U. S. NUCLEAR REGULATORY COMMISSION
REGION I

Report No. 50-293/88-17

Docket No. 50-293

License No. DPR-35 Priority - Category C

Licensee: Boston Edison Company
800 Boylston Street
Boston, Massachusetts 02199

Facility Name: Pilgrim Nuclear Power Station

Inspection At: Plymouth, Massachusetts and Braintree, Massachusetts

Inspection Conducted: April 25 to May 5, 1988

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Inspection Summary: See Sections 1.1, Scope of Inspection and 1.2, Summary of Findings.

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1.0 Introduction

1.1 Scope of Inspection

The purpose of this special maintenance assessment team inspection was to perform an in-depth assessment of maintenance activities at Pilgrim Nuclear Power Station (PNPS). Particular emphasis was placed on maintenance activities associated with the high pressure coolant injection system and reactor core isolation cooling system that were completed during the current outage, as well as ongoing maintenance activities that had the potential to impact plant safety.

The Acting Deputy Director, Division of Reactor Safety, NRC Region I, and two team members held a pre-inspection planning meeting with licensee nuclear engineering management and staff personnel at the Braintree, Massachusetts office on April 19, 1988. The team inspection was performed onsite during the period of April 25 to May 5, 1988, and at the Braintree office on April 28, 1988. Attendees at the entrance interview and a maintenance program briefing on April 25, 1988, an interim exit interview on April 28, 1988 and the exit interview on May 5, 1988 are listed in Appendices A, B, C and D, respectively. Individuals interviewed by the NRC team during the course of the inspection are listed in Appendix E.

At no time during this inspection was the licensee presented with any written material. The licensee did not indicate that proprietary material was presented for review during this inspection.

1.2 Summary of Findings

The assessment team concluded that, based on its observations and findings, there were several strengths and certain deficiencies, including some that were considered significant deficiencies, in the licensee's conduct of maintenance activities of PNPS.

Licensee program and performance strengths included:

- various system and plant walkdowns performed by Systems Engineering Division and Quality Assurance Surveillance Division personnel and Management Watch Program managers (in addition to normal operator rounds), which are a positive and generally effective initiative to improve the overall material condition of the facility (section 3.3);

- the generally excellent state of cleanliness of plant areas and equipment (section 3.3);

- substantially improved access to plant areas for routine operations and maintenance activities, as a result of an effective area and systems decontamination program (section 3.3);

- prompt and comprehensive licensee action, following an inspector's discovery of an apparently isolated example of a watch engineer's tag discrepancy, to correct the discrepant condition and to verify that all other tags were correct (section 3.3);

- the systems specialist's responsiveness to resolving inspector questions and concerns, regarding identified differences in the installed configuration of similar components of the control rod drive system (section 3.3);

- corporate engineering support for maintenance (section 4.3);

- functions of the System Engineering Division (section 4.3);

- maintenance interfaces particularly with respect to the coordinated performance of maintenance activities. Specific strengths were noted regarding:

  - the work control (MR) initiation, review, approval, prioritization, planning, scheduling , oversight and restoration processes;

  - quality verification of maintenance work;

  - maintenance department radiological advisor coordination functions; and,

  - ALARA group functions of job planning, work-in-progress review, post-work critique and incorporation of lessons learned (section 7.3).

Significant deficiencies included:

Program

- lack of clearly delineated maintenance request and other work control practices in approved procedures or other directives, as specifically noted by the excessive delay in revising the maintenance manual, and in formalizing the current plant work control practices for maintenance; and

- lack of effective means to specify unique instructions for routine maintenance tasks covered by procedure 3.M.1-11, which resulted in inadequate preparation of work packages for such tasks (Section 2.3).

Performance

- In addition, the team determined that there was an overall performance deficiency related to lack of attention to or unfamiliarity with, various elements of the work control process, as evidenced by:

  •• numerous incomplete or incorrect MR/MSC forms;

  •• ad hoc expansion or revision of the original work scope during maintenance in the field without management or engineering approval or subsequent documentation of the actual completed work;

  •• entire work packages, including all the necessary instructions, not available at the work site;

  •• documentation of material used, maintenance and test equipment information, and work performed (included torquing values) by quality control, vice maintenance, personnel;

  •• uncontrolled storage of maintenance records; and

  •• post work testing documentation deficiencies. (Section 2.3)

Staffing

- A staffing deficiency was noted regarding the inability to obtain a stable staff within certain supervisory positions of the Maintenance Section, and the potential adverse impact of newly hired supervisors on assuring quality planning and oversight of maintenance activities (Section 8.2).

Other program and performance deficiencies of less significance are detailed, as applicable, in the conclusions to each report section.

2.0 Conduct of Maintenance Work

2.1 Scope of Review

The inspectors reviewed, in depth, activities associated with the maintenance request (MR) packages listed in Appendix F. These reviews were conducted to determine that:

- work instructions delineated proper work steps, including administrative controls for lifted leads/jumpers, etc.;

- acceptance criteria/parameters were technically correct and clearly presented;

- work acceptability was documented and accurate;

- problems were followed up and resolved;
- independent overview was accomplished as appropriate (e.g. QC inspection, supervisory checks); and,
- interfaces and other support were initiated when necessary.

2.2 Observations and Findings

a. Administrative Controls for Maintenance

The inspectors observed that the maintenance manual was under major revision during this inspection. The manual has been undergoing a revision for some time but still was not completely revised and issued. At the inspectors' request, the licensee provided a draft copy of the revised manual for preliminary review. The inspectors noted that the draft manual did not contain the section regarding maintenance policies. Also, it appeared that the changes as incorporated in the draft do not substantially differ from the previous manual with the exception of position titles and responsibilities.

The inspectors determined that the draft maintenance manual was comprised of various unrelated documents, e.g. position descriptions/responsibilities, administrative instructions and memoranda, that were merely connected with an index. The overall purpose, intent, structure, and hierarchy of the maintenance manual with respect to other station directives and procedures was not evident. A substantial effort is needed to develop a comprehensive maintenance manual.

Procedure 1.5.3, "Maintenance Requests", provides the administrative program for implementing corrective and preventive maintenance activities. The procedure describes the maintenance request (MR) as the maintenance control document used to identify problems and initiate, plan, track and report maintenance activities. The processing of the MR is described in the procedure and is also summarized in a flow chart attached to the procedure. The licensee, however, is implementing the MR process differently than described in the procedure and attachments. The licensee has changed the MR process such that procedure 1.5.3 does not completely describe what is being done to control maintenance activities. There have also been changes in the titles of the personnel responsible for performing various activities. The maintenance interfaces with the operations, engineering, quality assurance and health physics departments are discussed in Section 7.2 of this report.

The licensee has drafted a new flow chart (see Figure 1), which outlines the current process being used to control MR's, and the licensee plans to revise procedure 1.5.3 to describe the current MR control process.

FIGURE 1

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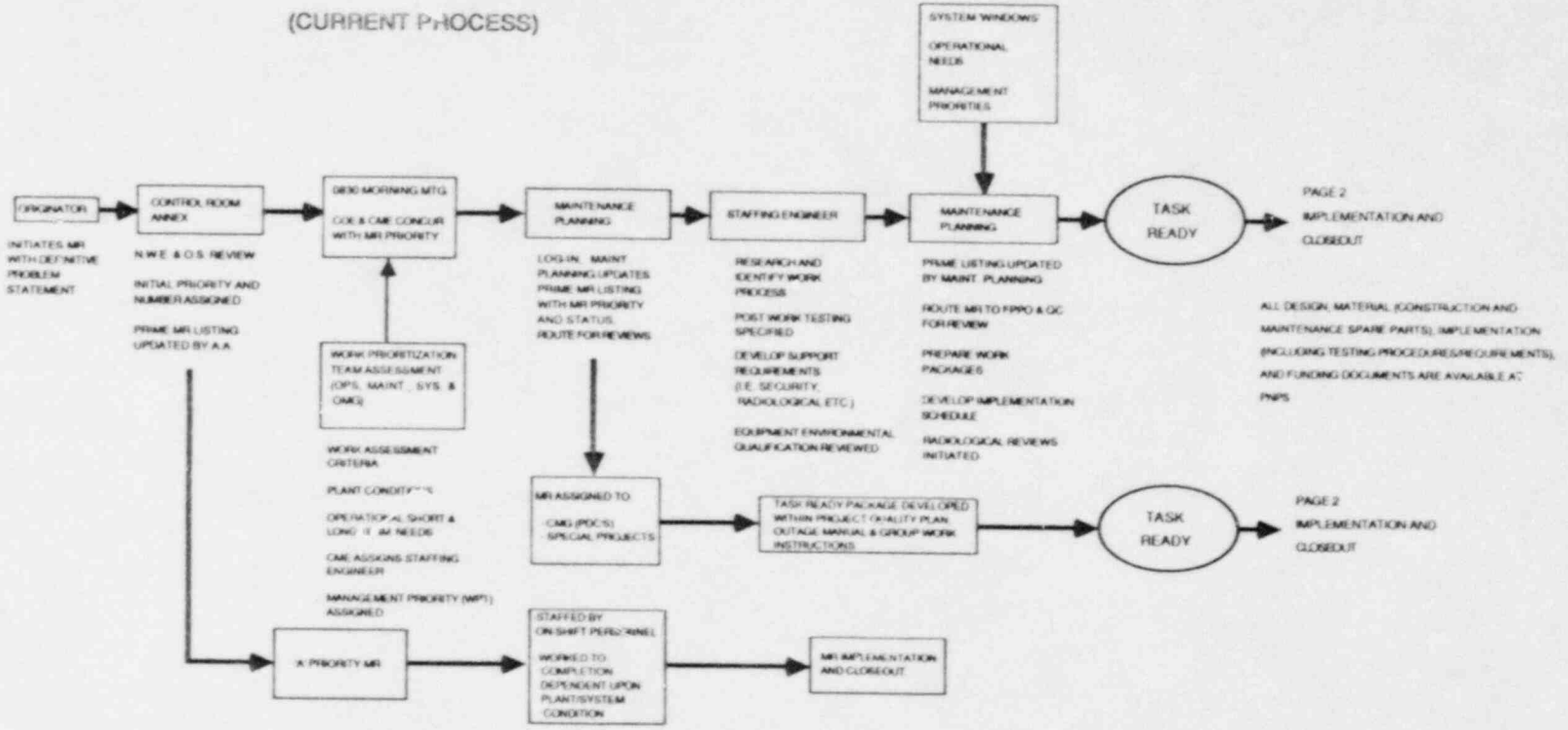
IDENTIFICATION, PRIORITIZATION [illegible]ANNING AND SCHEDULING

(CURRENT PROCESS)



SOURCE DOCUMENTS

PNPS PROC. 1.4.5, PNPS TAGGING PROCEDURE
PNPS PROC. 1.5.3, MAINTENANCE REQUESTS
PNPS PROC. 1.5.7, UNPLANNED MAINTENANCE

PNPS PROC. 6.1-022, ISSUE, USE & TERMINATION OF RADIATION WORK PERMITS (RWPs)
PNPS PROC. 6.10-013, ALARA JOB REVIEWS

OM-1, OUTAGE PLANNING SYSTEM
OM-2, OUTAGE IMPLEMENTATION

MR. R.G. BIRD MEMO DATED 2/4/88, WORK MANAGEMENT AND CONTROL - CRITERIA FOR DETERMINING AND PRIORITIZING EFFORT
MR. R.A. ANDERSON MEMO DATED 2/9/88, WORK PRIORITIZATION TEAM

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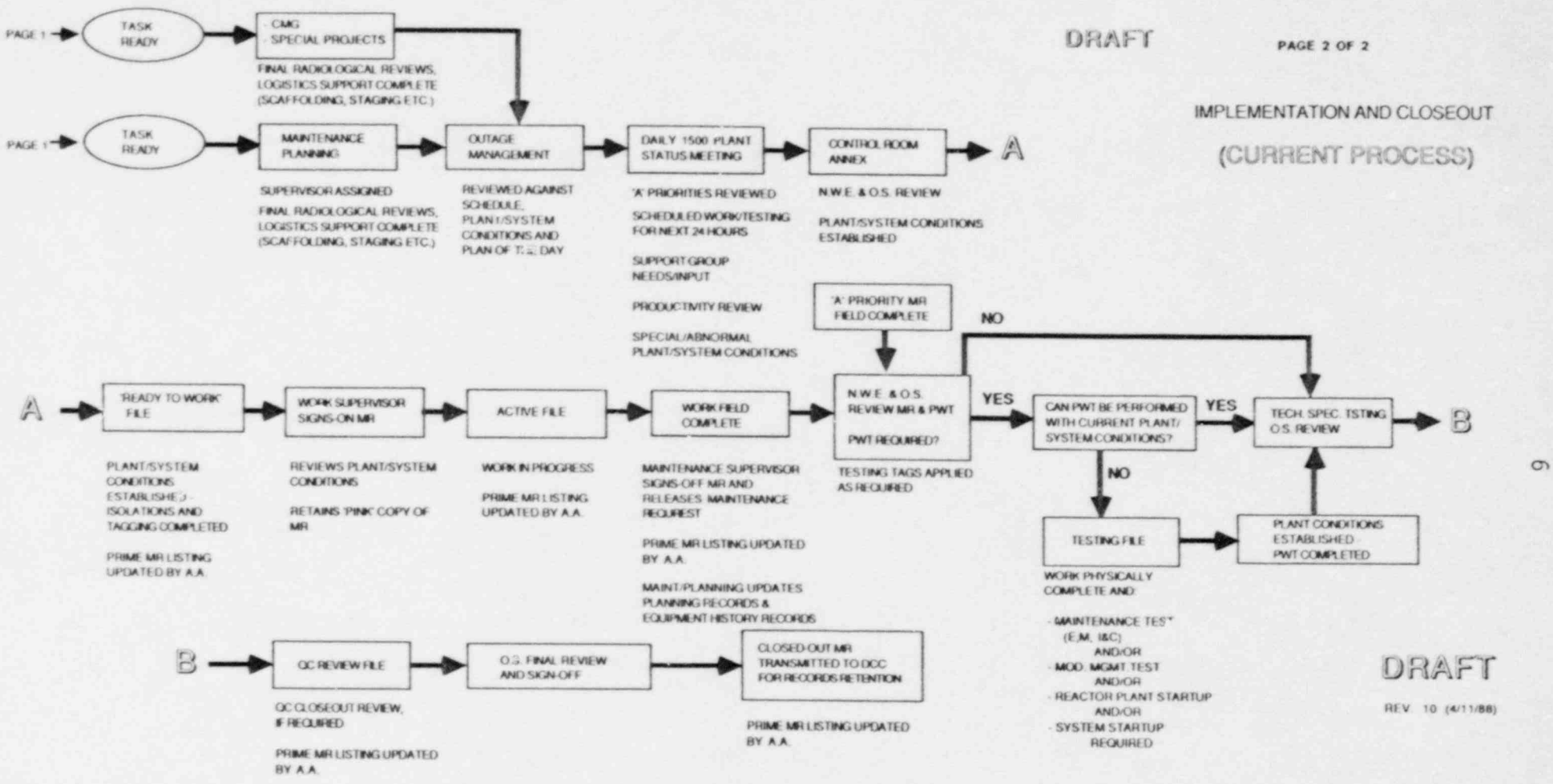
FIGURE 1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PAGE 2 OF 2
IMPLEMENTATION AND CLOSEOUT
(CURRENT PROCESS)
PAGE 1
TASK READY
- CMG
- SPECIAL PROJECTS
FINAL RADIOLOGICAL REVIEWS, LOGISTICS SUPPORT COMPLETE (SCAFFOLDING, STAGING ETC.)
PAGE 1
TASK READY
MAINTENANCE PLANNING
SUPERVISOR ASSIGNED
FINAL RADIOLOGICAL REVIEWS, LOGISTICS SUPPORT COMPLETE (SCAFFOLDING, STAGING ETC.)
OUTAGE MANAGEMENT
REVIEWED AGAINST SCHEDULE, PLANT/SYSTEM CONDITIONS AND PLAN OF THE DAY
DAILY 1500 PLANT STATUS MEETING
'A' PRIORITIES REVIEWED
SCHEDULED WORK/TESTING FOR NEXT 24 HOURS
SUPPORT GROUP NEEDS/INPUT
PRODUCTIVITY REVIEW
SPECIAL/ABNORMAL PLANT/SYSTEM CONDITIONS
CONTROL ROOM ANNEX
N.W.E. & O.S. REVIEW
PLANT/SYSTEM CONDITIONS ESTABLISHED
A
A
'READY TO WORK' FILE
PLANT/SYSTEM CONDITIONS ESTABLISHED - ISOLATIONS AND TAGGING COMPLETED
PRIME MR LISTING UPDATED BY A.A.
WORK SUPERVISOR SIGNS-ON MR
REVIEWS PLANT/SYSTEM CONDITIONS
RETAINS 'PINK' COPY OF MR
ACTIVE FILE
WORK IN PROGRESS
PRIME MR LISTING UPDATED BY A.A.
WORK FIELD COMPLETE
MAINTENANCE SUPERVISOR SIGNS-OFF MR AND RELEASES MAINTENANCE REQUIREST
PRIME MR LISTING UPDATED BY A.A.
MAINT./PLANNING UPDATES PLANNING RECORDS & EQUIPMENT HISTORY RECORDS
'A' PRIORITY MR FIELD COMPLETE
N.W.E. & O.S. REVIEW MR & PWT
PWT REQUIRED?
NO
YES
TESTING TAGS APPLIED AS REQUIRED
CAN PWT BE PERFORMED WITH CURRENT PLANT/ SYSTEM CONDITIONS?
YES
NO
TECH. SPEC. TSTING O.S. REVIEW
B
TESTING FILE
WORK PHYSICALLY COMPLETE AND:
- MAINTENANCE TEST (E,M, I&C) AND/OR
- MOD. MGMT. TEST AND/OR
- REACTOR PLANT STARTUP AND/OR
- SYSTEM STARTUP REQUIRED
PLANT CONDITIONS ESTABLISHED - PWT COMPLETED
B
QC REVIEW FILE
QC CLOSEOUT REVIEW, IF REQUIRED
PRIME MR LISTING UPDATED BY A.A.
O.S. FINAL REVIEW AND SIGN-OFF
CLOSED-OUT MR TRANSMITTED TO DCC FOR RECORDS RETENTION
PRIME MR LISTING UPDATED BY A.A.
DRAFT
REV. 10 (4/11/88)

b. Nonspecific Routine Maintenance Procedure

The inspector reviewed routine maintenance procedure 3.M.1-11, Rev. 6, for scope, clarity, and adequacy of contents. The procedure was designed to control routine maintenance activities for which no specific procedure or restriction exists. The procedure does not contain any specific requirements, steps or acceptance criteria, and simply refers the user back to the MR, Maintenance Summary and Control (MSC) form, or the manufacturer's instructions. However, use of this procedure was widely specified and referenced on MR's (e.g. 87-23-60, 87-23-30, 87-27-59, 83-13-99, 88-10-34) as a controlling procedure without any additional specific work instructions, acceptance criteria, or specific requirements from the manufacturer's instructions. Thus, the maintenance operation covered by any specific MR referencing this procedure relied on the good judgement of the maintenance technician in selection of the work to be performed and the acceptance criteria. While a specific procedure for all possible routine maintenance activities may not be available, a general procedure is needed. Maintenance work, no matter how routine, is not exactly the same. There are various work steps and acceptance criteria required to ensure acceptable work. But there appeared to be no mechanism in procedure 3.M.1-11 to initiate or record specific steps or instructions applicable only to the work covered by the MR referencing this procedure, or to specify the requirements from the vendor manuals.

The Plant Maintenance Section Manager, during the course of the inspection, prohibited the further use of procedure 3.M.1-11 to conduct maintenance activities. The licensee informed the inspector that the procedure would be evaluated for adequacy and either retired or revised to make it more meaningful.

c. Use of Temporary Procedures for Extended Periods

The licensee initiates and approves temporary procedures for work and situations not covered by permanent procedures and for work of a temporary nature. The inspector observed that many maintenance, test and inspection procedures were classified as TP's for extended periods of time. In response to the inspector's query, the licensee QC supervisor informed the inspector that a TP is valid for a maximum of two years from the day of approval, and that no provisions exist for extending the life of a TP. The inspector, however, noted that some TP's issued in 1985 and 1986 were still in an active status, such as TP's: 85-107, 85-113, 85-119, 86-36, 86-45, 86-54, 86-70, 86-71 and 86-74. TP's are needed for short term, non-routine unusual situations not within the scope of normal procedures, therefore any procedure which is needed for routine activities and spans a period longer than the operating cycle of the plant can not be considered temporary.

d. Maintenance Work Control Processes

During the inspection, based on the collective witnessing of maintenance work, review of records, and discussions with licensee personnel, the inspectors determined that various work control documents in use, e.g. pre-job briefing sheets, maintenance planner work package checklists and MR walkdown checklists, were not controlled or formalized by procedures. These work control documents are good initiatives, and that if they are formalized and controlled to assure quality of effort by different individuals and consistency of the results, they may significantly increase the effectiveness of the maintenance activities, in general.

In addition, the inspectors determined that there were activities performed and documents used that were not controlled or formalized by procedures. Specific instructions and criteria do not exist for controlling the determination, review and approval of MR cancellation. The use of the MSC form is not formalized. Therefore, there is no procedural guidance for minimum informational content, review, approval or control to assure adequacy and validity of the information/instructions provided in the MSC's. This concern was brought to the licensee's attention in a previous inspection as Inspector Follow Item 85-26-03 and was followed up in inspection report 50-293/87-38. The licensee, during inspection 87-38, indicated that the MR procedure would be revised to include specific guidance on the use of the MSC. The MR procedure was revised, however, the information regarding the use of the MSC was not included. The inspectors identified the following MSC deficiencies which the inspectors considered were caused, in part, by the procedural inadequacy.

- For MR 86-23-41 (high pressure coolant injection [HPCI] preventive maintenance); pre and post weld area inspections were required but not documented on the corresponding MSC.
- Material use was not consistently documented on the MSC's reviewed.
- The final signature by staff engineers was not consistently documented.
- Generally, the MSC forms were not completely and correctly filled out.
- Estimated radiation levels were not consistently recorded.
- There are no specific provisions on the MSC's to document the work performed and post-work testing completed, although the forms are being used to document work.

In addition, the scope of work covered by MR's was, in several instances, (MR Nos. 86-23-74, 86-23-41, 88-3-16), expanded beyond the approved scope. MR procedure 1.5.3, Rev. 24, paragraph II.B, states that MSC's will not be used to revise or change the intent of MR work scope.

e. Maintenance Request Documentation Packages

The inspector observed that the MR packages were not comprehensive and that there was evidence of a lack of attention to detail. The inspector identified numerous shortcomings in the documentation of the work performed for MR 86-23-41 as described below.

- There was no documentation on maintenance summary and control form (MSC) 86-23-41-2 of the extent of the work performed to repair the flex conduit referenced.

- There was no documentation on MSC 86-23-41-18 of the location, size, type, etc. of the insulation installed on the HPCI turbine.

- There was no documentation on MSC 86-23-41-8 of the affected cables, the leads lifted or the extent of work performed on the conduit.

- There was no documentation on MSC 86-23-41-10 of what cables were pulled or the terminations that were made.

- There was no documentation on MSC 86-23-41-20 of the leads lifted, or the repairs made to the flex conduit. The completed procedure 3.M.3-8 which was specified as the procedure to be used to do the work was not attached to the MSC.

- There was no documentation on MSC 86-23-41-19 of the lifting and landing of the leads.

- Although MSCs 86-23-41-7 and 86-23-41-16 referenced the removal and/or reinstallation of the HPCI turbine stop valve, there was no specific documentation in the MR package of the work being performed on the valve. There were no instructions or procedures for performing the valve work either referenced or enclosed with the MR package. It was not apparent, from the MR package, who performed the work or what it involved.

- There was no documentation on MSC 86-23-41-5 of the work performed to remove and reinstall the mechanical overspeed tappet assembly for the HPCI turbine. There were no instructions or procedures for performing the work either referenced or enclosed with the MR package. The tappet was machined but there was no documentation of the as-left diameter of the machined tappet. It was not apparent from the MR

package, who performed the removal and reinstallation activities or what they specifically involved.

- Although MSC 86-23-41-19 referenced a test to measure the force required to lift the HPCI mechanical overspeed tappet assembly, there was no specific documentation in the MR package that the test was performed. There were no instructions or procedures for performing the test, or test results either referenced or enclosed with the MR package. It was not apparent, from the MR package, who performed the test, or what it specifically involved.

- There was no documentation in the MR 86-23-41 package of the work performed as preventive maintenance in accordance with the technical manual. There was no MSC that specifically controlled the preventive maintenance activities performed. Procedure 3.M.4-14, "Rotating Equipment Inspection Assembly and Disassembly", was used to perform the work. The procedure stated "disassemble per tech manual, clean parts to be reused and reassemble per technical manual". There was no reference to the specific technical manual sections that described the work to be performed. There was no documentation of the actual work that was performed. There were many steps outlined in the technical manual, however, the MR package documentation did not specify those that were accomplished.

There was no documentation of the attempt to tighten the bolts on the HPCI test line check valve worked under MR 88-23-43 (leak on valve 2301-11). The inspectors were informed by the mechanics that when they attempted to tighten the bolts the wrench bounced back on them. The valve continued to leak and a gasket was subsequently replaced to stop the leak. The inspectors reviewed the MR after the work was completed and determined that the attempt to tighten the bolts was not documented and consequently it is not known to what value the bolts were torqued.

In addition, the inspector identified that a portion of the work scope of MR 88-6-20 (Repair Leak on HO-286, 287) was crossed out without documenting the reason; and there was no MSC used to document the scope of the work performed under MR 88-13-12 (Partial Overhaul of MO-1301-49). The attached work procedures did not consistently require signatures after each work step which made it difficult to determine what work was performed. The valve overhaul procedure attached to the MR did not define the scope of the work; rather, the overhaul was conducted in the presence of a maintenance supervisor who defined the scope of the work as it was performed. There was no clear documentation of the vendor requirements of the activities accomplished.

For MR's 88-10-34 (Repair Leak on HD-1001-333B)and 88-10-35 (Repair Leak on HD-1001-332B) there was no requirement checked for the need for special certified test reports on the weld material withdrawal sheets and there was a change in material used without any identifiable signature of the person making the change.

f. Quality Control of Maintenance

The inspector, while reviewing MR packages, determined that certain information was being recorded by quality control (QC) personnel and not by maintenance personnel. Examples of the types of information missing from the MR's included:

- material used, including material receipt inspection report (MRIR) numbers;
- welder qualification data and weld material used;
- measuring and test equipment records of use and calibration dates; and,
- documentation of work performed including specific maintenance actions and actual torque values.

Maintenance personnel, when questioned about the specific MR's, could not provide the above information in order to reconstruct the work that was performed. The maintenance personnel, however, provided the inspector with the quality control inspection reports (QCIR's) that corresponded to the MR's. Those reports contained some of the above information necessary to reconstruct the work performed. The inspector determined, based on the aforementioned observations and discussions, that the maintenance organization was relying on QC personnel to document certain maintenance-related information. The inspector expressed a concern about this method of recording data, since the QCIR does not become a part of the MR package. The MR packages, therefore, are incomplete in that they do not contain sufficient information to reconstruct the activities performed. These findings were discussed with the Plant Maintenance Section Manager who acknowledged the inspector's concerns.

g. Storage of Maintenance Records

Maintenance personnel, while trying to reconstruct the work performed under MR 86-23-41 (high pressure coolant injection (HPCI) system preventive maintenance), retrieved an uncontrolled binder from the maintenance department files. That binder contained various supplementary information, related to the work performed on the HPCI turbine, including the drawings and sketches used to perform the work. The inspector determined that the applicable master drawings had not been updated to reflect the work performed. After discussions with the inspector, the maintenance personnel submitted an

engineering service request (ESR) to update the affected drawings to show the new weld identifications. The inspector, during the review of the binder, determined that the original working copies of the procedure for heavy load handling operations (3.M.1-14), used for removing the stop valve and turbine casing and subsequently reinstalling only the stop valve, were stored in the uncontrolled binder. But the completed copy of 3.M.1-14 for reinstalling the turbine casing was not in the binder. The maintenance personnel informed the inspector that the original copies of the 3.M.1-14 procedure would be placed in the MR package where they originally should have been filed. The maintenance personnel, however, could not locate the completed copy of 3.M.1-14 used for reinstalling the turbine casing.

h. Post Work Testing Documentation

The inspector reviewed various post work testing (PWT) forms attached to the MR's. The following discrepancies involving the documentation of post work testing were identified by the inspector.

- The PWT review form (3M1-30-B-1) was not used for MR 87-23-60 (Dual Indication When AO-2301 Is Open). It was not clear what testing was performed to establish operability since the PWT procedure block of the MR just stated "operable".

- A PWT review sheet was attached to MR 87-23-53 (Discrepancies in Junction Box T2303); however, specific testing was not identified and the form was not completed. The PWT block on the MR also referenced TP 87-199, unctional Test of HPCI Using Temporary Steam" which was performed as an operability test.

- The globe and gate valve operational check sheet attached to the PWT review sheet for MR 86-23-26 (Body to Bonnet Leak on Valve 2301-22) was not completed. The PWT procedure block stated "no leakage", but it was not apparent whether this was a requirement for testing or a test result. The PWT block on the MR also referenced TP 87-199 which was performed as an operability test.

- There was no documentation of the inservice leak test of the small bore HPCI piping which was welded in MR 86-23-41, although the PWT section of the MR was signed off as complete. The licensee informed the inspector that this testing was not performed, and that it will be performed when the system is at full operating pressure. However, there was no provision or documentation to ensure that the testing would be performed.

i. Junction Box Maintenance Work

The inspector determined that the documentation package of MR 87-23-53 was not complete in that TP 87-83, "Control Panel Wiring Inspection", data sheets were missing from the package. The enclosed QC cover sheet for inspection report (IR) 87-23-53A referenced terminations torqued to six inch-pounds, whereas the TP 87-83 data sheets enclosed with the MR package indicated terminations torqued to eleven inch-pounds. The inspector also identified that some of the TP 87-83 data sheets enclosed with the MR package were not complete in that there were no initials documenting the lifting of the lead, the second verification or the QC verification. Maintenance personnel informed the inspector that the apparent reason for the incomplete data sheets was that the leads were incorrectly torqued to six inch-pounds even though the QC IR 87-23-53A identified that no discrepancies were noted when the terminations were torqued to six inch-pounds. The maintenance personnel stated that the leads were not lifted again and that is why the data sheets were incomplete. The documentation of the lifting of the lead, the second verification, and the QC verification, therefore, was apparently recorded on the data sheets referencing the six inch-pound torque. The terminations in question were apparently retorqued to the correct eleven inch-pound value. The QC IR 87-23-53C corresponding to the apparent retorquing to eleven inch-pounds did not reference that the activities performed were to correct the earlier nonconformance of torquing the terminations to six inch-pounds. The maintenance personnel were not able to definitely establish what really occurred since the original TP 87-83 data sheets showing the six inch-pound values were not included in the MR package and there was no explanation of the circumstances that took place. The information within the QC inspection reports did not provide any additional assistance in reconstructing the activities that took place since both IR 87-23-53A (six inch-pounds torque) and IR 87-23-53C (eleven inch-pounds) noted that no discrepancies were identified.

j. Single Maintenance Request Initiated for Safety Related/Non-Safety Related Work

The replacement of two drain valves, one safety related and one non-safety related, was originally planned to be accomplished using the single MR 88-10-25. After QC review, however, the one MR was replaced by two MR's 88-10-34 and 88-10-35, one safety related and one non-safety related. The inspector determined that the current maintenance practices and procedures did not have the necessary instructions to determine whether safety related and non-safety related activities on identical components should be worked separately.

k. Administrative Controls for Lifted Leads and Jumpers

There appeared to be no formalized system to control and document lifted leads and jumper installation. When requested by the inspectors the licensee could not identify any approved procedure or instruction to control and document lifted leads and jumpers. The licensee informed the inspector that a procedure is currently under development for control of lifted leads and jumpers.

l. Administrative Controls for Torquing

There appeared to be no formalized system to control the torquing of bolts and fastening devices. Specifically, there was no general specification or procedure that established standards for minimum and maximum torque values and the pattern of torquing. The licensee acknowledged the inspector's comments on the lack of established torque specifications.

m. Lack of Review of Completed MR Packages

The inspector determined that there was no final audit or review of the completed MR package by the maintenance department to assure that the MR's are complete and conform to the planning, work, testing and documentation requirements. The absence of a final review performed by maintenance department personnel, engineers, or supervision restricts management awareness of the adequacy of the work performed. The lack of review of the completed MR packages attributed to many of the findings discussed above.

2.3 Conclusions

Based on the above observations and findings, the team concluded that, although there were certain strengths in the licensee's performance of activities that support the conduct of maintenance (e.g. engineering, planning, scheduling, package preparation, etc.) as discussed in sections 4.3 and 7.3, there were several deficiencies in the licensee's program for conduct of maintenance.

The observed significant program deficiencies included:

- lack of clearly defined maintenance request and other work control practices in approved plant and department procedures or other directives, as specifically noted by the excessive delay in revising the maintenance manual, and in formalizing the current plant work control practices for maintenance;

- lack of effective means to specify unique instructions for routine maintenance tasks covered by procedure 3.M.1-11, which resulted in inadequate preparation of work packages for such tasks.

Other program deficiencies included:

- lack of clear guidance for use of temporary procedures;
- lack of final reviews of MR packages by the maintenance department to assure completeness and adequacy of tasks performed, and documentation provided for the task; and
- lack of procedures for lifted leads and jumpers, and bolt torque requirements.

In addition, the team determined that there was an overall significant performance deficiency related to worker disregard, or unfamiliarity, with various elements of the work control process, as evidenced by:

- misuse of the non-specific routine maintenance procedure 3.M.1-11;
- numerous incomplete or incorrect MR/MSC forms;
- ad hoc expansion or revision of the original work scope during maintenance in the field without management or engineering approval or subsequent documentation of the actual completed work;
- entire work packages, including all the necessary instructions, not available at the work site;
- documentation of material used, maintenance and test equipment information, and work performed (included torquing values) by quality control, vice maintenance, personnel;
- uncontrolled storage of maintenance records; and
- post work testing documentation deficiencies.

3.0 Component and System Walkdowns

3.1 Scope of Review

The inspectors performed component and system walkdowns (walk-through inspections) to assess the general condition of the plant. The areas associated with maintenance activities and the state of housekeeping were emphasized. To ascertain the adequacy of the licensee's efforts in this area, the inspectors examined the following elements.

- Post-work cleanup and general cleanliness conditions of the work area and equipment.

- Components/systems configuration and appearance consistency with applicable drawings.
- Operating equipment functioning, e.g. without excessive vibration.
- Performance of maintenance and test activities.
- Availability/presence of supervisory/management and technical personnel in the plant area (such as formal/informal work observation, walkdown).

3.2 Observations and Findings

a. Licensee Walkdowns

The licensee performs various system and plant walkdowns in addition to the normal operator rounds. The Systems Engineering Division, the Quality Assurance Surveillance Division and various managers involved in the Management Watch Program conduct plant and system walkdowns and inspections, as described below.

1. Systems Specialists

The systems specialists, in the Systems Engineering Division, perform daily informal walkdowns of those systems for which they are responsible. The Systems Engineering Division personnel also perform more formal system walkdowns and area inspections in accordance with the checklists in procedure SI-SG.1010, "Systems Group Systems Walkdown and Area Inspection Guidelines." The systems specialists perform their walkdowns and inspections to identify and document safety hazards, material conditions and overall cleanliness of the plant, and they generate MR's, failure and malfunction reports (F&MR's), engineering services requests (ESR's) and procedure change notices as appropriate to ensure that abnormal conditions are corrected.

2. Management Watch Program

The licensee, effective March 29, 1988, directed Construction Management, Maintenance, Outage Management, Plant Support, Systems Engineering, Chemistry and Health Physics department managers (and backups) to conduct weekly plant inspection tours. These tours are conducted to inspect selected areas for deficiencies with equipment markers, old MR's, temporary equipment, temporary modifications, equipment and tool storage, and equipment condition. The tour members identify and record problem areas and assign responsibilities in writing to correct the problems that can be immediately corrected. The tour leader also has the authority to request preparation of ESR's, MR's, F&MR's, to implement corrective actions as necessary. Examples

of the types of identified items included: poor equipment identification, unsecured equipment, the need for better in-plant health physics instructions, equipment no longer in use, missing conduit and receptacle covers and housekeeping issues. The mechanism for tracking the closure of the identified items has not been formalized. The current system requires that the manager responsible for closure of an item notify the Station Director's office in writing that their assignments were completed. The licensee is currently developing a formal tracking system to ensure that the assignments are completed and the identified deficiencies are corrected.

3. Quality Assurance Surveillance Division

The QA Surveillance Division conducts both facility tours and system alignment walkdowns. The QA personnel upon identifying problems would either generate a deficiency report (DR), an immediate corrective action trending input sheet (ICA) or a recommendation as appropriate for the situation. The QA personnel are responsible for ensuring closeout of the DR's and the ICA's and the tracking the recommendations.

The QA personnel have conducted five facility tours so far this year. The toured areas included the reactor building, the diesel generator area, the radwaste area and the turbine deck. The items identified during the facility tours included three ICA's - to address the control of posted work procedures in the plant, to remove paint drop cloths from the plant and to remove a portable fire extinguisher that did not have a current inspection date.

QA personnel have performed system alignment surveillances for the residual heat removal, reactor building closed cooling water, standby gas treatment and the fire protection systems so far this year. These surveillances are conducted by verifying that the system alignment in the field corresponds with the applicable drawings, line up procedures and checklists. The items identified during the surveillances included an ICA for the control of a temporary modification and various recommendations to ensure consistency between the drawings, procedures and installed equipment.

b. Inspector Walkdowns

The inspectors independently performed walk-through inspections in the reactor building, control room, cable spreading/switchgear room, and battery rooms. The HPCI and RCIC system areas and equipment were especially examined. The walk-through inspections were performed on many occasions by the inspectors individually and jointly with licensee personnel during this inspection period.

The inspectors observed that the areas and equipment examined generally were in an excellent state of cleanliness. Also, the licensee had implemented an effective program to decontaminate most plant areas such that routine operations and maintenance activities could be conducted without unnecessary compensation for burdensome radiological area and system contamination conditions that previously existed.

Although the general material condition of systems and components was considered good, overall, the inspectors determined that there were cetain deficiencies in material condition or licensee performance, as described in the sections that follow.

1. General Reactor Building Walkdowns

   The inspectors' observations of material condition deficiencies and the licensee's actions are summarized below.

   - The inspectors noted the newly painted equipment throughout the plant which greatly enhanced housekeeping appearances, however, it was apparent that some surfaces such as valve stems, packing, gaskets, limit switches, linkages etc. were also painted, which could impact equipment performance. The inspectors determined that the painting was done by a contractor who was trained and instructed not to paint some surfaces. However, during the various tours conducted by the inspectors, the conditions observed were potentially detrimental to component operation. The licensee's acceptance criteria for the completed painting did not appear to be adequate, in that various equipment that should not have been painted was found painted. The specific equipment identified by the inspectors was brought to the licensee's attention who initiated MR's to remove the paint. The inspectors determined, however, that there was no formal program to ensure that unwanted paint is removed so that the equipment will function as designed.

   - There was water (apparent minor leak) on the stem and packing gland of control rod drive valve CRD-170-MO-302-10. The licensee initiated an MR to repair the valve.

   - The oxygen detection devices in the 125V/250Vdc distribution enclosures were not functioning properly. The licensee stated that these detectors are not required and that they will be removed.

   - A pressure gauge (23-PS-9090) in the HPCI pump discharge monitoring system was pegged over-scale high. The licensee stated that the gauge being pegged over-scale high was correct and that the systems alarm at a decreasing pressure

of approximately 450 pounds. The inspector verified that the instrument was capable of performing under the conditions in which it was being used.

- There was evidence of inadequate post-work cleanup in the residual heat removal A and B loop tie header isolation valve area. The inspectors observed the following articles/equipment left behind after the day shift, despite no work being performed during the evening shift.

  2 drum cradles
  several covered 55 gallon drums
  portable steps
  discarded linen gloves on the floor
  ear plug wrappers on the floor
  socket and ratchet wrench
  mops and buckets
  hand dolly
  rolls of masking tape

  The licensee cleaned this area after the inspectors brought it to their attention.

- There was evidence of oil leaks on various threaded connections on the reactor recirculation pump motor - generator sets X-204A and B. The licensee stated that there were existing MR's to address the problem.

2. Control Room Observations

On May 3, 1988, the inspectors observed ongoing control room activities as well as the general status of the various systems. The inspector noted that a watch engineer's tag, number 12-35, on containment isolation valve MO-1201-05 indicated an "open" position. The tag also showed a "closed" position which was crossed out without any signature or initial. The inspector reviewed the watch engineer's tag log to verify the log entry. The original "open" position in the log was crossed out and a "closed" position was indicated. The correct valve position should have been "open" as confirmed by the watch engineer and the systems specialist. The inspector reviewed the tagging procedure 1.4.5 "PNPS Tagging Procedure," Rev. 22. The procedure does not provide detailed information on control of the watch engineer's tags. Specifically, there is no requirement in the procedure for the watch engineer to sign off the tag when it is initiated or modified. There is no independent verification of the watch engineer's action as far as this tag is concerned.

Following discussions with the inspector, licensee personnel removed the old tag and replaced it with a new one indicating the correct valve position in the control room panel as well as the log book. The licensee also took prompt action and verified that all the other watch engineer's tags were correct. The inspector was informed that the licensee is planning to eliminate use of the watch engineer's tag when the tagging procedure is revised.

Outside the main control room area the inspector noted that the seismic recorders were out of calibration. The calibration due date on the calibration sticker was March 10, 1988. Further investigation determined that:

- the recorders are calibrated by the vendor (Kinemetrics) who is normally contacted before the calibration due date, although there is no formal instruction to do so and there is no procedure that includes the calibration requirement;

- the licensee's calibration program does not include these recorders; and,

- the vendor calibration is required by the due date or every refueling outage.

The inspector determined that these recorders and their calibration are not required by the Technical Specifications.

The licensee stated that they plan to include these recorders in their instrument calibration program and reevaluate the frequency of calibration.

3. Control Rod Drive System Walkdown

The inspector conducted a detailed system walkdown on April 29, 1988, with the cognizant systems specialist. The following observations/ findings were made regarding material condition or licensee performance deficiencies.

- An electrical cable was found hanging above the hydraulic control units (HCU). It was not clear whether the cable was energized or not. The cable could not be traced immediately. The systems specialist stated that this concern would be resolved.

- There are approximately 1300 hand operated valves in this system. Approximately 50% of those valves are safety related. Most of the valve stems were dry and it was evident that they have not been lubricated for a long time. The inspector determined that the licensee does not have a lubrication program in place for such valves except that

45 valves are lubricated each refueling when they are rebuilt.

- The inspector observed five out of 145 accumulators slightly leaking through the seals at the top. Due to those leaks, the integrity of the accumulators was in question. The systems specialist plans to consult the vendor and expects their formal assessment.

- The limit switches were out of alignment on several diaphragm scram valves (e.g. CV-126 and CV-127). The limit switches on a few of the valves were out of alignment, such that there may be no indication of the rod position in the control room. NOTE: Some of these problems were already identified by the systems specialist during his previous system walkdowns.

- The hydraulic control units (HCU) include two different types of solenoids. The inspector determined that the solenoids have different vendor part numbers but perform the same functions. A replacement-in-kind review process was questioned. Upon further investigation that included a review of the original procurement documents, the inspector determined that the vendor had provided adequate justification and that the two different styles of solenoids were acceptable.

- The inspector observed that some of the accumulators had a different pressure rating than the others. The inspector reviewed the entire procurement process for these cylinders, such as stock material authorizations (SMA), purchase orders, receipt inspections, and product certifications of compliance from the vendor. The inspector also reviewed the engineering evaluations and the final disposition of the discrepancy in pressure ratings. The inspector determined that the licensee had taken appropriate actions and that the review supported the final disposition of satisfactory acceptance of the accumulators. The licensee follow-up on this issue was thorough and timely.

- On three scram valves, some of the threads on the threaded portion of the stems were found damaged. The damaged thread could make it difficult to adjust the limit switch brackets.

- On valve HCU-06-15, a plastic bucket was observed hanging on the valve to apparently contain the valve leakage. This is contrary to the licensee's normal practice under the catch containment program for collection of leakage. The

systems specialist took prompt action and the bucket was removed. There was no valve leakage.

- A few plastic retainers were observed on the top of some scram relays. This was inconsistent compared to the rest of the valves whose original design had spring retainers. The systems specialist provided the necessary documentation that accepted the use of the plastic retainers.

- The accumulator at HCU-38-83 had a different design for the clamp on the top. The inspector questioned the discrepancy compared to the other accumulators. The new clamp was determined to be acceptable based on the vendor provided data sheet.

- The inspector noted that approximately eight scram valve stems had paint on them. The licensee stated that MRs would be generated to correct this problem.

- One of the pressure gauge needles at HCU-30-03 was found bent. The inspector also noted some variations in the pressure reading of other pressure gauges and therefore questioned the calibration. It was found that the pressure variation was within the acceptable range and that all the gauges were calibrated per the established frequency. The bent needle of the pressure gauge could affect the accuracy of the readout. The systems specialist expanded the existing MR (88-3-29) to repair this gauge.

- The support frame for the HCU units is fastened to the floor. The base of the frame is made out of piping sections. The current design of fastening includes two flat washers and a nut and, therefore, the pipe has line contact when the nut is torqued. The normal site practice is to use curved washers to assure full surface contact. In the past, licensee personnel had found that several of these bolts were missing, and loose or missing washers possibly due to the use of flat washers. Although the current installation is in accordance with the approved vendor drawing, the licensee intends to reassess the adequacy of the existing washers and take appropriate action.

- The conduit support frame near the HCU-30-0 had a loose bolt which fastens to the floor. The systems specialist stated that an MR would be written to correct this condition.

- The CRD pump B had a loose lubrication sight glass that could cause a loss of lubricating oil for the bearing. The system specialist stated that an MR would be issued to correct this condition.

- The CRD pump B cooling water temperature gauge had a missing glass and cover. The systems specialist stated that MR 88-30-39 was issued to correct this problem.

- The CRD pump B gearbox had an oil leak. The licensee stated that MR 88-3-37 was generated to repair the leak.

- Two out of three gauges on the PCV-302-6B flow control valve head were also missing glass covers. The systems specialist stated that an MR would be issued to correct this condition.

- The inspector witnessed the ongoing work on the CRD system pump A. The work was carried out under MR 88-3-16 (high pump vibration), dated February 19, 1988. The inspector reviewed the work package existing at the worksite and determined the following specific examples of maintenance work control/documentation inadequacies and discrepancies, that were described generally in Section 2.2.

  - The MR described the problem of high pump vibration identified during the performance of preventive maintenance. The MSC form, dated April 27, 1988, which was included in the work package, related to the retaping of the heater lead connections which was beyond the original scope of the MR.

  - The details of the work to be performed to eliminate the vibration problem were provided on a plain piece of paper on April 5, 1988, attached to the pre-job briefing paper and used by the maintenance supervisor to brief the work crew, instead of using the MSC which is designed to describe the detailed scope of work related to the MR.

  - The MSC form normally is approved by the watch engineer per the routine maintenance practice. However, this approval was bypassed when the scope of the job was established as explained above.

  - The MR references several applicable work procedures such as the vendor's manual V-310, and Repair Procedures 3.M.4.14 and 3.M.14-1-15. However, none of the procedures were available at the work site.

- •• The details of the scope of work were prepared by the maintenance planner based upon the informal communication with the systems specialist.

- •• Non-applicable parts of the MR were not identified as such.

4. Reactor Core Isolation Cooling System (RCIC)

The inspector conducted a detailed walkdown of RCIC with the cognizant systems specialist and identified the following material condition discrepancies and concerns.

- Two turbine seal leak off valves, HO-1301-73 and 74, needed lubrication on the stems. The licensee stated that an MR would be generated to lubricate the valve stems.

- An electrical conduit on the RCIC turbine from the trip throttle valve limit switch to junction box T-1303 was found snapped out of the box. The licensee stated that an MR would be generated to repair the conduit.

- On the RCIC turbine, the bearing temperature gauge 13-TS-1301-2 was inoperable. MR 86-13-49 had been generated but no deficiency tag was attached to the gauge.

- The RCIC turbine pump had two plastic inserts inside the wells on inboard and outboard bearings. The systems specialist stated that an MR would be written to replace the plastic inserts with metal inserts.

- The oil filler plug on the RCIC pump inboard bearing is painted so that it would be difficult to open by hand. The systems specialist stated that the plug will be exercised to ensure easy removal.

- The RCIC system manual valves did not appear to have been lubricated in a long time. In addition, the governor and throttle valve linkage, diaphragm valves CV-1301-12 and 13, and two diaphragm valves on the safety related RCIC area cooler units AO-4043 A&B needed lubrication. Considering the condition of the latter valves, it was not apparent that any preventive maintenance had been previously done on the coolers. The licensee stated that MRs would be written to perform the lubrication.

- The gland packing hold down plate on the MO-1301-61 valve was improperly mounted and the bolts were bent. The systems specialist issued an F&MR report to document the deficiency and initiate corrective action.

- Several components on the turbine unit had been painted after the testing was done. The paint was spread on these components where it did not belong and could impact their operability. The licensee stated that an MR would be written to remove unwanted paint.

- The electrical conduits on MO-1301-53 and 48 were loose at the connector. The licensee stated that an MR would be generated to correct this condition.

5. Miscellaneous Walkdown Items

During a walkdown in the transversing incore probe (TIP) room, the inspector observed a few tubes not mounted on their respective supports. The inspector was informed that the tubes, if mounted on the supports, would cause additional stress on the traveling wire. The inspector questioned whether the proper solution would be to modify the existing supports to suit the tube contour rather than leaving them unsupported. The systems specialist agreed that the current condition is a deviation from the original design. The systems specialist also stated that apparently there was no documentation supporting the acceptability of the condition and that necessary corrective actions would be initiated.

The inspector witnessed the maintenance activity being performed under MR 88-20-48 (temporary supports for PVC piping) and also discussed the job with the senior construction engineer present. The work package was complete with all the necessary instructions and approvals and the personnel were performing in compliance with the procedures. The inspector verified that safety checks on the scaffolding in the area and that other safety measures were taken by the work crew.

The inspector witnessed replacement of an electrical relay (CR-120A) under MR 88-12-18. The licensee had an ongoing program to replace 37 safety related relays. Thirteen relays have already been replaced. The licensee had performed a root cause analysis and then a definitive action plan was developed. The root cause of the failure was determined to be the higher

than normal temperature inside the relay cabinet. The short term plan was being implemented and included the replacement of all the existing 115v coils with 120v coils for the safety related relays. Once a relay cabinet is complete a new temperature profile will be generated and then a long term action plan will be developed while taking into account the effectiveness of short term actions.

The relay replacement was satisfactory; however, minor administrative deficiencies were noted such as: (1) The MSC was prepared by the planner on May 3, 1988, but the MR did not reflect that because the appropriate block was not checked; (2) the start time and date block were not checked; (3) the MR stated "procedures 3.M-1-11 and 3.M.3.8 to be used if applicable;" (The inspector noted that procedure 3.M.3.8, in fact was required to do the job) (4) the package did not contain the general procedure 3.M-1-11; and (5) while the correct coil was installed, the work package did not include the specific part number, or other identification. These were further specific examples of the general work control and documentation discrepancies discussed in Section 2.2.

c. Cleanliness Standard

The licensee commits to ANSI N18.7-1976 in Section 2.3.2 of their NRC approved QA Program Manual, and this standard requires conformance to ANSI N45.2.1-1973 for cleanliness during maintenance activities during the plant operations phase. At the inspector's request for cleanliness control procedures the licensee provided a Bechtel Specification dated February 14, 1972. This specification had been adopted by the licensee (Specification Number 6498-M-303), but did not refer to ANSI standard N45.2.1. During review of the work packages and other maintenance instructions, the inspector noted that the M-303 specification was not referenced. The M-303 specification is referenced during design changes. The matter was discussed with the QC division manager, who stated that the QC division planned to incorporate this standard in the QC instruction manual. Also, the engineering and maintenance divisions would be contacted to coordinate the revision of M-303 to incorporate ANSI N45.2.1 and to subsequently include the specification in the engineering and maintenance manuals.

3.3 Conclusions

Based on the above observations and findings, the team concluded that there were some notable performance strengths, as well as certain program deficiencies, regarding the material condition of areas, systems and equipment.

The observed performance strengths included:

- various system and plant walkdowns performed by Systems Engineering Division and Ouality Assurance Surveillance Division personnel and Management Watch Program managers (in addition to normal operator rounds), which are a positive and generally effective initiative to improve the overall material condition of the facility;

- the generally excellent state of cleanliness of plant areas and equipment;

- substantially improved access to plant areas for routine operations and maintenance activities, as a result of an effective area and systems decontamination program;

- prompt and comprehensive licensee action, following an inspector's discovery of an apparently isolated example of a watch engineer's tag discrepancy, to correct the discrepant condition and to verify that all other tags were correct; and

- the systems specialist's responsiveness and ability to resolve inspector questions and concerns, regarding identified differences in the installed configuration of similar components of the control rod drive system.

Observed program deficiencies included:

- lack of clear delineation, in the licensee's tagging procedure, instructions or guidance for sign-off approval and verification of watch engineer's tags;

- lack of a plan to eliminate the observed poor material conditions that resulted from improper painting of equipment and to reverify operability of affected components;

- lack of a comprehensive lubrication program for plant equipment, in general, and manual-operated valves in particular;

- an informal, non-specified calibration program for seismic recorders; and,

- lack of a cleanliness standard traceable to ANSI N45.2.1-1973 which is a QA Program commitment.

The general material condition of systems and components was determined to be good, overall. However, the inspectors identified many material condition or licensee performance deficiencies, which apparently had minor safety significance. Most of the deficiencies had not been identified during licensee walkdowns, indicating that increased management attention is needed to achieve the licensee's goal of material excellence.

4.0 Engineering Support for Maintenance

4.1 Scope of the Review

The primary objective of the review was to assess the technical and management support provided by the licensee's corporate and onsite engineering organizations to the plant maintenance department in general, and to complex tasks in particular. The assessment of engineering involvement and support in the selected areas was specifically focused to determine that:

- appropriate root cause analyses were performed for failures and malfunctions;
- staff and systems engineers fulfill their roles; and
- the engineering support to plant maintenance was timely and appropriate to the effective resolution of maintenance problems.

Documents reviewed for this inspection are listed in the Appendix F to this report.

4.2 Observations and Findings

a. Corporate Engineering

The inspectors reviewed documentation, held discussions with engineering and management personnel, and visually examined recently completed or scheduled maintenance work to ascertain the adequacy of engineering support.

Five root cause analyses listed in Appendix F performed by onsite systems specialists were reviewed for adequacy of problem description, analytical approach, and conclusions. The inspector observed that the methods and process of root cause analysis were well organized, controlled and the conclusions were technically valid. The analysis was sufficiently detailed to establish the technical and operational basis for the conclusions reached and the validity of technical approach.

The inspector also noted that the documented analyses were timely, and were distributed to cognizant management and technical personnel for information. The root cause analysis program also appears to enhance the effectiveness of the failure and malfunction trend analysis program (see section 5.0).

To assess the extent of systems specialists and staff engineers roles and their interfaces with each other, operations, and maintenance staff, the inspectors interviewed systems specialists, systems engineers, control room nuclear watch engineers, and Nuclear Engineering Department (NED) staff engineers for their understanding

of their own and other groups responsibility and effectiveness of interfaces.

The inspector reviewed engineering services requests (ESR's) initiated by systems specialists/engineers to obtain staff engineering assistance from NED. The inspector selected a sample of ten ESR's for the HPCI & RCIC systems (listed in Appendix F) to verify the effectiveness of this process to provide timely and adequate engineering support to maintenance. The inspector observed that in the past the ESR's were channeled through the Plant Maintenance Section to NED. Apparently due to the workload in the Maintenance Section, ESR's sometimes did not receive prompt attention and processing. However, after the formation of the Systems Engineering Division, the responsibility of ESR processing was assigned to that division which had systems specialists dedicated to specific safety-related and non safety-related systems.

The inspector noted that the ESR system was now effectively implemented by systems specialists to request engineering services from NED for design/modification services including evaluation and resolution of complex maintenance and system problems. The inspector was informed that with few exceptions NED intends to respond to every ESR within 30 days of ESR logging in NED. The 30-day response is a preliminary or interim response detailing NED's evaluation of the scope of problem, projected schedule of NED work, priority and engineering resources assigned, and any interim recommendation. In cases where the resolution was possible within the 30 days, this response constitutes the final resolution. Based on the review of the selected sample, the inspector determined that NED has generally fulfilled its responsibility of responding to the plant within the 30-day period without significant delays.

The onsite engineering representative (OER) of the NED used a computerized system for tracking ESR's. The status report identified the ESR, the date of receipt in the engineering department, originally scheduled completion date, projected completion date, and the NED engineer responsible for the requested work. In these status reports, although the original schedule date was not revised, the projected completion date was revised as necessary to reflect the current status of the ESR.

During the review of the ESR status report with the onsite engineering representative and systems specialists, the inspector noted that, because the status report was not used for day-to-day follow-up, the OER or the systems specialists were not familiar with the format. Also, the computer tracking system was deficient in that it always indicated a projected completion date a day earlier than the report date. The tracking system and the status report, therefore, is of limited value. Consequently, the systems specialists individually tracked high priority ESR's for their own jobs.

The inspector determined that the Systems Engineering Division did not normally receive ESR status reports. However, following discussions with the inspector, the Systems Engineering Division Manager indicated that if the status reports were sorted into specific systems with accurate projected completion dates, it could provide useful information to systems specialists.

In addition, the NED on its own initiative and as part of its design and plant betterment responsibility initiated studies, evaluations, industry experience tracking and analysis, and has recommended improvements in plant reliability. A good example of the effect of the above was the risk/safety analysis data base for the plant. This data base represented an important element of the overall risk and reliability data system currently under development for Pilgrim Station.

The Pilgrim data base was being developed from the cumulative experience of a large population of nuclear power plants, which was stated as documented in the "Pickard, Lowe and Garrick, Inc. (PLG) "proprietary data base", and a comprehensive plant specific data base developed from a detailed review of the Pilgrim plant records. The generic data (PLG data) base has evolved from probalistic risk assessment (PRA) studies that PLG has performed. It was based on US light water reactors evaluated by PLG in past PRA studies.

The inspector reviewed the safety evaluations performed by NED for proposed modifications, tests, or experiments for unresolved safety issues. The specific safety evaluation reviewed by the inspector involved the addition of a vacuum relief line to the HPCI system turbine exhaust pipe. This modification added new safety related components, and altered a safety related system. The purpose of this modification was to reduce the potential for severe hydrodynamic transients (water hammer) in the HPCI turbine exhaust line, and was recommended by General Electric Co. in SIL No. 30, dated October 31, 1973 applicable to all BWR plants. The inspector observed that the evaluation was sufficiently detailed to demonstrate the basis of conclusions with: all supporting technical analyses; system descriptions that identified other supporting systems, subsystems and components affected; and the recommended FSAR changes.

b. Onsite Engineering Support

Tne onsite engineering activities were basically concentrated in the Systems Engineering Division. The division was formed in early 1987 within the Technical Section to focus on improving the material condition and reliability of plant systems. The overall mission of the division was included in the Mission Organization and Policy (MOP) document. The division activities were performed per its division reference manual. The manual described training, qualification requirements of the staff, authorities and

responsibilities, interfaces with other groups as well as formalization of their activities.

Based on the discussions with the division management and staff, as well as detailed walkdowns with the systems specialists, the inspector made the following observations.

- The systems specialists were knowledgeable and experienced. They received training as prescribed in the division manual. The inspector noted that systems specialists conducted frequent system walkdowns to keep themselves aware of system status. Each systems specialist maintained a current listing of assigned system(s) conditions and status, including but not limited to the current problems, on-going work, planned activities, overall system operability status, and any other significant observation. Although the system status report was not formalized by procedures, it appeared to be a useful compilation of overall system status, and was extensively used by other groups, i.e. operations support staff and control room personnel.

- The systems specialists also initiated MR's to correct identified problems, and they maintained current status of deficiency tags generated during prior walkdowns. During the system walkdowns by the inspectors, the knowledge and experience of systems specialists was evident.

- The inspector also assessed the extent of a systems specialist's engineering support to, and involvement with maintenance activities associated with control rod drive (CRD) pump A, as discussed in Section 3.2. The inspector observed that the repair of the CRD system pump under MR 88-3-16 was completed following an engineering assessment of the problem. The systems specialist did a thorough research on this pump by looking into the machinery history file and then developed an action plan. The plan included rebuilding of the pump. The inspector verified that the pump was running satisfactorily per the post work testing requirements. However, the engineering assessment was not formalized. The plan was written by the maintenance planner based on the informal discussions. The Systems Engineering Division Manager agreed with the inspector to formalize the engineering assessment with the systems specialist.

- The replacement of the electrical relays under MR 88-12-18 was well supported by onsite and corporate engineering staff.

- The systems specialist witnessed ongoing maintenance activity to assure the required maintenance was carried out promptly.

- The systems specialist coordinated all applicable site engineering service requests (ESR) with the onsite engineering representative.

- A systems specialist participated in the daily meetings conducted by the work priorization team in establishing ESR priorities.

4.3 Conclusions

a. Corporate Engineering

Overall, corporate engineering support for maintenance was considered a performance strength.

The Nuclear Engineering Department (NED) of the licensee's Nuclear Engineering and Quality Assurance Organization is adeqautely staffed with experienced engineers to effectively support design changes and modifications in the plant and to effectively conduct engineering analyses and evaluations to support plant operations and maintenance activities. The NED also effectively collects and analyzes general industry data to recommend and plan safety improvements in the plant, by participating in and interfacing with industry groups, and aggressively undertakes initiatives for plant safety and performance improvements. The quality and timeliness of corporate engineering support to the plant through the ESR system and safety evaluations has improved and appeared to be effective in providing appropriate resolution of maintenance problems. There appeared to be frequent contacts and information interchange between corporate design engineers, plant engineers and systems specialists.

b. Onsite Engineering Support

Overall, functions of the Systems Engineering Division were quite effective and particularly strengthened engineering support for maintenance. The division was well structured and staffed by qualified personnel. The division activities were performed per its established reference manual.

The observed program and performance deficiencies, which when corrected could enhance the effectiveness of onsite engineering support, included:

- informal engineering assessments that were conducted to support the plant maintenance activities; and,

- lack of procedural guidance or instructions regarding the purpose, scope, content, use and distribution of the current system status reports.

5.0 Equipment History and Trend Analysis

5.1 Scope of Review

The primary focus of this review was to ascertain the adequacy, extent, and effectiveness of licensee's overall effort, and management's attention in this area. The inspector specifically selected the applicable elements of the program for examination to determine whether:

- the equipment history and trend analysis were centralized or divided;
- the program was formalized;
- the effort was viable and overall results were evident; and
- any significant problem has been resolved.

The documents reviewed for this effort are listed in Appendix F.

5.2 Observations and Findings

To assess the effectiveness of equipment history and trending programs, the inspector reviewed records and held discussions with licensee management and technical personnel. The effort of the Nuclear Engineering Department (NED) was reviewed separately in the licensee's Braintree, Massachusetts, office and the overall trend analysis program was reviewed at the plant site. The details of the review are summarized below.

The licensee's Nuclear Engineering Department tracks and analyzes plant and industry data to enhance reliability, availability, and maintainability of plant systems and components. The results of this effort, reviewed by the inspector, indicated a comprehensive study of selected plant systems. NED has initiated a compilation of system and equipment data referred to as "Pilgrim Risk Analysis Data Base". The data collection effort covers a period of January 1978 through March 1987. For specific component failure data, the period covers January 1978 through April 1986. The cornerstone of the effort is the planned Bayesian Analysis of the developed data base. The analysis is based on Bayesian interpretation of probability and the concept of "probability of frequency". The data collection approach, various definitions and criteria used, and the documents used to develop the Pilgrim plant specific data base were reviewed.

In the data base, for each component and failure mode, failure events are summarized on a data summary sheet. Another summary describes the corresponding number of demands or operating hours, and how the success data are developed in the component.

The NED also tracks industry data through the Nuclear Plant Reliability Data System. The above data are classified as the Pilgrim Reliability Data Base, and are used to establish and analyze significant trends in plant performance. A monthly report is provided to licensee management.

At the plant site there are several different systems which are called trending by different site organizations. Each of these activities is specifically geared to meet the needs of the organization monitoring the trend. For example, the systems engineering division monitors and trends equipment vibration, and failure and malfunction reports; the maintenance department trends and analyzes instrumentation and control (I&C) system surveillance and calibration; and the site engineering group of the NED monitors ESRs. The inadequacy of the ESR status report has been discussed in section 4.2.a of this report.

The inspector noted that the equipment vibration monitoring and trending are computerized, and are adequate for the purpose for which they are intended. However, the trending and analysis of F&MRs are based on uncontrolled data maintained by an engineer in the compliance department in a personal computer. The licensee's controlled data base which utilizes the SEEK computer system has an extensive data entry backlog ranging from three months to almost a year by different individuals in the licensee organization. The SEEK data base system, therefore, is inadequate to provide a meaningful trend analysis.

The inspector, however, did note that the systems engineering division issues a formal F&MR trend analysis report every six months. This trend analysis is based on the uncontrolled data discussed above. The report is divided into ten major areas, e.g. I&C, electrical, mechanical, etc. The licensee has issued these trend analysis reports since 1983.

The inspector reviewed the two reports issued for the year 1987. The first covering the period from January 1987 through June 1987, and the other from July 1987 through December 1987. The reports contained generally sufficient information and analyzed general trends in the broad areas. They also had some specific recommendations to the management for improvements in the areas analyzed.

The inspector, however, determined that there was no established distribution list for the report, and the recommendations contained in the report are not tracked to determine if the recommendations have been accepted or rejected by the management. Also, there was no engineering review mechanism established to determine, if the recommendation has been accepted, whether an effective corrective action has been implemented to reverse the adverse trend.

In the maintenance section, the I&C trending program is based on a computer system developed for the licensee by Quadrex Corporation. The program is currently in the process of implementation in the I&C division of the maintenance section. The inspector reviewed the program with assistance from the licensee's compliance engineer and the I&C division manager. The computer program developed by Quadrex appeared to have extensive capabilities for an effective trend analysis. The inspector was informed by the management of the maintenance section that they planned to integrate other areas of maintenance, such as electrical and mechanical, into the same system over a period of time when the system is fully developed and implemented.

5.3 Conclusions

Based on the above observations and findings, the team concluded that a program deficiency existed in this area, in that there was no coherent, centralized and controlled equipment history and trend analysis program. Although several distinct efforts in this area were implemented and appeared to vary in effectiveness from marginal to excellent, a strong, controlled program with clear overall objectives policies and implementing instructions was not evident. Due to the fragmentation of the program, an effective, centralized monitoring of equipment history and trends, and resulting recommendations, also was not evident. The contribution of this program in resolving significant trends before they became problems did not appear to be effective overall.

6.0 Vendor and Other Technical Information

6.1 Scope of Review

The inspectors review of maintenance work (see section 2.0) included a determination whether generic issues are factored into the maintenance of equipment. The technical information included, but was not limited to General Electric (GE) Service Information Letters (SIL's), INPO Nuclear Plant Reliability Data System (NPRDS) and SERs, Significant Event Reports (SER's), Licensee Event Reports (LER's) and Vendor Manuals.

6.2 Observations and Findings

The inspectors noted that several generic issues impacted the particular maintenance work that was reviewed during this inspection. It was verified that this information was considered and factored into MR's or other appropriate actions were taken as discussed below.

a. GE SIL's and INPO Information

The process for obtaining vendor technical information (VTI) from General Electric (the Nuclear Steam System Supplier) was reviewed and discussed with the principal systems specialist, who is the cognizant responsible individual. This engineer is on a direct mail list for GE VTI and distributes the information to the appropriate engineering discipline for review. This VTI is placed into a computerized data base, it is tracked internally and there is a feedback mechanism to GE. This individual also receives the monthly distribution of INPO generic information.

b. SIL 392 Supplement 1 - Improved HPCI Turbine Mechanical Overspeed Trip Design

General Electric (GE) recommended that utilities operating BWRs with Terry Corporation HPCI turbines replace the mechanical overspeed trip tappet assemblies with the modified design which incorporates a smaller tappet diameter of 0.738 to 0.740 inches. The smaller tappet diameter increases the tappet-to-valve body clearance to a range of 0.010 to 0.013 inches when the assembly is dry and at ambient temperature. An alternative action stated by GE was to machine existing tappets' diameters to a range of 0.738 to 0.740 inches.

The licensee addressed SIL 392 Supplement 1 under MR 86-23-41, MSC-5. The tappet for the mechanical overspeed trip tappet assembly was machined to provide a 0.013-inch tappet-to-valve body clearance.

c. SIL 306 - HPCI Turbine Stop Valve Hydraulic Cylinder Seal Failure

General Electric recommended that BWR operators with Terry HPCI turbines examine the stop valve hydraulic cylinder for bypass leakage around the cylinder piston on a quarterly basis until the seals are replaced and annually thereafter. GE also recommended that the stop valve hydraulic cylinder piston cup seals be replaced at the first convenient maintenance opportunity or within seven days, if excess leakage is detected at the cylinder drain line.

The licensee is currently performing the valve examinations in accordance with the SIL. The systems specialist is tracking and scheduling the examinations. The last examination was performed on November 5, 1987 and the systems specialist stated that since the plant is not operating, the next examination would take place during plant startup. The stop valve will then be examined quarterly until the piston cup seals are replaced. The seal replacement will occur the next time the stop valve is disassembled.

d. SIL 30 - Severe Hydrodynamic Transients

GE recommended this modification to all BWR owners and the licensee acted on this issue (see section 4.0, Corporate Engineering for details).

e. INPO SER 19-86 - Check Valve Failure

INPO SER 19-86 described the potential problems associated with missing tack welds in the Anchor Darling check valves (classes 150, 300 and 900).

The licensee identified fourteen check valves of this type in service at Pilgrim with four located in the feedwater system, one each in the HPCI and RCIC systems and eight in the main steam vacuum relief system and initiated MR's to inspect them. The results of the inspections identified that there were no tack welds required on the HPCI turbine exhaust check valve and that a tack weld was missing on a vacuum relief valve which was subsequently repaired to correct the problem.

f. LER 87-019 - Automatic Actuation of Primary Containment System Group 6 Isolation Valve

LER 87-19 describes an actuation of the reactor water cleanup system. The actuation resulted in the automatic closure of the inboard RWCU/primay containment system isolation valve MO-1201-02. The actuation occured during the installation of a calibrated temperature switch in the inboard primary containment isolation system logic circuit that controls the isolation valve. The temperature switch was inadvertently grounded during the installation and caused the logic circuit fuse to blow. The cause of the actuation was determined to be personnel error. The licensee's long term corrective actions were to revise procedure 8.M.2-1.2.2, to provide cautions to the I and C technicians and the control room staff and to prepare an engineering service request (ESR) to evaluate the possibility of changing the calibration frequency of the area high temperature switches.

The licensee has revised procedure 8.M.2-1.2.2 to include caution statements throughout the procedure which warn that inadvertent grounding of the temperature switch would cause a loss of power and that the reactor water cleanup system would isolate. The licensee has also submitted an ESR (88-322) suggesting a reduction in the calibration frequency of the temperature switches or an upgrade of the system by replacing the switches or utilizing snap type connectors. The ESR is currently being evaluated by the Nuclear Engineering Department.

6.3 Conclusions

No program or performance deficiencies were identified with respect to the licensee's process for factoring vendor and other technical information into the care of equipment. The licensee has established and implemented a VTI program with GE. Based on the sample reviewed, this effort was effective.

The limited sample of three GE SIL's, one INPO SER and an LER that were reviewed exhibited appropriate considerations and actions.

Licensee performance with respect to the above indicated the effort was functioning well and management support was evident.

7.0 Maintenance Interface with Others

7.1 Scope of Review

The inspectors evaluated the effectiveness of interfaces with the engineering (site and corporate offices), plant operations, QA/QC and Health Physics/Radiation Protection (HP) groups. (See attached Figure 2, Boston Edison Company Pilgrim Nuclear Power Station and Nuclear Organization Charts dated May 5, 1988.) The evaluation included consideration of certain interface attributes and methods, when the inspectors determined that a condition(s) appeared to require such communications, and specifically included a determination that:

- necessary contacts were accomplished; and
- documented/oral concerns (expressed during worker interviews) were followed up and originators advised of results.

7.2 Observations and Findings

a. Operations

The maintenance interface with operations is defined in the maintenance request (MR) procedure 1.5.3-1 Rev. 24. The MR is initiated by the maintenance planning group, then the nuclear operations supervisor (NOS) reviews the MR for duplication, scope of the work, potential impact on Technical Specifications, system number, and signs it. After the entire package is prepared and approved, the NOS reviews the package again and establishes the system/component isolation requirements. The nuclear watch engineer (NWE) then reviews the package for safety related work, reverifies operability requirements (Technical Specification LCO) and adequacy of isolation and approves the MR for isolation. The NOS then prepares the necessary tags and places them on the components and authorizes work to start.

BOSTON EDISON COMPANY
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FIGURE 2

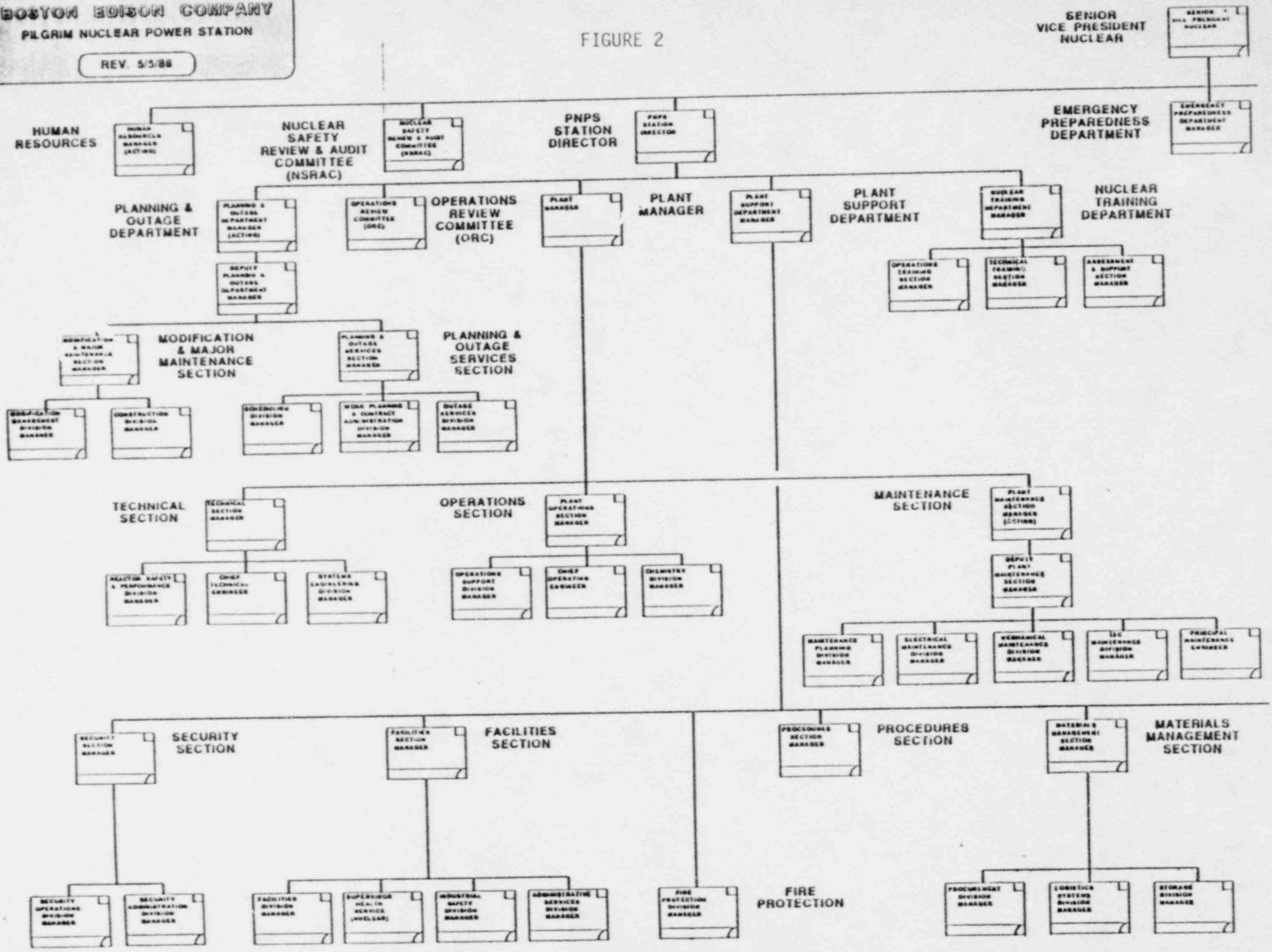
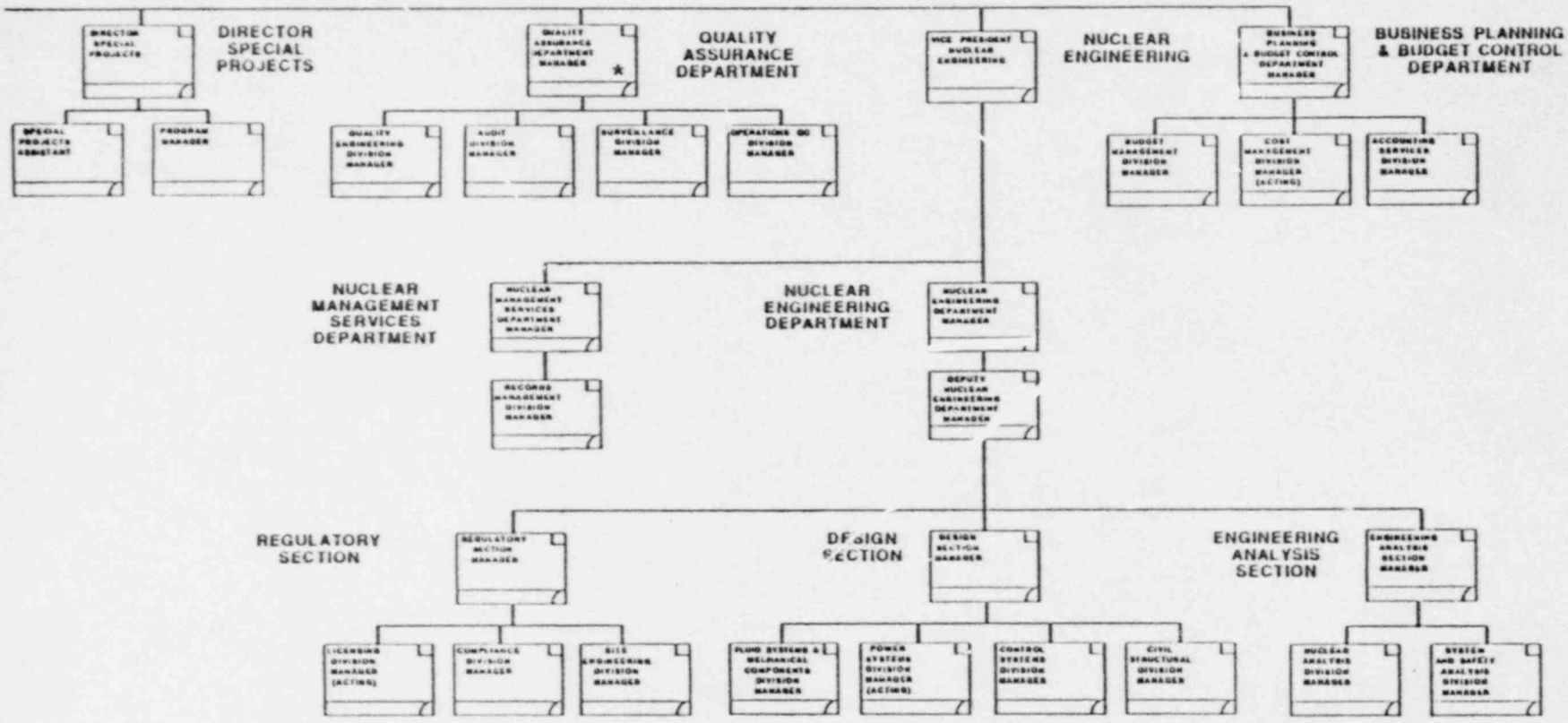
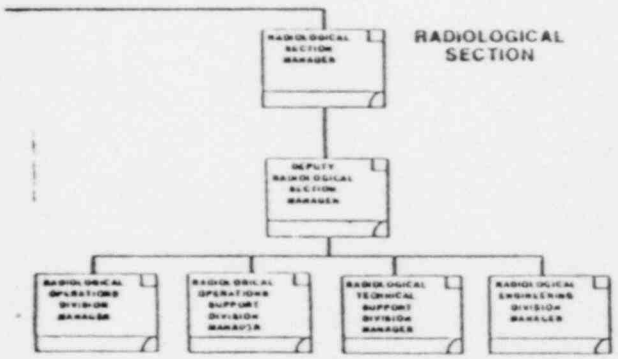


FIGURE 2

NUCLEAR ORGANIZATION

REV. 5/5/88





* In transition from V.P. Engineering to Senior V.P. Nuclear

Once the work is completed, the NOS is responsible for accepting the work, following satisfactory completion of the post-work testing requirements, and also for removing the tags.

Based upon the inspector's review of several MR's, the interfaces as described above were effective.

b. Engineering

The Systems Engineering Division includes systems specialists who maintain overall system oversight. The offsite and onsite design engineering groups provide the necessary support on design changes, modifications, etc. The maintenance interface with these engineering staffs is discussed in section 4.0.

c. Quality Assurance

The inspector discussed the maintenance interfaces with three groups of the Quality Assurance Department, namely the Audit Division, Surveillance Division, and the Operations QC Division. The following observations and findings were made for each group.

1. Audit Division

This division performs audits in accordance with QA department procedure 18.01 which complies to 10 CFR 50, Appendix B criteria. The audit division conducts approximately three system audits every year such that all the Appendix B criteria are covered within a two-year period. The Audit Division, until two years ago, conducted specific programmatic reviews. The inspector reviewed three recently conducted system audits, namely (1) Shutdown From Outside Control Room, (2) Residual Heat Removal System and (3) Standby Liquid Control System. These audits were reviewed to determine the licensee's assessment of maintenance. Apparently, since the system audits took the cross section of several phases of the operation, no indepth assessment of the maintenance program activities was made in these audits. The audits were primarily based upon documentation review and very little on monitoring the maintenance activities. Based on the limited sample of audits reviewed during this inspection, the effectiveness of the audit program could not be determined.

2. Operations QC Division

The Operations QC Division, establishes necessary hold points during their review of the maintenance requests related to nuclear safety, fire protection and environmental qualification. After the work activity is complete, a QC inspector reviews the work package assuring all the QC open items are satisfied and

then signs off the MR. The QC inspector then prepares the inspection report.

The inspector reviewed several QC inspection reports (QCIRs) and work packages and also discussed the details of the inspection program with the QC manager and determined the following.

- The QC inspector, while witnessing the work activity, often identifies and resolves the issues at the same time, but the QC inspection report does not provide any details of QC observations or actions taken for resolution.

- The hold points established on the maintenance request and or applicable procedure were appropriately selected and signed off. However, the QCIR does not address the specific hold points inspected or the QC inspector's findings related to hold point observations to facilitate future trending.

- The inspector reviewed some of the open nonconformance reports (NCR's). The QC group was tracking the NCR's very closely and had current status on each.

- The control on procurement items was adequate. The QC inspectors had formal instructions to conduct the receipt inspection. The process of inspection was very much document oriented, and included little selective physical verification. However, recording of data as well as the acceptance was done per established procedure. The procurement records were easily retrievable.

- The QC group is short four of the authorized sixteen QC engineers. Hiring requests have been authorized to fill these positions and the QC manager has taken the necessary action to increase staff size to that authorized.

- The QC manual did not require specific document control measures for identification of individuals or organizations responsible for preparing, reviewing, approving and issuing documents.

To assess the effectiveness of the procurement process, the inspector followed up a discrepancy noted during the walkdown of the CRD system. The discrepancy was on the pressure rating of the accumulators. The QC inspector was able to retrieve all the necessary documentation such as the procurement request, purchase order, receipt inspection, certificate of compliance as well as vendors documents explaining the discrepancy in pressure rating, etc. No deficiency was found.

3. Surveillance Division

The Surveillance Division performs surveillances on the ongoing plant activities such as use of measuring and test equipment, failure and malfunction reports, maintenance, procedure compliances, etc. The inspector reviewed several surveillance reports and made the following observations.

•• The group consists of qualified and well trained staff.

•• The quality of surveillance reports was found to be satisfactory.

•• The group has a formal system for tracking the deficiencies identified during the surveillance.

•• The deficiency report system includes deficiency identification date, response date, extensions, completion dates, etc. All the extensions are granted by the Vice President only, however, extensions to complete outstanding deficiencies did not always have definitive commitment dates.

d. Health Physics

The maintenance department staff includes a radiological advisor who coordinates maintenance activities involving radiological conditions with the health physics and the ALARA groups. The inspector discussed maintenance activities with the radiological advisor and ALARA engineers, reviewed several work packages including the one involving reactor vessel reassembly MR-87-54-16 with estimated radiation exposure of approximately 20 Man Rem. The inspector determined the following.

- The licensee has a formal procedure to conduct ALARA job reviews (procedure number G.10-013), depending upon the estimated exposure levels.

- The coordination of maintenance activities is accomplished through a single point of contact, the Radiological Advisor, who provides basic information on the radiation work permit (RWP) such as exact location of maintenance activity, estimated man hours, component, and the number of workers. This single point of contact provides very effective interfaces with other groups.

- The RWP then goes to the health physics (HP) group. Depending upon the radiological condition within the designated work area they determine various requirements such as protective clothing, respiratory protection, and monitoring.

- Based on the radiological conditions, the ALARA group develops engineering controls to minimize radiation exposure.

- The final approval of the RWP is by the HP supervisor who normally reviews only the original HP input and not the ALARA engineering controls. In many instances, when the ALARA controls are implemented, the radiation exposure working conditions are altered and the RWP is revised to take advantage of the better working conditions. The licensee has recognized this redundancy and is considering several resolutions including a revised RWP review/approval flowpath where the Radiological Advisor would coordinate the ALARA and HP inputs so as to reduce the number of RWPs needing revision after issuance.

- The ALARA process also includes a detailed job review while the work is in progress to assess the effectiveness of the engineering controls as well as make necessary changes to reflect current radiological conditions.

- There is a post job review critique process. The critique includes assessment of each task activity performed, estimated exposure versus actual, adequacy of engineering controls, training, mock-up, lessons learned, etc. The final results are documented for future repeat jobs. The current method of retrieving this data is manual. The licensee plans to computerize the system to assist maintenance planners in planning the repeat jobs.

- The exposure performance data are based on initial estimated exposure versus actual, but it does not take into account the reduced estimated exposure as a result of ALARA engineering controls or the total number of RWP's and job activities that support and conduct the work. The same is true for skin contamination data. The ALARA group leader plans to include these measures in developing the ALARA performance data.

- The ALARA group has an experienced and well-qualified staff, and has demonstrated effectiveness in reducing radiation exposures.

7.3 Conclusions

Based on the above observations and findings, the team concluded that maintenance interfaces generally were effective, particularly with respect to the coordinated performance of maintenance activities. Specific strengths were noted regarding:

- the work control (MR) initiation, review, approval, prioritization, planning, scheduling, oversight and restoration processes;

- engineering support for maintenance (see section 4.3);

- quality verification of maintenance work;
- maintenance department radiological advisor coordination functions; and,
- ALARA group functions of job planning, work-in-progress review, post-work critique and incorporation of lessons learned.

Program and performance deficiencies were noted, in that:

- the licensee's current system audit program appeared to be too general, as evidenced by the three audits reviewed that did not indicate in-depth audit of the maintenance program;
- the QC inspection reports did not include necessary details on the resolution of the deficiencies found during the work in progress; and
- the coordination between the HP and ALARA groups appeared ineffective, as recognized by the licensee in its discussions of how the current RWP flow path resulted in revisions of the previously established RWP's.

8.0 Maintenance Backlog and Staffing

8.1 Scope of Review

The inspectors reviewed the scheduled maintenance work versus the work deferred for selected components (see section 2.0) in order to determine that:

- the deferred maintenance is reasonable from a reliability, safety and completion date standpoint; and
- licensee analysis tnat any cumulative adverse effect minor work could have on equipment.

The status of the total maintenance work backlog was reviewed and reasons for selected pre-1987 work items being uncompleted.

The education, experience and or training of all levels of pre-maintenance deparment, was reviewed including the use use of contracted personnel vs. permanent personnel.

8.2 Observations and Findings

a. Maintenance Backlog

The inspector selected several open MR's (see Appendix F) initiated since 1983 for work on components in the high pressure coolant injection, reactor core isolation cooling (RCIC), and core spray (CS) systems. The status of each MR, priorities assigned the work, and

expected completion dates were discussed with cognizant systems engineers. It was determined that the reasons for the deferred maintenance was reasonable from a reliability, safety and completion date standpoint except as discussed below.

The licensee intended to perform testing on approximately 90 dc breakers in the HPCI and RCIC systems after the plant returned to full power. This decision was based on successful testing and maintenance of a sample of ten breakers in response to problems identified during a previous NRC inspection (report number 50-293/88-08). The validity of the sample size was questioned and a telephone conference was held between inspectors (resident, team and Region I) and licensee engineers and management. It was agreed that the licensee will perform testing on a sample more representive of the breaker population and this issue will be included in NRC follow-up associated with inspection report 50-293/88-08.

The inspector also reviewed the listing of work addressed by those MR's designated Priority 1 (i.e., must be completed prior to plant restart) and held discussions on their status and manpower loading with cognizant systems specialists. It appeared that the type of work and human resources needed should not prevent the approximately 135 Priority 1 MR's from being completed prior to the licensee-scheduled August 1988 plant restart.

The licensee's tracking system for the total sum of open MR's was not conducive to a work comparability analysis between pre-1986 levels with a reasonable expenditure of inspector resources. However, the licensee publishes a monthly summary of the NUORG (Nuclear Organization) Tracking Programs, that trends 30 types of action/work documents such as engineering service requests, failure and malfunction reports and MR's. A review of this report indicated that 190 MR's remain open from the pre-September 1986 total of 1891. Of 1929 MR's issued since then, 1706 remain open. Of the total 1896 open MR's, approximately 700 remained open for post work/operational testing. The licensee also tracks performance excellence indicators (see Figure 3), which include open MR's and MR's required for restart.

b. Maintenance Staffing

Five of the eight authorized Maintenance and Planning Division supervisor and planner positions are filled by contractor personnel. These positions include the Senior Maintenance Planning and Senior Maintenance Scheduling Supervisor positions, two Senior Maintenance Planner positions, and one Maintenance Planner/Scheduler. Also, three of the four Electrical Maintenance Supervisor positions, and three of the six I&C Maintenance Supervisor positions are vacant. Contractors are being used on a temporary basis to fill two of the Electrical Maintenance Supervisor vacancies. The licensee informed the inspectors that hiring requests have been issued for all openings

PILGRIM NUCLEAR POWER STATION

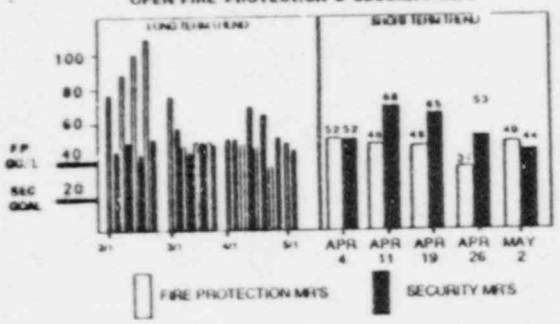
FIGURE 3

5/3/88

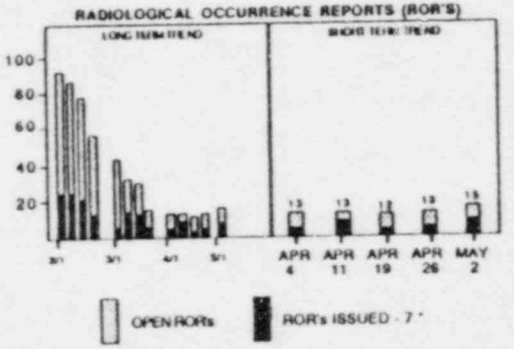
PERFORMANCE EXCELLENCE INDICATORS

(STATUS AS OF MAY 2, 1988)

OPEN FIRE PROTECTION & SECURITY MR'S

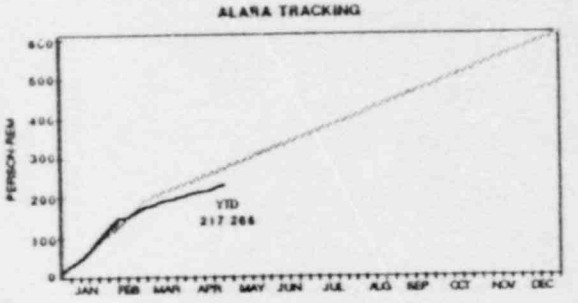


RADIOLOGICAL OCCURRENCE REPORTS (ROR'S)

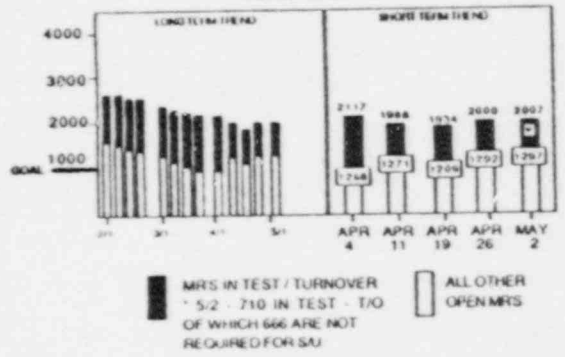


* 5/2 - 2 MAJOR ROR's

ALARA TRACKING

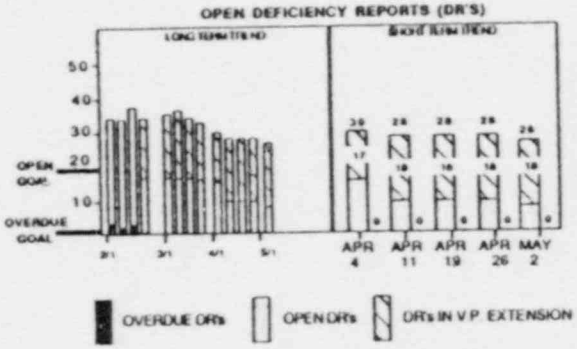


TOTAL OPEN MR'S

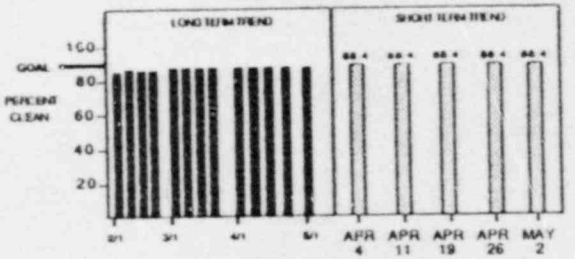


* 5/2 - 710 IN TEST - T/O OF WHICH 666 ARE NOT REQUIRED FOR SU

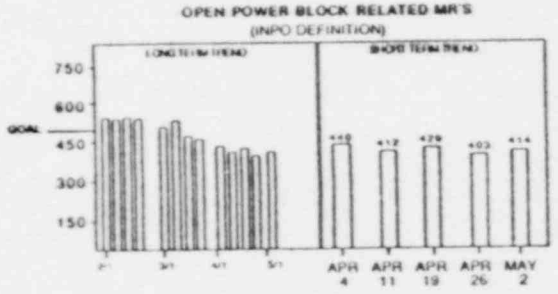
OPEN DEFICIENCY REPORTS (DR'S)



PLANT DECONTAMINATION

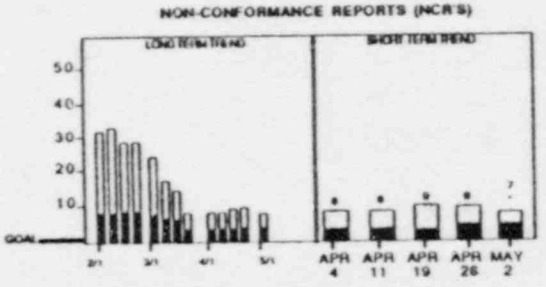


OPEN POWER BLOCK RELATED MR'S
(INPO DEFINITION)



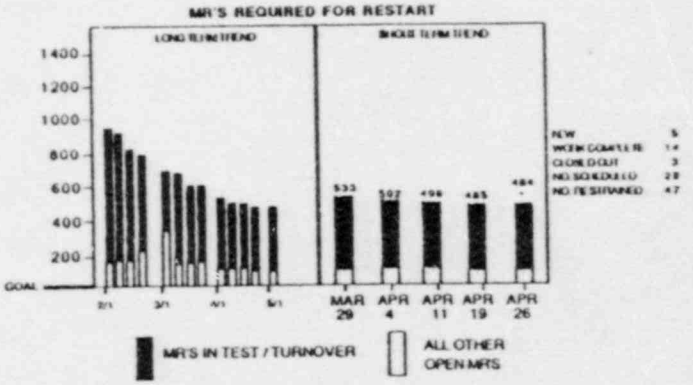
* DOES NOT INCLUDE MR's IN TESTING AND CLOSE OUT

NON-CONFORMANCE REPORTS (NCR'S)



* 5/2 - 4 POWER BLOCK NCR's

MR'S REQUIRED FOR RESTART



* 5/2 - 97 PHYSICAL WORK TO BE COMPLETED

in the Electrical Division and that personnel are being interviewed for the positions; and hiring is in progress to fill the I&C Division positions.

The inspectors reviewed the experience levels of the maintenance personnel currently filling the manager, engineer and supervisor positions. The inspectors determined that the personnel filling the positions had the following ranges of applicable discipline experience: Maintenance Managers (11-29 years), Maintenance Engineers (6-12 years), Electrical Division Supervisors (12-15 years), Mechanical Division Supervisors (11-36 years), I&C Division Supervisors (4-24 years) and Planning and Scheduling Division Supervisors (19-23 years).

The inspectors also reviewed the experience levels of the craft personnel performing the work. The inspectors determined that the nuclear control technician applicable Pilgrim Nuclear Power Station maintenance experience ranges are as follows: approximately 31% with greater than five years, approximately 54% with less than five years and approximately 15% apprentices. The inspector determined that the mechanics and electricians combined possess a higher percentage of craft with greater than five years of applicable Pilgrim Nuclear Power Station maintenance experience. The ranges of experience for the mechanics and electricians combined are as follows: approximately 53% with greater than five years, approximately 31% with less than five years and approximately 16% apprentices.

8.3 Conclusions

Based on the above observations and findings, the team concluded that the licensee's control and management of the maintenance backlog of deferred Priority 1 work was generally effective, in that:

- the open status of the specific MR's reviewed was due to reasonable causes and the concerns expressed by the inspectors were resolved promptly in a satisfactory manner; and

- the work designated Priority 1 appeared to be manageable and able to be completed prior to plant restart.

A significant staffing deficiency was noted regarding the inability to obtain a stable staff within certain supervisory positions of the Maintenance Section, and the potential adverse impact of newly hired supervisors on assuring quality planning and oversight of maintenance activities.

Also, a performance deficiency was noted, as it appeared that the licensee's best efforts to date have not substantially reduced the standing level of non-Priority 1 work waiting to be done, based on a numerical comparison of open MR's from pre-September 1986 and the present. (Although this is a common indicator of insufficient staff, this was not conclusively established during this inspection.)

APPENDIX A

ENTRANCE INTERVIEW ATTENDEES

APRIL 25, 1988

Boston Edison Company

R. Anderson, Plant Manager

N. Desmond, Quality Control Division Manager

F. Famulari, Quality Assurance Manager

R. Grazio, Field Engineering Section Manager

B. Lunn, Senior Compliance Engineer

J. Mattia, Quality Assurance Surveillance Division Manager

R. Sherry, Plant Maintenance Section Manager

C. Stephenson, Senior Compliance Engineer

R. Whetsel, Senior Compliance Engineer

U.S. Nuclear Regulatory Commission

J. Lyash, Resident Inspector - Pilgrim

C. Warren, Senior Resident Inspector - Pilgrim

Maintenance Inspection Team Members

APPENDIX B

MAINTENANCE PROGRAM BRIEFING ATTENDEES

APRIL 25, 1988

Boston Edison Company

W. Armstrong, Outage Services Division Manager

S. Bernat, Senior Systems Specialist

B. Cobb, Instrument and Controls Division Manager

N. Desmond, Quality Control Division Manager

K. O'Donnell, Electrical Maintenance Division Manager

J. Goedtke, Mechanical Maintenance Division Manager

B. Grammont, Plant Maintenance Section Deputy Manager, Maintenance Division

R. Mattos, Senior Systems Specialist

P. Moraites, Maintenance Planning Division Manager

R. Sherry, Plant Maintenance Section Manager

C. Stephenson, Senior Compliance Engineer

R. Whetsel, Senior Compliance Engineer

U.S. Nuclear Regulatory Commission

Maintenance Inspection Team Members

APPENDIX C

INTERIM EXIT INTERVIEW ATTENDEES

APRIL 28, 1988

Boston Edison Company

R. Anderson, Plant Manager

D. Barnett, Assistant to Director Special Projects

W. Clancy, Systems Section Manager

N. Desmond, Quality Control Division Manager

R. Fairbank, Design Section Manager

P. Hamilton, Compliance Division Manager

R. Moraites, Maintenance Planning Division Manager

R. Mattos, Senior Systems Specialist

R. Sherry, Maintenance Section Manager

R. Whetsel, Senior Compliance Engineer

U.S. Nuclear Regulatory Commission

R. Gallo, Chief, Operations Branch

T. Kim, Resident Inspector - Pilgrim

Maintenance Inspection Team Members (except G. Napuda)

APPENDIX D

EXIT INTERVIEW ATTENDEES

MAY 5, 1988

Boston Edison Company

J. Alexander, Plant Operations Section Manager

R. Bird, Senior Vice President Nuclear

N. Desmond, Quality Control Division Manager

F. Famulari, Quality Assurance Manager

P. Hamilton, Compliance Division Manager

K. Highfill, Pilgrim Nuclear Power Station Dorector

J. Mattia, Quality Assurance Surveillance Division Manager

M. Perito, Lead Senior Systems Engineer, Sytems Engineering Division

J. Seery, Technical Section Manager

R. Sherry, Plant Maintenance Section Manager

R. Whetsel, Senior Compliance Engineer, Compliance Division

U.S. Nuclear Regulatory Commission

S. Collins, Deputy Director, Division of Reactor Projects

W. Johnston, Acting Director, Division of Reactor Safety

T. Kim, Resident Inspector - Pilgrim

J. Lyash, Resident Inspector - Pilgrim

Maintenance Inspection Team Members

APPENDIX E

PERSONS CONTACTED

APRIL 25 TO MAY 5, 1988

The Boston Edison Company personnel listed below provided substantive information either during informal interviews, periodic contacts or on-the-job discussions with the NRC team members during the course of the inspection. Other individuals were observed conducting in-process work activities or were contacted to obtain general information.

J. Alexander, Plant Operations Section Manager

E. Almeida, Lead Senior Systems Engineer, Systems Engineering Division

R. Anderson, Plant Manager

P. Antonopoulos, Engineering Analysis Section Manager

W. Armstrong, Outage Services Division Manager

S. Bernat, Senior Systems Specialist, Systems Engineering Division

S. Bibo, Audit Division Manager

M. Boggs, Electrical Supervisor MOV Testing (Quadrex Corp), Electrical Maintenance Division

N. Brosee, Manager in Training

J. Calfa, Systems Specialist, Systems Engineering Division

P. Callahan, Onsite Engineering Representative

W. Clancy, Systems Engineering Division Manager

B. Cobb, Instrument and Controls Maintenance Division Manager

N. Desmond, Operations Quality Control Division Manager

R. Fairbank, Design Section Manager

F. Famulari, Quality Assurance Department Manager

S. Fleischman, HP Coordinator (Bartlett Nuclear, Inc.), Maintenance Planning Division

P. Ginnetty, Mechanical Maintenance Supervisor, Mechanical Maintenance Division

J. Goedtke, Mechanical Maintenance Division Manager

D. Hanley, Senior Reliability Engineer, Risk and Reliability Division

L. Kitchen, Systems Specialist, Systems Engineering Division

P. Moraites, Maintenance Planning Division Manager

J. Mattia, Quality Assurance Surveillance Division Manager

R. Mattos, Senior Systems Specialist, Systems Engineering Division

G. Mileris, Senior Mechanical Engineer, Fluid Systems and Mechanical Components Division

F. Mogolesko, Principal Engineer, System and Safety Analysis Division

J. Peters, Senior Construction Engineer, Construction Division

J. Poorbaugh, Senior QA Engineer, Surveillance Division

J. Posselt, Senior Supervising ALARA Engineer, Radiological Operations Support Division

W. Riggs, Fluid Systems and Mechanical Components Division Manager

R. Sherry, Plant Maintenance Section Manager

APPENDIX F

DOCUMENTS REVIEWED

Maintenance Requests

87-13-3	Perform Maintenance on 13A-K32 relay	Cancelled
87-13-48	Repair leak on HO-1301-17	Completed
88-13-12	Partial Overhaul of MO-1301-49	Completed
83-13-22	Check bypass valve AO-1301-71	Cancelled
83-22-2	Investigate closing of MO-1301-16	Completed
85-13-30	Repack MOV-1301-32	Completed
83-13-99	MOV-1301-17 burnt operator	Completed
88-10-34	Repair leak on HD-1001-333B	Completed
88-10-35	Repair leak on HD-1001-332B	Completed
88-6-20	Repair leak on HO-286, 287	Open
86-23-41	HPCI five year PM	Open
87-23-53	Discrepancies in box T2303	Completed
87-23-8	Temporary Mod for HPCI	Completed
87-622	Faulty resistor in HPCI speed control	Completed
87-23-18	Resolve DR1126 problems	Completed
86-23-26	Body to bonnet leak on 2301-22	Completed
87-23-71	Replace gauge adjacent to HO-2301-83	Cancelled
88-23-41	HPCI oil cooler hi oil temperature alarm	Cancelled
87-23-60	Valve shows dual indication when open AO-2301-31	Completed
88-23-30	Vavle shos dual indication when open AO-2301-31	Completed
87-23-3	Perform maintenance on relay	Cancelled
87-23-4	Perform maintenance on relay	Cancelled
87-23-5	Perform maintenance on relay	Cancelled

86-23-64	Replace motor on 2301-5	Cancelled
87-23-69	MO-2301-14 Valve stem keyway damaged	Cancelled
87-23-106	HPCI valve overload alarm - in and out	Completed
87-23-59	Body to bonnet leak on 2301-7	Cancelled
87-23-74	Perform internal inspection 2301-45	Completed
87-27-59	MO-3873 indication light not working properly	Cancelled
88-23-16	MCC 824 terminations unacceptable	Completed

Procedures

8.M.2-2.7 CSCS Pump Discharge Monitors, Revision 9

TP 87-83 Control Panel Wiring Inspection, Revision 3

3.M.1-30 Post Work Testing Guidance, Revision 0

3.M.1-11 Routine Maintenance, Revision 6

3.M.3.8 Inspection/Troubleshooting - Electrical Circuits, Revision 10

1.5.3 Maintenance Requests, Revision 24

1.4.5 PNPS Tagging Procedure, Revision 22

QA/QC Reports

88-9.1-1 Facility Tour Surveillance

88-9.1-2 Facility Tour Surveillance

88-9.1-3 Facility Tour Surveillance

88-9.1-4 Facility Tour Surveillance

88-9.1-5 Facility Tour Surveillance

88-1.4-1 System Alignment Surveillance

88-1.4-2 System Alignment Surveillance

88-1.4-3 System Alignment Surveillance

88-1.4-4 System Alignment Surveillance

88-04 Shutdown From Outside Control Room Audit

88-3.1-6 Measuring and Test Equipment Surveillance

88-3.1-2 F&MR Surveillance

88-3.1-22 Preventive Maintenance Surveillance

88-3.1-20 Cancelled MR Surveillance

87-3.1-17 24, 125, 250 Volt DC Battery Charger Surveillance

87-3.1-4 Classification of MR Surveillance

87-3.1-13 Material Control Surveillance

87-3.1-7 Post Work Testing Surveillance

Miscellaneous

V-0257 Terry Corporation vendor manual for HPCI turbine

SG88-088 Office Memorandum - Work Prioritization Team

System Status Summary Report for HPCI dated April 15, 1988

Maintenance Group Performance Indicators for Week Ending April 16, 1988

Commercial Quality Item Evaluation Log

HPCI Performance Review, dated August 27, 1987

HPCI/RCIC Testing with Auxiliary Steam Completion Report, dated January 11, 1988

Follow-up and Evaluation of IEB:85-03

Pilgrim Plant Specific Data Base

Pilgrim Risk Analysis Data Base

Executive Management Information Report, Performance Monitoring for HPCI

Backlog Maintenance Requests (MR)

MR-86-46-431 Through 438 and 440, Perform Breaker Test and Maintenance

MR-87-13-2, Perform Maintenance on Relay

MR-87-13-73, Flange Gaskets Not Conforming to Pipe Specification

MR-88-13-5, Safety Related Terminations Unacceptable

MR-88-13-17, Replace Terminal Block Connection

MR-83-46-460, 463, 467, 469 and 473, Breaker Calibration and Overhaul

MR-86-23-45, HPCI Quarterly Oil Sample

MR-88-23-26, Repair Stellite Overlay on Valve Disc

MR-86-13-46, Cracked Insulator Barrier

MR-86-46-[illegible] and 430, Breaker Test and Maintenance

Engineering Services Requests (ESR):

88-293 : Power System

88-18 : Control System

88-341 : Civil/Structural

88-276 : Power System

88-409 : Control System

88-140 : Control System

88-140,Rev: Control System

88-075 : Power System

88-075,Rev: Power System

88-168 : Mechanical System

88-153 : Mechanical System

88-170 : Mechanical System

Drawings

M-MOV1: Motor Operated Valves Information Table

M-MOV2: Motor Operated Valves Information Table

M-MOV3: Motor Operated Valves Information Table

M-MOV4: Motor Operated Valves Information Table

M-MOV5: Motor Operated Valves Information Table

M-MOV6: Motor Operated Valves Information Table

M1J6-4: Process Diagram - HPCI

Failure and Malfunction Reports (F&MR)

87-596 : HPCI Turbine

87-597 : EDG 'B'

88-37 : HPCI Valve MOV-2301-5

87-657 : RWCU System, Valves MO-5 and 80

F&MR Trend Analysis Reports for January - June 1987 and July - December 1987

Plant Design Change Requests (PDCR) and Safety Evaluations

88-15 : Replacement of VEX-104 A&B Fans

85-59,Rev1: HPCI Vacuum Breaker (SE #2268)

--N/A-- : Change in HPCI Start Time (SE #1830)

85-35 : Hydraulic By-pass Around EG-R Actuator (SE #1833)