VOLUME I

FINAL REPORT OF AN INDEPENDENT REVIEW OF NINE MILE 2 RELATED NRC CAT INSPECTIONS AND SALP REPORT AND NIAGARA MOHAWK IDENTIFIED DEFICIENCIES

SUMMARY AND CONCLUSIONS

REVISION 1

Prepared For

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FOREWORD

Volumes I, II and III of this report were distributed simultaneously to the Nuclear Regulatory Commission and to Niagara Mohawk Power Corporation on December 26, 1984. Volume I contained the Executive Summary and the Summary and Conclusions for the entire report. Details of each assessment were contained in Volume II and identification of each document assessed, the result of the assessment and assigned responsibility for corrective action are shown in matrices in Volume III.

The Executive Summary and Summary and Conclusions reported certain data in a different manner than had been presented orally to the NRC and NMPC. While both methods were consistent with the results shown in Volumes II and III, the Summary exaggerated the percent deficient previously reported for Phases I, II and III. In these three phases, the number of items previously identified by the NRC and NMPC exceeds the number of documents in which the deficiencies were identified. In Phase IV the number of deficient items and the number of documents are essentially on a one-for-one basis. The original version of Volume I evaluated all four phases on a document basis. If only one of several items covered by a specific document were found deficient by the Assessment Team in implemented corrective action, the entire document was judged unsatisfactory. For example, Phase I consisted of 60 documents containing 365 items. Based on 13 of 60 documents being deficient to some degree, the percent unsatisfactory was 22 percent. Based on 38 items of 365 being deficient the percent unsatisfactory is 10.1 percent. When the information was furnished to the NRC in a meeting November 14, 1984 and in the interim reports, the percent unsatisfactory was furnished on this latter basis.

Throughout the assessment, the team made recommendations intended to enhance the effectiveness of corrective action on future occurrences of similar conditions. In all cases where recommendations were made, the committed corrective action had been implemented and was satisfactory for the specific deficiency identified. In some instances, reviewers of Volume I had the perception that the categorization "Satisfactory with Recommendations" equated in some manner to "Unsatisfactory". This perception is incorrect.

In the original version of this volume, the responsibility for corrective action for Phases I, II and III was assigned to Niagara Mohawk even though the responsibility for taking corrective action was that of one of the major contractors. This revision of Volume I assigns the responsibility for corrective action to the organization responsible for implementing it.

When the observed condition was judged to be unsatisfactory, a Corrective Action Request (CAR) was originated by the team. There were 77 CARs and 6 ITT Inspection Reports written, but these applied to 132 different deficiencies. It was not clear to some reviewers that a CAR could apply to more than one deficiency and thus appear repetitively in the report against more than one deficiency, more than one criterion or more than one of the four phases. The assignment of CARs to individual quality assurance criteria has been reviewed. Some have been deleted where the assessment was concluded to be inappropriate. The total numbers of CARs and IRs remain unchanged.

The report included Pareto analyses relating to the deficiencies in the original document and those identified by the Assessment Team in their inspection of hardware and review of documents. The purpose of these analyses was to isolate the principal causes of deficiency by responsible organization and to identify those areas where corrective action could bring about the greatest improvement. The manner of displaying this information contributed to confusion, because in order to provide a larger and therefore more meaningful sample, items that were dispositioned "Satisfactory with Recommendations" and "Unsatisfactory" were combined together solely for the purpose of analysis. This was an alternative to analyzing the entire population for each contractor. Word changes have been made to make the analysis of Phases I, II and III consistent with other revisions in the report and to clarify the intent of such combination. In addition, for further clarification, quantities have been restated numerically rather than as a percentage of the total number of deficiencies. This provides a more readily understood view of the results.

Finally, the Assessment Team evaluated certain but not all of the overall aspects of the quality assurance program as to the degree of being satisfactory. Such evaluation was beyond the scope of the assigned task, but more importantly it is not considered that

such evaluations can be generically applied to NMPC and the five principal site contractors. Such evaluations occurred in only 12 of 18 areas evaluated in Section 4.0 of Volume I and have now been deleted.

Revised areas throughout are identified by a line in the right hand margin.

In summary, the purposes of the revision to Volume I are as follows:

- Present summarized data in the same manner as presented in charts shown the NRC in a meeting November 14, 1984 and consistent with the manner shown in interim reports.
- Assign the responsibility for corrective action to the organizations required to implement it.
- Clarify the acceptability of corrective actions for which the Assessment Team made recommendations.
- Clarify that Corrective Action Requests may, and often do, apply to more than one deficiency, quality assurance criterion, or phase of the assessment.
- Provide an overall statement on the adequacy of the corrective action effort.
- Eliminate confusion that reviewers of the original version of Volume I, may have experienced.

EXECUTIVE SUMMARY

The Nuclear Regulatory Commission (NRC) directed Niagara Mohawk Power Corporation (NMPC) to have an independent assessment of corrective action implementation and adequacy performed. Management Analysis Company (MAC) was commissioned by NMPC to perform this independent assessment of corrective and preventive actions related to deficiencies identified by the Construction Appraisal Team (CAT) report, the most recent Systematic Assessment of Licensee Performance (SALP) report, NMPC and its five major site contractors during the period January 1, 1981 to March 31, 1984. The independent assessment was divided into four phases. Interim reports were issued for the first three phases. This report includes the final results of the first three phases and the results of the fourth phase. Many of the recommendations made in the interim reports have since been implemented by NMPC. This report does not assess the effectiveness of such implementation or of changes in organization, staffing, and program made since March 31, 1984.

The results of the assessment show that 96.1 percent of the items for which corrective action commitments made by NMPC and its contractors over this period were adequately implemented. In 9.7 percent of these cases, the MAC Independent Assessment Team (Assessment Team) made recommendations to enhance the effectiveness of corrective action. In 3.9 percent of the cases, the committed corrective action was either not implemented or not implemented adequately.

The Phase I Interim Report covered 38 of 60 NRC-identified CAT items, for which the Assessment Team issued 6 Corrective Action Requests (CARs). Sixty-six CAT items were originated, but 6 were either non-safety-related or combined with other CAT items reducing the evaluated number to 60. The remaining 22 items have since been assessed, and resulted in the issuance of 6 additional CARs.

The Phase II Interim Report covered 33 of 36 NRC violations identified in the NRC SALP report, and 15 of 61 Construction Deficiency Reports (CDRs). One CAR was issued, 38 NRC SALP items were originated, but 2 were for the deficiencies already addressed in CAT items, thus reducing the number to 36. Two SALP items and three CDR items have

since been evaluated by the Assessment Team. No additional CARs were issued. Three SALP items and 46 CDR items are still unresolved and require closure by NMPC, so corrective action could not be confirmed.

The Phase III Interim Report covered 169 of 196 NMPC audit findings, for which four CARs were issued. Two hundred sixteen NMPC Audit Items were originated, but 19 were either non-safety-related, covered in another phase or were Nine Mile 1 items. Of the remaining 27 items, 7 remain open and require NMPC closure, and 20 are evaluated here. No additional CARs were originated.

There was no interim report for Phase IV. It covered 2,644 deficiency documents for the five major site contractors. The evaluation showed 2,554 corrective action commitments to have been satisfactorily resolved. One hundred fifty of these were judged Satisfactory with additional action recommended to enhance corrective action effectiveness. In 90 cases, the corrective action had not been implemented adequately and CARs were originated.

While the overall results of the assessment showed acceptability in 96.3 percent of the cases, indicating a high degree of reliability in implementing committed corrective actions, some deficiencies were identified by the Assessment Team. Acceptable corrective action has been categorized as "Satisfactory" and "Satisfactory with Recommendations". In both cases, the corrective action was implemented and was effective for the specific deficiency. Analysis showed that the primary areas of deficiency related to 8 of the 18 Criteria of 10CFR 50, Appendix B, and 5 concerns related to hardware deficiencies. These areas are discussed further in the following paragraphs.

Programmatic Deficiencies

Programmatic deficiencies related to 8 of the 18 Criteria of 10CFR50, Appendix B, have been identified as requiring improvement. Seventy-seven Corrective Action Requests (CAR) were originated to identify conditions judged to be unsatisfactory during the assessments. A CAR may apply to more than one criterion, deficiency or phase of the assessment.

Design Control

Both NMPC and Stone and Webster Engineering Corporation (SWEC) have made improvements in the design control system, including instituting a computerized system for posting design changes, reducing the number of drawing stations and providing faster distribution of changes. However, the assessment pointed out areas that still need improvement. Some drawings are still not being reviewed according to procedures, design changes are not always posted against each affected drawing and the number of changes indicate inadequate review of proposed changes. The Assessment Team initiated 3 CARs for this Criterion:

84.0042 84.0067 84.0072

Instructions, Procedures and Drawings

Lack of appropriate procedures and improper procedural implementation have been indicated as the root cause of many of the deficiencies. Improvement should be made by including acceptance criteria and inspection attributes in inspection plans and procedures. The Assessment Team initiated 2 CARs for this Criterion:

84.0114 84.0116

Control of Purchased Materials

Source inspection planning which will require witness testing and verification of objective evidence has been committed to by SWEC Quality Assurance (QA), but has not yet been implemented. NMPC has committed to participate (selectively) in source inspection. The Assessment Team initiated 2 CARs for this Criterion:

84.0132 84.0160

Special Processes

Some of the deficiencies associated with the requirements of this Criterion have been corrected. The Assessment Team issued a CAR because of improperly maintained welder qualification records, and data transferred from one qualification record to another without cross-reference or certification signature. Reactor Controls, Incorporated (RCI)

has resolved this problem. However, both ITT Grinnell (ITT) and RCI have visual inspection and penetrant testing problems involving piping. Deviation Reports (DRs) have been closed prior to completion of radiography and discontinuities were later disclosed requiring another DR to be issued. The Assessment Team initiated 4 CARs for this Criterion:

84.0054	84.0114	84.0161	84.0154

Inspection

Inspection problems were identified throughout every aspect of this assessment. Raceway installation inspections were not being performed in a timely manner. Inspection plans and procedures contained deficiencies in the acceptance criteria. No inspection attributes or criteria had been provided for Kellem grips, separation barriers or protrusions into the cable tray. Mechanical inspection checklists for piping did not reflect the latest design changes. There were also several instances in which field Quality Control (QC) inspectors prepared deficiency reports based on reference dimensions rather than required dimensions. The Assessment Team initiated 7 CARs for this Criterion:

84.0055	84.0066	84.0069	84.0070
84.0077	84.0105	84.0138	

Nonconformance Control

NMPC's and SWEC's systems for nonconformance control have been improved somewhat through the establishment of an improved training program which encompasses more than just QA and QC personnel. This will improve the quality awareness of all site personnel. However, Engineering and Design Coordination Reports (E&DCRs) are still used to document nonconforming conditions. The tracking system for Nonconformance and Disposition Reports (N&Ds) is ineffective and there is no mechanism for tracking disposition or implementation of corrective action by a contractor. The Assessment Team initiated 15 CARs for this Criterion:

84.0074	84.0075	84.0089	84.0101
84.0095	84.0107	84.0108	84.0111
84.0114	84.0115	84.0145	84.0153
84.0159	84.0165	84.0172	

Corrective Action

Both NMPC and SWEC have problems with the corrective action process, both in terms of delays in implementation and verification of corrective action. Responses to corrective actions have been slow. Verification to ensure that previously installed items meet updated criteria is lacking. The use of Type "A" and Type "C" Inspection Reports (IRs) has hampered the corrective action process because Type "A" do not normally include the action taken or justification to close, and Type "C" will preclude trending. Some improvement has been witnessed in the form of revised procedures and an updated trending program. The Assessment Team initiated 19 CARs for this Criterion:

84.0049	84.0050	84.0052	84.0058
84.0063	84.0071	84.0088	84.0091
84.0102	84.0105	84.0117	84.0118
84.0119	84.0136	84.0137	84.0140
84.0141	84.0152	84.0154	

Quality Assurance Records

NMPC and SWEC have both addressed the problem of document control and QA records and have established a task force to review this area. However, problems still persist concerning accessibility and retrievability of all documents including QA records. Related documents are not always cross referenced. The facilities for housing many of the active QA records are inadequate. One-hour fire-safe cabinets are being used for permanent records. Only a minimum number of turnover packages have been transmitted to NMPC. The Assessment Team initiated 5 CARs for this Criterion:

84.0047	84.0120	84.0151	84.0144
84.0056			

Hardware Deficiencies

Hardware-related deficiencies have been identified in five areas of concern, as discussed in the following sections.

Welding

Significant progress has been made in correcting NRC-identified deficiencies in the area of weld repairing, weld material control and welding qualifications. However, the results of this assessment have emphasized that welding quality was a major problem throughout the period assessed. The project needs to reduce the number of undersize welds and improve initiation and maintenance of weld data cards and other documentation.

Piping

Most of the piping problems at NMP-2 can be attributed to ITT and RCI. ITT is not inspecting for attributes such as configuration, location and interferences which make it difficult to evaluate the overall condition of the piping program. A walkdown procedure has been developed to assure that piping attributes are inspected, but in some cases checklists for piping installations do not contain reference to the latest design documents. The new procedure requires provision for configuration inspection. This area needs additional improvement.

Pipe Hangers and Support

NMPC did not fully address the NRC concern regarding ITT pipe support and restraint deficiencies not being identified during Construction Acceptance Inspections. ITT inspections of pipe supports and restraints have also not been effective in assuring that hardware conforms to design requirements. NMPC and SWEC have instituted actions to improve ITT overall performance in this area. The effectiveness of their actions should be monitored and revised as necessary.

Materials Storage and Control

Some improvement has been made in correcting NRC-identified deficiencies in the area of materials traceability and housekeeping, but the primary concern of plant and laydown area storage is still a problem. Repeated inspections of these areas by the Assessment Team have indicated that the problems of intermixing of dissimilar items, intermixing of acceptable and rejected materials, storage of safety-related materials at a level lower than required, lack of dunnage for packaging sensitive items and protection from damage and deterioration to safety-related equipment continue. Personnel involved should be informed of the necessary requirements and discipline established and enforced to assure compliance.

Power Generation Control Complex (PGCC)

The separation criteria as it relates to the PGCC continues to be a problem. NMPC QA has not provided assurance that this criteria has been satisfied. Many GE Field Design Instructions (FDIs) and Field Deviation Design Reports (FDDRs) remain open. Separation

attributes are not always accurately recorded on IRs. QC continues to identify disparities in cable separations as something which can be done later by entering an (L) on the IR for tracking purposes and subsequent reinspection. This is better than the former method of identifying missed criteria as "later" without a tracking device to accomplish reinspection, but is still inadequate.

The Assessment Team determined that a number of CARs related to hardware as well as to quality criteria. A number of the CARs related to hardware only. Hardware-related CARs are those which identified a condition that made, or could make, the hardware nonconforming or indeterminate to existing specified requirements if the condition had not been identified. The following list includes these CARs considered to be hardware related.

84.0042	84.0066	84.0108	84.0151
84.0043	84.0069	84.0109	84.0154
84.0048	84.0070	84.0114	84.0156
84.0049	84.0071	84.0115	84.0157
84.0050	84.0072	84.0116	84.0159
84.0052	84.0073	84.0117	84.0160
84.0054	84.0074	84.0118	84.0167
84.0055	84.0075	84.0119	84.0168
84.0056	84.0089	84.0135	84.0169
84.0057	84.0090	84.0137	84.0171
84.0058	84.0092	84.0138	84.0173
84.0062	84.0094	84.0139	
84.0063	84.0105	84.0140	
84.0064	84.0107	84.0145	

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1.0 INTRODUCTION

1.1 SCOPE

As part of its order modifying the construction permit for the Nine Mile Point Unit 2 (NMP-2) nuclear station, the Nuclear Regulatory Commission (NRC) directed Niagara Mohawk Power Corporation (NMPC) to have an independent assessment of corrective and preventive actions performed. This assessment was to address deficiencies identified by recent NRC inspections and by NMPC and its site contractors between January 1, 1981, when construction was resumed, and March 31, 1984, when a restructured quality assurance (QA) organization was in place. Actual restructuring began in January 1984.

The NRC specifically directed NMPC to address the corrective action commitments made in response to the Construction Appraisal Team (CAT) report of January 31, 1984, the most recent Systematic Assessment of Licensee Performance (SALP) report, deficiencies identified by NMPC as a result of its own surveillance and audit activities, and deficiencies identified by the major site contractors: Stone and Webster Engineering Corporation (SWEC), ITT Grinnell Industrial Piping, Incorporated (ITT), Reactor Controls, Incorporated (RCI), General Electric (GE), and Johnson Controls, Incorporated (JCI).

Management Analysis Company (MAC) was commissioned by NMPC to perform an independent review of corrective action commitments and implementations for program deficiencies and nonconformances for the period January 1, 1981 through March 31, 1984. The purpose of this review was to determine whether the underlying or fundamental causes for the deficiencies had been correctly identified, and whether corrective and preventive actions have adequately addressed the underlying and fundamental causes and resolved the deficiencies.

1.2 PROJECT APPROACH

Analysis of the task defined by the NRC made it evident that the work could be divided into four phases: the first two directed to NRC findings and concerns, the third to NMPC surveillance and audits, and the fourth to deficiencies identified by the major site contractors. Much of the work of the various phases was actually performed in parallel. MAC assembled a

team of highly qualified personnel to perform the assessment from its own staff and from other consulting and engineering organizations. This Independent Assessment Team (Assessment Team) was made up of individuals with no previous involvement at NMP-2. Each team member had technical expertise in one or more of the following disciplines:

- Civil/Structural
- Electrical/Instrumentation and Controls (I&C)
- Welding/Nondestructive Examination (NDE)
- Mechanical
- Material and Receiving
- Software

As many as 45 professionals were used over an approximate 6-month period, with an average of 36 persons throughout the assessment. The Assessment Team averaged 13 years of nuclear experience and had a total of 1,047 years of accumulated professional experience. Team members reviewed a total of 2,940 documents and related corrective action commitments. Of the total, 1,920 documents related to corrected physical components, systems or structures, which were assessed for conformance to specified requirements as well as for correction of the identified deficiencies.

Deficiencies were segregated by discipline (e.g., mechanical, electrical, civil/structural) and assigned through discipline leaders to individual team members for evaluation. The Assessment Team evaluated the corrective and preventive actions that NMPC or its appropriate contractor considered adequate to resolve the deficiency.

Deficiencies identified by the NRC CAT inspection, SALP assessment and by NMPC audit and surveillance activities were 100 percent evaluated. Because of the relatively large number of deficiencies identified by the site contractors over the period in question, a statistical sampling plan was used to identify the deficiencies to be evaluated. The deficiencies were identified as programmatic or hardware-related and further separated by discipline.

The deficiencies in each specific discipline identified by each specific contractor constituted a lot. Each lot was sampled at normal sampling levels in accordance with MIL-STD-105D, Tables I, IIA and VIIA, (with the modification that populations under 100 were 100 percent inspected) to achieve a 95 percent confidence level that 95 percent of the lot was of adequate quality. If the sample confirmed that the required level of quality had been maintained, the lot was considered acceptable and no further reinspection was required. If the sample disclosed that the required level of quality had not been maintained, the sample size was increased to tightened sampling. If tightened also showed that the desired quality level had not been obtained, the Assessment Team made recommendations for improvement which are contained in this report.

The Assessment Team's effort consisted of a thorough review of the stated corrective and preventive action and stated or implied root cause; interviews with responsible personnel; review of design, appropriate processes, acceptance criteria and methods; evaluation of related procedures and other documentation; and evaluation of personnel skill requirements and qualifications. The Assessment Team performed sufficient reinspection of affected hardware to determine whether the corrective action had been implemented as stated, and whether it had been appropriately applied on a generic basis such as would preclude recurrence of a like problem on different items of hardware or documentation.

Reinspection coincided with a review of QA documents providing acceptance criteria, e.g., procedures, design drawings, specifications, checklists, inspection instructions used in performing the original quality assessment, and those documents pertaining to corrective and preventive measures after the deficiency was identified. Required physical inspections were performed by personnel qualified in the appropriate discipline.

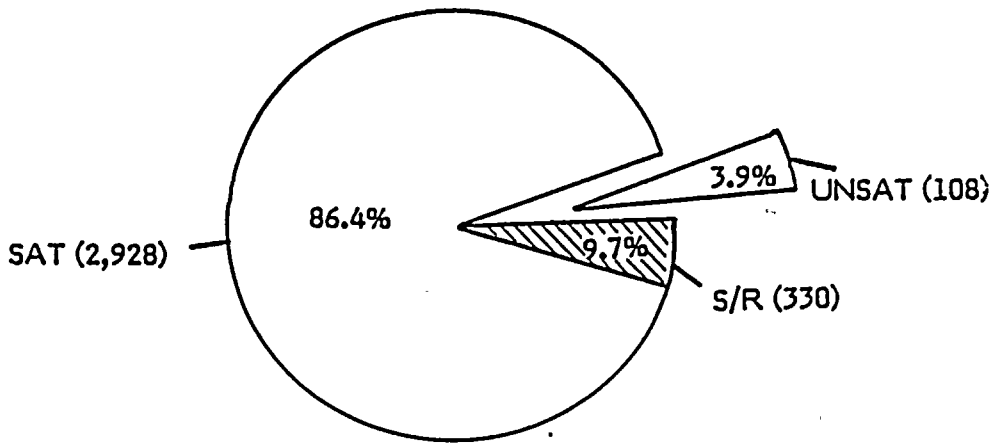
Corrective action relating to any deficiency was evaluated as "Satisfactory", "Satisfactory with Recommendation", or "Unsatisfactory". A "Satisfactory" rating indicated that the fundamental cause of the deficiency had been correctly identified and that the corrective and preventive action had

adequately addressed the cause and resolved the deficiency. A rating of "Satisfactory with Recommendation" indicated that the action had adequately addressed the specific deficiency, but the Assessment Team felt further action would assist in precluding recurrence of the problem. Corrective actions rated as "Unsatisfactory" were those for which the committed corrective and preventive measures had not been implemented, or was ineffective in resolving the deficiency. Items rated "Unsatisfactory" were identified on an NMPC Corrective Action Request (CAR) by the Assessment Team and issued to NMPC for disposition. Those CARs originated by the Assessment Team which were closed by NMPC were also reviewed for adequacy of corrective action.

1.3 OVERVIEW

The Assessment Team evaluated 2,940 deficiency documents, totaling 3,390 items, and determined by review of documents and by physical inspection of accessible hardware items whether corrective and preventive action had been taken which properly addressed the stated deficiency and was appropriately and effectively applied to preclude recurrence. As the following figure shows, this review disclosed that for 96.1 percent of the items evaluated, the corrective action was appropriate and corrected the specific deficiency. This disclosed a high degree of reliability on the part of NMPC and its contractors in implementing corrective action as committed. Acceptable corrective actions have been categorized as "Satisfactory" and "Satisfactory with Recommendations". In both cases, the committed corrective action was implemented and was effective for the specific deficiency. In 9.7 percent of the items evaluated, the Assessment Team made recommendations to improve the effectiveness of the corrective action.

TOTAL ITEM ASSESSMENTS
SATISFACTORY (SAT),
SATISFACTORY WITH RECOMMENDATION (S/R),
AND UNSATISFACTORY (UNSAT)
ALL CONTRACTORS



These assessments were further categorized by the phase of the project in which the records were evaluated. This categorization is shown on Table 1 below.

TABLE 1

TOTAL ITEM ASSESSMENTS BY PROJECT PHASE

PHASE	I	II	III	IV	TOTAL
Number of Items					
Satisfactory	328	191	185	2,554	3,258
Unsatisfactory	37	1	4	90	132
TOTAL ASSESSMENTS	365	192	189	2,644	3,390
Percentage Breakdown					
Satisfactory	89.9	99.5	97.9	96.6	96.1
Unsatisfactory	10.1	0.5	2.1	3.4	3.9

Table 2 shows the distribution of the rated assessments among the responsible organizations.

TABLE 2

TOTAL DOCUMENT ASSESSMENTS BY ORGANIZATION

ORGANIZATION	NMPC	SWEC	ITT	JCI	RCI	GE	TOTAL
Number of Documents							
Satisfactory	51	1,240	894	412	178	57	2,832
Unsatisfactory	1	42	36	9	19	1	108
TOTAL ASSESSMENTS	52	1,282	930	421	197	58	2,940
Percentage Breakdown							
Satisfactory	98.1	96.7	96.1	97.8	90.4	99.8	96.3
Unsatisfactory	1.9	3.3	3.9	2.1	9.3	0.2	3.7

On this basis, 96.3 percent were assessed as being Satisfactory or Satisfactory with Recommendation and 3.7 percent were Unsatisfactory. There was some variation in the results of the individual phases.

Phase I items were found to be Satisfactory or Satisfactory with Recommendation in 328 of 365 items instances, for 89.9 percent of the total. Phase II corrective action was found to be Satisfactory or Satisfactory with Recommendation in 99.5 percent of the total. Phase III items were Satisfactory or Satisfactory with Recommendation in 97.9 percent of the total assessments, and Phase IV items were Satisfactory or Satisfactory with Recommendation in 96.6 percent of the total. The need for significant improvement in addressing and implementing effective corrective action was identified only for Phase I.

Those items rated Satisfactory with Recommendation constituted 35.6 percent of Phase I, 6.3 percent of Phase II, 20.1 percent of Phase III, and 5.7 percent of Phase IV. In general, this indicates that while corrective action was

considered adequate for the specific deficiency, a more comprehensive action would have been more effective in precluding recurrence of the deficiency on the same or a similar item. In other words, while the need for significant improvements in addressing and implementing corrective action applied mainly to Phase I, the need to significantly enhance corrective actions to improve overall effectiveness is evident for Phases I, II and III.

Those items rated Unsatisfactory constituted 10.1 percent of Phase I, 0.5 percent of Phase II, 2.1 percent of Phase III and 3.4 percent of Phase IV. This shows that corrective action implementation exceeded 95 percent in each individual phase except Phase I. In general, this indicates that while corrective action was not totally adequate for these specific deficiencies, only in Phase I was the inadequacy significant.

While the overall results were generally satisfactory, the Assessment Team identified specific areas which should be improved. These areas and the organizations to which they apply become more evident when further analyses are made to determine the causes of the 3.9 percent judged Unsatisfactory and the 9.7 percent where further action was recommended of the items. Combining data for Pareto analysis of deficiency documents where corrective action was judged "Satisfactory with Recommendations" and "Unsatisfactory" provides a sample that identifies areas where action in preventing recurrence of deficiencies would be most beneficial.

This volume provides condensations of recommendations made relative to individual deficiencies in Volume II. Satisfying the individual recommendations in Volume II will satisfy the recommendations made in this volume.

1.4 ORGANIZATION OF REPORT

This report is divided into three volumes. Volume I presents the overall results of the assessment and analyses, conclusions, and recommendations for further action and possible improvement.

Volume II contains the assessments of those corrective and preventive actions relating to specific deficiencies which were judged by the Assessment Team to be Unsatisfactory or Satisfactory with Recommendation. Owing to the large number of actions rated Satisfactory, detailed assessments are not included in this report. Objective evidence supporting Satisfactory evaluations is available in the Assessment Team's files.

Volume III contains the matrices of the assessed items for Phases I, II, III and IV. Each matrix lists in numerical order the completion status, the MAC disposition of each item, type of deficiency and investigative method.

Interim Reports were published by the Assessment Team at the conclusion of Phases I, II and III. Each of the Interim Reports recorded the results of assessments of corrective action that were complete at the scheduled time for the report. This report includes the updated results of the Interim Reports for Phases I, II and III, and the results of the Phase IV assessment.

2.0 SUMMARY OF ASSESSMENT RESULTS

The following sections summarize the results of the MAC Assessment Team's evaluation. General NRC concerns stated in the CAT and SALP reports are addressed, as well as specific deficiencies for which the team found the implementation of corrective and preventive actions to be less than satisfactory.

2.1 NRC ORDER ITEMS

The NRC, in its CAT and SALP reports and Order, identified significant programmatic problems with NMPC's QA program, specifically in site auditing programs, the corrective action system, Procurement Quality Assurance (PQA), document control, design change control and timeliness of inspection and correction activities. The NRC's Order also identified areas of concern involving hardware, specifically radiographic film, concrete expansion anchors, and cable installation in the Power Generation Control Complex (PGCC). These areas were specifically addressed in NMPC's response to the Order dated May 14, 1984. They are addressed in this report to the extent that the Assessment Team's evaluation substantiated or resolved them.

2.1.1 Quality Assurance Program

The NRC SALP report cited a weakness within the NMPC/SWEC/ITT QA program. The Assessment Team reviewed and evaluated the QA programs of site contractors by means of interviews and program/procedure overview.

The NMPC site QA program has been strengthened. Quality Assurance Procedure (QAP) 19.04, "Quality Assurance Department at Nine Mile Point #2", was issued March 22, 1984, to describe the site organization and define responsibilities. The site organization chart describes the responsibilities of each of the four units which make up the site organization. Additional emphasis has been placed on the audit and surveillance programs.

SWEC quality programs have been upgraded, partly in response to the CAT and SALP findings and partly as a continuation of ongoing quality improvement programs. Additional emphasis has been placed on auditing and surveillance of construction activities. Special task groups have been established to investigate

problem areas. The Quality Control (QC) staff has been increased by approximately 20 percent. Procedures have been revised to provide better control of quality activities.

ITT has increased the site quality staff to provide better coverage of construction activities. The Director of Quality Assurance/Quality Control (QA/QC) was assigned the responsibility for developing trend reports to identify problem areas and provide a measure of progress. Work is underway to utilize a computerized system for preparing trend reports. The quality documentation effort has been upgraded and reorganized. It now is directed by a Manager who reports directly to the Director, QA/QC. Approval has been requested for additional QA Engineers.

Procedures governing project activities have been reviewed and, where indicated, upgraded to direct more attention to quality and to assure the completed facility will conform to established requirements.

The measures noted above should improve quality performance in the areas of concern noted in the SALP report. Some problem areas persist, and additional improvements can be expected as the longer range program improvements become effective.

For example, the results of the independent assessment confirm that quality program weaknesses existed in the areas identified by the NRC. While implementation of the actions noted above were confirmed by the Assessment Team, it is too early to measure the effectiveness of such changes. In addition, the Assessment Team made specific recommendations that, together with continued emphasis on surveillance and audits, should enhance program effectiveness.

2.1.2 Site Auditing Program

The CAT report stated that the SWEC auditing program was not sufficient and did not effectively identify and resolve major construction problems. The Assessment Team's review of the SWEC auditing program procedures revealed general directives for compliance with ANSI N45.2.12 and specific instructions regarding audit format and forms utilization. The procedures appear adequate and should result in an effective audit system, if properly implemented.

Actions taken to improve the SWEC audit program included initiation of a project procedure which addresses timely close-out of audit observations; increased audit frequency per the 1984 audit schedule; and supplementing the audit staff with technical specialists from outside the quality organization. The preventive action planned is appropriate.

The Assessment Team, in its review of SWEC's Audit Findings, noted a considerable lack of objective evidence that the actions taken to resolve the findings were completed. Examples include Pre-survey ASME III Audit 1983, C-4 and Site Audit 24, 1981. Additional SWEC reported deficiencies, Nonconformance and Disposition Reports (N&Ds), and Inspection Reports (IRs), have also been closed without sufficient evidence that corrective action was verified. There was no enforced time limit for reply or conclusion. Field Quality Control (FQC) inspectors did not identify nonconformances adequately which resulted in excessive time spent researching problem resolutions.

Significant deficiencies in the NMPC audit program were addressed in the CAT report. The Assessment Team verified that the NMPC approach to site audits has since been evaluated and positive action has been taken to emphasize hardware in subsequent audits. This action has been initiated through development and implementation of new QA procedures. The 150 "open audit items" identified by the NRC have since been closed and reported through the new NMPC computerized tracking and trending system, and NMPC has discontinued the use of "open audit items".

A number of NMPC's audit items were closed without verification that required actions were accomplished and documented. Eight NMPC audit items failed to identify objective evidence to support audit closure. Many NMPC audit items failed to identify adequate corrective action and actions to prevent recurrence of audit deficiencies.

The NRC also expressed a concern that in the case of NMPC and ITT some audit observations should have been written as nonconformances, and that there is not a mechanism in place to review audit observations for significance and reportability. NMPC revised their program to include provisions for reviewing audit deficiencies for significance. This concern was addressed in CAT Item

43D-83. The Assessment Team's review revealed that the licensing procedures associated with reporting and correction of deficiencies under 10CFR50.55(e) and 10CFR, Part 21, have now been implemented. ITT issued a letter indicating that the Management Audit Report would include a statement that the 10CFR50.55(e) review has been accomplished. In the case of ITT, the Assessment Team recommends that timely review for reportability and commitments for actions to prevent recurrence be addressed by ITT in procedures to assure continued compliance. Auditor training on reportable deficiencies should be reevaluated, and any items lacking objective evidence of 10CFR50.55(e) review should be rereviewed and documented.

Response time has been inordinately long for vendor and contractor Audit Findings which resulted in Audit Reports not being closed in a timely manner. In one instance, this resulted in inadvertent use of an unapproved supplier. Additionally, NMPC has accepted contractors' responses to audit findings without always having made a comprehensive review of supporting documentation.

The Assessment Team identified at least ten NMPC audit items that were not closed in a timely manner in accordance with procedural requirements. For SWEC's N&Ds, there were several instances of delays of up to 70 days from the time the nonconformances were first discovered until the nonconformance document was prepared. Some examples are SWEC's N&Ds 5332, 5026, 5145, 6943, and 4841. An excessive amount of delay was also noted in the revising of Construction Management Procedures (CMPs). In assessing SWEC Site Audit 23, one CMP revision required seven months, another ten months. The program should be reviewed for efficiency and timeliness.

2.1.3 Corrective Action System

The NRC stated in its CAT report that "corrective action systems were deficient with regard to the correction of nonconformances identified and the associated documentation". The NRC's concerns regarding the adequacy of NMPC's verification of corrective action focused on documentation, timeliness, and the effectiveness of surveillance and verification activities.

Documentation

Some Engineering and Design Coordination Reports (E&DCRs) were used to document nonconforming conditions, as noted in CAT Item 9-83. The Assessment Team found by review of training records that training of site office personnel, Cherry Hill PQA personnel and selected key personnel in the proper use of these has been accomplished. Engineering changes of acceptance criteria are now resolved for CAT item deficiencies, but FQC verifications have not been performed to ensure that previously installed items would meet the revised criteria. FQC verification of previously installed items is planned but not as yet implemented. SWEC issued Project Procedure (PP) 24, Supplement Number #24-67 on March 30, 1984 to provide additional construction guidance relative to situations in which a design change is issued after an installation has been completed and inspected. The Assessment Team recommends that all previously issued design documents, E&DCRs and Engineering Change Notices (ECNs), that identified nonconforming conditions be reviewed for potential reportability under 10CFR50.55(e) and 10CFR, Part 21.

The SALP report also noted problems in the documentation of corrective action. The NRC noted that the documentation packet should contain a copy of the initial survey report with the assigned concern number; action that was initiated to correct; 10CFR50.55(e) interim report, if applicable; verified corrective action taken; final 10CFR50.55(e) report, if applicable, together with the NRC final IR with the line item notice of closure; and that such documentation should be mandatory. The Assessment Team determined that all documentation packages processed of late have been very complete, and the appropriate degree of documentation is now required. Therefore, this is no longer considered a concern.

The NRC also expressed concern that the use of Type "C" IRs preclude trending, and allow training, meetings and memos to be used to correct the deficiency rather than preparing an N&D. The Assessment Team substantiated the NRC concern, and recommends that Type "C" IRs be utilized as a programmatic surveillance document only. Any corrective action for hardware deficiencies required by a Type "C" IR should be dispositioned using a N&D. It is recommended that further follow-up on this concern be initiated by NMPC. CAR

84.0166 was issued by the Assessment Team on the timely closure of SWEC's Type "C" IRs.

SWEC Type "A" IRs do not normally indicate the action taken and/or the justification to close the deficiency. This results in little supporting documentation to verify what actions were taken to resolve the problem. This deficiency contributed to CAR 84.0116 regarding reworked anchor bolts.

Timeliness

Excessive contractor delays in implementing committed corrective/preventive action were noted in the CAT Assessment. An example of this is CAT Item 31-83. The SALP report also noted delays of up to eight months in initiating, resolving and dispositioning deficiencies. Examples include NRC Item 81-13-01E and CDR 81-02.

The Assessment Team noted some inadequacies in the tracking system for N&Ds related to expeditious closure of open N&Ds. The present system forwards a copy of the dispositioned N&D to the contractor for his action. There is no mechanism for tracking what the contractor is doing to implement the disposition and close the N&D. N&D-4952, for example, has remained open for more than a year with the contractor taking no action to make the necessary repairs.

The N&D log should be monitored periodically and status updates provided so that N&Ds can be closed out more expeditiously. N&D-2928 is an example of an N&D that has been superseded numerous times because of changes in condition details. An effort should be made by SWEC's FQC to provide complete information such as with sketches identifying the as-built situation. The engineer should then confirm the situation so that a complete disposition can be provided to resolve the entire discrepancy.

Verification of Corrective Action

The NRC noted that reinspection activities by contractors and verifications by NMPC's QA have not been totally effective. Examples of this condition were found by the Assessment Team in CAT Item 25-83, "RCI Undersized Welds";

CAT Item 41-83, "Weld Filler Control"; and CAT Item 21-83, "Cives Undersized Welds", which resulted in the issuance of CARs 84.0043, 84.0105 and 84.0057.

2.1.4 Procurement Quality Assurance

The NRC's concern that material inspected at the source prior to release by SWEC-PQC has often been in noncompliance with procurement documents was assessed by CAT Item 7-83. The Assessment Team verified that corrective action addressed the commitment to revise source inspection planning to require witness testing and verification of objective evidence. The preventive action plans require for NMPC to participate in source inspection (selectively). The action taken, in addition to implementation of the recommendations in Section 4.0, should resolve this concern.

The NRC also noted that although the inspection plan for Cives Steel required 100 percent visual examination in accordance with AWS D.1.1, beams were found with insufficient weld material. This has been addressed in CAT Item 21-83. The Assessment Team noted 11 unsatisfactory welds that were identified and reported on N&Ds, but were then dispositioned "accept as is". The Assessment Team has recommended that the entire lot (not just those that were considered unsatisfactory) be reinspected and dispositions made by Engineering to ensure that beams with unsatisfactory welds are not being used elsewhere in the project.

2.1.5 Document and Design Change Control

Document Control

The major NRC concerns pertaining to document control were: (1) drawings were not being reviewed according to procedures, and (2) NMPC and SWEC did not have adequate control over the design change system.

The Assessment Team verified that NMPC has instituted a number of changes in its document control system. It has established a computerized system for posting design changes and reduced the number of drawing stations to aid in more prompt distribution of changes. In addition, NMPC established a task force to review the problem and a review process for new drawings. The Assessment Team recommends that all NMPC permanent plant records be

indexed, protected, consolidated and retrievable in accordance with ANSI N45.2.9. At present, records are difficult to access, as they are kept in several different locations and indexing for retrievability is not uniform.

Despite improvements and continued attention by NMPC and SWEC, document control continues to present problems. Improvements have been and are being made but problem areas still persist. Related documents do not cross-reference each other for ease of tracking. The ITT program(s) for identifying, voiding, superseding, invalidating and closing deficiency documents should be reevaluated. In one case, four different DRs, one N&D and one IR were generated to identify and process the same problem which, in the final analysis, was not a nonconformance. A verification of deficiency should be initiated on each nonconforming condition identified in order to prevent this type of situation. The basis for closure of voided or superseded nonconformance documents should also be listed on applicable forms.

Frequently insufficient or incorrect reference information and disposition directions are provided on corrective action documents. For example, ITT N&D-477 was submitted to SWEC for disposition; however, SWEC returned same to ITT unanswered because of insufficient information. SWEC requested ITT to reevaluate and provide supporting data and resubmit. This action never occurred, and the N&D was subsequently closed by originating other N&Ds.

There appears to be a programmatic deficiency in ITT's N&D program. In the specific case of ITT's N&D IG-1750, the N&D was subsequently revised from CAT II to CAT I when the close-out signature was applied without obtaining new signatures from those who previously approved the disposition. The procedures should be revised to correct this problem. ITT procedure FQC 10.1-4, Revision 15, does not require the N&D form to be fully completed when a new N&D is issued unless the N&D has been processed by Document Control. This deficiency allows N&Ds to be superseded or revised by subsequent N&Ds without providing a paper trail to follow the problem. The procedure should be amended.

Design Change Control

The NRC's CAT report identified problems in the document change control program indicating that "crafts and inspectors may not be using the latest design documents in the performance of their work". It also cited the "high rate of design change initiation and the inability to maintain and revise construction drawings in a timely manner to reflect such changes".

During the Assessment Team's review of drawings, it was noted that recent changes to some drawings use generic and non-specific terminology in the drawing revision block. An example is "(F-8, G-8) as per latest design documents". Several examples of this were noted. This practice makes it virtually impossible to identify whether all appropriate changes have been incorporated. SWEC should be required to be more explicit in identification of changes to drawings.

The NRC's concern that QC inspection had not been given inspection attributes to assure that equipment (battery rack) installations are consistent with seismic qualification requirements was addressed in CAT Item 2-83. This was not substantiated by the Assessment Team. The inspector properly inspected to the drawing, which specified "steel" bolts. This specification is consistent with seismic qualifications. The Assessment Team concurs with NMPC's conclusion.

The NRC's concern that inadequate procedural control exists for tracking all aspects of equipment and their design changes with seismic qualification requirements was addressed in CAT Item 2-83. NMPC's actions were to identify and review existing assemblies and connections for consistency with seismic qualifications, and to establish tracking controls for design changes with seismic qualification requirements in SWEC's PP 94. The Assessment Team verified that these actions were appropriate and that they had been implemented.

2.1.6 Radiographic Film Quality

In its CAT report, the NRC found NMPC's program for review and acceptance of radiographs was deficient. The Assessment Team substantiated this concern. It found that the overall quality of the radiographic film and its handling was poor. Original film was not available for those weldments that were

repaired, making it impossible to determine what area was actually repaired, or if full coverage of the repair area was obtained. In the majority of cases, no "reader sheet" for the original weld was available when repairs were required. The condition of the film was such that there was concern whether the film would remain legible for the duration of the required retention. Finally, there were discontinuities on some radiographic film that were not noted on the Radiographic Examination (RT) reader sheet.

The NRC noted that SWEC IRs identifying radiographic problems were not being dispositioned in a timely manner, corrective action appeared inadequate, and SWEC had failed to control and monitor the site radiographic activities of ITT.

The Assessment Team reviewed the problem and the corrective action that had been taken. NMPC conducted a 100 percent review of ITT's radiographs which had been accepted and filed in the vault as of January 1984. Deficiencies discovered by NMPC during the review were noted on NMPC's Surveillance Reports (SRs). As a result of NMPC SRs, SWEC generated several Type "C" IRs to track NMPC-identified deficiencies and initiate corrective action. The majority of these Type "C" IRs were still open as of November 1984. SWEC is now in the process of conducting a 100 percent review of all ITT radiographs.

Problems with radiography processing and control have also been identified by SWEC, ITT and RCI. Surveillance activities by NMPC and SWEC are continuing and progress is being achieved. The major concern is that nonconformance reports are continually being generated and the action plan is becoming fragmented and unwieldy. It is recommended that a matrix be generated for this CAT Item to identify the concern and progress taken to address/resolve the problem.

A film review was performed by NMPC in response to NRC Bulletin 82-01 and 82-01, Revision 1, Supplement 1, which required 100 percent review of shop radiographs for quality class 1 and 2 piping with wall thickness less than 1/2-inch. During NMPC's film review, enhancement problems were discovered with regard to two specific radiographers. The review was conducted at both the shop and at NMP-2. The original scope was expanded to include all field radiographs taken within the time frame that the radiographers in question per-

formed work at NMP-2. Wherever possible, all radiographs suspected of enhancement were re-radiographed. In some cases welds were cut out and, in other cases, welds had been deleted due to design changes. However, corrective action was performed in all cases.

The Assessment Team reviewed all related documentation pertaining to the enhancement problem and also performed a review of radiographs (approximately 150). This review concurred that the enhancement problem was in fact isolated to the two radiographers in question. The enhancement condition is no longer a problem, and the other radiographic problems also appear to be in the process of resolution.

Based on the action taken to date and the actions in progress, the Assessment Team believes that radiography performed on-site will meet the quality requirements.

2.1.7 Concrete Expansion Anchors

In its CAT report and in the Order, the NRC stated that concrete expansion anchors were not adequately set. This was based on an observed loss of tension preload, of an E&DCR's request for "slippage" criteria, and strength differences between the concrete used in the pre-qualification test and that used in the field. Based on the tension tests performed, SWEC has concluded that the bolts have been properly set. The Assessment Team reviewed the relevant documentation and concurs in this determination.

The NRC also noted that there was no inspection attribute to assure nuts are not "bottoming out" on the threads of the concrete expansion anchor bolts. The Assessment Team verified that revision 4 to Specification S203G included an attribute for "bottoming out". Installation procedures for "drilled-in concrete type expansion anchors" have been revised to include this inspection attribute.

2.1.8 Power Generation Control Complex

The NRC's Order observed cable separation violations in cables in PGCC ductways and cables which enter PGCC control boards. The Assessment Team found that concerns are actively being addressed by NMPC, SWEC and GE by developing and implementing subdivisional separation instructions for modifying the class 1E division panels and termination cabinets involved in previously accepted shop or vendor wiring.

The status of this work accomplished to date was still unclear to the Assessment Team. Many Field Design Instructions (FDIs) and Field Deviation Design Reports (FDDRs) remain to be closed out. Work, rework and repair still must be performed throughout the PGCC complex for the reduction or elimination of all separation criteria concerns. It appears that NMPC is not proceeding forcefully to get GE and SWEC to resolve the separation criteria problem. There are numerous change documents to resolve the problems related to GE equipment, to authorize the work, and to verify the completion of work. A concerted effort must be made to close-out the documentation by completing the prescribed work. Specific examples of this concern are discussed below.

The underfloor raceway covers have not been installed for proper separation. Attention should be given to installing the covers as soon as possible in the sequence of events. Installation of the covers at a later date may be a significant problem.

Separation attributes are not always accurately recorded on IRs, as the Assessment Team verified for CAT Items 3-83 and 8-83. The IRs were marked as "later" or "NR" when divisional separation criteria were not met, rather than being documented as nonconformances. The use of "NR", which is improper, occurred once and is considered an isolated case. Inspection plans no longer allow divisional separation to be inspected later, but have been modified to allow the use of an "L" (later) attribute for separation barriers which will be tracked by computer for subsequent inspection.

Power cable separation criteria were not being met and were not being identified on QA inspection records according to CAT Item 8-83. The concern was in reference to the inspections made of partial cable pulls. NMPC's corrective

action was to revise Inspection Plan N20E061AF1025 to require that partial cable pulls be inspected back through the last raceway section or to the extent necessary to assure that the cable met specification requirements. The Assessment Team verified and concurred with the appropriateness of this action.

2.2 DISCIPLINE ASSESSMENT ITEMS

2.2.1 Civil/Structural

Generally, concreting activities were found by the NRC to be in accordance with the specifications and applicable requirements, except for reinforcing steel spacing violations in one placement, inadequacies in the inspection plan for concrete surface defects, and acceptance criteria for unit weight tests.

The NRC's concern that reinforcing steel violations were not identified by SWEC's QC Inspection, and that the retraining session to prevent recurrence was conducted improperly was confined specifically to one concrete placement. To alleviate the concerns, the preplacement IR was marked "Unsat" and the reinforcing steel violations were corrected prior to concrete placement. Improper training was corrected by conducting a second training session relative to reinforcing steel placement. This training was conducted by the SWEC Discipline Inspection Supervisor. The Assessment Team verified the resolution of the concerns.

The NRC's concern regarding inadequate inspection criteria for concrete surface inspections which led to the installation of plates and equipment on concrete surfaces that have not been inspected has been resolved. A review of selected Surveillance Inspection Reports (SIRs) by the Assessment Team disclosed that there were no surface-mounted plates which covered voids or honeycomb areas. Documentation identifying the resolution of the concrete surface inspection concern and the Assessment Team's concurrence has been provided under CAT Item 38-83.

The NRC's concern relative to adequate acceptance criteria used for concrete unit weight tests has been resolved. SWEC Engineering reviewed all concrete unit weight reports for concrete placements to verify that shielding

requirements were adequate, which the Assessment Team determined was an acceptable resolution. In addition, a new attribute has been added to the Inspection Plan for Specification S203H requiring that SWEC Engineering will be notified if the unit weight of concrete falls below 138 pounds per cubic foot. Resolution of this concern and the Assessment Team's concurrence has been documented for CAT Item 36-83.

The NRC cited the lack of evidence of repair or retesting for one concrete truck mixer (truck #25) which had failed mixer uniformity testing. The Assessment Team's review of concrete compressive strength test reports for a one-month period after the failed mixer uniformity test substantiated the acceptability of the concrete that was used out of mixer truck #25. A new attribute has been added to the SWEC QA Inspection Plan for Specification S203A requiring that a letter be sent to the contractor informing him that a truck with a deficient mixer cannot be used until the unsatisfactory condition is corrected. The Assessment Team verified and concurred with this resolution.

2.2.2 Electrical

Deficiencies in electrical and instrumentation construction identified by CAT included (1) use of indeterminate materials in seismic bolting applications, (2) lack of documentation for inspection attributes, and (3) inadequate use of procedures containing appropriate acceptance criteria.

Seismic Bolting

The NRC's concern that the Motor Control Center (MCC) seismic qualification is not approved by the vendor and that material substitutions are being made on-site without the vendor's knowledge was addressed in CAT Item 2-83. The Assessment Team reviewed SWEC's evaluation of the NRC concern and agrees with its determination. SWEC reviews and accepts vendor designs and seismic qualification reports. SWEC, not the vendor, is responsible for assuring that on-site items do not violate seismic qualifications. In this case, there was no material substitution and no violation of seismic qualifications.

CAT Item 2-83 addressed the NRC's concern that there is no assurance that the site as-built MCC (material substitution) is considered for the seismic report.

NMPC's action was to obtain a revised vendor drawing (to be approved by SWEC), and to perform an inspection to verify that correct bolting had been used. These actions were subsequently found unnecessary, since the seismic analysis showed that the bolts that were specified and used were acceptable. The fact that the vendor had used a specific grade of bolt in his seismic testing was irrelevant. The Assessment Team reviewed and concurred in this determination.

Acceptance Criteria

The NRC's concern with cable installation which is not in conformance with the Final Safety Analysis Report (FSAR) or Institute of Electrical and Electronic Engineers (IEEE) 384 has been addressed in CAT Item 3-83. GE has taken exception to the FSAR commitment to Regulatory Guide 1.75, "Physical Independence of Electrical Systems", which endorses IEEE Standard 384, "Trial-Use Standard Criteria for Separation of Class 1E Equipment and Circuits", and, in so doing, has submitted to the NRC a comparison of the GE NMP-2 design to the criteria contained in Regulatory Guide 1.75 and IEEE 384. As of this date, no response has been forthcoming from the NRC. The Assessment Team determined that subject to NRC's acceptance of GE's position, the stated concern is resolved.

2.2.3 Welding/NDE

Problems in the Welding/NDE area identified by the NRC involved 1) the quality of radiographic film, and 2) the quality of welds and associated documentation. The first concern was addressed above in Section 2.1.7, Radiographic Film Quality. The second concern, addressed in this section, covers weld quality, welding repairs, weld material control, welder qualifications, and weld inspection.

The NRC identified a large number of undersized shop welds for supports by Cives Steel in CAT Item 21-83. Based on visual inspection, 15 to 20 percent were rejectable. The N&D used to close out the deficiency sampled only a small number of welds. The Assessment Team recommends that all support welds by Cives Steel be dispositioned by Engineering which should alleviate this concern upon implementation.

A number of problems has been noted regarding weld documentation, including illegible welder's stencils, bypassed holdpoints on weld data sheets, incomplete Weld Material Requisitions (WMRs), and Construction Completeness Checklists. While some corrective action has been taken, more is necessary. For example, FQC people verify welder's stencils and training of FQC personnel was initiated, but stencils are applied by welders and they should be trained in the proper application of the stencil. This would eliminate the problem at its source.

Training is also required to eliminate the bypassing of identified holdpoints, accelerate the organization of nonconformance when holdpoints are bypassed and in properly and fully completing WMRs, Construction Completeness Checklists and like documents.

Weld Repairs

The Assessment Team found a number of problems with weld repairs, as discussed in the following paragraphs. Over-grinding is a common occurrence when attempting to remove minor defects. Crafts should be instructed not to chase (grind) defects to the extent that minimum material thickness is violated. Defects which cannot be removed with a minimum of grinding should be directed to Engineeing for disposition.

All contractors exceed engineering weld design size when performing weld repairs. During reinspection this condition existed in approximately 75 percent of reworked welds. Although no distortion was observed, depositing more metal than required by design is costly in time and material. Crafts should be instructed/trained to limit weld size to Engineering requirements. Instruction should be applicable to initial weld, repair and rework.

ITT consistently failed to identify weld repairs according to Specification P301C which states that "each attempt at repair of a subject weld will be identified with an R_1, R_2, etc., as required". On pipe restraint weld repairs, the interpretation of Specification P301C, i.e., replacement of weld numbers on major repairs and determining when a weld should or should not show a "deleted" indicator, is inconsistent.

SWEC's QA procedure, QS-9.3, specifies that Weld Data Sheets/Weld Repair Data Sheets are not required for welds which do not require Nondestructive Examination (NDE). This condition created difficulty in verifying the adequate close-out of these type IRs. Due to a lack of documentation, the Assessment Team had no choice but to accept rework of welds based on visual inspection of condition (if accessible) and inspector's signature. This practice is also performed by other contractors on-site. The Assessment Team determined this to be unsatisfactory and CAR 84.0114 was issued.

Weld Material Control

The Assessment Team also found a number of problems with weld material control. JCI weld filler material control procedures require the foreman or welder to place the weld number of the joint being welded on the carbon copy of the WMR (Quality Category I only). When reviewing WMRs, it is difficult to determine where welding was actually performed from these documents. The current Revision 12 of Quality Assurance Standard 9.04 has deleted the above sentence but did not replace the requirement; therefore, the weld number placement section is not covered clearly.

The surveillance performed by SWEC on control of weld filler material is performed once a week, but the surveillance does not distinguish between CAT I or CAT II work. Therefore, many of the WMRs inspected are for CAT II work or welder testing, etc. The NRC's concerns relative to weld rod control have been addressed in CAT Item 41-83. Committed corrective action has been considered inadequate and CAR 84.0105 has been initiated. In addition, minor errors are frequently made when completing WMRs. The Assessment Team recommends a program modification to provide clear definition of responsibilities for quality verification, increased QC in-process inspection and monitoring, and additional training for crafts.

Welder Qualifications

The NRC's concern that welder qualifications do not meet American Society of Mechanical Engineers (ASME) Code Section IX in effect at time of qualification

was addressed in CAT Item 26-83. The condition of some welder qualification records was observed by the Assessment Team to be unsatisfactory and CAR 84.0042 was generated.

Weld Inspection

The NRC cited problems involving ITT in the visual and penetrant inspection of piping welds in stainless steel systems, and the visual inspection of welds on pipe supports/restraints. Also, problems with the visual inspection of piping support welds and the documentation for some welder qualifications were identified in activities involving RCI.

The Assessment Team found that ITT has on many occasions closed Deviation Reports (DRs) prior to completion of radiography. At a later date, radiography is performed and rejected, and another DR is generated. This sequence of events is duplicated numerous times, until an acceptable radiograph is available. Most of the DRs generated do not reference the previous DR. In some cases, five or six repairs have been made to a weldment for the same type of discontinuity. In addition to difficulty created in tracking a defective weld, DRs do not receive Engineering disposition. Excessive repairs to weld joints could be detrimental to the integrity of the weld. In addition, evaluation of the root cause of conditions causing unacceptable radiographs is not evident. The Assessment Team recommends establishing a means of identifying the cut-out or repair status of a weld. A space for noting the root cause should be added to forms used to report welding nonconformances.

2.2.4 Mechanical

Piping

The NRC found in its CAT report that Heating, Ventilating and Air Conditioning equipment (HVAC) and piping runs were generally constructed in accordance with applicable requirements except in two areas: ITT pipe support/restraint deficiencies not identified during construction acceptance inspections, and deficiencies in RCI's piping QA/QC program. The NRC indicated that ITT's QC inspection is not inspecting for piping attributes such as configuration, location and interferences. The corrective action included a final walkdown procedure that is intended to further assure such piping attributes are inspected.

However, no CAT items assessed provided an evaluation of the configuration inspections and resultant rework/repair versus construction progress. CAT Item 15-83 evaluated inspection planning and construction status but did not include activities specific to ITT's QC inspection attributes or an evaluation. The Assessment Team's conclusion is that NMPC did not address the issue. The concerns of the issue remain unevaluated.

Piping Supports and Restraints

ITT's QC inspections of pipe supports/restraints have not been totally effective in assuring that hardware conform to design requirements. CAT Item 14-83 did partially address the concern but limited itself to support/restraint inspections for adequate clearance. Planning and statusing activities affecting all construction activities were initiated, but nothing specifically addressed the NRC concern. CAT Item 53-83 limited itself to fillet welds on supports/restraints and addressed the effectiveness of these inspections only. The concern of the adequacy of pipe support/restraint inspections to assure that hardware conform to design requirements remains unaddressed by NMPC.

RCI Program Weaknesses

The CAT report also identified RCI QA/QC program weaknesses in documentation, drawing document control, documentation of nonconforming conditions and procedural timing of inspections. CAT Item 17-83 addressed several specific nonconformances identified by the NRC which had also been identified on RCI Nonconformance Reports (NCRs) prior to the NRC CAT inspection. CAT Item 18-83 addressed RCI program weaknesses regarding time of inspection, establishment of holdpoints and acceptance criteria. CAT Item 19-83 addressed RCI QA/QC program weaknesses regarding (a) bypassing QA review and subsequent action through identification of nonconforming conditions on documents other than those intended to be used to report nonconforming conditions, and (b) failure to address the complete problem on reported nonconformities. CAR 84.0050 was issued to report RCI's failure to issue NCRs and to follow procedures.

CAT Item 20A-83 addressed RCI QA/QC program weaknesses regarding lack of requirements to identify on SRs, data sheets, and inspection checklists those

change documents (ECNs or NCRs) in effect at the time of inspection; CAR 84.0161 resulted. While procedures have been revised to now require identification of ECNs and NCRs in effect at time of inspection, implementation of this requirement was assessed as inadequate. CAT Item 20B-83 addressed the problem of excessive quantities of change documents outstanding against drawings. Although it was later determined that a deficiency did not exist, the Assessment Team's review of RCI's document control revealed continuing concerns which warrant improvement. NMPC and SWEC should monitor RCI's implementation of the drawing controls in its procedures to ensure that the Engineering Change Control Log is used effectively.

Mechanical Bolting

The NRC cited deficiencies in mechanical equipment bolting that pertained to inadequate QC verification of bolt torquing and inadequate QC inspection relative to missing bolt washers. The corrective action required washers to be added to anchor bolts and the bolts retorqued. Required torque values were applied to the anchor bolts and documented by SWEC FQC during installation. NMPC instructed SWEC to develop a sampling plan for inspection of all safety-related installed equipment to verify that anchor bolt fasteners as installed are in conformance with design requirements. The Assessment Team concluded that SWEC failed to provide effective evidence that the attributes list for the sampling plan was approved by NMPC prior to implementation of the plan. As a result CAR 84.0055 was issued by the Assessment Team.

2.2.5 Materials/Receiving

The CAT report found project storage and maintenance programs to be acceptable, but some specific deficiencies were noted in material traceability, material control and storage, housekeeping, and source inspections.

Material Traceability

NRC concerns regarding material traceability in the structural assembly of electrical equipment were addressed by CAT Item 2-83. Battery racks were assembled using unmarked material; inadequacies in drawings and specifications were noted; and inspection plans did not include inspection bolting attributes for

material requirements. The Assessment Team determined by verification of documentation and field inspection that all relative and required corrective action had been taken. Actions to prevent recurrence are adequate and are in place.

Storage and Housekeeping

Several instances of inadequate housekeeping and improper storage of materials and equipment have been addressed in CAT Item 46-83. Several examples of improper storage and lack of protection from damage and deterioration to safety-related equipment in the plant and in laydown areas were noted by the Assessment Team. Action taken to correct housekeeping/storage conditions was evaluated and determined to be inadequate or ineffective. Some improvement has been evidenced in specific areas; however, the overall condition has not significantly improved and CAR 84.0140 has been issued by the Assessment Team.

An overall programmatic evaluation of the materials and receiving operations resulted in observations of the following unresolved deficiencies in the housekeeping and material storage area.

- Dissimilar materials stored/stacked together
- Lack of dunnage
- Storage at lower level than specified, such as D for B
- Material stored in unassigned areas
- Contractor material intermixed
- Use of rejected handling slings
- Scrap, surplus, rejected and accepted material intermixed

2.3 PROGRAMMATIC ITEMS

2.3.1 Training

According to both the CAT and SALP reports, SWEC's and ITT's training records were difficult to use. Subsequent reviews by the Assessment Team noted similar problems for JCI and Comstock. The programs, in general, included no lesson plans, little detail as to subject matter and no pre-determined list of

required attendees. No written examination notes and no signed attendance sheets were available. The procedure title, number or revision of the procedure trained to are often not noted on the training records.

Because JCI's training requirements were not proceduralized adequately, and numerous informal training sessions of requirements, such as required reading, were not recorded and filed with the individual's Qualification/Certification Record, it was extremely difficult to determine even minimum capability. The question of adequate experience for certification could not be answered. JCI should document the basis for certification by including details of experience and educational background.

There is a tendency to not require additional training or retraining for isolated case deficiencies when training would be appropriate preventive action. Examples include NRC items 82-12-02 and 83-02-06. The Assessment Team found evidence that SWEC's training program has improved. A new training coordinator has been employed. There has been some attempt to have ITT and Comstock personnel train under the SWEC program but there is no evidence that this has happened or that the programs of ITT and Comstock are improved. In addition, no attempt has been made to retrain in isolated case problems as a preventive action measure.

In general, the adequacy and quality of the training records remain a concern, but improvements planned in the overall training program should result in better records.

2.3.2 Communication

The Assessment Team noted what appears to have been a communication problem between NMPC and GE. This resulted in an interface problem that affected GE drawings, test instructions, ship short authorizations, and work order packages, and caused delays in implementing the required corrective action. Procedural modifications have been made, but these will take time to show positive results. At the moment, this remains an area of concern.

2.3.3 Inspection

CAT Item 1-83 addressed the NRC's concern that raceway installation inspections are not being performed in a timely manner. A sampling of 48 recent raceway tickets showed an average of 70 days between completion and inspection. Nevertheless, the resolution is considered satisfactory since the Assessment Team has also verified that cable pulling is not to be performed until the raceway has been accepted.

The NRC's concern that inspection plans and procedures contain deficiencies relative to inspection criteria was addressed in CAT Item 6-83. No inspection attributes or criteria had been provided for Kellem grips, temporary identification, separation barriers or protrusions into the cable tray, although these attributes had been specified. The Assessment Team found that NMPC appropriately revised the inspection plans and procedures to provide for inspection of these attributes, but did not make provision for verifying the installation of permanent Kellem grips permitted to be installed after cable pulling. A recommendation for correcting this has been made under CAT Item 6-83.

CAT Item 11-83 identified a programmatic deficiency regarding FQC personnel being unaware of procedural requirements for Preliminary Inspection Verification (PIV) inspection or completing IRs without actually inspecting the equipment. The Assessment Team recommends that training in this area be expanded to disciplines other than craft and electrical, and should have a more extensive curriculum.

The CAT report also noted that ITT inspection checklists for piping do not reflect the latest design document. Corrective and preventive actions were initiated to assure that ITT inspection checklists will reflect the latest design and/or design change document. The Assessment Team concluded that corrective action had not been completely addressed, and therefore, CAR 84-0058 was issued. Its satisfactory completion will resolve the concern.

Inspection Attributes

The lack of documentation on IRs (not identifying drawing revision and the E&DCR to which the item was inspected) was addressed in CAT Item 4-83. The Assessment Team verified that NMPC had revised appropriate procedures to require recording of the specific documents used, and to review prior inspections to verify that the latest documents at the time of inspection had been used. The procedures have been revised, but that the reviews of prior inspections had not been performed. CAR 84.0058 was issued by the Assessment Team.

There were several instances when field QC inspectors prepared DRs based on reference dimensions on drawings rather than required dimensions. Reference dimensions were considered "absolute", resulting in nonconformance documents being processed which were invalid.

2.4 PHASE IV SAMPLING ASSESSMENTS

The Assessment for Phase IV was based on a sampling of deficiencies and nonconformances reported by the five major contractors during the period between January 1, 1981 and March 31, 1984. The items were divided among the Assessment Team by applicable discipline and, within each discipline, classified as either hardware or programmatic-related.

The statistical methods for sample selection were designed to provide 95 percent confidence that the evaluated elements of the entire population have less than 5 percent noncompliance. This is consistent with past NRC recommendations related to reinspections of safety-related items and will produce results at least equivalent to those expected from 100 percent inspection.

The statistical sampling methods used during the sample selection are in accordance with MIL-STD-105D Tables I, IIA and VIIA, probably the most widely used sampling standard applied to assess compliance with requirements.

Twelve categories of deficiencies in Phase IV had populations which allowed the application of the statistical sampling plan.

- When the sample validated that the required level of quality had been maintained, the lot was considered acceptable and no further sampling was required.
- When the sample disclosed that the required level of quality had not been maintained, the Assessment Team increased the sample size and tightened sampling per established tables.
- When tightened sampling disclosed that the desired quality level had been obtained, no further sampling was required of that lot.

2.4.1 Sampling Plan Results

The following table represents those categories of deficiencies whose populations were such that the statistically valid sampling plan was applicable. The categories shown below as "other" are those populations of deficiencies classified by the respective contractor as not pertaining to a specific discipline.

Hardware:

Org/Disc	Population	Total Quantity Sampled	Normal Accept Number	MAC Deficiencies	Tightened Accept Number	MAC Deficiencies	Results
SWEC Civil	1,166	128	2	0	N/A	--	Passed Normal
SWEC Mech	545	184	0	1	0	3	Failed Tightened
SWEC Elec	1,498	128	2	2	N/A	--	Passed Normal
SWEC NDE	265	133	0	1	0	5	Failed Tightened
SWEC Other	2,449	386	2	2	3	12	Failed Tightened
ITT Mech	1,246	127	2	2	N/A	--	Passed Normal
ITT NDE	1,387	281	2	2	3	8	Failed Tightened
ITT Other	414	163	0	1	0	2	Failed Tightened
JCI Mech	190	102	0	0	N/A	--	Passed Normal

Programmatic:

ITT Mech	213	100	0	1	0	5	Failed Tightened
ITT Other	415	145	0	1	0	9	Failed Tightened
JCI Other	428	107	0	1	0	1	Failed Tightened

2.4.2 Phase IV Hardware Sampling Assessment Analysis

SWEC

Conclusion

The results of the application of the statistically valid sampling plans to the Civil/Structural and Electrical populations of deficiencies provides justification for acceptance of the lots.

The results of the application of the statistically valid sampling plans for the defined populations of deficiencies for the Mechanical and Welding/NDE disciplines and SWEC hardware "other" provides justification for reinspection of these lots. All three lots failed tightened sampling.

Recommendation

The Mechanical and Welding/NDE items failing the original normal and tightened sampling plan should be verified by review of the stated deficiency, the original acceptance, criteria, and the committed corrective action, and verification through records or hardware reinspection as appropriate for corrective action implementation.

For the hardware "other" category, the Assessment Team has reviewed the CARs leading to the failure of the sampling plan and has made a judgment that none of the deficiencies reflect on the in-place quality of hardware. They are the kinds of deficiencies that can and should be resolved during document review prior to records turnover. On this basis, the Assessment Team recommends that SWEC and NMPC perform a technical review of the identified deficiencies and assess the possible impact on the project if such were to recur in the remainder of the population.

Mechanical hardware "other" items represent approximately 50 percent of the population and it is estimated on a worst-case basis, approximately 1,042 items would be required to be reinspected on a 100 percent basis. The Assessment Team recommends a normal sample of the remaining mechanical hardware "other" items be taken and if no hardware-affecting deficiencies are disclosed, the remainder of this population be accepted.

ITT

Conclusion

The results of the application of the statistically valid sampling plan for the defined population of deficiencies for the Mechanical discipline provides justification for acceptance of the lots.

The result of the application of the statistically valid sampling plan to the Welding/NDE and hardware "other" population of deficiencies provides justification for reinspection of this lot. These two lots failed tightened sampling.

Recommendation

The population of ITT Hardware Welding/NDE deficiencies was 1,387. A total of 281 items was reviewed. Ten of these were found to be unsatisfactory causing the sample category to fail the tightened sample plan. The Assessment Team has reviewed the ten failures, and has found that they represent the entire time period of the assessment. Seven of the ten failures relate to hardware deficiencies that involve the in-place quality of the item. The Assessment Team recommend that the contractor be given the responsibility for reinspecting the remaining 1,106 documented items. Upon completion of the contractor reinspections of these previously documented deficiencies, NMPC should perform a statistical sampling to verify the contractor's actions.

ITT hardware "other" items failing the original normal and tightened sampling plan should be verified by review of the stated deficiency, the original acceptance criteria, and the committed corrective action, and verification through records or hardware reinspection as appropriate for corrective action implementation.

JCI

Conclusion

The result of the application of the statistically valid sampling plan to the Mechanical population of deficiencies provides justification for acceptance of the lot.

2.4.3 Phase IV Programmatic Sampling Assessment Analysis

ITT

Conclusion

The result of the application of the statistically valid sampling plan to the Mechanical and programmatic "other" population of deficiencies provides justification for reinspection of these lots. The two lots failed the tightened sampling plan.

Recommendation

Items in these lots failing the original normal and tightened sampling plans should be reverified by review of the stated deficiency, the original acceptance criteria, and the committed corrective action, and verification through records or hardware reinspection as appropriate for corrective action implementation.

One hundred thirteen reinspections should be performed for the remaining Mechanical population and 270 reinspections should be performed for the remaining "other" population.

JCI

Conclusion

The result of the application of the statistically valid sampling plan to the programmatic "other" population of deficiencies provides justification for reinspection of the lot. The lot failed the tightened sampling plan.

Recommendation

Items in the lot failing the original normal and tightened sampling plan should be reverified by review of the stated deficiency, the original acceptance criteria, and the committed corrective action, and verification through records or hardware reinspections as appropriate for corrective action implementation. Three hundred twenty-one reinspections should be performed for the remaining population.

3.0 ANALYSIS OF DEFICIENCY DOCUMENTS

3.1 INTRODUCTION

This section presents a quantitative analysis of the results of the evaluation of deficiency documents, for the project as a whole, and for each responsible organization (NMPC, SWEC, ITT, etc.) The Assessment Team developed a series of codes for classifying hardware and programmatic deficiencies and their causes in order to analyze which of those causes occurred most frequently. Programmatic deficiencies were identified in accordance with the 18 Criteria of 10CFR50, Appendix B. Hardware deficiencies were categorized according to 51 codes relating to construction materials, components and processes. Two thousand nine hundred forty records were assessed, resulting in 4,300 coded deficiencies, including those on the original deficiency document and those resulting from evaluation by the Assessment Team as to corrective action implementation. These 4,300 coded deficiencies included 1,701 programmatic deficiencies and 2,459 hardware deficiencies. One hundred forty were identified as "no deficiency".

Pareto charts were developed and analyzed in order to pinpoint those areas in which efforts at improvement could be made most effectively. The Pareto principle holds that a majority of the significant problems have relatively few causes. This method of analysis graphically identifies the significant areas requiring correction and also displays those where the effort to bring about correction may be more costly than the benefits to be derived.

The Pareto analysis was conducted for all deficiencies evaluated by the Assessment Team, and for those deficiencies evaluated by the Assessment Team as Satisfactory with Recommendation (S/R) or Unsatisfactory (UNSAT). The purpose in combining these two sets of data is solely to provide a large enough sample of the total population to provide more meaningful data as to the underlying causes of problems than would have resulted from analyzing only those categorized as Unsatisfactory. This was an alternative to analyzing the entire population.

The Pareto analysis program identified the cause, whether the deficiency was programmatic or hardware-related, the responsible organization and the phase

of the program in which the deficiency was evaluated. One or more deficiency codes were assigned to each deficiency to reflect the cited problem, as well as any discrepancy in the resolution of the identified problem. These data were then entered into a computer and sorted by various methods to identify significant populations of deficiency codes related to each specific organization.

The following contractors and vendors were coded as SWEC responsibilities:

L. K. Comstock	Electrical
Cives Steel	Structural/Steel Erector
Walsh Construction Company	Civil
Northern Ready Mix	Concrete Supplier
Dames and Moore	Geotechnical Services
Miscellaneous suppliers	

For all contractors, deficiencies may be categorized as either hardware or programmatic or a combination of both and are so displayed in the Pareto charts. The same record may provide both hardware and programmatic deficiencies. The total coded deficiencies will be generally greater than the number of documents judged Satisfactory with Recommendation or Unsatisfactory.

The programmatic coded deficiencies and the hardware coded deficiencies for all organizations as identified by the original deficiency documents are shown on Figures A and B, respectively. Figure A indicates that deficiencies against the following Criteria of 10CFR50, Appendix B, accounted for more than 5 percent of the total deficiencies: Criteria 17 (Quality Assurance Records); 5 (Instructions, Procedures and Drawings); 10 (Inspections); 15 (Nonconforming Materials, Parts or Components); 2 (Quality Assurance Program); 9 (Control of Special Processes); 16 (Corrective Action); 8 (Identification and Control of Materials, Parts and Components); and 3 (Design Control). These are the significant areas of programmatic deficiencies for the period covered by this assessment.

Figure B indicates that deficiencies in excess of 5 percent of the total exist against only 4 of 51 hardware deficiency codes: 38 (Welding); 41 (Pipe and Hanger/Supports); 63 (Material); and 40 (Piping/Pipe Spools).

Pareto Analysis
Distribution of Programmatic
Deficiency Codes– All Contractors

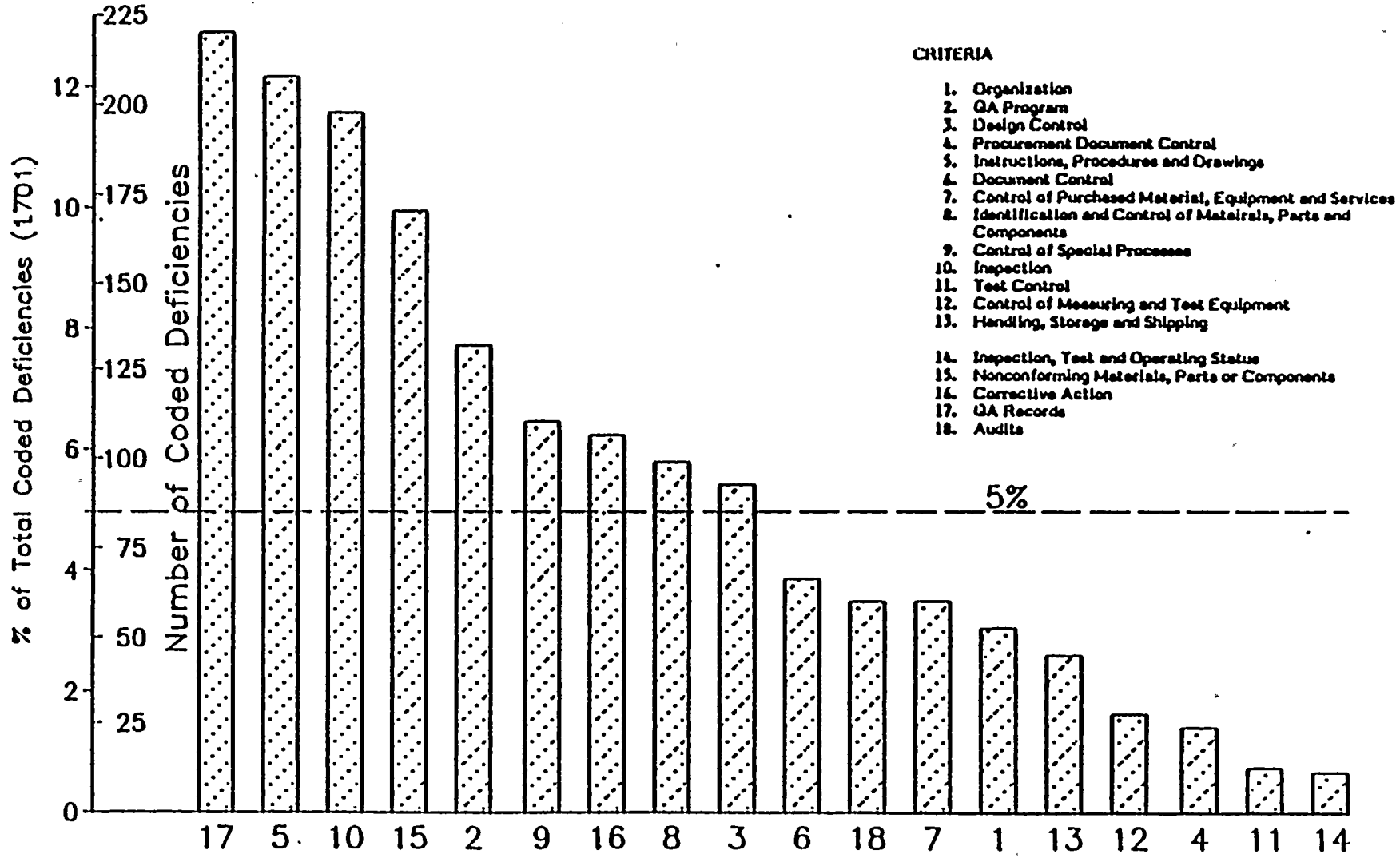
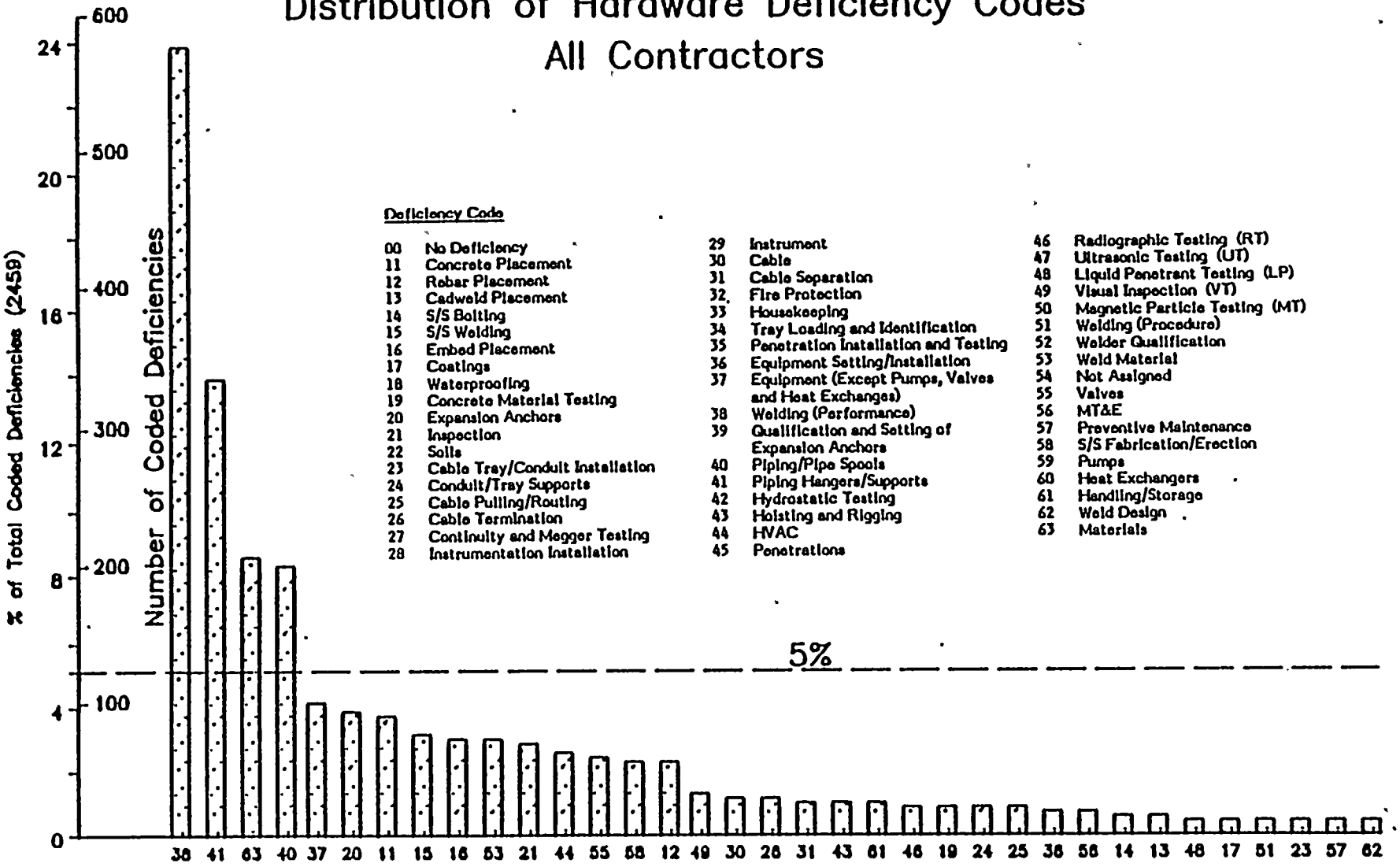


Figure A

Pareto Analysis
Distribution of Hardware Deficiency Codes
All Contractors



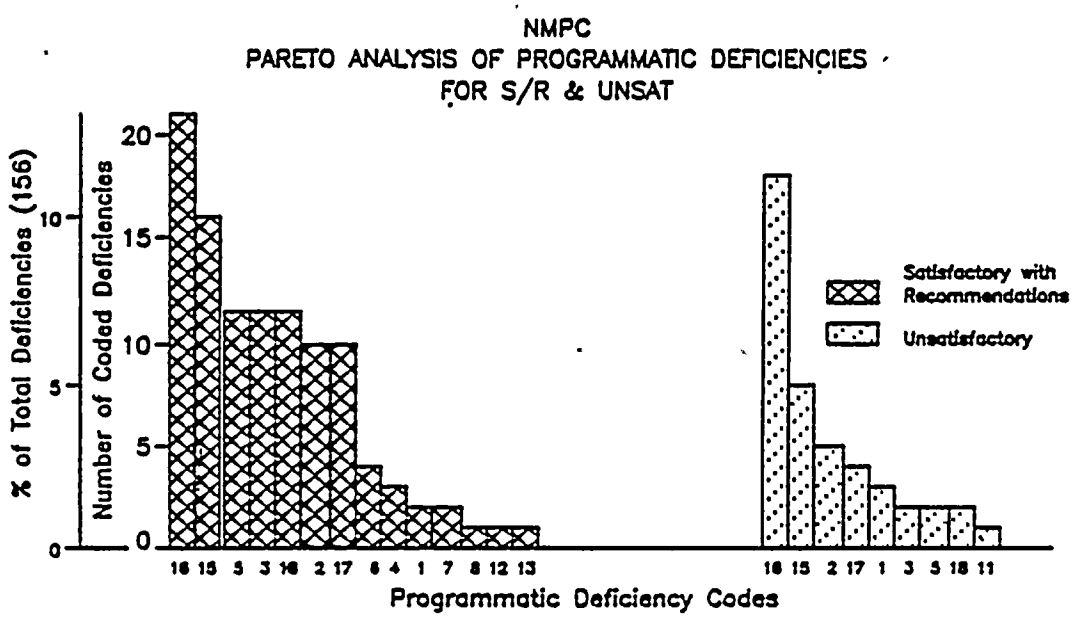
Deficiency Code

00	No Deficiency	29	Instrument	46	Radiographic Testing (RT)
11	Concrete Placement	30	Cable	47	Ultrasonic Testing (UT)
12	Rebar Placement	31	Cable Separation	48	Liquid Penetrant Testing (LP)
13	Cadweld Placement	32	Fire Protection	49	Visual Inspection (VT)
14	S/S Bolting	33	Housekeeping	50	Magnetic Particle Testing (MT)
15	S/S Welding	34	Tray Loading and Identification	51	Welding (Procedure)
16	Embed Placement	35	Penetration Installation and Testing	52	Welder Qualification
17	Coatings	36	Equipment Setting/Installation	53	Weld Material
18	Waterproofing	37	Equipment (Except Pumps, Valves and Heat Exchanges)	54	Not Assigned
19	Concrete Material Testing	38	Welding (Performance)	55	Valves
20	Expansion Anchors	39	Qualification and Setting of Expansion Anchors	56	MT&E
21	Inspection	40	Piping/Pipe Spools	57	Preventive Maintenance
22	Soils	41	Piping Hangers/Supports	58	S/S Fabrication/Erection
23	Cable Tray/Conduit Installation	42	Hydrostatic Testing	59	Pumps
24	Conduit/Tray Supports	43	Hoisting and Rigging	60	Heat Exchangers
25	Cable Pulling/Routing	44	HVAC	61	Handling/Storage
26	Cable Termination	45	Penetrations	62	Weld Design
27	Continuity and Megger Testing			63	Materials
28	Instrumentation Installation				

Figure B

3.2 PHASE I, II AND III ANALYSIS

Phase I, II and III programmatic/hardware deficiencies consisted of mechanical, electrical/I&C, civil/structural, welding/NDE, material/receiving and software deficiencies noted by NMPC on corrective action documents as programmatic or hardware related. All 296 of the NMPC programmatic/hardware documents were evaluated by the Assessment Team. Of these 296 deficiency documents, 93.9 percent were rated by the Assessment Team as Satisfactory or Satisfactory with Recommendations. When translated into deficient items rather than documents, the results are 94.4 percent Satisfactory and Satisfactory with Recommendations and 5.6 percent Unsatisfactory.



Out of the 88 NMPC documents evaluated as Satisfactory with Recommendation or Unsatisfactory, there were 156 coded deficiencies. These were combined for analysis. The distribution of the most significant coded deficiencies among the various criteria are as follows:

		Coded Deficiencies
• Criterion 16	Corrective Action	39
• Criterion 15	Nonconforming Material, Parts or Components	24
• Criterion 2	Quality Assurance Program	15
• Criterion 5	Instructions, Procedures and Drawings	14
• Criterion 3	Design Control	14
• Criterion 18	Audits	14
• Criterion 17	Quality Assurance Records	14

The principal root causes of these deficiencies, in descending order of importance, are:

- Not implemented in approved program/procedures
- Deficiency in the approved program/procedures
- Lack of timeliness

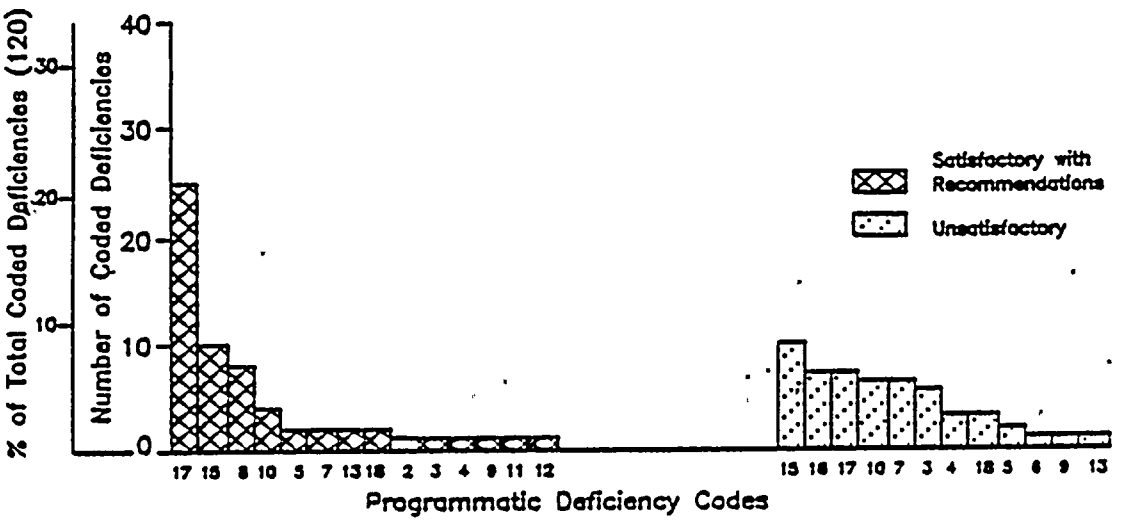
In addition, the following root causes for hardware deficiencies are also applicable:

- Inadequate workmanship
- Inadequate material traceability
- Inadequate handling/storage/protection
- Inadequate reinspection of dispositions
- Inadequate design detail
- Inadequate acceptance criteria

3.3 SWEC PROGRAMMATIC

One hundred forty-one documents detailing civil/structural, electrical/I&C, welding/NDE, mechanical and other deficiencies noted by SWEC on corrective action documents as programmatic-related were assessed by the Assessment Team. Due to the relatively small size of the populations of these previously identified deficiencies, these disciplines were assessed as a group.

SWEC
PARETO ANALYSIS OF PROGRAMMATIC DEFICIENCIES
CODES FOR S/R & UNSAT



There were a total of 120 programmatic coded deficiencies against 10 SWEC programmatic and 90 hardware documents assessed as Satisfactory with Recommendation or Unsatisfactory. These data have been combined for the purpose of analysis. The quantities shown reflect the distribution of the coded deficiencies among the various criteria. The following are the most significant problem areas:

			Coded Deficiencies
•	Criterion 17	Quality Assurance Records	33
•	Criterion 15	Nonconforming Materials, Parts or Components	20
•	Criterion 10	Inspection	11
•	Criterion 7	Control of Purchased Material, Equipment and Services	9

		Coded Deficiencies
• Criterion 8	Identification and Control of Materials, Parts and Components	8
• Criterion 3	Design Control	7

The principal root causes of these Criteria deficiencies, in descending order of importance, are:

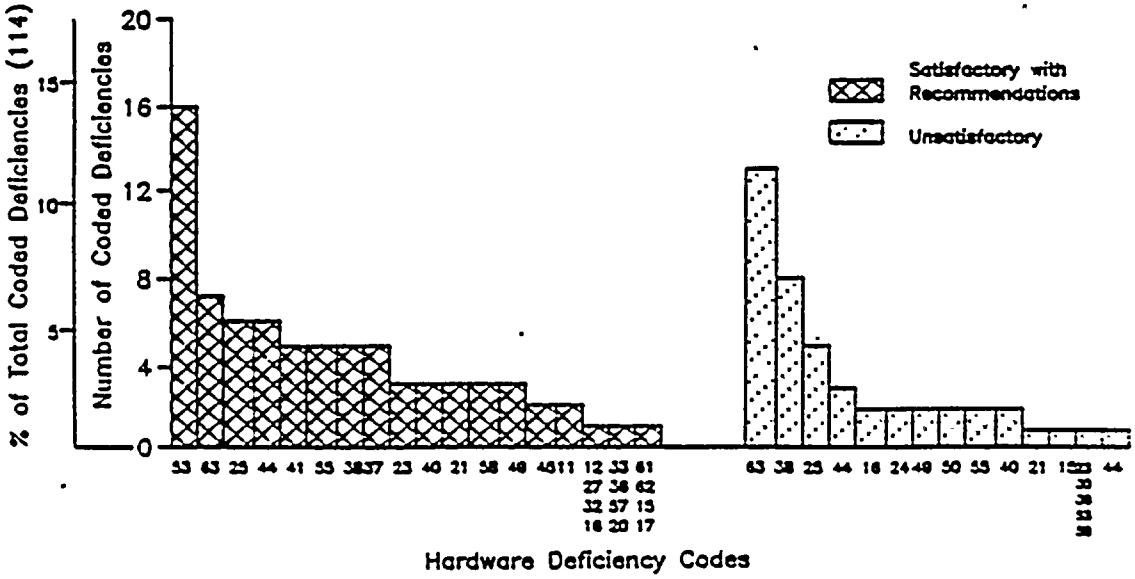
- Deficiency in the approved program/procedures
- Not implemented in approved programs/procedures

3.4 SWEC HARDWARE

SWEC hardware consisted of mechanical, electrical/I&C, civil/structural, welding/NDE and other deficiencies noted by SWEC on corrective action documents as hardware-related. A total of 960 SWEC hardware documents were assessed by the Assessment Team.

Due to the large size of the population of these previously identified deficiencies, they were assessed by the application of a statistically valid sampling plan.

SWEC
PARETO ANALYSIS OF HARDWARE DEFICIENCIES
FOR S/R & UNSAT



There were a total of 114 hardware deficiencies coded against 90 SWEC hardware and 10 programmatic documents assessed as Satisfactory with Recommendation or Unsatisfactory. These data have been combined for the purpose of analysis. The following are the most significant problem areas. The quantities shown represent the distribution of these coded deficiencies among the various codes; none of these categories accounted for as much as 5 percent of the total population of assessed documents.

		Coded Deficiencies
• Code 63	Material Control	22
• Code 53	Control of Weld Material	16
• Code 38	Welding	13
• Code 25	Cable Pulling	13
• Code 44	HVAC	11
• Code 55	Valves	7

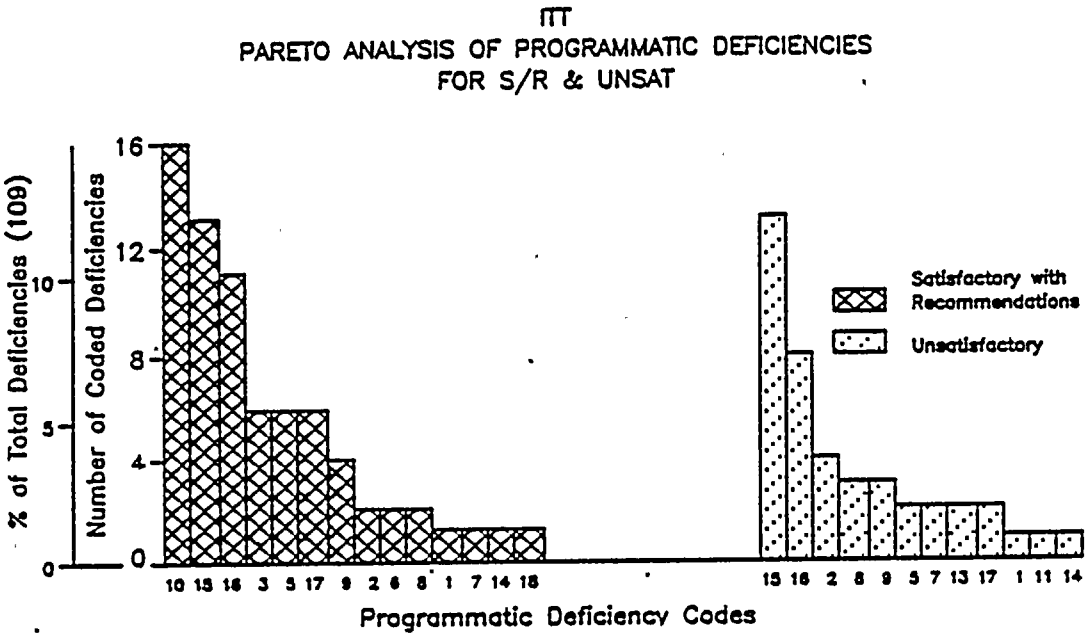
The principal root causes of these deficiency codes, in descending order of importance, are:

- Inadequate/incomplete documentation
- Inadequate workmanship
- Failure to follow procedures
- Vendor error
- Inadequate configuration control
- Inadequate disposition on nonconforming documents
- Inadequate reinspection of dispositioned nonconforming documents

3.5 ITT PROGRAMMATIC

ITT programmatic deficiencies consisted of civil/structural, welding/NDE, mechanical and other deficiencies noted by ITT on corrective action documents as programmatic-related. A total of 331 ITT programmatic documents were assessed by the Assessment Team.

Due to the large size of the populations of the mechanical and other classified deficiencies, these were assessed by the application of the statistically valid sampling plan. Civil/structural and welding/NDE were assessed in their entirety.



There were a total of 109 programmatic coded deficiencies against 41 ITT programmatic and 57 hardware documents assessed as Satisfactory with Recommendation or Unsatisfactory. These data were combined for the purpose of analysis. The following are the most significant problem areas. Quantities shown reflect the distribution of coded deficiencies among the various criteria.

		Coded Deficiencies
• Criterion 15	Nonconforming Materials, Parts or Components	28
• Criterion 16	Corrective Action	19
• Criterion 10	Inspection	16

The following accounted for less than 5 percent of all assessed documents but were contributory:

		Coded Deficiencies
• Criterion 5	Instructions, Procedures and Drawings	8

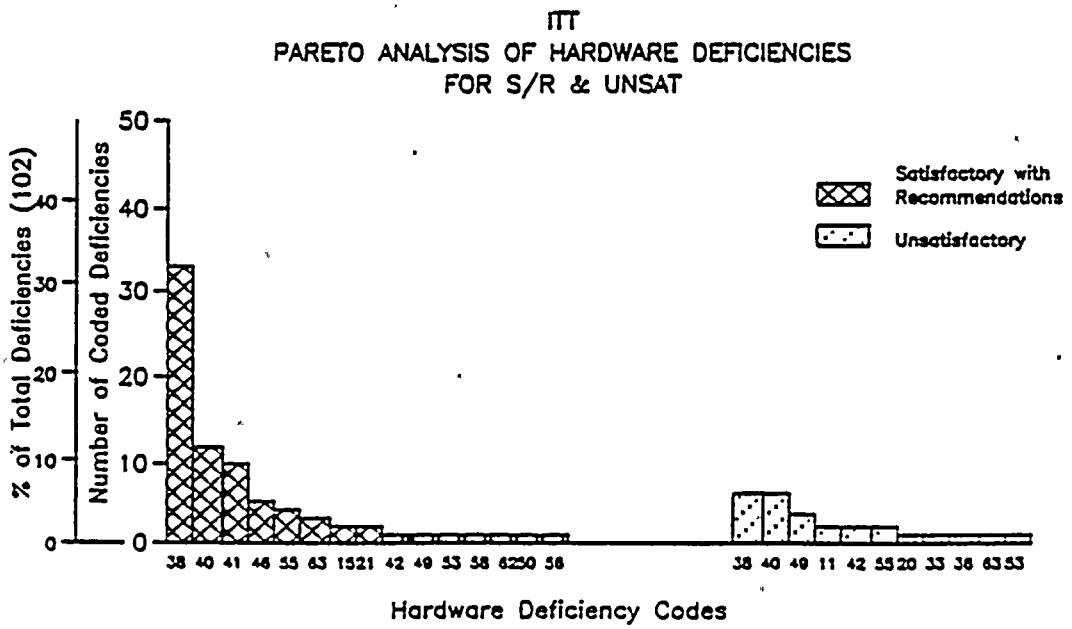
		Coded Deficiencies
• Criterion 17	Quality Assurance Records	8
• Criterion 2	Quality Assurance Program	6
• Criterion 3	Design Control	6
• Criterion 9	Special Processes	7

The principal root causes of the Criteria deficiencies, in descending order of importance, are:

- Not implemented in approved program/procedures
- Lack of timeliness
- Deficiency in approved program/procedures

3.6 ITT HARDWARE

ITT hardware consisted of welding/NDE, mechanical and other deficiencies noted by ITT on corrective action documents as hardware-related. A total of 571 ITT hardware documents were assessed by the Assessment Team.



Due to the large size of the populations of these previously identified deficiencies, these were assessed by the application of the statistically valid sampling plan to each of the ITT-defined population breakdowns.

There were a total of 102 hardware coded deficiencies against 57 ITT hardware and 41 programmatic documents assessed as Satisfactory with Recommendation and Unsatisfactory. This data has been combined for the purpose of analysis. The following are the most significant problem areas. The distribution of coded deficiencies among the various codes is as follows:

		Coded Deficiencies
• Code 38	Welding	38
• Code 40	Piping and Pipe Spools	17
• Code 41	Piping Hangers and Supports	10
• Code 55	Valves	6

The principal root causes of these deficiency codes, in descending order of importance, are:

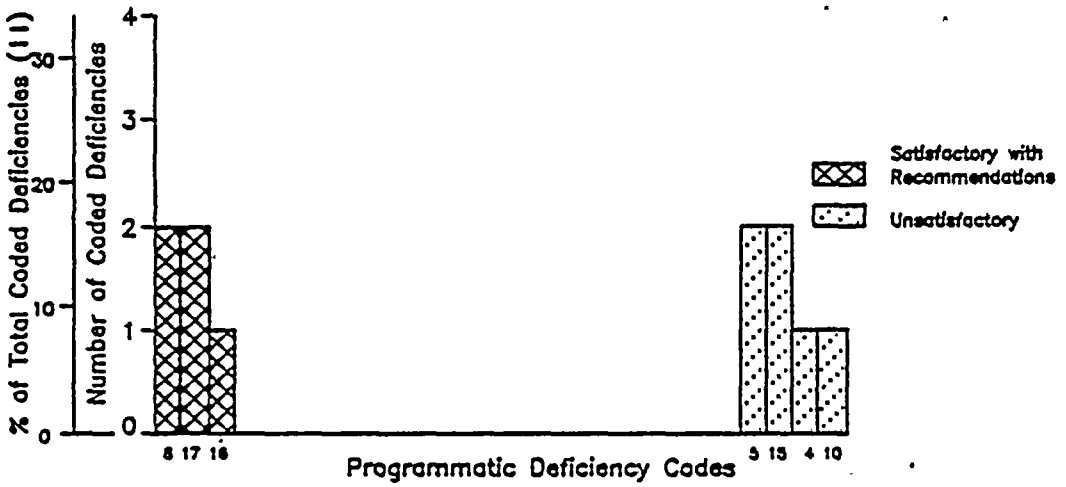
- Inadequate workmanship
- Inadequate handling/storage/protection
- Failure to follow procedures
- Inadequate configuration control
- Inadequate timeliness
- Inadequate design detail

3.7 JCI PROGRAMMATIC

JCI programmatic consisted of civil/structural, welding/NDE, electrical/I&C, mechanical and other deficiencies noted by JCI on corrective action documents as programmatic-related. A total of 197 JCI programmatic documents were assessed by the Assessment Team.

Due to the size of the population of these previously identified deficiencies, they were assessed by the application of the statistically valid sampling plan to each of the JCI-defined population breakdowns.

JCI
PARTETO ANALYSIS OF PROGRAMMATIC DEFICIENCIES
FOR S/R & UNSAT



A total of 11 JCI progammatic coded deficiencies were identified against 8 programmatic and 5 hardware documents assessed as Satisfactory with Recommendation or Unsatisfactory. These combined data were analyzed to determine the most significant problem areas. However, a population of 12 is too small for accurate analysis, and furthermore, none of the areas represents as much as 2 percent of the total population of assessed documents. The quantities shown represent the distribution of the coded deficiencies against the various criteria.

		Coded Deficiencies
• Criterion 5	Instruction Procedures and Drawings	2
• Criterion 8	Identification and Control of Material, Parts or Components	2
• Criterion 15	Nonconforming Material, Parts or Components	2
• Criterion 17	Quality Assurance Records	2

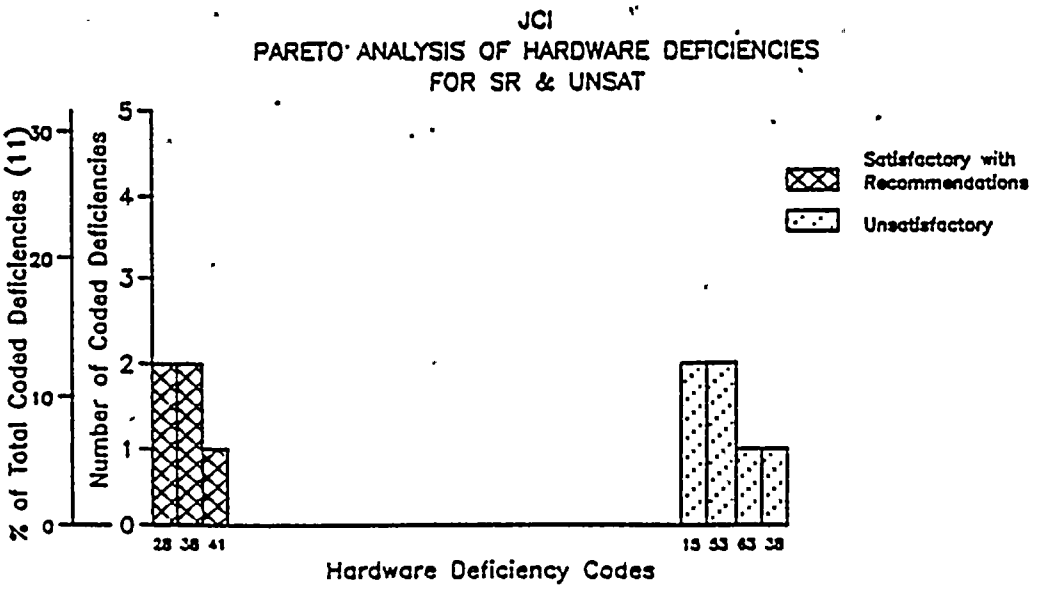
The principal root cause of these coded deficiencies is:

- Not implemented in approved program/procedures

3.8 JCI HARDWARE

JCI hardware consisted of civil/structural, welding/NDE, mechanical and other deficiencies noted by SWEC on corrective action documents as hardware-related. A total of 222 JCI hardware documents were assessed by the Assessment Team.

Due to the size of the populations in the mechanical discipline, the previously identified deficiencies were assessed by the application of a statistically valid sampling plan. In all other disciplines, 100 percent of the population was assessed.



A total of 11 hardware-coded deficiencies representing five JCI hardware and eight programmatic documents assessed as Satisfactory with Recommendation or Unsatisfactory were identified. These data have been combined for the purpose of analysis. None of these codes represent as much as 5 percent of the

total population. The following listing represents the distribution of coded deficiencies within the various codes:

		Coded Deficiencies
• Code 38	Welding	3
• Code 28	Instrumentation Installation	2
• Code 15	Structural Steel Welding	2
• Code 53	Weld Material	2

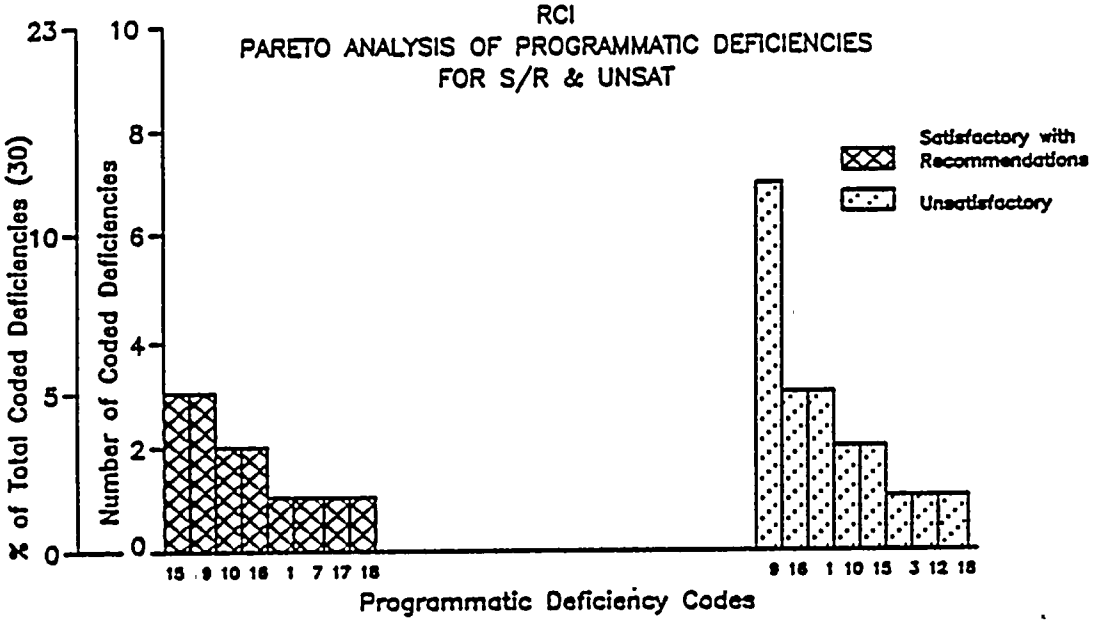
The established root causes of these deficiency codes, in descending order of importance, are:

- Inadequate workmanship
- Failure to follow procedures
- Inadequate material traceability
- Incomplete documentation
- Inadequate configuration control
- Inadequate identification

3.9 RCI PROGRAMMATIC

RCI programmatic consisted of welding/NDE, mechanical and other deficiencies noted by RCI on corrective action documents as programmatic-related. A total of 104 RCI documents were identified as programmatic and were evaluated by the Assessment Team.

One hundred percent of the population was assessed. There were 10 RCI programmatic and 17 hardware documents assessed as Satisfactory with Recommendation or Unsatisfactory, which resulted in 30 programmatic coded deficiencies. These data were combined for the purpose of analysis.



All of these coded deficiencies could be classified under 10CFR50, Appendix B, Criterion XVI Corrective Action; however, for further analysis these have been classified to identify the specific area where corrective action was not fully accomplished in the following tabulations. None of these areas accounts for more than 3 percent of the total population. The following are the most significant problem areas within the total of coded deficiencies.

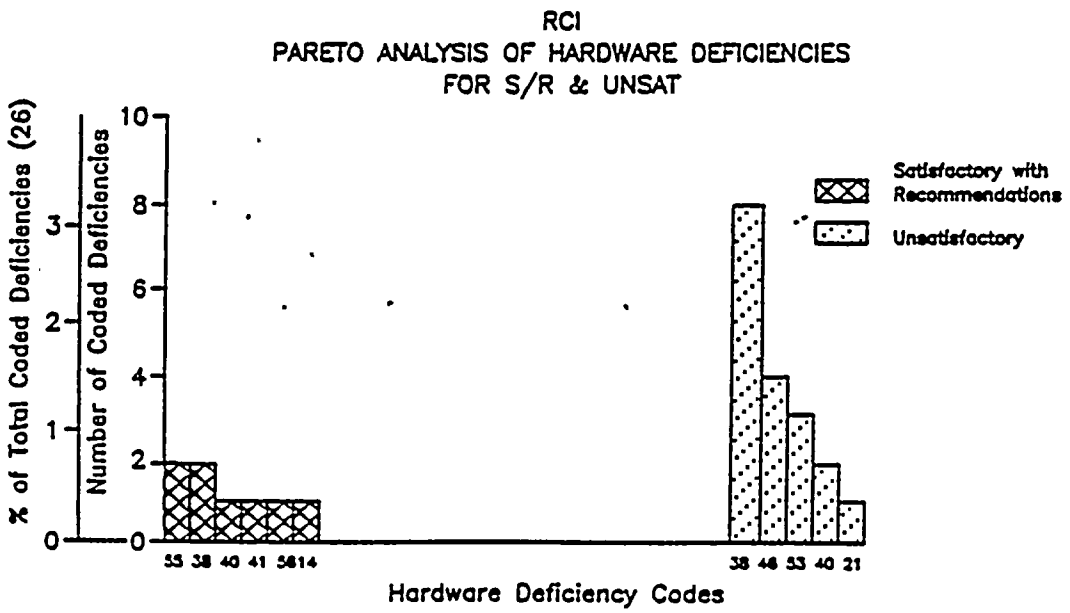
		Coded Deficiencies
• Criterion 9	Special Processes	10
• Criterion 15	Nonconforming Material, Parts or Components	5
• Criterion 16	Corrective Action	5
• Criterion 10	Inspection	4
• Criterion 1	Organization	4
• Criterion 18	Audits	4

The principal root causes of these deficiencies, in descending order of importance, are:

- Not implemented in approved program/procedures
- Deficiency in the approved program/procedures

3.10 RCI HARDWARE

RCI hardware consisted of welding/NDE, mechanical and other deficiencies noted by RCI on corrective action documents as hardware-related. A total of 78 RCI hardware documents were assessed by the Assessment Team. One hundred percent of the population was assessed.



There were a total of 26 hardware coded deficiencies identified for 17 RCI hardware and 10 programmatic documents assessed as Satisfactory with Recommendation or Unsatisfactory. These data were combined for the purpose of analysis. The following are the most significant problem areas identified. The quantities shown represent the distribution of coded deficiencies within the various codes.

		Coded Deficiencies
• Code 38	Welding	10
• Code 46	Radiographic Testing	4

Other areas contributing to the total are:

		Coded Deficiencies
• Code 40	Piping/Pipe Spools	3
• Code 53	Weld Material	3
• Code 55	Valves	2

The principal root causes of these deficiencies, in descending order of importance, are:

- Inadequate workmanship
- Inadequate material traceability
- Inadequate handling/storage/protection
- Incomplete documentation
- Inadequate cleanliness control

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 NRC ORDER ITEM ASSESSMENT

4.1.1 Quality Assurance Program

Conclusion

NMPC and all five major contractors at NMP-2 have improved their QA Programs. Organization and functional delineation has been accomplished. A CAR was issued for a deficiency in this area but has since been resolved. The staffs of each organization have been increased in the appropriate areas. Procedures defining responsibilities and interfaces have been accomplished in most cases. Procedures governing project activities have been upgraded. The auditing function has improved the scope of audit schedules to include more hardware activities.

Problems, however, still persist. For Criterion 7 of the 18 Criteria to 10CFR50, Appendix B, there is still room for improvement. It is the opinion of the Assessment Team that NMPC has either corrected or has an acceptable plan for correcting the deficiencies noted.

Recommendations

- Continue to emphasize audits and surveillance as a means of identifying areas of noncompliance, statusing QA program progress and assuring program effectiveness
- Emphasize the importance of determining root cause as a means of avoiding repetition of past problems
- Refine the computerized trending program by improving the data base and deficiency codes; restrict interpretation of problem and cause codes to as few people as possible to avoid a dilution of repetitiveness through differences in interpretation; consider assigning a Corrective Action Coordinator to perform these tasks
- Continue upper management's involvement in the QA program; require monthly reports on:
  - The performance and closing of audits and surveillance
  - The status of the corrective action program (deficiency reporting documents opened and closed, charts and graphs)

- Trending results

- Continue to upgrade procedures and training programs to keep up with the state of the art and avoid repetition of adverse conditions

4.1.2 Site Auditing Programs

Conclusion

Both NMPC and SWEC have evaluated their audit programs and have taken positive action to improve them. New and revised procedures have been developed which are in compliance with ANSI N45.2.12. Auditors are being trained and certified to ANSI N45.2.23. Audit programs are concentrating on construction and hardware problems and the use of technically qualified auditors outside the QA organization. The Assessment Team concluded that the audit programs of both NMPC and SWEC are vastly improved, and there is strong evidence that the proper steps are being taken to prevent recurrence of those kinds of problems cited by the NRC.

Recommendations

- Enforce the new requirements for timely closure of audit findings and audit reports

- Assure that all audit findings incorporate the determinations of root cause and action to prevent recurrence

- Continue training of new auditors and retraining of certified auditors in the latest auditing techniques and goals

- Better distinguish between the surveillance program and the audit program

4.1.3 Corrective Action System

Conclusion

There continue to be problems with the corrective action systems of both NMPC and SWEC, both in terms of delays in implementing corrective action and verification of corrective action. E&DCRs are used to record nonconformances; the training system for N&Ds is ineffective; and there is no mechanism for tracking contractor implementation of dispositions. Responses to

corrective action continue to be slow. Verification to ensure that previously installed items meet updated criteria is lacking. The use of Type "A" and Type "C" IRs has hampered the corrective action verification process. The Assessment Team concluded that although some improvement has been achieved in the form of revised procedures and an updated trending program, much remains to be done.

Recommendations

- Establish a Corrective Action Coordinator to initiate tracking, trending and reporting of corrective action progress
- Establish a log for deficiency reporting documents as a basis for statusing corrective action
- Develop a system that requires prompt reply and action
- Discontinue the use of SWEC Type "C" IRs as a nonconformance document

4.1.4 Document Control

Conclusion

NMPC and SWEC have gone to great lengths to address the problems of document control, and have established a task force to review the existing and upcoming problems of document control. However, the Assessment Team noted continued problems with access and retrievability. Related documents were not cross-referenced for ease of tracking. The facilities for housing the many documents are inadequate, and only one-hour fire safe cabinets are being used for permanent records. The Assessment Team concluded that both NMPC and SWEC have a significant document control problem that must be addressed before the monumental task of system turnover.

Recommendations

- Prepare now for the eventuality of document turnover by prioritizing the work effort and simplifying the workflow
- Make sure that all permanent plant records are indexed, protected, consolidated and retrievable in accordance with ANSI N45.2.9

- Provide more space and better equipment for housing the working documents and permanent records
- Hire and train additional personnel for the document control effort

4.1.5 Design Change Control

Conclusion

NMPC and SWEC have taken steps to improve the design control system, such as instituting a computerized system for posting design changes, reducing the number of drawing stations and attempting to make prompt distribution of changes. However, the Assessment Team identified situations in which drawings were not being reviewed according to procedure, design changes were not being posted against each affected drawing and the number of changes indicate inadequate design change review. In the opinion of the Assessment Team, both NMPC and SWEC are to be commended for their dedication to resolving the design change problem, and they have appropriately identified steps required to ensure the integrity of the design documents.

Recommendations

- Improve the review cycle for drawing changes and thereby reduce the volume of changes
- Improve and increase training in the area of change control to preclude working to inaccurate or missing procedures
- Continue to reduce the number of drawing stations
- Reduce the time it takes to incorporate a design change in order to assure that all personnel are working to the latest revision
- Standardize the terminology used in the drawing revision block to avoid ambiguity, and ensure that appropriate design changes have been incorporated

4.1.6 Procurement Quality Assurance

Conclusion

The NRC's concerns relative to Criterion 7 requirements are well founded. Lack of attention to specification requirements in the inspection process was

evident and the commitment to perform 100 percent reinspection was not carried through to the Inspection Plan Checklist. SWEC has instituted a training program for PQA inspectors which seems to be working. The Assessment Team could not find any further evidence of material being accepted that did not conform to acceptance standards. Additionally, source inspection is now required for selected Category I items. The Assessment Team concluded that the program and system for controlling procurement at NMP-2 as required by Criterion 7 is in place and working. The implementation of commitments should prevent recurrence.

Recommendations

- Reinspect all Cives steel beams to ensure unsatisfactory welds are not being used elsewhere on the project
- Continue to improve the training of PQA/QC personnel in Criterion 7 principles and industry requirements
- Avoid bypassing source inspection in lieu of inspection upon receipt
- Assure that specification and drawing requirements are included in the Receipt Inspection Checklist

4.1.7 Radiographic Film

Conclusion

The Assessment Team performed an extensive review of radiographic film processing and control by SWEC, ITT and RCI. The condition of the film and handling practices were poor. The original film was not available for welds requiring repair. NMPC conducted a 100 percent review of ITT radiographs that were accepted and filed in the vault. Deficiencies were recorded on SRs and conditions corrected.

The Assessment Team concluded that radiographic film problems identified by the CAT Team and documented on the order have been corrected, but this operation should be monitored through frequent audits and surveillances to ensure the continued integrity of the radiographic process.

Recommendations

- Provide the controls and equipment necessary to process and store new and processed film in an appropriate manner
- Continue training radiographers and film handling personnel in proper handling practices for processed film
- Perform regularly scheduled surveillance and inspection of film processing and handling, as an adjunct to the auditing efforts

4.1.8 Concrete Expansion Anchor Bolts

Conclusion

A review of the action taken by SWEC to substantiate the adequacy of installed concrete expansion anchor bolts was conducted by the Assessment Team. The NRC expressed concern that some concrete anchors were not adequately set. SWEC concluded that the bolts were set properly. The Assessment Team agrees with this conclusion.

Recommendations

- Continue to adhere to the strict requirements of the concrete expansion anchor bolt installation procedures
- Continue surveillance of the installation activities to provide assurance of adherence to design requirements

4.1.9 Power Generation Control Complex

Conclusion

The Assessment Team has reviewed the NRC order which notes the PGCC deficiencies related to separation criteria and the concern that NMPC has not provided assurance that this criteria has been satisfied. They have also evaluated what has been done to correct the adverse conditions. At this point, it is still unclear how much corrective action has been accomplished. Many FDIs and FDDRs have not yet been closed out, and progress is slow. A considerable amount of work involves GE equipment and there seems to be a reluctance to push GE.

Recommendations

- Make a concerted effort to complete the prescribed work so that related documentation can be closed out
- Install separation covers for installed underfloor raceways as close to raceway installation as possible
- Revise Inspection Plan N20E061AF1025 to require that partial cable pulls be inspected to the extent necessary to assure that installed cable meets specification requirements

4.2 DISCIPLINE ASSESSMENTS

4.2.1 Civil/Structural - Concrete

Conclusion

With the exception of one reinforcing steel spacing violation, which was not identified by QC, the concreting activities were found to be Satisfactory by the NRC. The NRC's concerns regarding adequate inspection criteria for concrete surfaces and criteria for concrete unit weight tests have been resolved. Concrete that had been mixed with a truck that failed mixer uninformity testing was certified as acceptable through reviewing compressive strength test reports.

Recommendations

None.

4.2.2 Civil/Structural - Concrete Expansion Anchors

This NRC concern is addressed in Section 4.1.8.

4.2.3 Electrical/I&C - PGCC

This NRC concern is addressed in Section 4.1.9.

4.2.4 Electrical/I&C - Seismic Criteria

Conclusion

The NRC's concern regarding seismic bolting criteria as it applies to the Motor Control Center (MCC) was given to SWEC for corrective action. SWEC's evaluation of the material substitution practices was reviewed by the Assessment Team during a CAT Item evaluation. SWEC determined that they are responsible for assuring that the substituted items do not violate seismic qualification. Inspection by NMPC substantiated the fact that the bolts as specified and as used were acceptable. The Assessment Team determined through a review that the bolts were acceptable and concurred with action and conclusions of the deficiency item disposition.

Recommendations

None.

4.2.5 Welding/NDE - Weld Quality and Associated Documentation

Conclusion

Weld quality problems have been documented by the NRC and by internal audits of ITT, Cives and RCI welding operations. Undersized, oversized and not-to-specification welds were noted in several areas. The NRC noted that a large number of Cives shop welds for supports were undersized and 15 to 20 percent were rejectable. Rejected welds were recorded on N&Ds and dispositioned "accept as is" but only a sampling of the rejected welds were on the N&Ds. The Assessment Team concludes that welding practices at NMP-2 require considerable attention from QA to improve weld quality and improve associated documentation.

Recommendations

- Examine the recurrence of undersized and oversized welds and take positive steps to improve the integrity of this operation
- Perform source examination to preclude off-site welding arriving in a nonconforming condition

- Develop improved procedures for on-site welding; review and approve procedures used for off-site welding
- Improve weld documentation and originate and maintain weld data sheets as permanent records

4.2.6 Welding/NDE - Weld Repairs

Conclusion

All contractors' deficiency reporting documents have indicated excess weld repairs for both butt and fillet welds. All contractors exceed engineering weld design size (approximately 75 percent of the time). ITT failed to identify weld repairs not in accordance with the applicable specifications. Over-grinding has been a common practice for removing minor defects. These are all rather minor program discrepancies which can be corrected with additional training and welding procedures.

Recommendations

- Address welding performance data to determine and monitor welder's capability
- Direct defects that cannot be removed with minimum grinding to Engineering for disposition
- Instruct craft to limit weld size for repairs to specified Engineering requirements

4.2.7 Welding/NDE - Weld Material Control

Conclusion

The most significant weld material control problem was that of weld rod control, which resulted in the initiation of a CAR by the Assessment Team. The CAR has been satisfactorily resolved.

Recommendations

- Increase the frequency of QC in-process inspection and monitoring
- Review WMRs for completeness so that minor errors are not repeated

4.2.8 Welding/NDE - Welding Qualifications

Conclusion

The NRC had identified a case of welder qualifications not meeting ASME Code Section IX in effect at the time of qualification. The Assessment Team determined that welder qualification records were inadequate and issued a CAR for the condition. The CAR has subsequently been resolved satisfactorily and closed.

Recommendation

None.

4.2.9 Welding/NDE - Weld Inspection

Conclusion

The radiographic film problems have been discussed in Section 4.1.7 of this report. The NRC has indicated that ITT and RCI have problems in the NDE area. They noted that both of these contractors had visual and penetrant inspection problems involving piping and pipe supports/restraints. Additionally, ITT, on many occasions, has closed DRs prior to completion of radiography. In some cases, radiography performed later disclosed unacceptable discontinuities, necessitating another DR. The Assessment Team has determined that most of the problems involving NDE operations have been resolved.

Recommendations

- Reference a preceding DR when generating a follow-on DR for the same welding problem, to prevent repeating repairs for the same discontinuity
- Assign Engineering to disposition DRs when the integrity of the weld is in question
- Establish the number of times a given weld can be reworked prior to removing the entire weld
- Establish a means by which the cut out or repaired section of the weld can readily be identified for NDE purposes

4.2.10 Mechanical - Piping

Conclusion

The NRC identified problems with the piping QC programs of ITT and RCI. ITT is not inspecting for piping attributes such as configuration, location and interferences. Another problem indicated was that checklists for piping did not reflect the latest design documents. Corrective action included a final walkdown procedure intended to assure that piping attributes are inspected, and inspection checklists were changed to assure that latest design revisions have been incorporated. However, no attention was given to configuration inspection or resultant rework versus construction progress. The Assessment Team issued a CAR for unsatisfactory conditions in this area.

Recommendations

- Assure that inspection plans and procedures contain the attributes of configuration, location and interferences to be inspected
- Assure that the inspection plans and procedures determine acceptance criteria
- Revise ITT inspection checklists to reflect the later design change references

4.2.11 Mechanical - Pipe Supports and Restraints

Conclusion

NRC's main area of concern in the piping area was that ITT pipe support/restraint deficiencies are not being identified during construction acceptance inspection. ITT inspections of pipe supports/restraints have not been totally effective in assuring that hardware conforms to design requirements. NMPC did not specifically address the NRC concern in proposed corrective action; therefore, the response remains incomplete. The Assessment Team concluded that the question of adequacy of pipe support/restraint inspections to assure hardware conformity to design requirement remains unanswered.

Recommendation

- Revise the action plan for CAT Items 14-83 and/or CAT Item 53-83 to include an evaluation and improvements to the inspection process for pipe supports/restraints, to assure conformity between design and hardware

4.2.12 Mechanical - RCI Program Weaknesses

Conclusion

The NRC has identified QA/QC program weaknesses for RCI with regard to document and design control, documentation of nonconforming conditions and procedural timing of inspections. Special criticism was levied because of failure to identify surveillance reports, data sheets, and inspection checklists, those change documents in effect at the time of inspection. The Assessment Team has reviewed the cited conditions, observed the RCI QC progress in overcoming these difficulties, and has concluded that RCI is strongly attempting to put together a viable QC program, but much work and training must still be accomplished.

Recommendations

- Monitor, inspect and audit RCI's implementation of drawing controls to assure that an engineering change log is being maintained and used effectively
- Establish holdpoints for inspection, establish acceptance criteria and perform inspections in a timely manner
- Document nonconformances on deficiency reporting documents rather than the document used for inspection

4.2.13 Mechanical - Bolting

Conclusion

NRC cited deficiencies in mechanical equipment bolting pertaining to inadequate verification of bolt torquing and missing bolt washers, indicating inadequate inspection. Required torque values were applied to anchor bolts in subsequent tests by SWEC FQC. A sampling plan was developed per NMPC instruction. However, the sampling plan inspected bolts for joining

components rather than anchor bolts. Consequently, the Assessment Team has issued a CAR which has not as yet been resolved.

Recommendation

- Reestablish a sampling plan for anchor bolts and close the Assessment Team-issued CAR

4.2.14 Materials/Receiving - Battery Racks

Conclusion

NRC was concerned about battery racks being assembled using unmarked material, and with inadequate drawings and specifications. The Assessment Team has determined that those deficiencies have been corrected.

Recommendations

None.

4.2.15 Materials/Receiving - Storage and Housekeeping

Conclusion

Several examples of improper storage and lack of protection from damage and deterioration of safety-related equipment in the plant and laydown areas have been noted by the NRC. The Assessment Team has made three monthly reviews of these conditions for verification purposes and has concluded that the conditions have somewhat improved, but it was necessary to issue a CAR for program inadequacies. The conclusion is that SWEC needs to make significant improvements in the system and facilities.

Recommendations

- Avoid storage in levels lower than specified
- Do not store materials in unassigned areas
- Do not mix dissimilar materials
- Do not intermingle contractors' materials

- Do not intermingle scrap, surplus, rejected and acceptable materials
- Maintain an adequate supply of dunnage

4.3 PROGRAMMATIC ITEMS

4.3.1 Training

Conclusion

Each of the five major contractors to NMP-2 has been cited for inadequate training programs. There is a tendency to not require additional training when isolated case deficiencies are identified. The Assessment Team has reviewed the training program of all five contractors. Evidence indicates that progress has been made in the form of SWEC's assignment of a new training coordinator along with a vastly improved schedule and curriculum definition. Records are still somewhat of a concern, but it is thought that progress is being made in correcting this problem.

Recommendations

- Improve the bring-up file for recertification of craftsmen and physical/ eye test requirements
- Continue to improve the training program for quality-affected operators
- Involve more than just line personnel in the training structure
- Add problem solving practice to the training sessions to increase interest and effectiveness

4.3.2 Communication

Conclusion

The Assessment Team determined that there was a decided commun cation problem between NMPC and GE, which resulted in an interface problem affecting GE drawings, test instructions, ship short authorizations and work order packages. The results were delays in implementing required corrective action. The assignment of a west coast NMPC liaison has helped considerably, along with procedural modifications. The Assessment Team feels this problem has been overcome and concludes that it is a satisfactory resolution.

Recommendations

None.

4.3.3 Inspection

Conclusion

A major portion of the NRC concerns about NMP-2 operations are the result of inadequate inspection practices and documentation. The NRC identified problems with inspection scheduling that resulted in construction delays. In some cases, inspection plans and procedures do not contain inspection attributes or acceptance criteria. Some FQC personnel are unaware of procedural requirements. Mechanical equipment checklists lack adequate QC verification of configuration, location and attachment details. Some do not have the latest design documentation references. Holdpoints on weld data sheets have been bypassed numerous times by all contractors. There are several instances when field QC inspectors prepared deficiency reports based on referenced dimensions on the drawing, rather than the required dimensions. All of these inspection program deficiencies have been observed, witnessed and reviewed by the Assessment Team. Some progress has been made in the form of improved procedures and applicable training, but much more should be accomplished.

Recommendations

- Ensure that inspection checklists reflect the latest design documents
- Assure that inspections are scheduled and performed in a timely manner
- Assure that acceptance criteria and attributes to be inspected are included in inspection plans and procedures
- Assure that mechanical equipment checklists contain a place for verification of configuration, location and attachment details
- Do not bypass holdpoints for welding operations
- Assign inspectors in the field

4.4 PHASE IV SAMPLING ASSESSMENT

Conclusions and Recommendations relative to the Phase IV sampling assessment are included in Section 2.4 of the report.