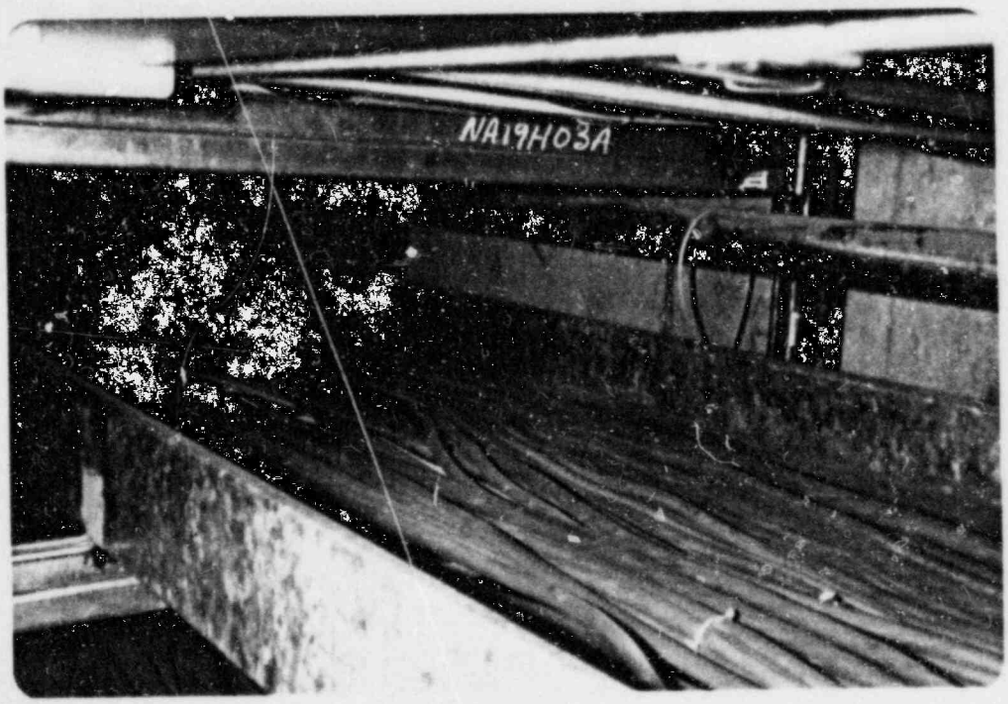


Photograph 3.11.2 Cables instalied in vertical tray-cables not attached to tray.

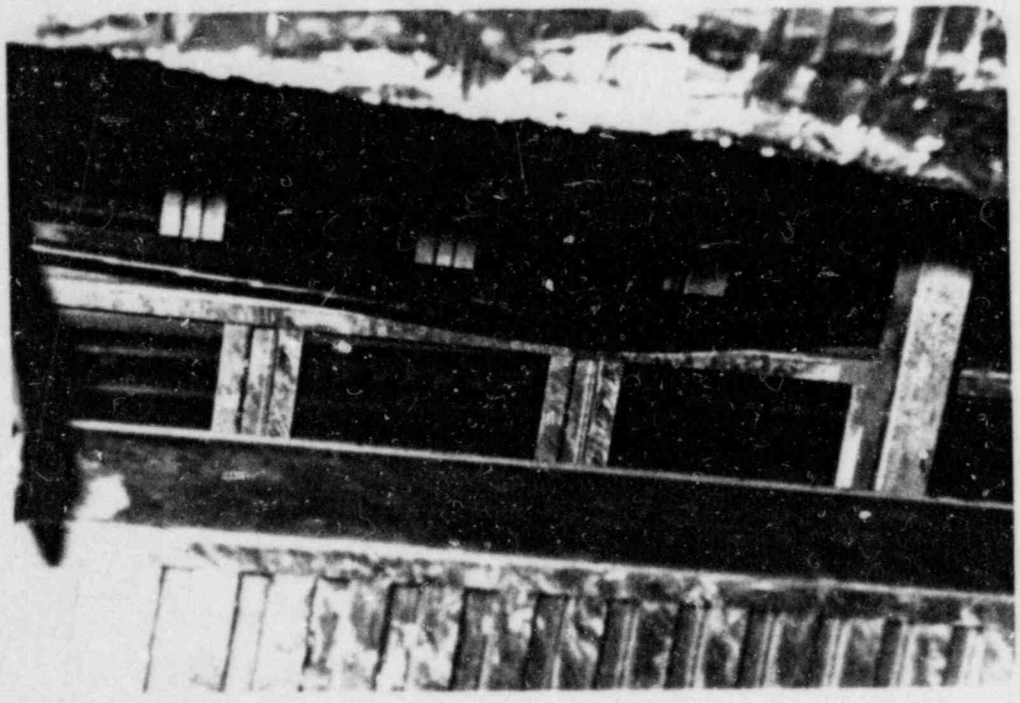
Photograph 3.11.3 Example of cable tray overfill.



Photograph 3.11.4 Cables not installed in a neat manner in cable tray.



Photograph 3.11.5 Cables installed in a neat manner in cable tray.



Photograph 3.11.6 BOP cable installed outside cable tray.

3.12 Electrical Motors and Motor Operator Valves

3.12.1 Motors

3.12.1.1 Purpose

A sample of safety related motors (4) was chosen to assess the conformance of the motor installation to the final design documents. The sample included motors from the Core Spray, Residual Heat Removal, and Diesel Generator Support Systems as illustrated in Figures 3.10.1 through 3.10.3.

3.12.1.2 Criteria

(1) Detroit Edison Engineering Standard Specification 3071-128.

(2) Detroit Edison Installation Specification 3071-33 .

(3) Detroit Edison Electrical Schematic and Connection Drawings as referenced herein.

3.12.1.3 Items Evaluated

(1) Diesel Generator #13 Fuel Transfer Pump B Motor

(2) RHR Outboard Valve E1150F008

(3) Core Spray Pump B Motor

(4) Core Spray Pump C Motor

3.12.1.4 Results

(1) Diesel Generator #13 Fuel Transfer Pump B Motor - (480V, 1 HP

The pump/motor was located in the RHR complex. A check of the cable termination indicated the cable was terminated according to schematic and connection drawing. All bolted connections were tight. A megger test of the motor indicated 900 megohms. The motor lead box was clean and properly sealed. 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.

(2) RHR Recirculation Extraction Outboard Valve - E1150F008 (250 VDC, 10.8 HP)

A check of the cable terminations to this valve motor indicated the power cable to the motor had been spliced. Detroit Edison personnel indicated the splice was necessary to obtain a wire size small enough to fit in the terminal lugs. The larger

cable was necessary to minimize voltage drop during the cable route. A check of the drawings showed the splice at the motor, however no splice was shown at distribution center breaker, 2PB-1 pos 5A (drawing 6I721-2201-5). A check of the distribution center showed similar splices had been made to permit terminating in the breaker lugs (see Photograph 3.12.2). This was not considered a major deviation. During the assessment of the valve operator, a wire (wire #13 from limit switch 7 to terminal block #13) was found broken at the wire lug (see Photograph 3.12.1). It appeared the lug had been broken because of excessive bending and movement of the lug. Detroit Edison personnel were immediately made aware of this deviation. Also noted during the assessment was the lack of identification of the valve.

(3) Core Spray Motors B & C (4160V, 800 HP)

Both motors were checked for proper installation according to manufacturer and Detroit Edison drawings. Of the two motors, motor B had the least concerns. Motor B had only one ground connection but required two according to the manufacturer (GE Spec. 992C510BA) and Detroit Edison (Specification 3071-33, para. 5.20.12.6) specifications. Motor C had a loose upper bearing oil drain plug, and a loose upper bearing cooling water pipe connection. The spare upper bearing thermocouple for Motor C had a loose blue lead at the thermocouple terminal block. The main power cable for Motor C was not terminated as shown on the drawings (6I721-2211-3 and 6SD721-2501-31). The wires were apparently rolled to obtain proper motor rotation.

Both motors 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 1. Other identification deviations noted with Motor C included no tag on the motor heater cable (should have been tagged 2012718-OP), and the conduit containing the main power cables to the motor was not marked with Division 1 markings.

Also noted, on both motors, was the opening from the thermocouple terminal box through the casing to the rotor. Concern was expressed that this opening needed to be sealed. Detroit Edison personnel forwarded this concern to the manufacturer (General Electric) for review. During the assessment, team members requested the high-potential test records for the main power cables for each motor. In reviewing the records, it was noted that these cables had been tested at 35KVAC on multiple occasions (Motor B three times and Motor C twice). Concern was expressed to Detroit Edison personnel that repeated testing at 35KV would damage the cable. This was not considered an operability problem since the cables operate at 4KV normally,

but was pointed out to help prevent unnecessary damage to the cables in the future.

3.12.1.5 Conclusions

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.

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.

The incidence of the openings in the Core Spray motors is not significant to prevent proper operation. The cover to the thermocouple terminal box should provide adequate sealing, however, a review is recommended to determine if the seal is adequate for operation during hostile environmental conditions.

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 EMOV's should be conducted to determine if a generic problem exists.

3.12.2 Electric Motor Operated Valves (EMOV's)

3.12.2.1 Purpose

The purpose of this assessment is to verify that the as-built installation of the selected electric motor operated valves is in accordance with the applicable drawings and specifications. A combination of the following attributes were utilized for the assessment: Installation, orientation, identification, terminations, overload connections and settings, and environmental seals.

3.12.2.2 Criteria

3071-33	Electrical Installation - Project Specification
3071-128	Electrical Installation - Project Specification
CAI0.000.006	Checkout and initial operations test procedure - "Hand Operated, Motor Operated Valve Test."
6I721-2211-7	Electrical Schematic "Core Spray Inboard Isolation Valves A & B E2150-F005A & F005B"
6I721-2201-12	Electrical Schematic "Reactor Recirc. Extrac. Iso. to RHR Valve E1150-F009"

6I721-2201-15 Electrical Schematic "Head Spray Inbd. Isol. Vlv. & RHR. Extr. to Equip. Drain Vlv. E1150-F022 and E1150-F040"

5SD721-2512-18 MCC 72C-3A "Frontal Elevation"

3.12.2.3 Items Evaluated

Four EMOVs were evaluated for installation adequacy. This evaluation included electrically stroking each valve (locally with the use of jumpers), both open and close, in order to verify proper motor rotation, limit switch calibration and valve stroke time. Electrical terminations were inspected for tightness and compliance with applicable electrical schematic. Electrical termination in each valve respective motor control center compartment and fuse panel, when applicable, was verified as well as the fuse sizing. Valve orientation was checked to assure the motor/limit switch compartment was not beneath the operator gear box. Additionally, the valves were checked to determine if it was adequately tagged for identification and the wiring and cabling at the point of termination was in compliance with the separation requirements.

3.12.2.4 Results

Limit and torque switches were verified as the valve was stroked to be in accordance with the switch development provided on each valve electrical schematic. Additionally, proper motor rotation and valve stroke time was verified and no deviations were found.

All cables terminating on the valves were verified to be tight and in accordance with the drawings. No deviations were found with the exception of valve E1150-F022 where the red and white conductors in cable 214660-B-1P were rolled in terminating them on motor terminals T2 and T3 respectively. Drawing shows red to T3 and white to T2. Additionally, the same cable did not have an identification tag at the valve.

Valve motor on E1150-F009 was found to be 19.2 horsepower. Both the electrical schematic and the MCC arrangement drawing shows the motor as being a 12.8 horsepower. Additionally, DCN-10558 was originated adding additional fusing for penetration overcurrent protection. The fuse on the secondary side of the control transformer should have been changed from a 15A to a 5A fuse but the 15A fuse was still installed. NCR 84-0943 was originated to resolve both the HP and fuse discrepancy. As a result of the above finding (19.2 hp vs. 12.8 hp), an additional 13 EMOVs were inspected to verify that the horsepower specified on the design drawings reflected the horsepower of the EMOs that were installed. No additional deviations were found.

Valve E2150-F005B has an electric brake intergal with the motor operator that is not shown on the electrical schematic.

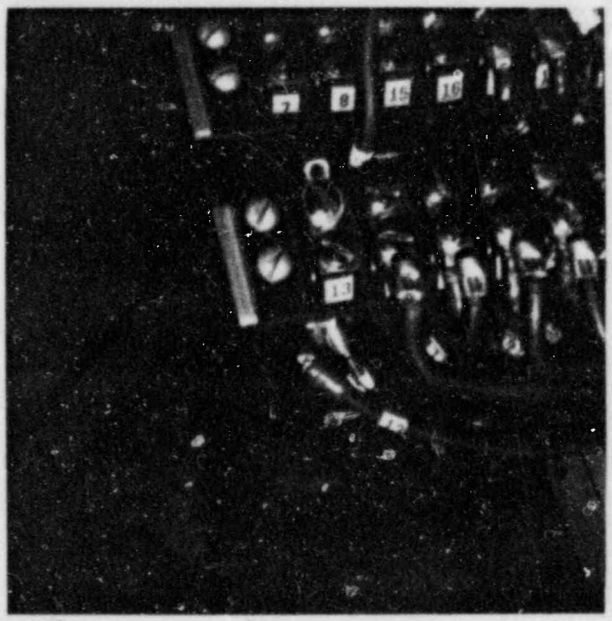
3.12.2.5 Conclusion

The results of the construction assessment indictes the EMOV's have been installed in accordance with the specified design requirements with the following exceptions:

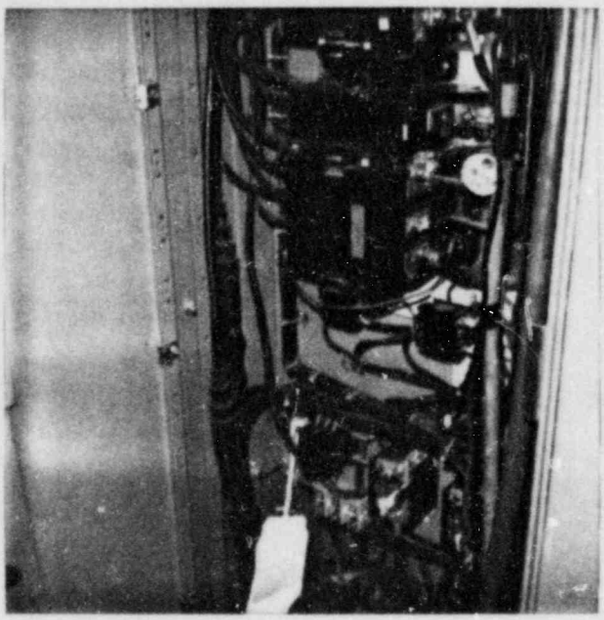
1) The conductor on valve E1150-F022 motor terminals were rolled to achieve proper motor rotation. Proper rotation was verified through valve operation. This item is not considered to be of major significance, however, installation drawing should be revised to reflect the as-built installation.

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-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. 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 HP motor.



Photograph 3.12.1 Example of a broken terminal lug on connections to limit switch terminations on electric motor operated valve.



Photograph 3.12.2 Example of a 350 MCM-4AWG cable splice in MCC 2PB-1.

3.13 Electrical Instrumentation

3.13.1 Process Instrument Loops

3.13.1.1 Purpose

The purpose of this assessment is to verify that the as-built installation of the selected electrical Process Instrument Loops is in accordance with the applicable drawings and specifications. The attributes reviewed include separation, termination, cabling, grounding, calibration and environmental protection.

3.13.1.2 Criteria

(1) Electrical Installation Project Specification - 3071-33

(2) Electrical Engineering Standard Specification - 3071-128

(3) Enrico Fermi Atomic Power Plant Unit 2 Instrument List

(4) Detroit Edison Electrical Schematic and Connection Drawings as referenced herein.

3.13.1.3 Items Evaluated

(1) Instrument B21-N091C - Reactor Level Indication

(2) Instrument B21-N094A - Reactor Pressure Indication

(3) Instrument T50-N412A - Drywell Temperature Monitoring

(4) Instrument E21-N003A - Core Spray Flow Monitoring

(5) Instrument D11-N006A - Radiation Monitoring

3.13.1.4 Results

(1) Instruments B21-N091C and B21-N094A - 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-P802 (Reactor Protection System Cabinet) 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%.

(2) 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 team member observed the changeout

and the calibration of the new thermocouple and wiring to the recorder. Detroit Edison personnel indicated the recorder was out of calibration, but it would be re-calibrated when the new thermocouple was connected.

(3) Instrument E21-N003A - This instrument is a GE flow transmitter (model 555111BDAA4WAL) 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.

(4) Instrument D11-N006A - This instrument provides radiation monitoring for the Main Steam Line Isolation. Some confusion existed initially regarding the availability of this instrument for review. Subsequent questioning indicated the cables to the instrument had been severed without Detroit Edison's knowledge (see Photograph 3.13.1). It was decided to continue the assessment after repair of the cables had been made. 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 only the wiring, calibration, and separation requirements for the instrument was not made. Detroit Edison personnel indicated the instrument was not within calibration at that time. A visual inspection of the instrument was made. During this review it was noted that coaxial cables 231575-E2, 231574-E2, 231569-E1, and 231568-E1 appeared to have been spliced.

Detroit Edison personnel indicated these locations were not splices, but had been crimped and the jackets repaired to maintain environmental protection. A review of the Detroit Edison specifications indicated this was an acceptable practice.

3.13.1.5 Conclusions

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 was found (calibration and grounding).

The problem of the required calibration accuracy for the reactor level and pressure instruments should be resolved prior to pre-operational 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.

3.13.2 Air Operated Valves (AOV)

3.13.2.1 Purpose

The purpose of this assessment is to verify that the as-built installation of the selected AOV's is in accordance with the applicable drawings and specifications. Attributes reviewed were separation, terminations, cable installation, limit switch calibration, and environmental protection.

3.13.2.2 Criteria

(1) 3071-33 Electrical Installation - Project Specification

(2) 3071-128 Electrical Engineering Standard Specification

(3) 6I721-2155-10 Schematic Diagram - Scram Solenoid Valve

(4) 6I721-2155-13 Schematic Diagram - Scram Valve Position Indication

(5) 6I721-2154-6 Wiring Diagram - Scram Solenoid Fuse Panel

(6) 6I721-2154-2 Wiring Diagram - Scram Solenoid Term. Base

(7) 6I721-2215-4 Schematic Diagram - E21-F006A and 6B

(8) 6I721-2135-1 Schematic Diagram - C41-F007

3.13.2.3 Items Evaluated

Five AOV's were evaluated for installation adequacy. This evaluation included: Electrically energizing each solenoid from the control room and stroking the valve both open and closed; verification of limit switch calibration; checking compliance with separation requirements at the AOV; inspection of electrical terminations as necessary to assure compliance with applicable design documents and specifications.

The five AOV's selected are as follows:

	Identification	System	Description
1.	E21-F006A	Core Spray	Inboard Isolation Testable Check Valve A
2.	E21-F006B	Core Spray	Inboard Isolation Testable Check Valve B
3.	C41-F007	Standby Liquid Control	Testable Check Valve
4.	C11-D001-117	Reactor Protection System	Scram Valve - Hydraulic Control Unit 30-03
5.	C11-D001-118	Reactor Protection System	Scram Valve - Hydraulic Control Unit 30-03

3.13.2.4 Results

All cables terminating at the local terminal boxes were verified to be in accordance with appropriate design drawings. Loose termination were identified on two valves as follows:

	Valve	Location	Terminal No.
1.	Scram Valves on HCU 30-03	GE Term. Box on Hydr. Cont. Unit	15
2.	E21-F006B	Local Term. Box	1, 7 and 10

Valves E21-F006A, B and C41-F007 have two sets of two limit switches each. Two to indicate open, intermediate and close position on the pneumatic actuator and two to indicate open, intermediate and close position on 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 Hydraulic Control Unit 30-03, it was noted that the adjacent Hydraulic Control Unit's (number 46-07), limit switch actuating plate was aligned such that it would not 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-F117-117 only.

Additionally, a general survey was conducted of the conduit installation in the area of the Scram Hydraulic Control Units. It was noted that many of the conduit installations were loose and could be

moved by touch. Conduit fitting on AOV C41-F007 limit switches was loose as well.

The backplate on the disk limit switch for valve C41-F007 was not tightened securely to the limit switch. The Detroit Edison technician, accompaning the assessors, was able to turn the backplate screws approximately two full turns without completely tightening the plate.

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.

3.13.2.5 Conclusions

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 valves 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.

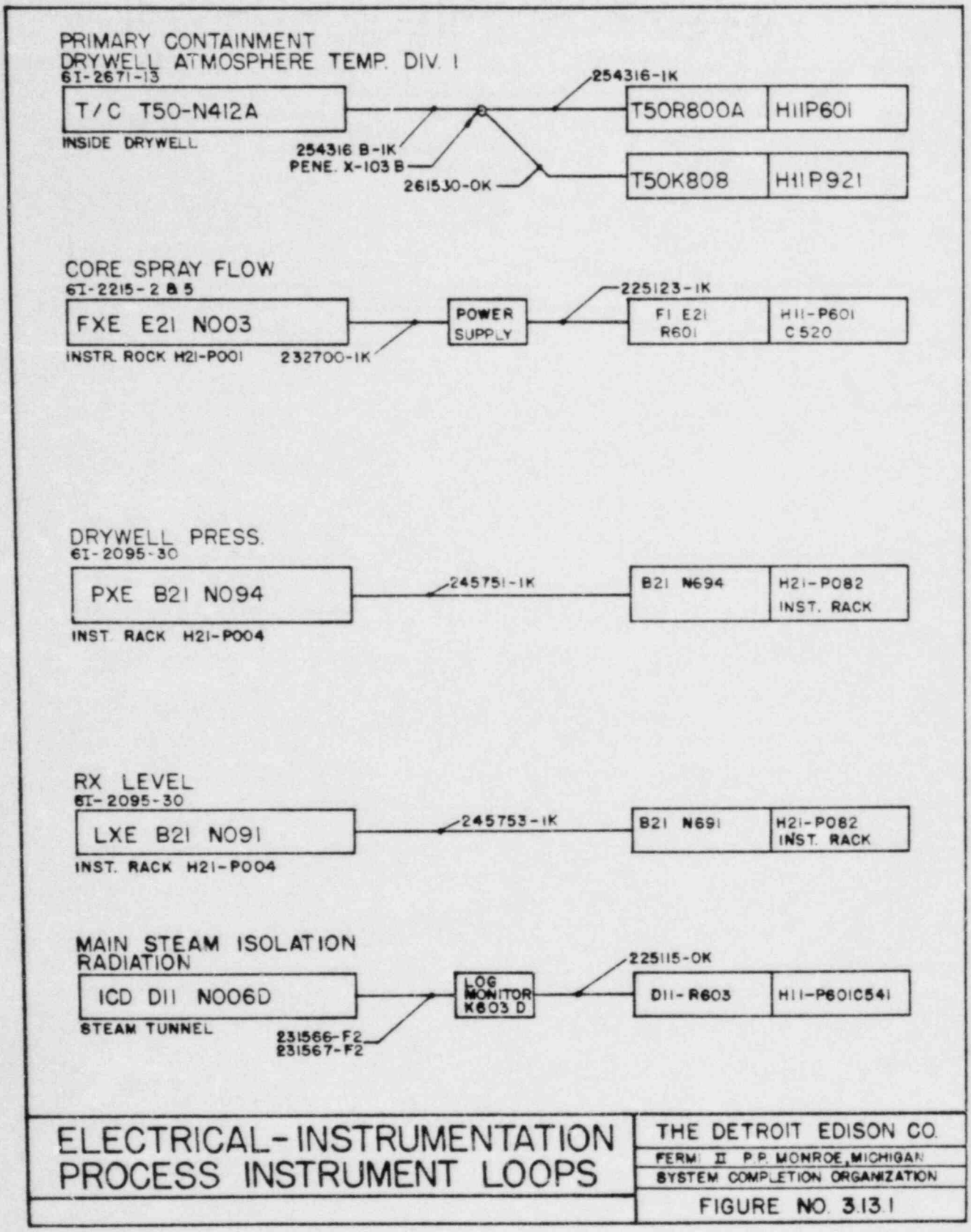
The assessment of the five AOV's selected for inspection resulted in two significant deviations. They are as follows:

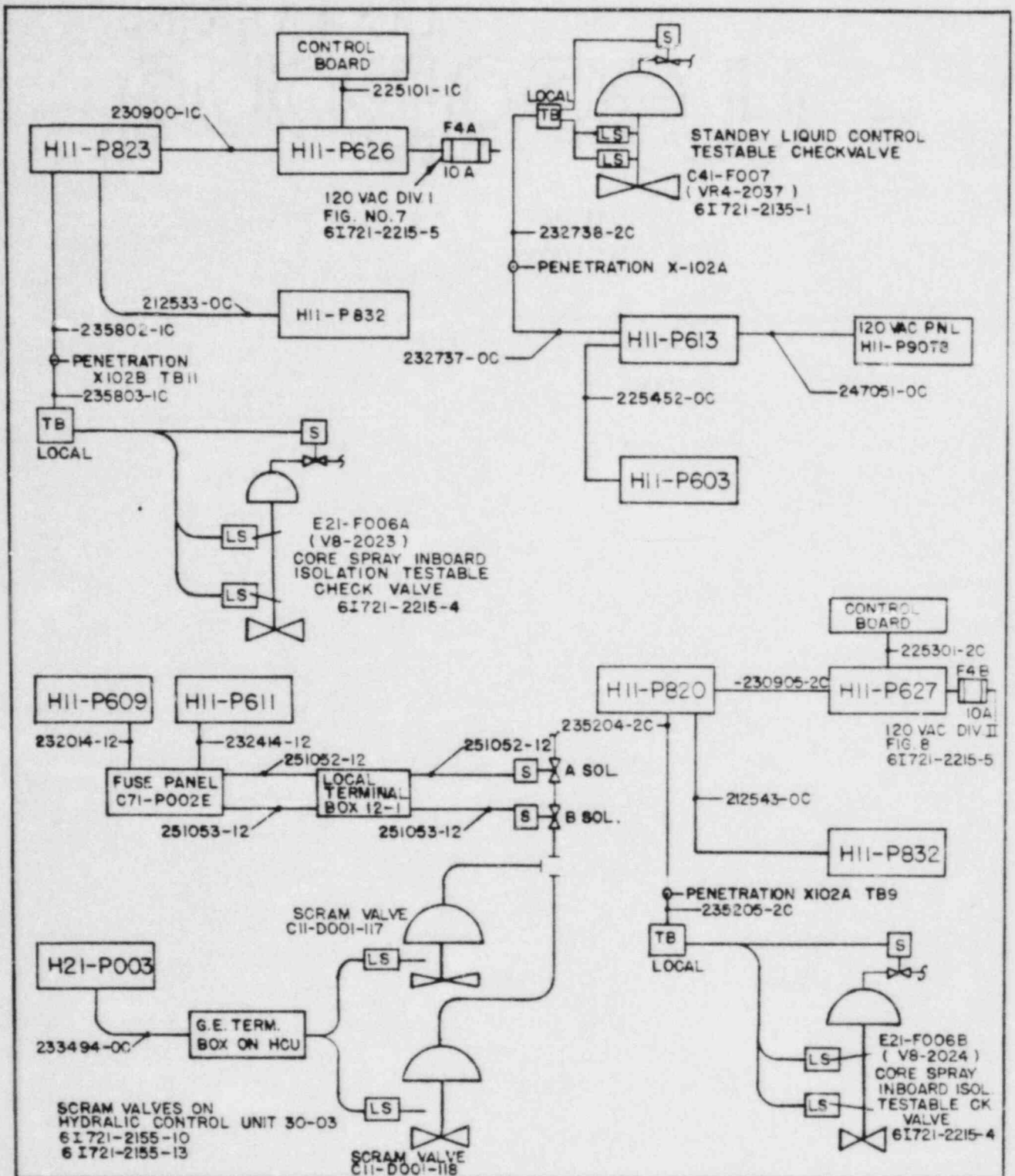
1) The limit switches on two valves, E21-F006A and B, and a third valve (scram valve C11-F117-117 on HCU 46-07) not initially included in the survey, were not properly calibrated to provide the required indication. The results of this assessment indicates a possible significant inadequacy in the overall 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.

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.

Pilot solenoid valve E/V-C41-F400 should be replaced due to its inoperability.


PRIMARY CONTAINMENT
DRYWELL ATMOSPHERE TEMP. DIV. 1
6I-2671-13
T/C T50-N412A
INSIDE DRYWELL
254316 B-1K
PENE. X-103 B
261530-0K
254316-1K
T50R800A
H11P601
T50K808
H11P921
CORE SPRAY FLOW
6I-2215-2 & 5
FXE E21 N003
INSTR. ROCK H21-P001
232700-1K
POWER SUPPLY
225123-1K
F1 E21 R601
H11-P601 C520
DRYWELL PRESS.
6I-2095-30
PXE B21 N094
INST. RACK H21-P004
245751-1K
B21 N694
H21-P082 INST. RACK
RX LEVEL
6I-2095-30
LXE B21 N091
INST. RACK H21-P004
245753-1K
B21 N691
H21-P082 INST. RACK
MAIN STEAM ISOLATION RADIATION
ICD D11 N006D
STEAM TUNNEL
231566-F2
231567-F2
LOG MONITOR K603 D
225115-0K
D11-R603
H11-P601C541
ELECTRICAL-INSTRUMENTATION
PROCESS INSTRUMENT LOOPS
THE DETROIT EDISON CO.
FERMI II P.P. MONROE, MICHIGAN
SYSTEM COMPLETION ORGANIZATION
FIGURE NO. 3.13.1

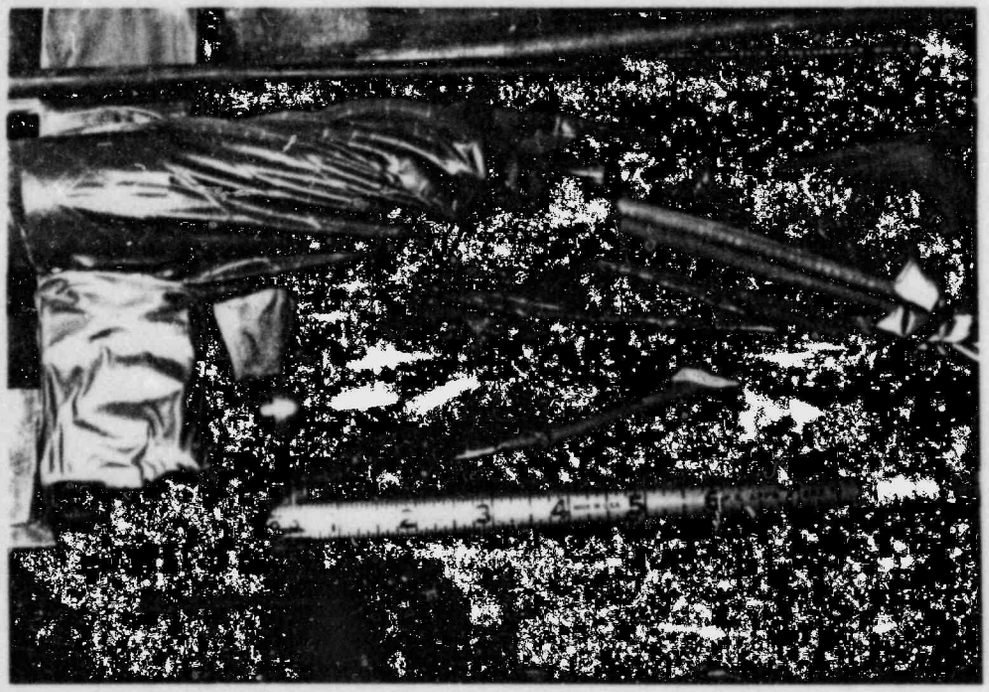


ELECTRICAL–INSTRUMENTATION AIR OPERATED VALVES

THE DETROIT EDISON CO.

FERMI II P.P. MONROE, MICHIGAN

FIGURE NO. 3.13.2



Photograph 3.13.1 Example of radiation monitor cable disconnection at sensor.

3.14 Electrical Control Boards and Cabinets

3.14.1 Control Board

3.14.1.1 Purpose

The purpose of this assessment is to assure that the installation of the Control Board (Combination Operating Panel - COP) (Photograph 3.14.1) and two interface cabinets (Photograph 3.14.2 and 3) are in compliance with applicable design drawings and specifications. Attributes included in this assessment were separation, materials installation and traceability, cabinet and component identification, point-to-point wiring check and cable interconnection with interface cabinets.

3.14.1.2 Criteria

(1) 14124-FEP-5.0 Bechtel Const/Maintenance Proc. "Meggering & Continuity Test"

(2) 3071-33 Electrical Installation - Project Specification

(3) 3071-128 Electrical Installation - Project Specification

(4) 6I721-2003-16 Assembly Drawing H11-P601B

(5) 6I721-2003-8 Assembly Drawing H11-P601A

(6) 6I721-2041-7 Wiring Diagram H11-P823 Part 1

(7) 6I721-2041-8 Wiring Diagram H11-P823 Part 2

(8) 6I721-2045-59 Wiring Diagram H11-P626
(9) 5I721-2040-20 Panel Layout H11-P626

(10) Electrical Schematics for Core Spray Pumps A & C, Valves E2150-F036A, 4A, 5A, 15A and 31A

3.14.1.3 Items Evaluated

The Division I Core Spray Portion of the COP, the Core Spray Relay Cabinet and the associated termination cabinet were evaluated for installation accuracy. This evaluation included verifying electrical continuity between control board switches/indicating lights and the relay/termination cabinets. During this inspection the control switches on the COP were operated to verify proper contact status per the electrical schematic for all switch positions. This was done through continuity checks at the appropriate termination cabinet terminals. Verification of the COP and termination cabinet wiring was provided in this manner.

Panel and cabinet assembly and mounting was compared with the fabrication and arrangement drawing to assess the as-built enclosures

compliance to the design drawings and specifications. Components were compared with their respective parts lists to evaluate traceability. Cabinet and components were inspected for proper nameplate identification. Wiring and cable terminations were reviewed for compliance with separation requirements and tightness of electrical connections.

The COP Panel Inserts and associated relay cabinet and termination cabinet that were inspected are as follows:

COP Insert	H11-P601A501
COP Insert	H11-P601B511
Termination Cabinet	H11-P823
Relay Cabinet	H11-P626

COP switch and indicating light wiring for the following Core Spray equipment was verified:

Equipment	Switches & Indicating Lights	
Core Spray Pump A	1A2 (S5A)	
Core Spray Pump B	1A4 (S5C)	
EMOV E2150-F036A	1A5 (S7A)	1A6 (S70A)
EMOV E2150-F004A	1B1 (S2A)	1B2 (S20A)
EMOV E2150-F005A	1B3 (S1A)	1B4 (S10A)
EMOV E2150-F015A	1B9 (S4A)	1B10 (S40A)
EMOV E2150-F031A	1B11 (S3A)	1B12 (S30A)

Including also was the inspection of Cable 225150-1C connector J4 in the top of termination cabinet H11-P823. A point-to-point wiring check was made from each connector pin to the cabinet terminal block to verify installation per the cabinet wiring diagram and connector drawing.

3.14.1.4 Results

Interconnecting wiring and cabling between COP H11-P601A and B and termination/relay cabinets H11-P823 and P626 for the selected control circuits was verified to be as specified on design drawings. The additional wiring checks inside the termination and relay cabinets identified no wiring deviations with the exception of one loose terminal connection on the right hand side of terminal F2 in termination cabinet H11-P823.

During the continuity check, Switchgear and Motor Control center power was disconnection. The terminations to be inspected were tested to verify that no voltage was present on the circuit. Control voltages were off, however, a voltage was measured ranging from 0 volts to 50 volt from the following terminal points and ground.

Term. No. in H11-P823	Voltage
G34	50V pulsating
G35 thru G43	5.5V pulsating
F35	No Voltage
F36	10 Volts
F1	40 Volts
F5	40 Volts

During the Control Board inspection, it was recognized that COP panel inserts H11-P601A501 and H11-P601B511 were not properly bolted to the COP structure. Insert H11-P601B511 has 18 studs securing it to the COP frame. Only three of the studs had nuts to secure it in place. Additionally, one of the studs was broken off at the insert to the immediate left (front view) of insert H11-P601B511. The COP sections H11-P601 and H11-P602 were checked to verify the supports bolting had been torqued to values specified in specification 3071-128-ED. Approximately forty (40) bolts were checked to 80% of the required values for the specified bolt size. Twenty of these bolts had been QC inspected and had been torqued to the specified values. The remaining twenty (20) bolts which had not been QC inspected had not been torqued to specified values. The majority of the remaining bolts within the cabinet have not been inspected.

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.

Material types and quantities installed were compared against the design drawings and parts lists. No deficiencies were identified on the COP, however, many of the Vendor drawings referenced on Parts List drawings 3I721-2974-35, 36, 42 and 43 were not available as Detroit Edison controlled documents. These drawings would be necessary for both maintaining or replacing the components. The following vendor drawings identified as not available through document control were as follows:

Parts List for H11-P601A501

Item No.	Vendor Dwg. No.
4	145C3226
5	159C4478
23	248A9754
28	248A9938
34	159C4391
40	225A5137
41	145A5322
64	175A7293

Parts List for H11-P601B511

Item No.	Vendor Dwg. No.
24	248A9683
37	225A5137
38	145A5322
40	193B1507
43	159C4391
65	175A7293

Material types and quantities installed in termination cabinet H11-P823 were compared against the design drawing and parts list. Items 6, 7, 8 and 9 on drawing 6I721-2977-24 had discrepancies in the quantities shown for each item, however, installed quantities were correct as shown on drawing 6I721-2056-3. For cabinet H11-P823, no controlled Edison document existed for the Pyle-National connectors that are used on the interconnecting cabling. A vendor catalog was used as information for verifying pin to terminal wiring.

Material types and quantities installed in relay cabinet H11-P626 were compared against the design drawings and parts list. The following deviations were noted:

G.E. P/L No. PL 238X734TG Item No.	Qty	P/L Ref Dwg. Cat. No.	Installed Cat. No.
1	10	12HGA111A2F	12HGA11A52F
3	12	12HFA51A2F	12HFA151A2F

Device R31-S017 had loose screws and fuses lying on its top cover inside cabinet H11-P626. The screws or fuses could fall between the terminal strip and cover on the back and possibly cause electrical damage to the equipment or prevent it from functioning properly. Additionally, an aerosol can of dust remover, with the label clearly identifying the contents to be flammable, was found in termination cabinet H11-P823.

Separation requirements, as specified in Note 4 for cabinet H11-P602 on drawing 6I721-2002-13, has not been met with the as-built installation. Note 4 requires 1" separation inside COP between opposite division cables when one is routed inside conduit. Orange conduit #QU-011-1C is in physical contact with blue cables #225340-2C and #225311-2C (see Photograph 3.14.5). Orange conduit #NA-068-1C is in physical contact with blue cables #225273-2C and 225376-2C (see Photograph 3.14.4).

3.14.1.5 Conclusions

The results of the construction assessment indicates the COP and interface cabinets have been installed in accordance with the specified design requirements with the following exception:

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

2. The voltages found present on control circuits and identified by the assessment team as a concern during the COP wiring check was addressed in two meetings attended by Detroit Edison Engineering, Duke Power and the NRC. The CAT Team was informed by Detroit Edison that the Diesel Generator Load Sequencing circuits was the only location where there was a problem with induced voltages. Detroit Edison has concluded that the induced voltages, as found on the control circuits by the CAT, does not constitute a problem in the operation of the plant.

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.

4. The tightening and checking of bolts 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.

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

6. 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.

3.14.2 Miscellaneous Terminal Cabinets

3.14.2.1 Purpose

The purpose of this assessment was to assure that the installation of the selected terminal cabinets were in compliance with applicable design drawings and specifications. Attributes reviewed in the

assessment included installation, terminations, separation, lugging, splicing, grounding, identification, tagging and mounting.

3.14.2.2 Criteria

(1) 3071-33 Electrical Installation - Project Specification

(2) 3071-128 Electrical Installation - Project Specification

(3) 6I721-2793-1 and 2 - Remote Shutdown Wiring Diagram

(4) 6I721-2006-12 - H11-P602B511 Wiring Diagram

(5) 6I721-2714-40 and 41 - Diesel Sequencer Panel Wiring Diagram

(6) 6I721-2041-5 - Termination Cabinet H11-P822 Wiring Diagram

3.14.2.3 Items Evaluated

Four miscellaneous control or terminal cabinets or boxes were inspected in addition to the COP and associated terminal/relay cabinets described in Section 3.14.1. They are as follows:

Cabinet Number	Description
898B	Diesel Sequencer Panel
H11-P602B511	Misc. Terminal Box
H21-P100/C35-P001	Remote Shutdown Panel
H11-P822	Termination Cabinet

The terminations of a selected number of cables in all four enclosures were evaluated for installation accuracy. Tightness of the connection as well as the correct wire gauge, proper separation and terminal identification was inspected. A random sample of the internal wiring was checked against the wiring diagrams for installation accuracy.

In addition to the above, the Diesel Sequencer Panel was inspected for proper tagging, grounding and mounting. Control components installed were compared against those specified on the design drawings.

3.14.2.4 Results

The installation of three items on the Diesel Sequencer Panel 898B did not conform with final design drawings. The installation of the ground bar did not conform to drawing 6I721-2714-1 which gave the location as left rear corner. However, the acutal location was in the center of the rear as specified by drawing 6I721-2002-17. The nameplate size installed on the cabinet was 2 1/2" x 4", whereas, drawing 4I721-2714-27 specified a 2" x 18" nameplate. Additionally, the cabinet nameplate located on the front of the panel was not shown on drawing 6I721-2714-3.

Conductor terminations on ten cables were checked for conformance with the drawings with no deviations noted. However, on the internal wiring check, one loose termination on Relay XK13 terminal 6 was identified.

In cabinet H11-P822 two loose terminations were identified. These were cable number 235611-1C terminated at terminal E56 and cable number 214541-1C terminated at terminal E32.

Wires between terminal box H11-P6028511 and the combination operating panels (COP) were specified as being 14 gauge on drawing 6I721-2006-12. The as-built installation is a combination of 14 and 20 gauge wiring. Additionally, the terminal strip marker by the terminal box identifying the individual terminal numbers was lying on the bottom of the box.

Spare conductors, color code "R" and "OB", on cable 214546-1C terminating on panel H21-P100/C35-P001, were shown on drawing 6I721-2793-2 as not being terminated. Conductors were actually terminated in cabinet but were not used in any circuit.

During the internal wiring check on panel H21-P100/C35-P001 (Remote Shutdown Panel), two wiring deviations were identified. Wiring from terminal strip AA to switches 100C7(BP) and 100C8(BR) were incorrect. The switches were to provide remote open and close control and indication for valve E1150-F009. The wiring, as installed, would open the valve when the close pushbutton was pushed and would close when the open button was pushed.

During the cable termination check on panel H11-P623, a 5" section of a bare copper ground wire with eight soldered copper wire connectors, approximately 3/4" long, resembling a section of a picket fence, was found lying on some cables in the upper part of the cabinet. This is one of numerous cases found where unsealed openings in the top of the cabinets had allowed debris and foreign materials to enter the cabinet. The accumulation of debris and foreign materials presents a future hazard to the proper operation of the equipment.

3.14.2.5 Conclusions

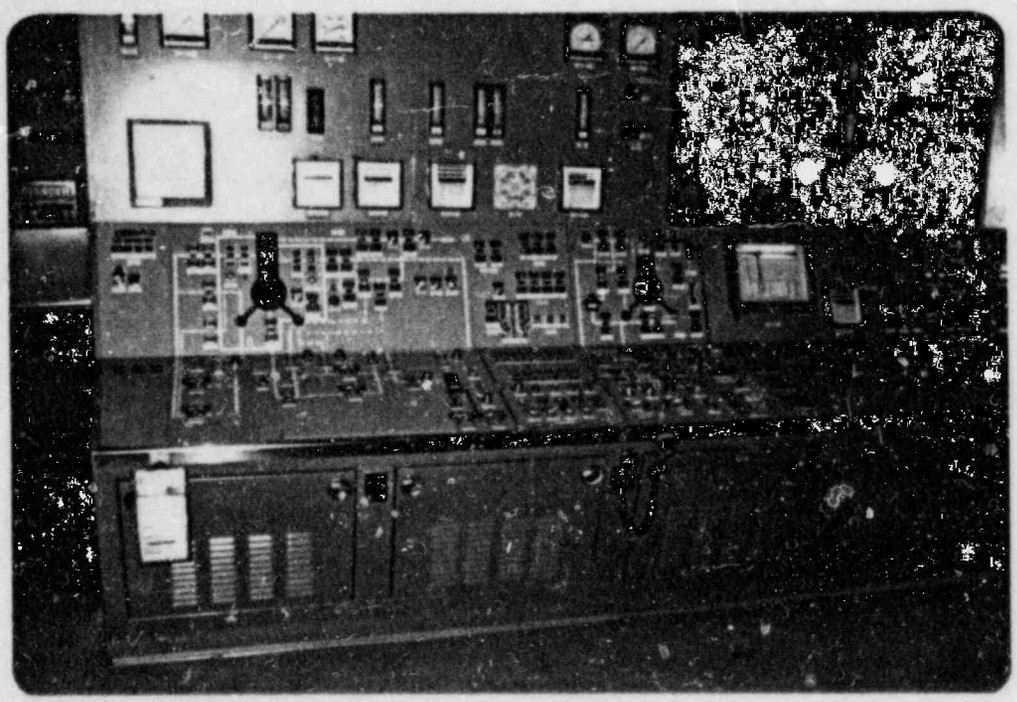
The nametag and ground bar deviations on panel 898B are not considered significant. The as-built installation is adequate, however, it is not in compliance with the design documents. The drawings should be revised to reflect the as-built condition.

One loose termination was identified in termination cabinet H11-P823, one in panel 898B and two in termination cabinet H11-P822. A total of 4 loose termination were found out of approximately 400 checked for 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.

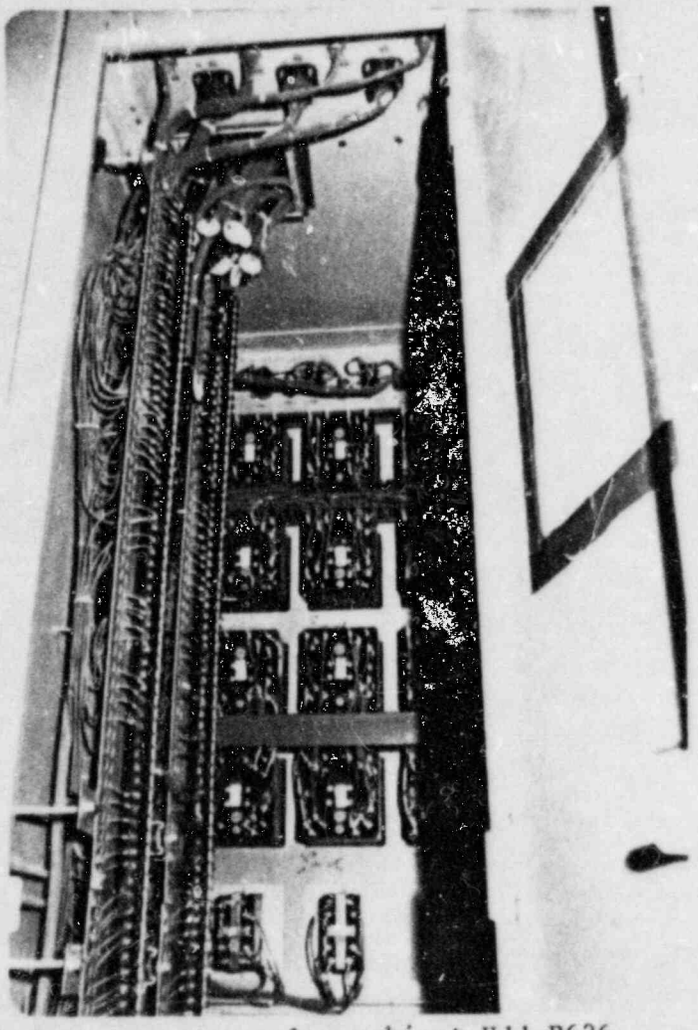
The 20 gauge wiring in terminal box H11-P602B511 is consistent with Detroit Edison's wiring practice for that type indicating light, however, it is a deviation from the drawings and the drawing should be revised to reflect the as-built condition. Additionally, the spare conductors in cable 214546-1C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

The incorrect wires identified in panel H21-P100/C35-P001 represented a significant breakdown in the plant pre-operational 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.

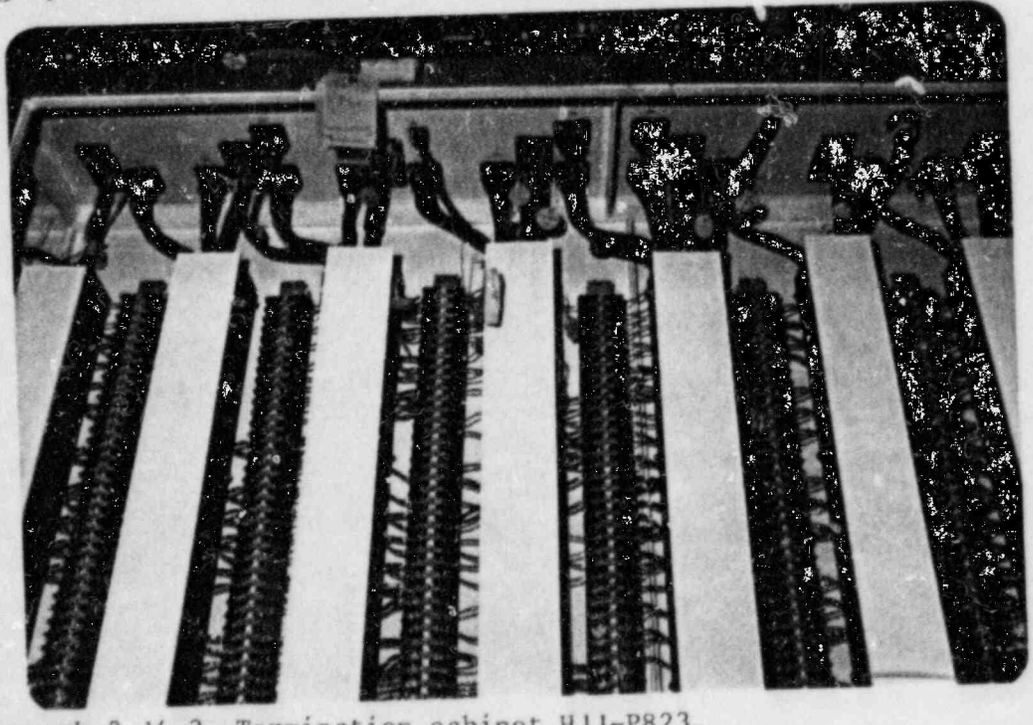
The foreign materials and debris found within the cabinets and panels represent insufficient attention to housekeeping. It is recommended that Detroit Edison inspect all panels and terminal cabinets to remove all dust, dirt, foreign materials, and debris. Also, provide an adequate method of sealing those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



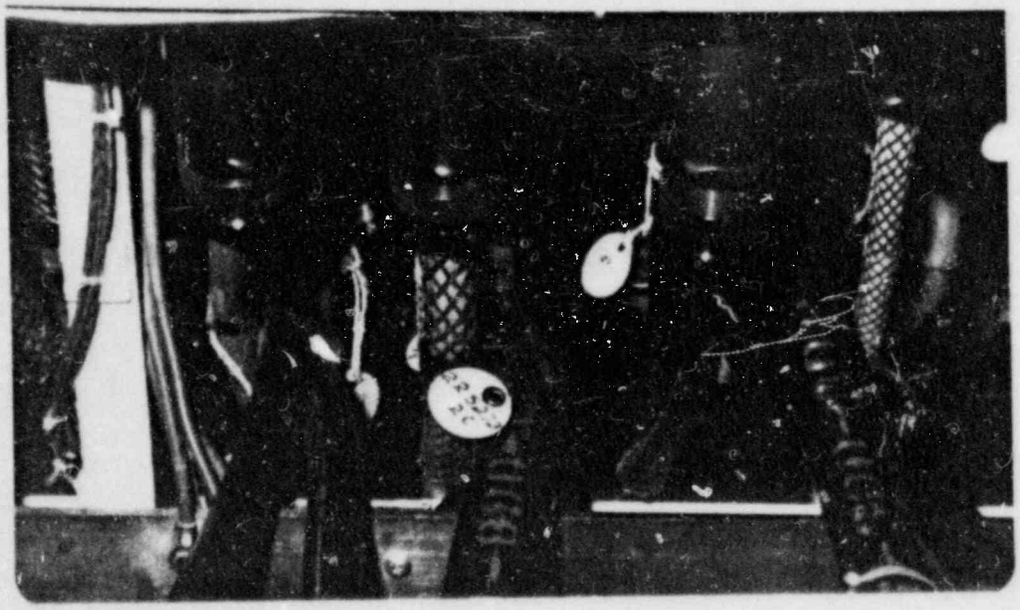
Photograph 3.14.1 Combination operating panel H11-P601A & B.



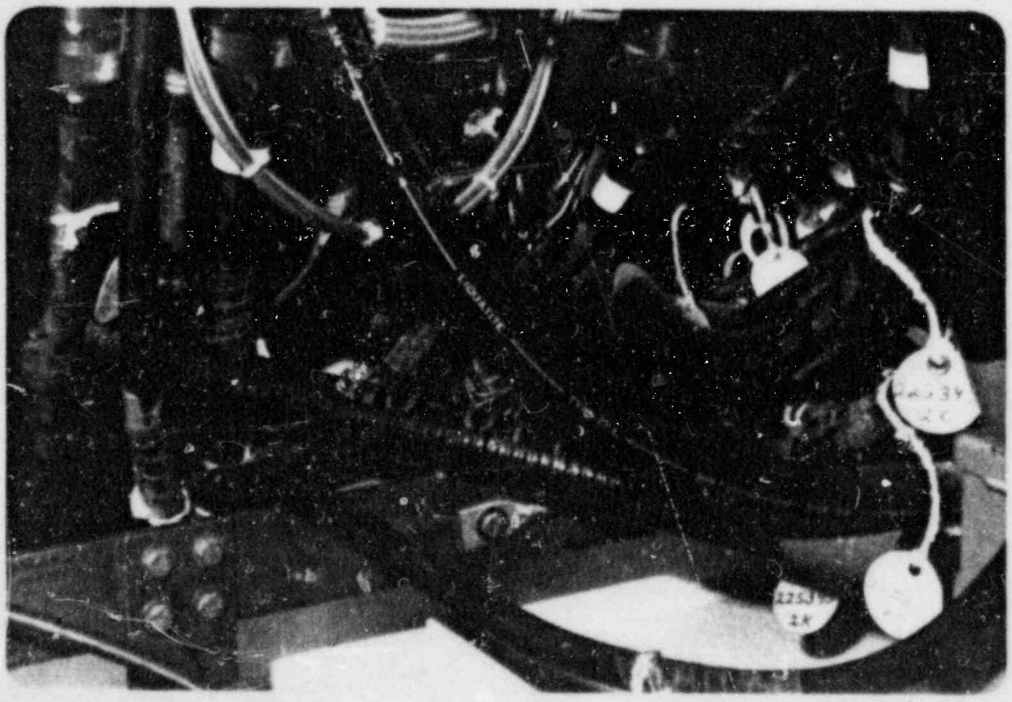
Photograph 3.14.2 Core spray relay cabinet H11-P626.



Photograph 3.14.3 Termination cabinet H11-P823.



Photograph 3.14.4



Photograph 3.14.5 Separation problem in control boards Division I and II cables in violation of separation criteria.

4.0 RECORDS EVALUATION

4.1 Design Changes

4.1.1 Design Changes - Civil

The purpose of this review was to assess the effectiveness of the design change notices, design change packages, design change requests and field modification requests. Within the reviews conducted in Sections 3.1, 3.2 and 3.4, these type documents were reviewed as part of the normal inspection process. As a result of this review, the civil team made two recommendations relating to design changes. In the area of cable tray hangers (Section 3.1.2) an excessive amount of change paper is necessary to inspect a support. In the area of torus supports (Section 3.2.1), three sets of drawings and outstanding change paper on each set is necessary to inspect a support. The team's recommendations are outlined in Section 6.0. The recommendations included providing an understandable method for determining what changes have been made and a review of the three sets of torus support drawings.

Although problems were encountered in the above areas, the overall program in the civil area appeared to be effective since only minor deviations were identified in the other civil areas examined.

4.1.2 Design Changes - Mechanical

The purpose of this review was to assess a sample of design change documents associated with the various mechanical systems and components covered by this report. These included such documents as Design Change Requets, Design Change Notices, Design Disposition Requests, Field Modification Requests and Nonconformance Reports. For some examples of the items reviewed, see Sections 4.3 and 4.4 of this report. A review was made to determine if the documents had been processed in accordance with applicable procedures and that the as-built or as-installed items reflected the required changes. Based on this review, the design change documents sampled have been properly processed and any required changes incorporated into the hardware with exceptions noted as follows. On the HPCI turbine, verification of the completion of FMRS-2572 Rev. A could not be traced from the records reviewed. There were some discrepancies in the resolution of NCR 84-620 on RCIC level switch E51-LSEE51N010 (see CAT-1 Number 112). These were considered isolated cases and not a generic problem.

4.1.3 Electrical Design Changes - Core Spray

4.1.3.1 Purpose

The purpose of the review was to assess a sampling of field and design originated design change documents for the Core Spray System. The assessment includes an evaluation of field installation, drawing incorporation and records tracking. A total of eighty-two design

change documents for the Core Spray System were obtained by the team for review.

4.1.3.2 Items Evaluated

(1) FMR S-650
(2) FMR 4284
(3) FMR S-1709
(4) DCR SUE-0346
(5) DCR SUE-427
(6) DCR SUE-1076
(7) FMR SM4000

4.1.3.3 Results

Eighty-two change documents were reviewed by the team. Twenty-three of these remained open awaiting incorporation in the referenced design documents. Four of the 23 open documents were reviewed for construction status and all had been completed in the field prior to December 1982. The remaining 59 were shown as incorporated into the referenced design documents.

Nine of these remaining 59 documents were reviewed for compliance with the revised design documents. One design change document had not been incorporated as written. This was DCR SUE-427 which had revised the fuse size and overload size in MCC 72C-3A - sition 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.

4.1.3.4 Conclusions

DCR SUE-427 had not been effectively incorporated on the design documents demonstrating a deviation in the verification of design changes. Had the unincorporated design change remained undetected, the electric circuit and motor may not have been adequately protected.

With the exception of the above, no additional deviations were identified. However, it is a concern of the assessor that drawing updates remain outstanding for excessive periods of time after field installation. A time lag of 2 1/2 years was noted on the 4 open documents that were reviewed for construction status.

4.2 Equipment Environment Qualification

4.2.1 Purpose

The purpose of this assessment was to determine if the installed equipment is in compliance with the current Environmental Qualification requirements.

4.2.2 Criteria

Electrical Equipment in Harsh Environment - 4 Volumes
EQ1-EF2-039 Detroit Edison Equipment Qualification File - Conax
EQ1-EF2-082 Detroit Edison Equipment Qualification File - Okonite
EQ1-EF2-040 Detroit Edison Equipment Qualification File - Rosemount
EQ1-EF2-058 Detroit Edison Equipment Qualification File - General Electric
EQ1-EF2-044 Detroit Edison Equipment Qualification File - Limitorque

4.2.3 Items Evaluated

The environmental qualification data for the following items were reviewed to determine their suitability for the environment in which they were used.

Item No.	Type	Description
254316B-1K	Cable	Thermocouple and Cable - Conax
214542A-1C	Cable	Okonite Cable
214540A-1P	Cable	Okonite Cable
231567-F2	Cable	Raychem Coaxial Cable
231566-F2	Cable	Rockbestos Coaxial Cable
T50-N412A	Thermocouple	Drywell Temperature Thermocouple
B21-NC91C	Level Transmitter	Reactor Vessel Level Transmitter
B21-N094A	Press. Transmitter	Reactor Vessel Pressure Transmitter
E2101-C001C	Motor	Core Spray Pump Motor "C"
E2150-F005A	EMOV	Core Spray Inboard Isolation Valve

4.2.4 Results

The documentation on the qualification of the five (5) cables and level transmitter B21-N091C indicate they are qualified for the environment in which they are used.

The thermocouple T50-N412A had recently been changed under FMR #5809 in order to meet NUREG 0588.

Pressure transmitter B21-N094A had been tested by an independent laboratory and determined to be adequate for a two year interim operation. This is documented as well as a component functional

analysis in the "Justification for Interim Operation" report in Equipment Qualification file number EQ1-EF2-040.

Motor E2101-C001C had been tested and qualified by its supplier, General Electric Company (see ED file #50.2621.0400 and G.E. Test Report #22A4722 dated 1/12/77) to the applicable environmental parameters.

EMOV 2E2150 F005A qualification data was reviewed and it was determined that it is scheduled for replacement in 1985 to meet NUREG 0588 requirements due to an unqualified brake. Several other EMOV's were reviewed but they were either to be replaced due to NUREG 0588 or had been reclassified to a non-safety classification not requiring qualification.

4.2.5 Conclusion

Equipment Qualification status on the sample items was adequately documented.

4.3 Core Spray Records

4.3.1 Purpose

A portion of the Core Spray System records were selected for review to determine that the required records were available and retrievable, completed in proper manner and in agreement with the installed equipment.

4.3.2 Items Evaluated

4.3.2.1 Equipment

Component Number	Component Name
E2101-C001A	Core Spray Pump A
E2101-C001B	Core Spray Pump B
E2101-C001C	Core Spray Pump C
E2101-C001D	Core Spray Pump D

Valve Number

V8-2016	V8-2048
V8-2018	V8-2050
V8-2020	V8-2057
V8-2022	V8-2058
V8-2024	V8-2097
V8-2026	V8-3584
V8-2034	V8-3585
V8-2036	V8-3586
V8-2037	

4.3.2.2 Piping Components

Records and components reviewed for Drawings 6M721-3053 and 3147 were as follows:

DDRs for Drawing 6M721-3053

1395	2060	2452
1413	2206	2554
1414	2246	2565
1475	2305	2575
1554	2322	2578
1635	2391	3932

NCR 82-065 and 82-035

Penetrations X-16A and X-53

Restricting Orifice E21-50-D0028

Expansion Joints E21-50-D003 and D004

N5 Data Report Packages 186 and 252

Small Bore Trim Sketches

01-DR1-MW-3053
02-DR1-MW-3053
03-UT-MW-3053
04-PT-E21-L400B
02-BYP-V8-2018
05-PLG-MW-3147
04-BYP-V8-2016
07-TL-MW-3147
08-TL-MW-3147
18-PLG-MW-3147
19-PLG-MW-3147
6WM-E21-5300-1
6WM-E21-2199-1

DRAVO Spool Pieces

Sketch 2734-462
Sketch 2734-463
Sketch 2734-464
Sketch 2734-465
Sketch 2734-289
Sketch 2734-233
Sketch 2734-234
Sketch 2734-235
Sketch 2734-236
Sketch 2734-237
Sketch 2734-238
Sketch 2734-239
Sketch 2734-240
Sketch 2734-241
Sketch 2734-242
Sketch 2734-243
Sketch 2734-244
Sketch 2734-245
Sketch 2734-246
Sketch 2734-247
Sketch 2734-248
Sketch 2734-249
Sketch 2734-250
Sketch 2734-251

4.3.3 Results

4.3.3.1 Equipment

Manufacturer QA documentation packages and receipt inspection reports were reviewed for each of the components identified in Section 4.3.2.1. In each case, the documentation packages and receipt inspection reports were considered to be complete, all paper in each package traceable to an applicable unique identifying number for the component being reviewed, and acceptable in content. During the Core Spray System piping walkdown, each component reviewed was identified in the field and correct location in the piping system verified.

4.3.3.2 Piping Components

The DDRs were reviewed and found to be adequately handled and completed. The two NCRs that were reviewed were properly completed. For the Penetrations, Restricting Orifices and Expansion Joints, the manufacturer's documentation was found to be in order and complete. The installation of the proper components was verified during piping walkdown. The N-5 Data Report Packages were reviewed and contained Field Weld Travelers, MTRs on filler metal, Hydrotest Reports, Walk-down Records and Walk Down Discrepancy Reports. All of these were

found to be properly completed except 3 minor items on the Walk Down Discrepancy Sheets. The Small Bore Piping and Trim Sketches were reviewed and found to have all required information completed. The Dravo spool piece drawings were reviewed against the piping drawings and found to be in order. The Dravo documentation packages were reviewed and found to be complete and contained the required information such as Data Reports, Certificates of Compliance, Examination Reports and QA Traceability Records.

4.3.4 Conclusions

The records reviewed for Core Spray Equipment and Piping Components were found to be complete and acceptable.

4.4 HPCI Turbine Refurbishment Record Review

4.4.1 Purpose

The applicable records were reviewed to determine if the HPCI Turbine has been refurbished and is in acceptable operational condition.

4.4.2 Items Evaluated

Component Number	Component Name
E4101-C002	HPCI Turbine

4.4.3 Results

The applicable contractor turn-over records were assembled by Detroit Edison for review. Below is a highlight summary of inspections and refurbishment work completed on the turbines.

Turbine Auxiliary Piping and Tubing Inspection

An inspection of the auxiliary piping and tubing was conducted during July 1980. As a result, the piping and tubing was cleaned, broken gauges replaced, and a thermocouple replaced.

Terry Turbine Assisted Turbine Inspection

A representative from the manufacturer, Terry Turbine, was present to assist Detroit Edison in conducting inspections and making any necessary repairs over the period of October 5 to October 14, 1983. Following is a list of the work completed during the period.

(1) Mechanical Hydraulic Overspeed Trip Inspection

(2) Gland Case Removal, Inspection and Reassembly

(3) Inboard Bearing Removal, Inspection, and Reassembly

Pressure Boundary Bolting Torque Check

Pressure boundary bolting was checked for proper torquing over the period of November 29, 1983 through December 1, 1983 on the following Turbine parts:

(1) Case Vertical Flange

(2) Case Horizontal Flange

(3) Steam Chest

(4) By-Pass Elbows

(5) Stop Valve

(6) Turbine Exhaust Flange

Torque values were recorded and compared against vendor required torque values. All bolting tested was found to be torqued acceptably.

In addition to the above work completed, General Electric has identified seven areas where design changes will improve the reliability and availability of the HPCI Turbine. Detroit Edison has initiated Field Modification Report (FMR) S-2572, Rev. A, to make the necessary changes. Completion of the FMR could not be verified from the records reviewed.

4.4.4 Conclusion

Based upon the records reviewed, there is reason to conclude that the Turbine is currently in acceptable overall condition and that Detroit Edison has initiated actions to make modifications that will enhance reliability and operability.

4.5 Soil Record Review

4.5.1 Purpose

The purpose of the Soils Record Review was to evaluate the RHR Complex Backfill Inspection Reports and the problems associated with the testing activities.

4.5.2 Documentation Reviewed

The following documents were reviewed:

A. Daniel International Internal Correspondence
B. Daniel QC Inspection Reports
C. Detroit Edison Internal Correspondence
D. Toledo Testing Laboratory Correspondence
E. Sargent & Lundy Correspondence and Final Analysis
F. Design Disposition Request #s C2663, C2738, C3150 and C3151

4.5.3 Results

The backfill density tests required as part of the evaluation of the Design Disposition Requests were reviewed. A total of 21 test pits were dug in the course of that evaluation. A random review of the actual calculations found no errors. These tests were documented in a standard acceptable soil density format.

4.5.4 Conclusions

All of the testing required by the disposition of the DDRs was adequate to evaluate the in-place density of the backfill. All of the testing complied with the requirements of ASTM C1557-70 and ASTM C136.

However, a number of the in-place density test performed did not meet the 125 lb/ft^3 wet density parameter established earlier. Additionally, a number of the in-place gradations did not comply to the specification requirements.

A final design analysis by Sargent and Lundy was conducted after receiving all of the density and gradation reports. A geotechnical evaluation determined that what was in place was acceptable.

Based on this review, the testing was adequate to give the Engineer an adequate analysis of the field conditions. Since the Engineer determined the values to be acceptable, this series of tests met the intended purpose.

5.0 THIRD PARTY ASSESSMENTS EVALUATION

5.1 Pipe Support Review by Stone & Webster Michigan, Inc.

5.1.1 Purpose

During the period of February 1983 to June 1983, Stone and Webster Michigan, Inc. was contracted to perform an engineering evaluation of pipe supports. The purpose of the CAT review was to evaluate the effectiveness of the Stone and Webster analysis of pipe supports.

5.1.2 Criteria

The criteria used was the Engineering Evaluation and Pipe Supports Reports issued by Stone and Webster Michigan, Inc. dated November 21, 1983 and April 26, 1984. The task number assigned to this project is 13067.64.

5.1.3 Items Evaluated

As stated in Paragraph 8.3 of Assessment Plan, inspection of 15 pipe hangers in 4 different systems were to be performed. Table 3.1.1 outlines the pipe supports which were inspected. Thirty-eight pipe supports in 10 systems were checked to the criteria which is outlined in Paragraph 3.1.1.2.

5.1.4 Results

The review of supports resulted in no major findings. The only concern deals with control of hardware catalogs. For additional data concerning this item, refer to Paragraph 3.1.1.5. The pipe supports reviewed will serve their intended purpose.

5.1.5 Conclusions

Based on the results of the pipe support review, the conclusions reached by Stone and Webster Michigan, Inc. appear to be a valid. This conclusion is that the pipe supports erected will serve their intended purpose.

5.2 Seismic Interaction Review by Sargent & Lundy

The purpose of the Sargent and Lundy interaction "rattlespace" walkdown study was to investigate all components in Category 1 buildings to verify that adequate spacing exists between components. Drawing revision should be submitted if adequate spacing does not exist. No report was available to review any results. Based on the CAT review this is an ongoing program and not a third party assessment.

The CAT team observed drawing revisions which were a result of the interaction study. It appears that based on the minimal rattlespace concerns identified by the team, the interaction study has been effective.

5.3 Thermal Separation Review by Detroit Edison

The assessment of Thermal Shielding at Fermi 2 by Detroit Edison was reviewed. The review indicated the Detroit Edison assessment consisted of an evaluation of the thermal shielding problem, the generation of shielding criteria (Revision S to Specification 3071-33, April 1984), the training of personnel to evaluate shielding problem areas, and the implementation of the criteria. Based on the review, it was concluded that the Detroit Edison assessment is actually a program to solve a recognized problem and is not a third party assessment. A review of thermal shielding was conducted as detailed in Section 3.11.4.

5.4 Cable Tray Review by Sargent & Lundy

Through discussion with Detroit Edison personnel, it was determined that the Sargent & Lundy cable tr y assessment is currently an ongoing process and when complete will cover 100% of the safety-related cable tray system. Their assessment is not complete and therefore an evaluation cannot be made at this time. The sample selected for the CAT Review would obviously fall within the Sargent & Lundy's 100% assessment and should be an accurate assessment of their review as well. Refer to Sections 3.1.2 and 3.11.2 of this report for the results and conclusions of the CAT Review.

5.5 Piping Configuration Review by Cygna

5.5.1 Purpose

In 1983, Cygna Energy Services of Chicago, IL was contracted to perform an independent design verification of a portion of the RHR System. The purpose of the CAT review was to evaluate the effectiveness of this design verification.

5.5.2 Criteria

(1) Cygna Report TR-83021-1, Rev. 0 dated April 29, 1983

(2) Detroit Edison Co. Drawing 6M721N-2053 Rev. S

(3) Detroit Edison Co. Drawing 6M721N-2184-1 Rev. R

(4) Detroit Edison Co. Drawing 6M721N-2184-2 Rev. G

5.5.3 Items Evaluated

A portion of RHR System reviewed by was selected for walkdown. This was the return line inside the RHR Complex to the Cooling Tower. A check was made to assure that the piping was installed in accordance with the drawings, that the required hangers were in place, and that the proper equipment and valves had been installed.

5.5.4 Results

The review of the piping, hangers and equipment resulted in no major findings.

5.5.5 Conclusions

Based on the results of the CAT review, the conclusions reached by Cygna appear to be valid. They conclude that the design control is adequate for the scope of the work evaluated.

5.6 Record Review by Management Analysis Company

5.6.1 Purpose

During the period of February 27 through April 18, 1984 Management Analysis Company conducted a third-party audit for Detroit Edison Company. The purpose of the audit was to assess the effectiveness of program implementation as evidenced in the quality records that have been generated over the course of the project. The Team made a review of this MAC audit as part of the overall program to determine the readiness for operation of Fermi 2.

5.6.2 Criteria

The criteria used for this review was the report issued by Management Analysis company dated May 14, 1984. This is MAC project number: MAC-84-G057 and Detroit Edison Company contract number: CC-434316.

5.6.3 Items Evaluated

As stated in paragraph 8.3 of Assessment Plan a check was planned to be made of 25 records which were reviewed in the MAC audit. Table 5.6.1 is a list of the ones which were reviewed. This shows a total of 42 which were reviewed by this CAT assessment. Twenty-five of those were specifically reviewed for an assessment of the MAC report. The other 17 were reviewed as part of the CAT review of the Core Spray records. These records were reviewed for availability, completeness, and accuracy. No attempt was made to assess the retrievability of these records.

5.6.4 Results

All of the records which the CAT team selected for review were found except for one record of some electrical equipment. Upon further search the next day this record was found. The records appeared to be complete and accurate. No errors or missing records were identified. Two items of concern resulted from this review. One is that the retrievability of all records are extremely slow. The system is not well organized and it takes an extremely long time to find a desired record. The other is that the records are not well organized and it is difficult to determine if all of the required records are in the files. No system was evident to define what records are required for each item.

5.6.5 Conclusions

Management Analysis apparently did a comprehensive audit of the records. It is evident from their report that they had the same difficulty finding records that this CAT team had. Once the records were found they appeared to be complete and accurate. It is

recognized that some of the records are more than ten years old and the requirements have changed over these years. Considering the requirements of the time frame of these records it is the opinion of this team that adequate records do exist. It is noted that the MAC report made seven significant recommendations concerning the management of the Fermi 2 records.

In his letter of July 29, 1984 (QA-84-1876) to the Duke Construction Assessment Team, Mr. G. M. Trahey, Director Nuclear Quality Assurance committed to certain actions on the part of Detroit Edison if all of these recommendation are acted upon and these actions are verified by a QA audit, the records for Fermi 2 should be at an acceptable level.

TABLE 5.6.1

VENDOR RECORDS

Equipment Type	RIR Number
Gaskets	8-21-80-2
Pipe Supports	3-13-81-2
2 x 3 Relief Valve & Core Spray	3-3-76-2
Pipe Whip Restraints	6-13-79-1B
Pipe Support Assemblies	11-10-78-2B
Strainers	5-15-79-2
Hydraulic Snubbers	1-28-83-2H
1 1/2" Relief Valve	4-18-79-1B
Pipe Clamps	5-28-82-2
1/2" Globe Valves-RHR System	8-7-75-7
Steel Rebar	5-9-78-3
Mechanical Snubbers	9-1-82-2A
Pipe Spool	3-30-79-1D
Regulators, Transfers Switchgear-Power Supplies	2-22-71-1C
Regulators, Transfers Switchgear-Power Supplies	2-22-77-11
Regulators, Transfers Switchgear-Power Supplies	2-22-77-2C

INSTALLATION RECORDS

Valves

V08-2024
V8-3386
V15-2008

Pipe Spools

P44-3055-002
E11-N2208-014
FW-E41-2297-1WF1
E-41-3162-9WFO N5-333
FW-E41-3172-7WO

Pipe Supports

E21-3149-G010
E21-3053-CSR2A
E21-3053-G001
E21-3053-G004
E21-3149-G003

Equipment

E2101 C001 Pump
E2150 D0028 Orifice

TABLE 5.6.1 (cont'd)

Penetrations

X-53
X-37A
X-220
X-224A
X-104D

Conduit

GG026-2C
HH-001-16

Cable

E11 214480-1C
E50 218240-1P
D44 211510-2C

6.0 CONCLUSIONS AND RECOMMENDATIONS

6.1 Recommendations

The following is a summary of the recommendations which the team feel should be implemented. For more detail see the specific section of the report.

(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.)

(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.)

(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.)

(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.)

(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.)

(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.)

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

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

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

(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. (Rev. Section 3.4.)

(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.)

(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 report.)

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

(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.)

(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.)

(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, and equipment 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.)

(17) This report has identified six areas where drawing updates or technical accuracies of the drawings are inadequate. The most significant of the six was the parts list drawings for the COP and Vendor supplied relay cabinets that either were not contorlled 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, 3.14.2.5, of this report.)

(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 ot 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. Section 3.13.2.5 and 3.14.2.5).

(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.)

(20) A comprehensive review should be conducted of the operability and calibration of all QA1 air operated valves limit switches and process instrumentation loops to ensure their proper operation. (Ref. Sections 3.13.1.5 - 3.13.2.5.)

(21) 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.)

(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 adn 3.14.2.5.)

(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)

(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.)

6.2 Final Conclusions

The areas found to be in acceptable conditions include pipe supports, concrete, welding in general, and the condition of mechanical equipment.

It is the opinion of the team that when all of the potential findings, as reported on the CAT-1 forms are resolved and the recommendations are implemented there will be reasonable assurance that no significant deviations from the final design disclosure documents exist.

APPENDIX 1

DUKE POWER COMPANY
CONSTRUCTION ASSESSMENT TEAM (CAT)

Team Leader: J. R. Wells

Civil, Structural, Pipe Supports, Cable Tray Supports, and HVAC Supports

Ass't Team Leader:
R. A. Morgan
R. L. Medlin
G. Fortenberry
W. G. Robinson
D. H. Llewellyn
L. C. Arnold
J. L. Moore

Electrical and Electrical Instrumentation

Ass't Team Leader:
B. M. Rice
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M. L. Shelby
G. D. Chronister
J. M. Hoover

Mechanical, Welding, NDE

Ass't Team Leader:
R. L. Williams
J. C. Sigmon
T. R. Bowen
M. H. Linderman
J. E. Cavender

FERMI-2
CAT-CIVIL-CHECKLIST

SECTION 7.1 Concrete Expansion Anchors

Item Identification: Expansion Anchor Connections, (50)

Location Various, see attached sheets.

Drawing ref. SC721-2002 Rev H Spec. Ref 3071-226 Rev E

SC721-2003 Rev A QA Procedure Ref _____ Rev _____

_____ Rev ___ Other Ref _____ Rev _____

_____ Rev ___ _____ Rev _____

_____ Rev ___ _____ Rev _____

Inspection Activity	Status N/A	Accept	Reject	Comments:
1 Type ☐ Sleeve ☒ Wedge ☒ Self Drilling		✓		From the 50 inspected, randomly checked type of anchor per design drawings.
2 Torque Check		✓		
3 Size, Spacing, Perpendicularity		✓		Randomly compared to design sketches.
4 Embedment		✓		
5 Thread Engagement		✓		
6 Plate Bearing On Concrete		✓		
7 Visual: Surrounding Concrete		✓		
8 Hole Examination		✓		Random review of holes during inspection.
9 Damage		✓		
10 UT Stud Length		✓		See UT Reports

Assessor Bob Medlin Date 6-27-84

FORM CAT-1

FERMI 2
FINAL CONSTRUCTION ASSESSMENT
POTENTIAL FINDING/CONCERN REPORT

☒ POTENTIAL FINDING
☐ ASSESSOR CONCERN

1. CAT ASSESSOR Bob Medlin DATE 6/19/84
2. CAT ITEM NUMBER 37
3. ITEM OF POTENTIAL FINDING/CONCERN
(South) Core Spray Piping Inside Drywell — Core Spray
SYSTEM/COMPONENT NAME — SYSTEM/COMPONENT PIS NO.
4. LOCATION Elev. 638' 1 5/8" (Whip Restraint CSB1BA), Elev. 637' 6 7/8" (CSB1AA), Az. 120°
5. DESCRIPTION OF POTENTIAL FINDING/ASSESSOR CONCERN Whip Restraint field location and drawing location (6M721-3053-2 rev. H) do not match.
6. THERE ARE ATTACHMENTS TO THIS REPORT YES ☐ NO ☒
7. IF YES LIST BELOW THOSE ATTACHMENTS
8. DOES THE ITEM OF POTENTIAL FINDING/CONCERN APPEAR TO BE IN DISAGREEMENT WITH A FINAL DESIGN DISCLOSURE DOCUMENT? YES ☒ NO ☐
9. IF YES, WHICH DOCUMENT 6M721-3053-2 rev H
10. REVIEWED [signature]
CAT TEAM LEADER

This part to be completed by Detroit Edison Company

11. NAME _____ SIGNATURE _____
PERSON ACCOMPANYING ASSESSOR — DISCIPLINE LEADER
12. RESOLUTION
13. ACTION COMPLETED _____ DATE _____
NQA ENGINEER

APPENDIX 4

List of CAT-1 Forms - Potential Findings and Assessment Concerns

CAT No.	Finding/ Concern	Subject
1	Concern	Construction Induced Damage to Torus
2	Finding	Missing Plates on Torus Support
3	Finding	Disconnected Rod on Pipe Whip Restraint
4	Concern	Control of Documents
5	Concern	Control of Pump Manual
6	Finding	Conflicting Operator Size on Valves
7	Finding	Undersized Fillet Weld on Restraint
8	Concern	Maintenance on Batteries
9	Concern	Identification of Batteries and Cable
10	Concern	Battery Rack Installation and Equipment Location
11	Concern	Core Spray Motor Equipment Installatic
12	Concern	Motor Control Center Protection and Maintenance
13	Finding	Motor Cable Termination
14	Finding	MC[illegible] Fuse Sizing Disagreement on Drawings
15	Concern	Damage to Penetration
16	Concern	Switchgear Nameplates and Housekeeping
17	Finding	Equipment Installed in Switchgear Not per Drawing
18	Finding	Equipment Installed in Switchgear Not per Drawing
19	Concern	Motor Thermocouple Box has Unused Opening
20	Finding	Weld Symbols for Pipe Support
21	Finding	Rejectable Weld on Torus Support
22	Concern	Loose Cable Connection and Housekeeping in MCC
23	Finding	Installed Equipment and Cable Tag Not per Drawings
24	Finding	Incorrect Motor Grounds and Nameplate
25	Finding	MCC Cable Not Installed per Drawing
26	Finding	Panel Cables Not Installed per Drawing
27	Concern	Loose Material on Top of Devices in Panel
28	Finding	Incorrect Quantity of Items on Parts List
29	Finding	Loose Terminal Connection on Control Panel
30	Finding	Watertight Door Deficiencies
31	Finding	Watertight Door Deficiencies
32	Finding	Loose Termination and Improper Identification
33	Finding	Coatings for Drywell
34	Finding	Pipe Support Catalog Item
35	Concern	Confusing Switchgear Mounting Details
36	Concern	Missing Cotter Pins on Restraint
37	Finding	Conflicting Drawings for Restraint
38	Concern	Missing Cotter Pins on Restraint
39	Finding	Wrong Welds Made on Restraint
40	Finding	Broken Wire Lug, Incorrect Drawing, Incorrect Identification
41	Concern	Fire Door Deficiencies
42	Finding	Anchor Edge Distance Deficiency
43	Finding	Fillet Weld Too Small on Pipe Support
44	Finding	Pipe Support Catalog Item
45	Concern	Pipe Support Spring Cans Need Resetting

CAT No.	Finding/ Concern	Subject
46	Finding	Nuts on Pipe Support not Properly Installed
47	Concern	Exposed Rebar in RHR Complex
48	Finding	Incorrect Valve Control Wiring Installation
49	Finding	Safety Valves Not Installed
50	Finding	No Motor Identification
51	Finding	Pipe Support Catalog Item
52	Concern	Arc Strikes on Drywell Plate
53	Concern	Lamination on Drywell Plate
54	Finding	Weld Deficiency on Drywell Plate
55	Finding	Items in Core Spray Records Not Closed Out
56	Finding	Installed Components Not per Drawing
57	Finding	Cable Termination Not per Drawing
58	Concern	No Edison Drawing for Installed Equipment Plus Housekeeping
59	Finding	Size of Installed Motor Differs From Drawing
60	Concern	Lack of Cleanliness on Core Spray Pump
61	Finding	Piping Not in Accordance With Design Drawing
62	Finding	Motor Connections Not per Drawing
63	Finding	Weld Deficiencies on Drywell Plate
64	Concern	Binding Strut on Pipe Support
65	Finding	Loose Termination on D.G. Panel Device
66	Concern	Installed Motor Brake Not per Drawing
67	Concern	Binding Strut on Pipe Support
68	Finding	Lack of Full Thread Engagement on Bolts
69	Finding	Bolts Undertorqued
70	Finding	Lack of Full Thread Engagement on Pump Bolts
71	Concern	Valve Not Tagged
72	Finding	Installed Items on Cabinet Not per Drawings
73	Finding	Incorrect Nameplate on Control Board
74	Concern	No Edison Drawing for Intalled Devices on Control Board
75	Finding	Control Board Bolts Not Torqued
76	Finding	Valve Tagged With Wrong Number
77	Finding	Valve Connections at Wrong Location
78	Finding	Valve Operator Orientation Not in Accordance With Dwg
79	Concern	Temporary Rigging to HVAC Support
80	Finding	Pipe Support Catalog Item
81	Concern	Pipe Support Shimming
82	Finding	Wrong Cold Load Setting and Missing Part for Pipe Support
83	Finding	Pipe Support Catalog Item
84	Concern	Pipe Support Lug Detail
85	Finding	Conflicting Design Drawings
86	Finding	Installed Wire Size Not per Drawing
87	Concern	Instrument Not Installed
88	Finding	HVAC Support Parts Not Installed Properly
89	Finding	Instrument Valve Not Properly Tagged
90	Concern	Missing Welder I.D.
91	Finding	HVAC Support Drawing Detail Inadequate
92	Concern	Damaged Bolts on Valve Operator

CAT No.	Finding/ Concern	Subject
93	Finding	HVAC Support Not Erectd to All Change Paper
94	Finding	HVAC Support Dimensions Wrong
95	Concern	Deep Wrench Marks on Pipe
96	Concern	Turbine Bearing Cover Bolting Missing
97	Finding	Cable Not Identified at EMOV
98	Concern	Penetration I.D., Damaged Gaskets, Missing Cover Bolts
99	Finding	Incomplete Environmental Sealing, Missing Cover Bolts
100	Finding	Incorrect Penetration Pressure, Missing Cover Bolts
101	Concern	Incomplete Shield Wire Installation thru Penetration
102	Concern	Valve Rusted Due to Packing Leakage
103	Concern	Damaged Level Sensing Instrument
104	Finding	Incomplete Environmental Shield on Penetration Cable
105	Concern	Induced Voltages on Control Circuits
106	Concern	Inability to Remove Penetration Top Cover
107	Concern	Inadequate Pull Space on Pump and Turbine
108	Finding	Cables not Secured to Tray per Specification
109	Finding	Conflicting Design Conditions on Valve
110	Finding	Conflicting Design Conditions on Valve
111	Concern	Conduit/Tray Rattlespace Item
112	Concern	Questioned Disposition of NCR
113	Finding	Installed Fuse Not per Drawing
114	Finding	Studs Found Undertorqued - RCIC Joint No. RO-D005
115	Finding	Studs Found Undertorqued - RCIC Joint No. RO-D005
116	Finding	Pump Strainers Tagged Improperly
117	Concern	PIS Numbers Do Not Agree With Drawing/Equipment Installed
118	Finding	Studs Found Undertorqued - RCIC
119	Finding	Faulty Limit Switch Mechanism
120	Finding	Cable Severed on Penetration Termination
121	Concern	Incorrect Instrumentation Grounding
122	Concern	Trash in Tube Steel Support
123	Finding	Studs Found Undertorqued - Valve V22-2204
124	Concern	Gouge in Drywell Plate Weld
125	Finding	Weld Procedure Qualification Review
126	Finding	Anchor Hole Too Large
127	Concern	Missing Drawing Detail on Cable Tray
128	Finding	Loose Cable Termination
129	Finding	Unsupported Cables in Tray
130	Finding	Cable Tray Overfill
131	Finding	Cables Not Installed per Drawing
132	Concern	Damaged Flexible Conduit
133	Finding	Installed Tray Not on Cable Documents
134	Finding	Cables Not Supported as Required
135	Finding	Cable Hanging Outside of Tray
136	Finding	Pull Box Cover Off and No Identifiction
137	Finding	Tray Violation of Separation Criteria
138	Finding	Conduit Violation of Separation Criteria
139	Concern	Cable Abandoned in Tray
140	Finding	Spare Conduit Not Capped per Specifications

CAT No.	Finding/ Concern	Subject
141	Finding	Wrong Type Anchors Installed on Cable Tray
142	Finding	Weld Symbol Incorrect on Cable Tray
143	Finding	Floor Connection Not per Drawing on Cable Tray
144	Finding	Floor Connection Not per Drawing on Cable Tray
145	Finding	Wrong Type Anchors Installed on Cable Tray
146	Finding	Detail Not Specified for Cable Tray Support
147	Finding	Detail Not Specified for Cable Tray Support
148	Finding	Incomplete Work on Cable Tray
149	Concern	No Thermal Expansion Capability - Support P44008001
150	Finding	Casing Bolts Not Torqued Properly - EECW Pump Div. II
151	Finding	Incomplete Thread Engagement - EECW Pump Div. I
152	Finding	Anchor Spacing Violation
153	Finding	Installed Conduit Not on Cable Cards
154	Concern	Foreign Items Located in Control Cabinets
155	Finding	Missing Expansion Anchor
156	Finding	Spare Conduit Not Capped per Specification
157	Concern	Fan Motor Attached to Expansion Anchor
158	Finding	Anchor Edge Distance Violation
159	Concern	Cover Missing on Electrical Box
160	Finding	Anchor Edge Distance Violation
161	Finding	Anchor Edge Distance Violation
162	Finding	Plates Improperly Welded - NIAS North Dehydration Units
163	Finding	Improper Belts Installed - Decay Heat South Fan (T4600C002)
164	Finding	Unsupported Cables Entering Cabinets
165	Finding	Inoperable Pilot Solenoid Valve
166	Finding	Valve Disk Limit Switches Out of Calibration
167	Finding	Loose Terminations on Two Valves
168	Finding	Loose Conduit Fitting of Valve Limit Switch
169	Concern	Loose Back Plate on Disk Limit Switches
170	Finding	Shore Barrier Below Specified Grade
171	Finding	Design Document and Field Installation Not per Completed DCR
172	Finding	No I.D. Tags on Instruments
173	Finding	No I.D. - Valve V8-3723
174		Void
175	Finding	No Cover on Heater/Thermocouple Lead Box - Drywell Cooling Fan C002
176	Finding	Missing Nuts/Broken Bolts - Drywell Cooling Unit B002
177	Finding	Instrument TE-N012C Damaged - Drywell Cooling Unit B003
178		Void
179	Finding	Damaged Access Panels - Drywell Cooling Unit B004
180	Concern	Installed Hanger Interferes With Terminal Box Cover
181	Finding	Linear Indication on Weld 6WM-B31-5218
182	Finding	Bolts Not Centered in Slotted Holes
183	Finding	Beams Have Square Cut Copes
184	Concern	FMRs & DCR Completed in 1982 Not on Drawings
185	Concern	Slotted Connections Not Effective
186	Concern	Connections Not Capped/Hooked Up - Instrument Penetration X-55B

CAT No.	Finding/ Concern	Subject
187	Concern	Connection Not Hooked Up or Capped - Instrument Penetration X-33A
188	Concern	Excessive Hi-Pot Testing of 4KV Cable
189	Concern	Missing Screws on Access Panel - Core Spray Pump Room Cooler
190	Concern	No Filters/Trash Screens Designed for Cooling Units
191	Concern	Incomplete Thread Engagement - HPCI Cooling Unit (T4100-B022)
192	Finding	Instrument Calibration Not per List
193	Finding	Drain Line Tap Needs Blind Flange - Reactor Recirc Pumps A & B
194	Finding	Torque Checks on Structural Steel Bolting
195	Concern	Improper I.D. Tags - Reactor Recirculation Pump A
196	Finding	Separation Criteria Violation in Control Board
197	Finding	No N-Stamp on Nameplates - Control Center HVAC Chilled Water Pumps
198	Concern	Significant Leakage - Control Center HVAC Chilled Water Pumps
199	Finding	Required Radial Clearances Not Provided on Block/Key Supports
200	Finding	Honeycomb Concrete Around Door Frame
201	Concern	Possible Unacceptable Stress Due to Rigid Pipe Support

APPENDIX 5

MINUTES OF MEETING

Subject: C.A.T. Report

Date: July 19, 1984

Time: 9:30 a.m.

Place: Fermi I Office Building - Green Room

Attendees:

Detroit Edison

T. A. Alessi - Director, Corporate Q.A.
J. C. Buck - NQA
J. R. Mullens - Engineering
S. H. Noetzel - Assistant Manager, EF2
G. Sharma - Engineering
W. M. Street - Engineering

Duke Power

R. S. Hulen - C.A.T.
R. A. Morgan - C.A.T.
J. R. Wells - C.A.T.

Nuclear Regulatory Commission

P. M. Byron - Senior Resident Inspector
T. P. Gwynn - Observer

The purpose of the meeting was to discuss technical comments on the draft report of the Duke Power Company Assessment. No judgement was to be questioned.

The conclusions and recommendations in the draft are still in the preliminary stage. Some of the conclusions may not be expressed in the final report as they are in the draft.

T. P. Gwynn stated there were three items to be discussed:

1) Minutes should be part of public record. J. R. Wells stated that these minutes will be an attachment to the Duke Report (Appendix 5).

2) Have any substansive changes been made to report since draft was issued? J. R. Wells stated that there are a number of areas with minor changes but none judged substantive by Duke. Results and

Conclusions may be supplemented by additional material but not substantive changes.

3) T. P. Gwynn's title was incorrectly used on Pages 2, 3, and 4. The correct title should be "NRC Observer." Duke agreed.

The following are page by page review comments:

Abstract		NCR should be changed to NRC. The word "Independent" second line should not be capitalized.
Page 1	Section 1.0	T. P. Gwynn asked if the Executive Summary will include significant findings? Yes, in the conclusions.
Page 2	Section 2.3	ASME Code Welds should be ASME Code Piping Welds. Duke agreed and will make the change.
Page 2	Section 2.4	ANSI "N45.6 qualified" shall be "N45.2.6 certified." Duke concurred and will make correction.
Page 4	Section 2.9	Add - NRC Observer was at the daily meetings. Duke will add this.
Page 5	Fig. 2.1.1	Drawing doesn't show RHR Building. Duke will add a note referencing RHR Complex location.
Page 10	Section 3.1.4.3 3rd line	Edison commented word "missing" should be "not completed." Duke will not incorporate this comment.
Page 10	Page 3.1.4.3 4th line	Most of the items in this paragraph are shown on drawings. Edison disagrees with both paragraphs. Edison disagrees that these are deviations because the items were shown on the drawings. Duke will not incorporate this information in Report because Detroit Edison did not provide the information at the time of the assessment.
Page 11	Para. 3.1.4.5	Detroit Edison suggests adding that there was a conflict between Manufacturer's Shop Drawings and G. E. Drawing. Duke will not incorporate this comment because Shop Drawing did not have G.E. approval.
Page 35	Section 3.2.2.4 Para. 6 4th line	The word "drawing" should be changed to "spec." Duke accepted comment and will make the change.

Page 39	Section 3.2.5.4	It was brought up that the fire doors installation inspection records were not requested.
Page 40	Section 3.3.4	T. P. Gwynn commented the report does not identify the physical status of the radiograph or the devations from the original work plan sample size. Duke will address in the final report and will report the actual number reviewed.
Page 66	Section 3.4.5	Duke intends to reword 3.4.5. Detroit Edison agrees with this decision.
Page 78	Section 3.6.1.5	Needs considerable rewriting for clarification. 3.6.1.5 states "The undertorquing on some of the bolting should have shown up in the form of leakage during testing if it were a problem." Question is: "Did this conclusion consider that undertorquing may have occurred after leak testing?" Duke's response is that they will consider in their rewrite of that paragraph.
Page 107	Section 3.7.6.5	Duke should consider the NRC's comments made on 3.6.1.5 when they rewrite Paragraph 3.7.6.5

Meeting adjourned at 11:30 a.m. for lunch. Reconvened at 12:30 p.m.

Page 129	Section 3.10.1.5 (last sentence)	Request by Edison is to insert "as required" after the word "sealing." Duke agrees with this and will make the change.
Page 130	Section 3.10.1	After "see photograph" Detroit Edison suggests that the words "seismic two over one" was considered in the design. Duke will check with their evaluator's notes and if there are any changes, Duke will make them. Duke will determine what is appropriate.
Page 130	Section 3.10.2.4 (last para. of Item 3)	Suggested additional words by Edison: "Drawings used for purchase of motor control centers and not for cabling." Duke understands Detroit Edison's comments regarding the differences in drawings and what they are used for. They will discuss this using their own notes and make any appropriate changes.
Page 131	Section 3.10.2.5	Edison suggests adding the words "as required" after "sealing" in the fourth sentence. Duke agrees.

Page 137	Section 3.11.1.4 (Para. 2 -- first sentence)	Detroit Edison believes that the spec allows for the use of tie wraps in lieu of a grip type of connection in this case. Duke does not agree with this interpretation and recommends that the spec. be revised.
Page 141	Section 3.11.3.5 (Para 3 2nd sentence)	Edison suggests adding phrase "and has verified in writing that pressures up to 70 psig are acceptable." Duke will review their notes and Edison will furnish Duke with that manufacturer's recommendations. They will review them along with their notes and make any recommendations that are appropriate.
Page 151	Section 3.12.1.4 (Para 3 bottom of pg. - last sentence)	Sentence should be deleted. The sentence does not reflect Detroit Edison's position on the subject. Edison's correct position is stated in the reference memo EF 2-63,333. Duke agrees that this section needs to be reworded to make it clear.
Page 168	Section 3.14.1.5 (Sect. 3 Para. 2)	Edison suggests clarifying sentence that only qualified items or components have been ordered and installed. Duke agrees to look at their notes and discuss whether there needs to be a change made.
Page 171	Section 3.14.2.5 (Para. 4)	Edison suggests that this is not a rolled wire incidence. Duke agrees it's not a rolled wire and they will change the words to reflect the actual situation.
Page 171	Section 3.14.2.5 last sentence	Edison suggests that in the last sentence the words "pre-operational tests" be changed to "C&IO tests." Duke will review this paragraph to clarify its meaning and intent.
Page 175	Section 4.1	This section references the electrical design changes, but the assessment plan (Page 3) included in the scope of the assessment a review of the design change program to verify its adequacy. Only electrical design changes are addressed in the final report. Duke agrees with that comment and they will take action to include the design changes for the other disciplines in the report.

Page 175	Section 4.1.4	The conclusions did not state Duke's assessment of the adequacy of the design change program. Duke will review this paragraph and clarify the conclusions reference.
Page 176	Section 4.2.4	NRC question is: "Where are the results?" Duke's reply: "The results will be provided."
Page 183	Section 5.4	T. Alessi to review and verify that this is a true Detroit Edison statement. If not, he will provide the correct information to Duke. Duke will rewrite this section to reflect the fact that this is not a third party assessment.
Page 188 - 190	Gen. Comment on Section 6.1	The NRC requested that Duke review their conclusions with regard to the facts provided in the report to assure themselves that the conclusions and recommendations are supported by the facts presented. Duke will review the conclusions and recommendations to assure themselves that they are supported by the facts contained in the report. The NRC asked what is the basis for the determination of sample sizes and their recommendation. Duke intends to delete the specific sample sizes.
Page 190	Item 21	During the daily briefing (June 29) the briefing indicated that terminations were a problem, mainly at the equipment end, rather than at the panel end of the wires. The report indicates the opposite. The NRC asks for clarification. Duke will look back and clarify their records and make any corrections that are needed in the report

The meeting adjourned at 2:15 p.m. to allow for typing of the minutes. To be reconvened at 2:45 p.m.

The minutes were reviewed for accuracy and concurred in by all parties. The meeting was adjourned at 3:45 p.m.