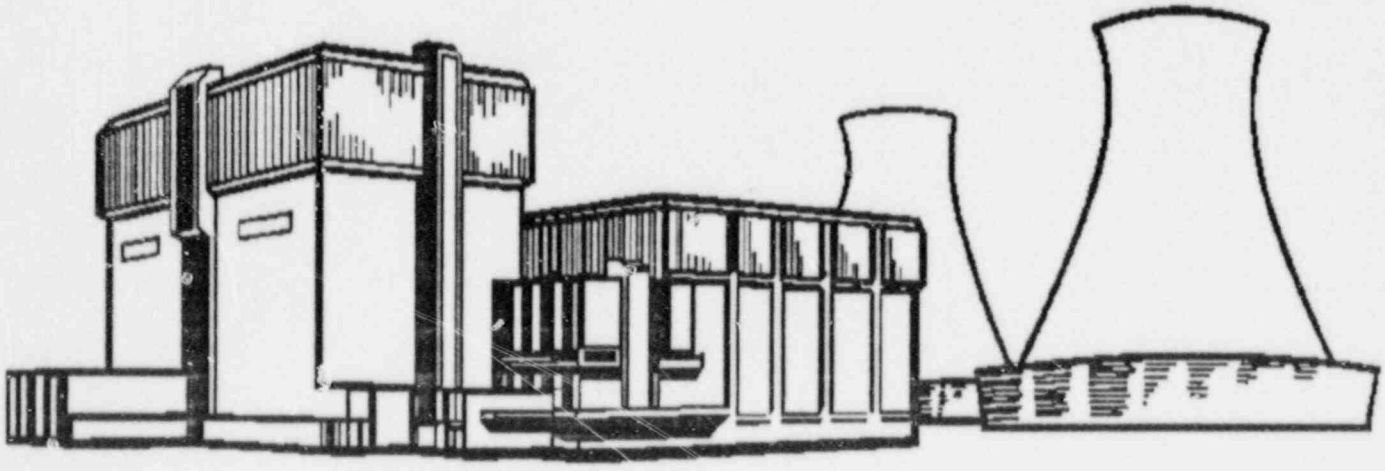
PHILADELPHIA ELECTRIC SERVICE GAS ELECTRIC COMPANY

READINESS PROGRAM ASSESSMENT FOR LIMERICK 2



EBI INTERNATIONAL

March 8, 1988

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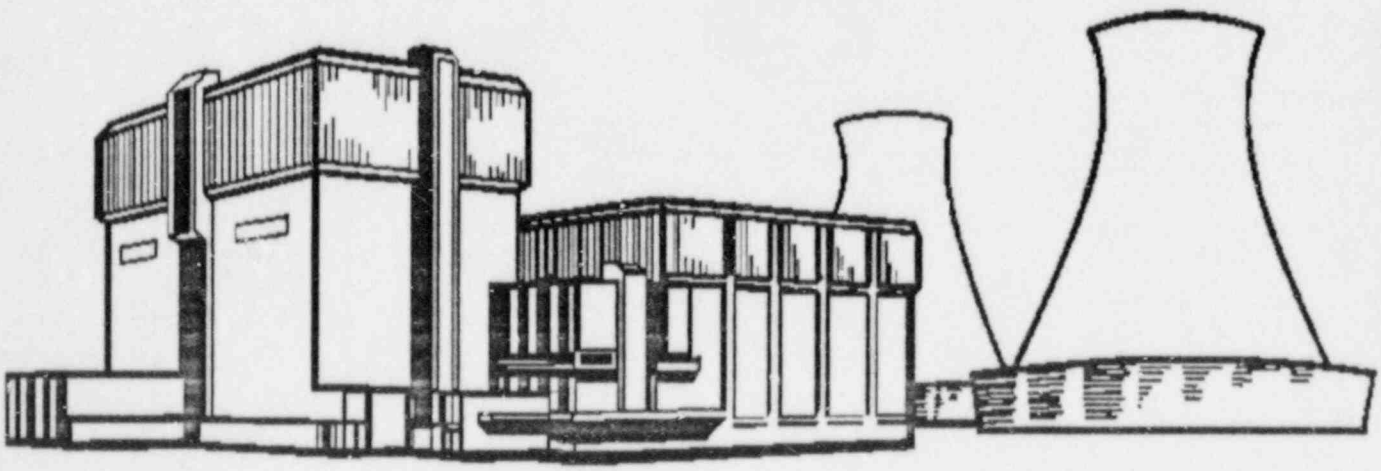

ERC INTERNATIONAL

March 8, 1988

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FOREWORD

This Report was prepared for Philadelphia Electric Company (PECo) corporate management by the Readiness Program Assessment Team. It presents the results of the Readiness Program Assessment which is a PECo self-assessment of existing Limerick 2 programs and processes to assure and demonstrate construction completion and readiness for operation in accordance with the licensing commitments. The Report can be used to demonstrate PECo programs and processes at Limerick 2 to parties that may be interested in learning more about the Project.

The Readiness Program Assessment Team was composed of PECo Limerick 2 managers and ERCI/IEAL Consultants. PECo and ERCI/IEAL personnel who participated in this assessment concur with the Report as indicated by their signatures on the following page.

The Readiness Program Assessment examined existing PECo programs and processes during a three-week period in August, 1987. It should be noted that some organizational changes have occurred as a result of PECo's November 1, 1987 reorganization. However, Limerick 2 programs and processes reviewed in this assessment are intended to remain unchanged.

The Readiness Program Assessment Report illustrates important elements comprising Limerick 2 Readiness programs. One of the principle products of the assessment is the development of three tiers of charts. These charts were developed to graphically depict how Limerick 2 programs and processes work and how they fit together. These charts are schematic in nature and are for informational use only.

The Readiness Program Assessment focused on existing PECo programs and processes and did not address their implementation.

LIMERICK 2

READINESS PROGRAM ASSESSMENT

	SIGNATURE	DATE
Management Board:		
R.J. Mattson (Chairman)		
B.E. Ballard	Blaine E. Ballard Jr	2/19/88
J.M. Corcoran		2/18/88
T.P. Gotzis		
E.C. Kistner		2/18/88
L.B. Pyrih		2/18/88
W.T. Ullrich		2/18/88
J.F. Walter		
Team Leader and Counterpart:		
D.B. Fetters		
V.W. Panciera		
Group Leaders and Counterparts:		
Licensing:		
H.D. Honan		
C.W. Wiedersum		
P.A. Ward		
Quality Assurance:		
K.W. Meck		2/18/88
R.F. Heishman		2/29/88

LIMERICK 2

READINESS PROGRAM ASSESSMENT

Engineering:

W.J. Coyle

R.J. Stipcevich

J.S. Fuoto

Construction:

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J.F. Walter

Start-up and Operations:

J.C. Nagle

W.T. Ullrich

J.K. Joosten

EXECUTIVE SUMMARY

Although the Nuclear Regulatory Commission's (NRC) regulatory requirements have been relatively stable since Limerick 1 was licensed, there have been significant changes in the way those regulatory requirements are interpreted and implemented in the licensing of new nuclear power plants. New interpretations place special emphasis on plant completion and operational readiness activities. In general, nuclear utilities want to demonstrate higher levels of completeness and operational readiness than ever before.

This special emphasis on completion and readiness has prompted utilities to formalize their completion and readiness activities to provide the required demonstrations. For example, nuclear utility executives are required by the NRC to certify, under oath and affirmation, that a new plant has been designed, constructed and tested and will be operated in accordance with NRC regulations. In addition, the NRC requests that a similar certification be provided for plant Technical Specifications. Certifications of this type require well-defined bases and a systematic method of accountability.

Philadelphia Electric Company (PECo) provided Limerick 1 Plant certification and Technical Specification certification letters to the NRC in October 1984. Limerick 1 was successfully licensed and has operated safely and reliably ever since. However, because of the changes in the regulatory climate mentioned above, PECo desires to take additional measures to demonstrate to the NRC that Limerick 2 is ready for an operating license.

To provide itself with higher degrees of assurance, PECo has taken the initiative and conducted a self-assessment of existing Limerick 2 programs and processes that relate to completion and readiness. This initiative is called the Readiness Program Assessment.

The objective of the Readiness Program Assessment is to identify and assess existing PECo programs and processes intended to assure and demonstrate completion of Limerick 2 and its readiness for operation in accordance with licensing commitments. Activities included in the Readiness Program Assessment are described in the Readiness Program Assessment Plan for Limerick 2 which was issued on July 31, 1987 and is attached as Appendix A.

The basic approach of the assessment is to:

- Identify and characterize existing PECo completion and readiness programs;

- Determine how these programs fit together in the context of plant completion and readiness for operation; and

- Determine the accountability structure that will certify construction completion and operational readiness to senior PECo management and the NRC.

The Readiness Program Assessment was conducted over a two month period in July and August, 1987. It was conducted as a joint effort by a team of PECo and International Energy Associates Limited (ERCI/IEAL) individuals.

The assessment addressed the following functional areas at Limerick 2:

- Licensing,
- Quality Assurance and Quality Control,
- Engineering, Design and Analysis,
- Construction,
- Hardware Readiness, and
- Organizational Readiness.

The results of the Readiness Program Assessment are contained in this Readiness Program Assessment Report. Principle products of the assessment include 90 charts depicting programs and processes and the completion and readiness accountability structure for Limerick 2.

The Team developed a three-tier system of charts to graphically depict existing and planned programs and processes at Limerick 2. These charts show the relationships of activities within a program and the interrelationships of activities among various programs.

The Third Tier Charts are the most detailed. They illustrate the procedures and controls employed to accomplish specific Limerick 2 line activities. In total, there are 82 Third Tier Charts that show the activities encompassed by the six functional areas.

There are six Second Tier Charts. Each Second Tier Chart depicts what is required for completion and readiness in a specific functional area. These charts organize and show the functional relationships among the Third Tier Charts in each functional area.

There are two First Tier Charts, the Executive Level Charts. There is a First Tier Chart for Engineering and Research (E&R), Chart ES-1, and a First Tier Chart for Nuclear Operations (NuOps) and Electric Production Organizations, Chart ES-2. These charts illustrate the completion and readiness accountability structure for Limerick 2. The accountability structure defines the reporting responsibilities of supervisors

and subordinate managers who must attest to corporate management that Limerick 2 is complete and that it is ready to operate in accordance with the licensing commitments. Verification provided by the Limerick 2 accountability structure will form the basis for and will support PECo certification letters to the NRC.

The Readiness Program Assessment Report provides characterizations of existing programs and processes, assesses PECo's ability to assure and demonstrate completion and readiness for Limerick 2, identifies open items and describes the plans for follow-up action to resolve open items.

The following descriptions provide a summary of the programs and processes in each of the functional areas.

LICENSING

The licensing bases for Limerick Generating Station (LGS) have been reviewed and approved by the NRC. PECo's policy of keeping Limerick 2 as much like Limerick 1 as possible helps assure that the number and magnitude of new licensing issues will be minimal. The three organizations involved in licensing Limerick 2 focus their activities on maintaining Limerick 2's licensing bases and managing licensing differences. The Licensing Plan developed by PECo for Limerick 2 helps to coordinate Limerick 2 licensing activities.

There are a number of programs that link Limerick 2 design and construction activities to LGS licensing documents. Programmatic links help assure that the as-built plant is accurately reflected in the licensing documents and that it is in compliance with NRC regulations. There are also links between Limerick 2 Quality Assurance, Start-up and Operations activities and LGS licensing documents. These links are not as programmatic as the design and construction links.

PECo has initiated several programs that go beyond what is required by the NRC, e.g., Nuclear and Environmental Section (NES) review of all Project Change Requests and Project Change Notices for risk significance. Such programs give PECo the assurance that the approach to Limerick 2 licensing will be responsive to NRC needs, well managed and controlled.

Several open items were identified in the licensing functional area. They were observed in three categories:

- Areas that will require new programs,
- Areas that will require improvements in existing programs to assure the accuracy of LGS licensing documents, and
- The area of organizational readiness.

New programs will include the review of NRC Generic Letters for Limerick 2 implications and the development of a Consolidated Open Items List Program and a Limerick 2 Technical Specification Preparation Program. Areas that may require better linkage to LGS licensing documents include the GE Field Deviation Disposition Request System and Start-up and Operations activities. A program used at Limerick 1 which will be updated and implemented at Limerick 2 is the Plant Certification Program. PECo also intends to develop program descriptions for several activities that are currently conducted but are undocumented. These activities include the Licensing Document Revision Program, the Regulatory Feedback Program, and Licensing Commitment Tracking.

Organizational readiness for Limerick 2 licensing organizations will be addressed by the Organizational Readiness Program currently under development.

QUALITY ASSURANCE

Quality assurance and quality control functions are strongly integrated throughout Limerick 2 programs and processes. Responsibilities of Quality Programs include:

- In-line review and approval,
- In-process and final inspection activities,
- Overview audit and surveillance activities, and
- Deficiency reporting.

Limerick 1 Quality Assurance/Quality Control (QA/QC) programs conform to NRC requirements and PECo's licensing commitments. The qualifications and training of personnel involved in quality activities are excellent. Most of the Limerick 2 Quality Assurance/Quality Control personnel were involved in Limerick 1 construction.

Two open items were observed in the functional area of Quality Assurance. First, the division of responsibility between the Engineering and Research (E&R) and Nuclear Operations (NuOps) Quality Assurance organizations involves a number of interfaces which require close coordination to ensure that all quality-related areas are covered effectively. Second, the involvement of the Nuclear Operations Quality Assurance Organization in the Peach Bottom restart effort has the potential to adversely impact the planning and implementation of Limerick 2 quality activities necessary for completion and readiness.

The organizational structure and readiness of the Quality Assurance functional area will be addressed further by the Organizational Readiness Program.

ENGINEERING

The engineering process includes substantial and appropriate interactions with Construction, Quality Assurance and Start-up so that the as-built hardware can be accurately reflected in design and other source documents. In addition, design and drawing control processes are structured to be effective in assuring that changes are incorporated in design documents. Procedures and programs are also in place to control design changes and assure that the design documents and their changes can be accurately reflected in the FSAR and other licensing documents. Open items appeared minor in nature and corrective action has been assigned.

CONSTRUCTION

There is a systematic and well-integrated Construction Program with strong programmatic and procedural links with Engineering, Start-up and Quality Assurance. There is a consistent and common understanding of procedures resulting in a Construction Program that is deliberate, planned and controlled. Since restart of Limerick 2 construction in February 1986, construction work has been controlled using discreet work packages which have enhanced management control and work planning. Work packages, together with quality control programs, are used to ensure that the plant is constructed in conformance with design documents. This process provides a reasonable basis to conclude that as-built facilities and systems are accurately reflected in the licensing documents and that licensing commitments are met.

One open item found in the Construction functional area relates to facility turnover to Nuclear Operations following completion of start-up testing. The facility turnover process includes a system walkdown just prior to interim turnover to PECo Construction. At this point, facility configuration control is invoked, but substantial start-up work and other controlled work are conducted during the interim turnover period. To ensure that performance of this work will not affect the facility adversely, it was decided that a second walkdown would be beneficial prior to facility turnover to Nuclear Operations. The purpose of the second walkdown is to inspect for such items as cleanliness, damage and missing items.

START-UP AND OPERATIONS

In the Start-up and Operations functional area, there are relatively strong hardware and facilities readiness programs in place based on a proven approach -- namely that used to license Limerick 1. In some specific areas where the Limerick 2 approach has been upgraded or is slightly different, the LGS licensing commitment wording should be reviewed and modified. There is also a need to prepare PECo organizations for a second

operating unit at LGS. The transition from a single-unit to a two-unit site is broad in scope and affects offsite as well as onsite organizations. Although Limerick 2 fuel load is more than eighteen months away, PECo organizations should begin to assess their ability to support operation of two units now. PECo plans to resolve organizational readiness using a specially developed Organizational Readiness Program separate from this report.

This program will systematically review each organizational group and establish Action Plans for assuring that it is ready for the second unit.

CONCLUSIONS

The Readiness Program Assessment has served three purposes:

- The charts provide a visual, documented method of describing and demonstrating existing PECo programs and processes;
- Open items have been identified and closeout actions have been defined, assigned and initiated; and
- PECo management has been alerted to completion and readiness concepts and is proceeding to apply them at Limerick 2.

The Readiness Program Assessment Team concludes that existing PECo programs and processes in the areas of Licensing, Quality Assurance, Engineering, Construction, Start-up and Operations can assure and demonstrate that Limerick 2 construction is complete and that it is ready for operation in accordance with the licensing commitments under the following conditions:

- that the programs and processes are properly implemented by the Project team, and
- that corrective action for the open items is developed and properly implemented.

To validate this conclusion and to monitor the status of open item resolution, PECo will reassess its programs and processes every six months and three months prior to fuel load. These reassessments will assure that new or revised programs and processes are equivalent to the programs and processes described in the Readiness Program Assessment Report and that open items are satisfactorily resolved.

1.0 INTRODUCTION, PURPOSE AND SCOPE

Since the TMI accident, the granting of an operating license has been a two-step process. When a plant has been essentially completed and a major part of its preoperational testing has been successfully accomplished, utility management requests permission of the Nuclear Regulatory Commission (NRC) to load fuel and conduct low power testing. The NRC Regional Administrator confirms that the plant is ready for fuel load and low power testing after assuring that open licensing items have been adequately resolved. The Director, Office of Nuclear Reactor Regulation (NRR), issues an operating license restricted to five percent of full power. This low power license allows the utility to conduct low power testing in partial fulfillment of Start-up Program requirements. During this period the NRC takes special care to assess testing operations. It assures itself that the plant performs as designed and that personnel are knowledgeable of plant operations and are well trained.

When low power testing has been satisfactorily completed and resolution of open licensing and inspection issues is achieved, the NRC staff recommends to the Commission that the low power restriction be lifted and that a new full power operating license be issued. The Commission meets with the NRC staff and utility management to review plant status and votes on whether or not the full power operating license should be approved. The Director, NRR, then issues a full power operating license at the appropriate time to permit the conduct of power ascension testing. This two step operating license process which involves extensive NRC interaction and surveillance has added greater importance to developing programs that ensure the completion of a plant for fuel load and readiness for power operations.

In general, a nuclear power plant is complete and ready to operate when its owner/operator achieves the following readiness objectives:

- Construction of the plant in accordance with design specifications, including licensing commitments to the NRC, is complete, and the plant is demonstrated to be ready by testing;
- The operating organization and supporting procedures and systems are adequate to reliably operate the plant in accordance with design specifications, including licensing commitments to the NRC; and
- The prerequisite steps and requirements of the NRC licensing process have been satisfied and an Operating License has been granted.

One method of evaluating these readiness objectives is to conduct a Readiness Review. A Readiness Review is a systematic evaluation of design, construction, testing and preparation for operation that can determine an acceptable endpoint for the construction and testing phases and the commencement of the operations phase for a nuclear power plant. Only a few utilities have conducted a Readiness Review prior to receiving an Operating License from the NRC.

In October 1984, Philadelphia Electric Company (PECo) obtained an Operating License for Limerick Generating Station (LGS), Unit 1. Programs and processes for construction and preparation for operations at Limerick 1 were adequate to facilitate the timely granting of the license by the NRC. Although the NRC regulatory requirements have been relatively stable since that time, there have been changes in the manner and extent to which these requirements are being implemented in the licensing of new plants. In addition, the NRC has placed greater emphasis on the need for a utility to complete nuclear units with a minimal number of open items before fuel load is allowed.

Existing PECo programs and processes at Limerick 2 are essentially the same as those used for Limerick 1. Programs and processes at Limerick 2 include improvements based on the lessons learned from their application at Limerick 1. PECo expects that Limerick 2 programs and processes will accomplish the same completion and readiness functions as they did for Limerick 1, only more effectively. However, PECo is interested in assuring itself and demonstrating to others that its programs and processes at Limerick 2 are adequate for completion and readiness in today's regulatory environment. Therefore, PECo has developed the Readiness Program Assessment. This initiative is a PECo self-assessment of existing programs and processes at Limerick 2. It provides additional insight into how PECo can affirm construction completion and readiness for operation of Limerick 2. It is designed to confirm that PECo can achieve the general readiness objectives stated above.

PECo believes that the programs and processes that led to construction completion and readiness for operation of Limerick 1 serve equivalent functions as the Readiness Reviews conducted at other nuclear construction projects. PECo has elected to conduct the Readiness Program Assessment at Limerick 2 to confirm this belief.

The purpose of the Readiness Program Assessment is to identify and assess existing PECo programs to assure and demonstrate completion of Limerick 2 and its readiness for operation in accordance with licensing commitments.

The Readiness Program Assessment was designed to accomplish the following:

- Identify and characterize existing completion and readiness programs for Limerick 2;

- o Determine how these programs fit together in the context of unit completion and readiness for operation;

- o Determine the accountability structure that verifies construction and testing completion and operational readiness conditions to senior PECo management and the NRC; and

- o Determine the key points of readiness.

The scope of the Readiness Program Assessment is confined to an assessment of existing PECo completion and readiness programs and processes at Limerick 2. The assessment does not address their implementation.

The Readiness Program Assessment Report documents the results of the Readiness Program Assessment. The Report was presented to PECo corporate management on February 18, 1988, which is approximately 18 months in advance of the proposed Operating License issue date. This gives PECo sufficient time to identify and complete corrective actions.

2.0 READINESS PROGRAM ASSESSMENT METHODOLOGY

2.1 SCHEDULE AND ORGANIZATION

The Readiness Program Assessment was conducted in a five-phase approach. The five phases are:

- Phase I - Planning,
- Phase II - First Site Visit,
- Phase III - Coordination,
- Phase IV - Second Site Visit, and
- Phase V - Assessment, Chart Refinement and Report Preparation.

This particular methodology was chosen to provide the following:

- Optimum coordination of the joint effort,
- A mutual understanding of Readiness Program Assessment objectives,
- A quicker ERCI/IEAL familiarization with existing Limerick 2 programs and processes, and
- Graphic documentation of these programs and processes to facilitate communication between PECo and those less familiar with Project.

The Readiness Program Assessment Team and Management Board was organized to facilitate implementation of the Readiness Program Assessment methodology. The composition of the Readiness Program Assessment Team and Management Board is shown in Figure 1.

The Management Board is composed of PECo and ERCI/IEAL managers and had overall responsibility for the Readiness Program Assessment. The Management Board provided guidance to the Team during the assessment, coordinated PECo ownership of the work and results, and submitted the Report to senior PECo management.

The Readiness Program Assessment Team is composed of PECo and ERCI/IEAL members. They were selected on the basis of their experience with completion and readiness programs and their knowledge of the areas to be assessed, namely; Licensing, Quality Assurance, Engineering, Construction, Start-up and Operations. PECo team members, in addition, had a detailed knowledge of Limerick 2 programs and processes and many had first hand experience with the construction, testing and licensing of Limerick 1.

Phase I covered a three-week period in which the Team studied basic information and materials needed for the assessment and developed a plan of action for the first site visit. Informational material described major PECo programs being used to design, construct, test, license and operate Limerick 2. Examples include the Quality Assurance Plan, Start-up Administrative Procedures, and the Index of Construction Procedures. This input and other pertinent information obtained

from readiness programs at other nuclear facilities was used in preparing for the first site visit. There were one-on-one discussions between ERCI/IEAL and PECo team members. An Assessment Outline was developed in each functional area, i.e., Licensing, Quality Assurance/Quality Control, Engineering, Construction, Start-up and Operations. The Assessment Outlines provided a "road map" to guide Readiness Program Assessment Team activities while on site. Each Assessment Outline consisted of:

- o A Purpose Section, which described what the team expected to accomplish during the site visit;
- o An Elements Section which described how information was to be obtained, e.g., what questions were appropriate to obtain the information;
- o An Activities Section, which outlined the areas to be reviewed; and
- o A Products Section which described what written output was expected from the site visit.

The Assessment Outlines for both site visits have been appended to the Readiness Program Assessment Plan, which is Appendix A to this Report.

Phase II, the First Site Visit, consisted of a series of interviews and discussions with PECo, the Architect/Engineer and other contractor personnel who were knowledgeable in the current programs, processes, systems, and procedures being used to design, construct and prepare Limerick 2 for operation. From these interviews and discussions, a preliminary set of charts was developed to describe the activities, the interfaces among activities, and the input and output required by each activity.

During Phase III, the Coordination phase, additional planning to prepare for the Second Site Visit was accomplished. New Assessment Outlines were developed for each functional area. These Assessment Outlines describe the activities and schedule of accomplishment for activities during Phase IV. For this effort, the concept of a three tier set of charts was devised. It was decided that Third Tier Charts would be the best method for demonstrating specific combinations of work activities needed to complete a significant portion of a complex plant activity, for example, HVAC installation. Third Tier Charts also depict major interfaces and coordination points among functional areas. Second Tier Charts cover the entire functional area, such as Construction, and summarize how combinations of Third Tier activities verify completion and readiness in that functional area. First Tier Charts, the Executive Summary Charts, describe the accountability structure for major organizational elements. They depict how PECo will affirm completion and readiness for the Engineering and Research, Nuclear Operations and Electric Production organizations.

Phase IV, the Second Site Visit, spanned two weeks duration. During this visit, specific activities were reviewed in greater detail to assess the programs and processes needed for completion and readiness and to develop greater chart detail. During this phase of chart development, emphasis was placed upon understanding key interfaces among the functional areas. Additional interviews were conducted to clarify areas of uncertainty. At the conclusion of Phase IV site activities, a Management Board meeting was held to review the results.

During Phase V; the Assessment, Chart Refinement and Report Preparation; the results of the previous four phases were consolidated. Additional analysis and chart preparation demanded the most attention. Open items were identified and put in final form. Proposed resolution and close-out action was identified and assigned. Several Management Board meetings were conducted to review and comment on the Report and to discuss open item resolution. The Readiness Program Assessment Report was submitted and presented to PECo corporate management.

2.2 PROGRAM DEPICTION

A series of charts schematically depicts the process PECo is using to satisfy itself that Limerick 2 has been designed, constructed and will be tested and operated in accordance with the licensing commitments.

First Tier Charts ES-1 and ES-2 depict the accountability structure for Engineering and Research (E&R) and Nuclear Operations (NuOps) respectively. Chart ES-1 lists the major organizational elements in the Engineering and Research Department that must verify readiness and provide written affirmation to the Vice-President, Engineering and Research that the plant is complete and satisfies licensing requirements. Chart ES-2 shows a similar accountability structure for Nuclear Operations and Electric Production to verify readiness and provide similar affirmation to the Vice-Presidents, Nuclear Operations and Electric Production. It should be noted that while ES-1 and ES-2 depict only the major organizational elements for readiness accountability, in fact, readiness accountability spans the entire range of organizations from first level supervision to senior level management.

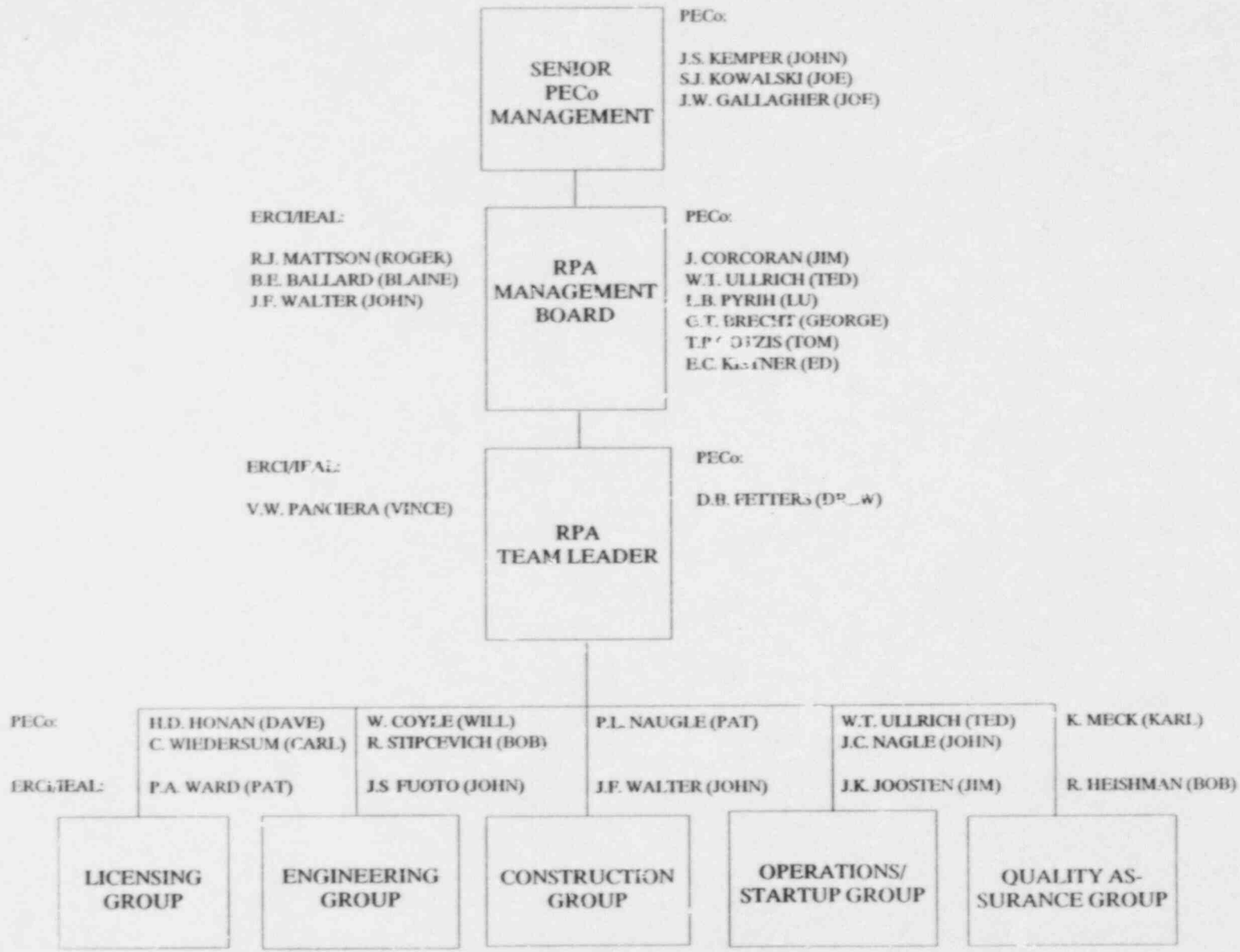
This assessment has not attempted to depict the lower level accountability structure since an additional level of effort to cover organizational readiness is planned. The Organizational Readiness Program currently under development will document the readiness accountability structure that is needed to ensure that the various organizations are ready to support two-unit operations. It is not described in this Report.

Completion and readiness in each functional area is depicted by a Second Tier chart. These charts show the functional relationships among the programs within a particular functional area (e.g. Engineering) and how these programs contribute to completion and readiness. For example Chart E-0, the Engineering Second Tier Chart shows how the Design Control Program and the Design Closure Program coordinate the major technical programs in Engineering. In addition, the Design Closure Program is a major input into the determination that Engineering is complete. Another type of Second Tier chart is shown in Chart Q-0, QA/QC Functional Activities. It lists those Quality Assurance/Quality Control activities that are carried out in each phase of plant development from design through operations. This chart not only depicts the functional relationships among the quality-related activities but also the relationship of Quality Assurance with other functional areas such as Construction and Engineering.

Third Tier Charts provide the details of each readiness or completion activity and depict major interfaces that exist among these activities.

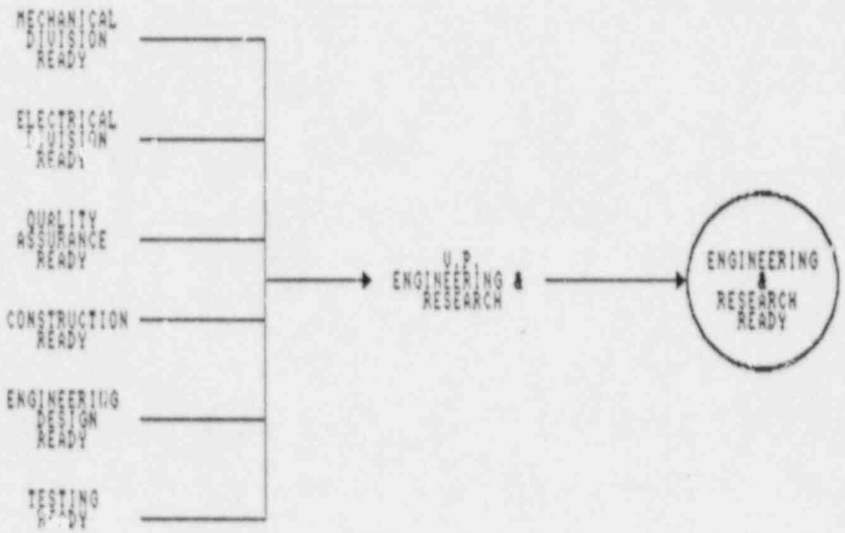
It should be noted that while the First Tier, Executive Summary Charts (ES-1 and ES-2) depict the completion and readiness accountability structure for the major PECo organizational elements, they were not intended to provide a direct correlation to the Second and Third Tier Charts. The Second and Third Tier Charts depict the procedures and programs used by PECo to design, construct, test and license Limerick 2. The First Tier Charts provide a "road map" for senior management to indicate those organizations responsible for completion and readiness in particular areas.

LIMERICK 2 READINESS PROGRAM ASSESSMENT ORGANIZATION



EXECUTIVE SUMMARY CHARTS

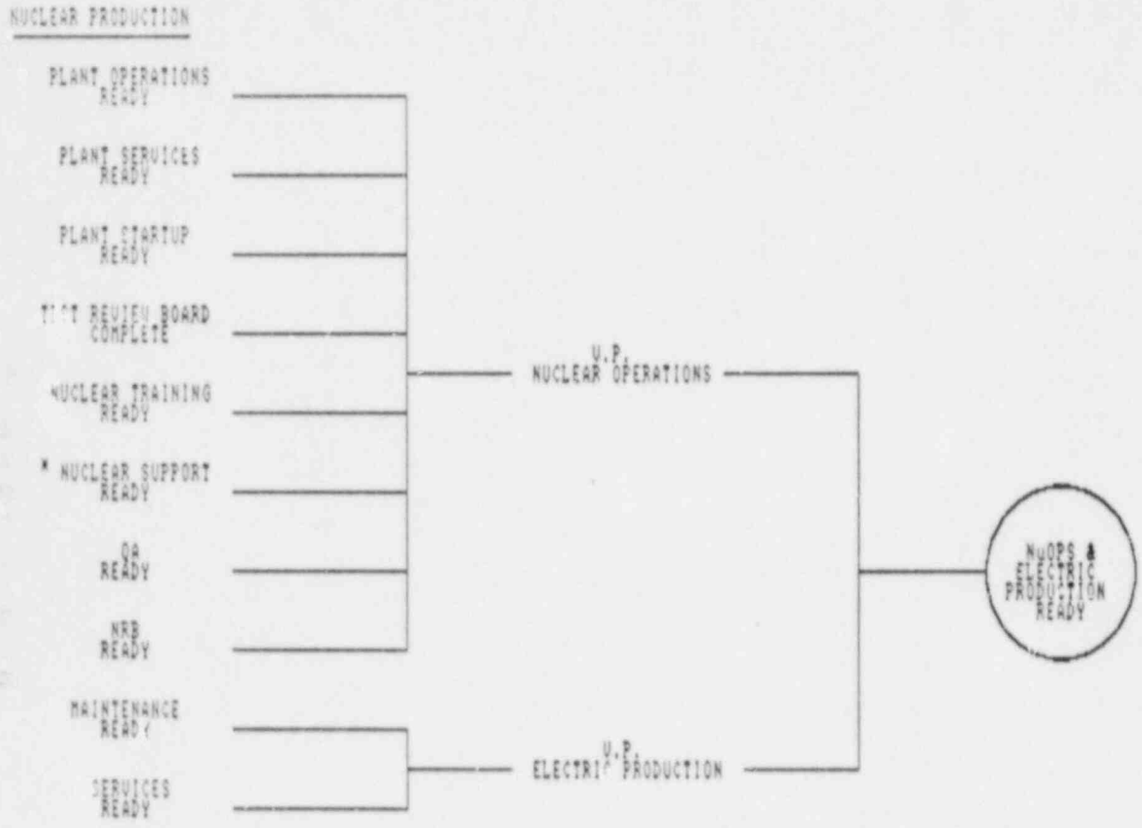
ES-1
ENGINEERING & RESEARCH READINESS



NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

ES-2
NUCLEAR OPERATIONS AND ELECTRIC PRODUCTION



NOTES:

* INCLUDES:

- LICENSING
- FUEL MANAGEMENT
- RADIOLOGICAL PROTECTION
- RADIOLOGICAL WASTE
- CHEMISTRY
- NUCLEAR SAFETY
- EMERGENCY PREPAREDNESS
- SECURITY

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

3.0 PROJECT APPROACH FOR LIMERICK 2

PECo's basic approach for successfully completing the Limerick 2 Project is to do the following:

- Keep Limerick 2 as much like Limerick 1 as possible, and
- Limit and maintain rigorous control of changes that must be made to Limerick 2.

In addition, Limerick 2 Project activities are to be conducted to the high Limerick Generating Station quality standards.

3.1 THE LIKENESS OF UNITS AT LIMERICK GENERATING STATION

PECo received the Low Power (5%) Operating License for Limerick 1 from the NRC in October, 1984. At the time of licensing, both PECo and the NRC were satisfied that Limerick 1 had been designed, constructed and tested in accordance with the Commission's regulations and that there was reasonable assurance it could be operated safely. This satisfaction was based on the following:

- Affirmation by the Vice-President, Engineering and Research, that the design, construction and testing of the plant, as described in the FSAR and other licensing documents, were essentially in compliance with applicable NRC regulations;
- Good ratings were given by the NRC in SALP reports;
- Satisfactory results of NRC team inspections prior to licensing;
- Satisfactory completion of the Independent Design Verification Program conducted on the Core Spray System;
- A small number of open issues, license conditions or deferrals at the time of licensing; and
- Independent confirmation by the Nuclear Review Board that the plant was complete and ready for operation.

In addition, PECo and the NRC were confident that the FSAR and other licensing documents accurately reflected the as-built configuration of Limerick 1.

The high quality of design and construction of Limerick 1 and the ability of PECo to operate Limerick 1 safely and reliably have been demonstrated since October 1984. In undertaking the construction of Limerick 2, PECo has adopted a firm management policy to keep the two units as much alike as possible. The advantages of this policy include:

- PECo has the confidence that Limerick design, construction and operating practices are effective because of the experience and good record that has been achieved with Limerick 1.
- Operators can be trained and licensed to operate both plants more easily.
- Maintenance and spare parts procurement is simpler.
- Enhancements made on one unit are usually applicable to the other unit.
- The licensing process is made simpler because the NRC treats the two units identically. The NRC staff Safety Evaluation Report (SER) was completed prior to granting the Limerick 1 operating license. The SER applies to both units. Also, the licensing hearings and the decisions of the NRC's Atomic Safety and Licensing Board and the subsequent Appeals Board Decisions apply to both units.

PECo believes that if it uses essentially the same programs and processes that it used to complete Limerick 1 and prepare it for operation, Limerick 2 can be completed and operated with the same success as experienced at Limerick 1.

3.2 CHANGE CONTROL

PECo is limiting and maintaining rigorous control of any changes that must be made to Limerick 2. Control of changes is achieved by a combination of programs and processes. The most important of these processes are:

- The Design Control Program,
- Configuration Control Processes, and
- The Licensing Document Revision Program.

3.2.1 Design Control Program

Prior to October 1984, the designs of Limerick 1 and 2 were sufficiently similar such that no distinction was drawn in the FSAR between the units. After Limerick 2 construction was delayed in 1984, the two units were no longer on comparable schedules and opportunities began to arise for the introduction of design differences. For example, differences developed because of changes in contractor personnel, NRC requirements, operating experience at Limerick 1, and construction and operating experience at Limerick 2 and elsewhere.

Before construction of Limerick 2 was resumed in early 1986, a thorough assessment of design and construction status was undertaken. Baseline information about design differences between units was collected, assessed and documented, and the formal Design Control Program was applied to the baseline design. Design documents, including those that contain PECo commitments to satisfy applicable regulatory requirements are controlled by this program. Control of the FSAR and other licensing documents is discussed in Section 3.2.3.

By maintaining a rigid Design Control Program, PECo controls the manner in which changes and deviations from the baseline design are identified, evaluated, and dispositioned by the engineering organizations. The foundation of the Design Control Program is the Project Change Request/Project Change Notice (PCR/PCN) process. The PCR/PCN process procedurally defines and controls PECo and contractor roles in the design change process and details necessary interactions with PECo Licensing Organizations. By thoroughly evaluating each design change deemed necessary, PECo can specifically identify any licensing or other actions required by the resulting design difference between Limerick 1 and Limerick 2.

3.2.2 Configuration Control Processes

PECo's system of configuration control is the means by which it ensures that the as-built plant is in accordance with the design documents. More fully described in Section 4.3, the configuration control system at Limerick 2, which augments the Design Control Program, incorporates As-built Reconciliation, formal walkdowns and other established programs in Engineering, Construction, Start-up, Operations, and Licensing. PECo's configuration control processes were successfully demonstrated at Limerick 1. PECo intends to employ essentially the same Limerick 1 configuration control processes at Limerick 2. Thus PECo expects that there will be the same degree of conformity between the physical plant and the design documents at Limerick 2 as there was at Limerick 1.

3.2.3 Licensing Document Revision Program

In general, a nuclear power plant is built in accordance with its design documents. These are developed to meet certain design specifications, NRC regulations and other licensing commitments made by the owner. The plant's safety design bases, system descriptions and how they meet NRC regulations are described in the Final Safety Analysis Report (FSAR). Therefore, the FSAR for any nuclear power plant is the primary document for cataloging a licensee's commitments to the NRC. The FSAR also describes how the owner and the plant adopt various other requirements and practices to implement those regulations. There are other documents that also contain licensing commitments and support the FSAR for Limerick 2. These other licensing documents include the following:

- Design Assessment Report,
- Equipment Qualification Report, and
- The Fire Protection Evaluation Report.

Design changes and changes to the as-built plant, whether originating within Limerick 1 from operating experience or within Limerick 2 for reasons of construction or operability improvement, are evaluated for applicability to both units and for conformance to licensing commitments. Needed design changes result in a change to a design document and may require reflection of the change in the FSAR or other licensing documents. The Licensing Document Revision Program is the process by which appropriate changes to the FSAR and other licensing documents are made. The Licensing Document Change Notice procedure documents the revision process.

Safety-significant changes proposed to the design are identified by PECo and are brought to the attention of the NRC. PECo then requests that the NRC review and accept the changes. NRC review and acceptance of such changes are documented in special Safety Evaluation Letters. Such changes are reflected in the FSAR and other licensing documents through the Licensing Document Revision Program.

Before an Operating License is issued by the NRC, utility senior management must certify that the plant has been designed, constructed and tested in accordance with applicable NRC regulations as described in the FSAR and other licensing documents. By starting with a proven design in Limerick 1, tightly controlling changes to that design, and updating licensing documents as required, PECo intends to make that certification with a high degree of confidence.

4.0 READINESS PROGRAM ASSESSMENT RESULTS

The following Sections provide the results of the Readiness Program Assessment in each of six functional areas, namely:

- o Licensing,
- o Quality Assurance/Quality Control,
- o Engineering, Design and Analysis,
- o Construction,
- o Hardware Readiness, and
- o Organizational Readiness

Each Section characterizes existing PECo programs, gives an assessment of PECo's completion and readiness capabilities and provides a discussion of open items and planned follow-up action.

4.1 LICENSING

4.1.1 Characterization of Programs Assessed

This Section discusses the Licensing functional area. It describes the basic licensing approach and licensing organizations for Limerick 2. It also characterizes existing Limerick 2 licensing programs and processes and other licensing-related processes that are either under development or are being implemented at Limerick 2.

4.1.1.1 Licensing Second Tier (Chart L-0)

In March, 1981, PECo submitted its application for an Operating License together with the Final Safety Analysis Report for the Limerick Generating Station (LGS) Units 1 and 2 to the Nuclear Regulatory Commission (NRC). In August 1983, the NRC published the results of its review in the Safety Evaluation Report (SER) for Limerick Generating Station Units 1 and 2. In that report and six supplements thereto, the NRC documented its approval of the licensing bases and safety analysis of both Limerick units.

In October 1983, the Advisory Committee on Reactor Safeguards (ACRS) issued a favorable letter to the NRC based on its Operating License review of LGS. However, the ACRS endorsement did not apply to Limerick 2 due to that unit's schedule uncertainty. Limerick 1 received its Operating License in October, 1984 and has achieved an excellent operating record through its first cycle and the initial stages of its second cycle. It has operated safely and reliably.

Since the NRC's approval of LGS is applicable to both Limerick 1 and 2, the licensing approach for Limerick 2 centers around keeping Limerick 2 as much like Limerick 1 as possible and closing out the limited number of specific licensing items that remain open for Limerick 2.

PECo assures that Limerick 2 is as much like Limerick 1 as possible by implementing essentially the same design, construction and testing procedures that were used for Limerick 1. In those areas where Limerick 2 will not be identical to Limerick 1, Limerick 2 alternatives are either developed to satisfy the same LGS licensing bases and safety analysis that have been reviewed and approved by the NRC or specific NRC approval of the change is obtained. LGS licensing bases and safety analyses are documented in the LGS licensing documents and other NRC correspondence. The following documents are designated as LGS licensing documents:

- the Limerick Generating Station, Units 1 and 2 Final Safety Analysis Report (FSAR),
- the Fire Protection Evaluation Report (FPER),
- the Design Assessment Report (DAR) for the Mark II containment, and
- the Equipment Qualification Report (EQR).

PECo has specific licensing activities and open items that must be completed before Limerick 2 is licensed. PECo has identified these as specific tasks and has described them in the Licensing Plan for Limerick 2. This plan will provide PECo with a means to demonstrate that licensing activities are complete and that Limerick 2 is ready for operation in accordance with the licensing commitments.

Prior to receipt of its Operating License for Limerick 2, PECo anticipates that it will be asked by the NRC to certify that the plant is in conformance with applicable regulations and is ready for operation. In addition, PECo anticipates that it will be asked to certify that Limerick 2 Technical Specifications reflect the unit, the FSAR and the SER. PECo licensing organizations are taking preplanned systematic steps to assure that these certifications can be made by Limerick 2 organizations with a high degree of confidence.

Licensing responsibilities at LGS are shared among three separate organizations. They are:

- the E&R Licensing Branch,
- the E&R Site Quality Assurance Organization, and
- the Nuclear Operations Licensing Section.

The E&R Licensing Branch is responsible for Limerick 2 licensing activities and supports the Nuclear Operations Licensing Section for operating unit licensing activities. The E&R Licensing Branch is responsible for FSAR maintenance and establishing standards for and review of 10CFR50.59 safety evaluations for all of PECo's operating units. The E&R Licensing Branch is also responsible for development and implementation of the Licensing Plan for Limerick 2. The E&R Licensing Branch is responsible for PECo's interface with NRC Headquarters personnel in Bethesda, Maryland regarding Limerick 2 licensing activities.

The E&R Site Quality Assurance Organization is responsible for PECo's interface with NRC Regional inspection personnel at Limerick 2 and coordination of other matters with the Regional Office of NRC. Its responsibilities include monitoring of Regional inspection activities and audits; identification, resolution and close-out of deficiencies; and management of open items identified by NRC Region I.

The Nuclear Operations Licensing Section is responsible for licensing activities associated with PECo's three operating nuclear units; namely, Peach Bottom 2 and 3 and Limerick 1. The Nuclear Operations Licensing Section uses the resources and expertise of the E&R Licensing Branch, as required, to support the operating units. The Nuclear Operations Licensing Section is responsible for PECo's interface with the NRC Headquarters and Regional personnel for the plants under its jurisdiction.

The Nuclear Operations Licensing Section and the E&R Licensing Branch belong to separate PECo organizations and report to their respective Vice-Presidents. Within the PECo organization, these two licensing organizations are coordinated by the Senior Vice-President. Eventually, the Nuclear Operations Licensing Section will assume licensing responsibility for Limerick 2 from the E&R Licensing Branch. This will occur when Limerick 2 is licensed and placed into operation.

The E&R Licensing Branch is responsible for the following Limerick 2 programs and processes:

- regulatory feed back activities,
- the Licensing Plan for Limerick 2,
- the Licensing Document Revision Program,
- the Licensing Commitment Tracking System. and
- the Plant Certification Program.

There are three additional programs that are relevant to Limerick 2 licensing. They are:

- the Open Items Tracking Program,
- the Post-Turnover Change Control Process, and
- the Limerick 2 Technical Specification Preparation Program.

Although none of these three programs are fully developed for Limerick 2, they are in various stages of development and implementation.

The Licensing Plan for Limerick 2 consolidates licensing activities for Limerick 2, including Limerick 2's basic licensing approach, and a summary of significant Limerick 2 licensing positions. The Licensing Plan for Limerick 2 has been developed and is maintained by the E&R Licensing Branch.

Licensing Plan activities and milestones are used to identify Limerick 2 readiness checkpoints. Licensing readiness checkpoints include the following:

- the Limerick 2 By-Product and Special Nuclear Material Licenses are obtained,
- the ACRS review of Limerick 2 is completed and the ACRS writes a favorable letter to the Commission,
- the Limerick 2 Technical Specifications are complete and certified,
- the Limerick Generating Station, Units 1 and 2 FSAR, other licensing documents and other licensing-related programs and documents are completed and the plant is certified to be in compliance with the Commission's regulations, and
- an acceptably small number of licensing open items remain and NRC Region I writes a favorable letter to the Commission regarding plant completion and readiness to operate.

Chart L-0 identifies and shows the functional relationships for Limerick 2 licensing readiness checkpoints. When the required licensing activities and milestones are complete, the readiness checkpoints for licensing are considered complete. When all of the readiness checkpoints are complete, the Licensing Plan is complete and Limerick 2 is "Licensing Ready."

4.1.1.2 Regulatory Feedback Activities (Chart L-0)

Limerick 2 licensing organizations are involved in monitoring the current regulatory environment and providing regulatory feedback to programs and processes in Licensing and other functional areas.

PECo has formal and informal information distribution systems to provide regulatory feedback and information to Limerick 2 organizations and individuals. Regulatory feedback and information activities include the following:

- the Federal Register review system,
- the NRC Bulletins and Notices Program,
- the NRC Generic Letter Program, and
- other information distribution activities.

These activities are not described by a Third Tier Chart, but are described below. The purpose of these activities is to assure that PECo is aware of and involved in the current regulatory environment and can anticipate potential licensing implications for Limerick 2.

The Federal Register review system, is administered by the E&R Licensing Branch. This activity facilitates systematic PECo review and comment for proposed rules and other statements by the NRC and provides a means of feedback from the current regulatory environment to Limerick 2 activities.

The NRC Bulletins and Notices Program provides a systematic method for distributing, reviewing and responding, as required, to NRC Bulletins and Notices. This program is administered by the E&R Project Management Section and is audited for closure by the E&R Site Quality Assurance Organization. Refer to Section 4.2 for an additional discussion of this program.

PECo is developing an NRC Generic Letter Program for Limerick 2. The NRC Generic Letter Program will be similar to the NRC Bulletins and Notices Program. It will provide feedback from the NRC and will allow PECo to evaluate the application of the information to Limerick 2.

PECo also is involved in the current regulatory environment by its participation in numerous industry activities (e.g., NUMARC, INPO, BWROG, etc.). PECo's Engineering and Research organization uses routing slips and the Document Control Form (DCF) system to distribute regulatory information (e.g., Bulletins, Notices and Generic Letters) to appropriate Limerick 2 organizations.

4.1.1.3 Licensing Document Revision Program (Chart L-1)

The purpose of the Licencing Document Revision Program is to assure that the FSAR and other licensing documents appropriately reflect plant features and operating practices. It is implemented by Limerick 2 Licensing personnel. The heart of the Licensing Document Revision Program is the Licensing Document Change Notice (LDCN) procedure. The LDCN procedure is provided in Appendix D of Volume I of the Limerick Generating Station Quality Assurance Plan. This procedure is administered by the E&R Licensing Branch and specifies the review, approval and processing steps necessary to control the configuration of LGS licensing documents.

The Design Control Program, the modification process and other engineering processes, including the Project Change Request/ Project Change Notice (PCR/PCN), provide the primary input to the LDCN process. Input is also provided by the Nuclear Operations organization when licensing document changes are required because of changes to Start-up or Operations activities. Bechtel and General Electric, as well as PECo, are involved in the ongoing process of maintaining the accuracy of the licensing documents.

4.1.1.4 Licensing Commitment Tracking System (Chart L-2)

PECo defines a commitment as any statement made in the FSAR or other licensing documents, any statement made in letters submitted to the NRC, or any statement made verbally in a meeting or conversation with NRC personnel and documented in a subsequent letter. Verbal statements only become commitments when they are documented in an official PECo letter.

It is not the intent of PECo to track all of its commitments with commitment tracking systems. For example, system descriptions in the FSAR are assumed to accurately reflect corresponding design documents which are assumed to be implemented and verified by existing Quality Assurance programs. Generally, only those commitments which require future action to satisfy specific NRC concerns are tracked.

There are three licensing commitment tracking systems for LGS. They are:

- The Nuclear Operations Licensing Section Tracking System,
- The E&R Licensing Branch List of Licensing Commitments, and
- The E&R Site Quality Assurance Organization NRC Open Items List.

The Nuclear Operations Licensing Section has developed and is about to implement an automated Licensing Commitment Management System. It is computerized and will track the licensing commitments for all of PECo's operating nuclear units using a large data base management system. Initially, Limerick 2's licensing commitments will not be included in this system. However, after licensing, new and existing commitments for Limerick 2 will be added to the data base and will be tracked by the system.

The E&R Licensing Branch maintains a List of Licensing Commitments for Limerick 1 and 2. This list identifies and provides the status of major Limerick 2 licensing commitments. The list also includes the commitment document source, description of the commitment, responsible organization, licensing coordinator, status and next action, due dates and submittal dates. The process of close-out and status updating is conducted by letters between the E&R Nuclear Environmental Section and various other organizations.

The Site Quality Assurance Organization also maintains a list of NRC commitments called the NRC Open Items List. This list is used to identify, status and track items in which the NRC Regional Office or Regional inspectors are involved. This list is computerized and contains all items which require action by PECo to satisfy NRC Regional needs separate from NRC Nuclear Reactor Regulation (NRR) licensing requirements. The types of

items included on the NRC Open Items List are:

- o results of NRC inspections, violations, deviations, unresolved issues, and inspector follow-up items;
- o NRC Bulletins, Circulars, and Notices and soon, NRC Generic Letters;
- o significant deficiency reports (10CFR21 and 50.55(e));
- o any other written commitments made to the NRC Region.

This list is periodically reviewed with the Limerick 2 NRC Resident Inspector to ensure consistency with the list maintained by the NRC and to provide updates as items are reviewed and accepted by the NRC. The list is also reviewed periodically by PECo management.

The information contained on all three of these tracking systems will be transferred to the Limerick 2 Consolidated Open Items List (COIL) at an appropriate time in the latter stages of Project completion and licensing. Consolidation of open items will contribute significantly to the control of outstanding issues at or near the time of licensing. The COIL is discussed in more detail in section 4.1.1.5.

PECo has established an additional step in the process for submitting correspondence to the NRC. Such correspondence normally receives several levels of review by appropriate in-line organizations. The additional step requires an independent Quality Assurance review and verification of completion and status statements.

4.1.1.5 Open Items Tracking Program (Chart L-3)

A Consolidated Open Item List (COIL) was used near the end of the Limerick 1 Project to identify and track items that required completion prior to licensing. Each item on the list was assigned a completion category depending on when the item had to be completed, e.g., prior to fuel load, low power testing, Power Ascension Testing, or first refueling outage. The completion category for each item, which was initially established by PECo managers, could be confirmed or changed by means of an Open Item Evaluation Form (OIEF) process. The OIEF process helped PECo manage close-out of open items on the COIL by taking into consideration operability requirements for each open item as specified by the Technical Specifications. The Limerick 1 COIL is described in greater detail in Appendix C.

PECo is developing a COIL for Limerick 2. It will be similar to that used on Limerick 1. It is anticipated that the Limerick 2 COIL will include many of the features of the Limerick 1 COIL but will also include improvements based on the lessons learned from Limerick 1 For example, PECo is considering a common data base for the Limerick 2 COIL to facilitate a smooth transition from individual open items lists (i.e., the Start-up

Work List and the Construction Punch List). There will be a COIL procedure applicable to Limerick 2 and an organization assigned responsibility for administering the COIL.

Chart L-3 depicts the COIL that was used on Limerick 1. Chart L-3 also includes some of the improvements planned for the Limerick 2 COIL. It shows that the COIL will consolidate open items from other individual tracking systems and be used as a final tracking and closeout mechanism. The COIL will be highly visible to PECo management and the NRC. Items on the COIL are either closed, converted to license conditions and licensing commitments or are transferred to the Plant Systems Completion List (PSCL) for closeout during the operations phase. The Plant Systems Completion List is discussed in more detail in Section 4.5. It is anticipated that Limerick 2 license conditions and licensing commitments will be entered on the Nuclear Operations Licensing Section Licensing Commitment Management System. It is anticipated that some items from the Plant Systems Completion List as well as from the Licensing Commitment Management System will be included eventually on the LGS Integrated Schedule.

4.1.1.6 Post-Turnover Change Control Process (Chart L-4)

Prior to turnover of facilities and systems to the station, design and engineering changes are controlled by the Design Control Program (Chart E-1). To provide a mechanism for making changes to plant features and operating policies after turnover to the station, the Post-Turnover Change Control Process will be implemented. This process is essentially identical to the modification process already in use at Limerick 1.

A licensing impact assessment step has been added to the Limerick 2 modification process for changes meeting the definition of major modifications. The purpose of this step is to consider the benefits of a proposed change to the facility as described in the FSAR compared to the risk to licensing posed by such a change near the end of the project. In the event the risk to licensing is found to be unacceptable and the change is not required for safety, the change will be deferred until after licensing.

Proposed changes not meeting the definition of a major modification are defined as minor modifications in accordance with Station Administration Procedure A-14 and the LGS Quality Assurance Plan, Volume II. Minor modifications are not considered to present a risk to licensing.

4.1.1.7 Limerick 2 Technical Specification Preparation (Chart L-5)

At the time of the Readiness Program Assessment, no formal program existed for the preparation of Limerick 2 Technical

Specifications. However, key individuals in Engineering and Research and in Nuclear Operations expressed several ideas for such a program. Elements of the Limerick 2 Technical Specification preparation activity will be based on these ideas and documented in a Limerick 2 Technical Specification Preparation Program Plan. Important elements of such a plan include:

- o Making Limerick 2 Technical Specifications as much like Limerick 1 Technical Specifications as possible to minimize NRC review and limit the need for operators to make distinctions or require retraining.

- o Making Unit 2 Technical Specifications a separate document to minimize the opportunity for intervention on Limerick 1 operations.

- o Consideration of input from various sources such as,

  - Licensing Document Revision Program,
  - Post-Turnover Change Control Process,
  - Design Control Program,
  - NRC Bulletins, Circulars, Information Notices and Generic Letters,
  - G-39 Program, "General Project Requirements for Unit 2 Construction During Unit 1 Operation for Limerick Generating Station"
  - Licensing Commitment Tracking Program,
  - Open Item Tracking Program,
  - Start-up and Operations experience, and
  - NRC and industry Technical Specification optimization activities.

- o Participation in the program by the following organizations:

  - Operations and Start-up,
  - Nuclear Operations Licensing Section,
  - E&R Licensing Branch,
  - Legal,
  - Engineering,
  - Bechtel,
  - General Electric, and
  - Consultants.

- o Consideration of the interface between Limerick 1 and Limerick 2 Technical Specifications,

- o Implementation of a method for certifying that Limerick 2 Technical Specifications are consistent with the plant, the FSAR and the Safety Evaluation Report, and

- Consideration of the extent of and schedule for incorporating Boiling Water Reactor Owner's Group Technical Specification optimization items as well as other potential improvements into the Technical Specifications for Limerick 1 and 2.

The Limerick 2 Technical Specification Preparation Program Plan is included as a task in the Licensing Plan for Limerick 2, as described above.

Chart L-5 depicts the basic elements of a Technical Specification Preparation Program.

4.1.1.8 Plant Certification Program. (No chart)

On Limerick 1, PECo was required by the NRC to certify that the plant was in conformance with NRC regulations prior to issuance of the Operating License. PECo, with the help of its contractors, developed a Plant Certification Program for Limerick 1. The program consisted of a listing of compliance statements that addressed each applicable regulation. These statements were verified by PECo personnel and the contractors for accuracy. The results of this program served as a basis for PECo's certification letter to the NRC.

The program developed for Limerick 1 will be updated for Limerick 2 to reflect changes to NRC regulations which have occurred since Limerick 1's certification as well as to reflect differences between Limerick 1 and 2.

4.1.2 Program Assessment

The Readiness Program Assessment for Licensing focused on the following major questions:

- Are there feedback mechanisms from the Design, Construction, Start-up and Operations organizations to assure that PECo meets its licensing commitments for Limerick 2?

- Is the Licensing Document Revision Program adequate for controlling changes to the licensing documents?

- Does PECo know and have control of its licensing commitments?

- Does PECo maintain an awareness of the regulatory environment?

- Can PECo corporate management be confident in certifying that Limerick 2 is in conformance with all applicable NRC regulations, or that Limerick 2 Technical Specifications reflect the plant, the FSAR and the Safety Evaluation Report? and

- How will Limerick 2 licensing organizations and corporate management know when all licensing activities are complete and that the unit is ready for operation?

The Readiness Program Assessment Team determined that there is a programmatic link between engineering and construction programs and LGS licensing documents. This linkage provides reasonable assurance that the FSAR and its supporting documents accurately reflect Limerick 2 physical configuration. There is a direct link between the licensing documents and engineering processes through the Design Control Program and Licensing Document Revision Program. The link between the licensing documents and construction processes is assured through the Design Control Program and configuration control activities.

There are also links between Quality Assurance, Start-up and Operations activities and the LGS licensing documents. However, in some cases these links are not programmatic and rely on experienced Project personnel to assure that changes in these activities are properly reflected in the licensing documents.

Limerick 2 Licensing personnel rely on the Licensing Document Revision Program to control the accuracy of the licensing documents. However, with exception of the Licensing Document Change Notice (LDCN) process, the Licensing Document Revision Program is undocumented. Although it is not a requirement, the Licensing Document Revision Program could be more efficiently and consistently implemented by developing a Licensing Document Revision Program Description.

PECo controls its licensing commitments by controlling its licensing documents. The Licensing Document Change Notice process is sound and adequately controls changes to the licensing documents. Changes to the licensing documents that have been identified as necessary or proposed, are systematically processed, reviewed and approved by PECo and its contractors through the Licensing Document Change Notice process. PECo has final approval authority for all changes to LGS licensing documents.

Even though the Probabilistic Risk Assessment (PRA) and the Severe Accident Risk Assessment (SARA) are not licensing documents, the Nuclear and Environmental Section (NES) reviews all Project Change Requests for risk impact. This supports PECo's commitments to the Advisory Committee on Reactor Safeguards (ACRS) to maintain the Limerick PRA up to date. It is also a very positive approach to risk management. The use of PRA as a tool for risk management has been encouraged by both the ACRS and the NRC staff.

In general, PECo personnel are aware of Limerick 2 licensing commitments. PECo uses a List of Licensing Commitments and the NRC Open Items List to document and control specific NRC

commitments on Limerick 2. Individuals associated with Limerick 2 provided consistent and accurate answers when questioned about licensing commitments in their areas.

Through its licensing organizations, participation in industry group activities and distribution of regulatory feedback information, PECo keeps the Limerick 2 Project Team informed of the current licensing environment. The distribution process for feedback information could be improved by documenting the informal distribution systems and consolidating all such activities under one coordinating program. This is not a requirement. However, a coordinated approach to information distribution can improve the effectiveness of the process.

PECo will update the Plant Certification Program used on Limerick 1 to serve as the basis for certifying that Limerick 2 has been designed, constructed and tested and will be operated in accordance with NRC regulations. The Plant Certification Program, in combination with the accountability structure developed based on this Readiness Program Assessment, will give corporate management confidence in certifying Limerick 2.

Based on elements proposed for incorporation in the Limerick 2 Technical Specification Preparation Program, PECo corporate management can also have a greater degree of confidence in certifying that Limerick 2 Technical Specifications reflect the as-built configuration, the FSAR and the Safety Evaluation Report.

The Limerick 2 Consolidated Open Items List, when fully developed and properly implemented, will provide an extremely useful completion and readiness tool for PECo and the NRC. It will provide complete and reliable information on the status of open items that are important to PECo and the NRC and will serve as part of the bases for the NRC's Region I letter.

Technical Specification verification can be accomplished programmatically as part of the Limerick 2 Technical Specification Preparation Program. This concept will be developed in the Program Plan.

The Licensing Plan for Limerick 2 is a comprehensive and useful document. It adequately identifies, assigns responsibilities and schedules the limited number of Limerick 2 licensing items that must be completed prior to licensing. When the routine, special and optional licensing activities described in the Plan are complete, Limerick 2 licensing organizations are assured that Limerick 2 is "Licensing Ready."

4.1.3 Open Items

4.1.3.1 Field Deviation Disposition Requests (FDDR) and the Licensing Documents.

There has been no programmatic connection between the FSAR and other licensing documents and the General Electric (GE) Field Deviation Disposition Request (FDDR) process. This is not a design or engineering problem. Refer to Chart E-1. This is a potential weakness in keeping the plant accurately reflected in the FSAR and other licensing documents.

PECo, Bechtel, and GE are reviewing approximately 3700 FDDRs that have been generated on Limerick 2. No licensing significance has been found with the 1000 FDDRs reviewed as of August 28, 1987. The remaining FDDRs will be evaluated. A programmatic change to the FDDR process is being considered that will provide a direct link between FDDRs and the licensing documents.

4.1.3.2 NRC Generic Letter Review Program

There is no program in place to systematically review NRC Generic Letters for potential implications to Limerick 2. This is a potential weakness in assuring sufficient PECo knowledge of the regulatory environment and appropriate feedback of regulatory information to affected Limerick 2 Project Team members.

PECo has recently initiated an NRC Generic Letter Review Program for Limerick 2. It will be integrated with the NRC Bulletins and Notices Program described in Appendix X of the Quality Assurance Plan, Volume I. The program will review all NRC Generic Letters for impact on Limerick 2, including consideration of previous Generic Letters. The marked-up procedure for the program was issued on October 1, 1987.

4.1.3.3 Start-up and Operations and the Licensing Documents

There is a less formal link between Start-up and Operations functional areas and the licensing documents than there is for Engineering and Construction functional areas. Although Start-up and Operations initiate updates to the licensing documents periodically, there is no programmatic requirement for updating other than the Start-up Field Report (SFR) for testing activities.

The need to develop a stronger link between Start-up and Operations activities and the licensing documents will be addressed under the Organizational Readiness Program discussed in Section 4.5.

4.1.3.4 Consolidated Open Items List

There is no Consolidated Open Items List (COIL) for Limerick 2. Although it is not required by the NRC, the COIL is a useful completion and readiness tool as demonstrated by its use on Limerick 1.

A Consolidated Open Items List, similar to that used on Limerick 1, will be developed and used during the later stages of the Limerick 2 Project. The Limerick 2 COIL will incorporate lessons learned from the Limerick 1 COIL and will be supported by the use of the Open Items Evaluation Form to evaluate and disposition COIL items. The Limerick 2 COIL will be automated and appropriate data and information will be managed by a large data base system. PECo will determine which organization will have lead responsibility for the COIL and which organizations will be included.

At the time of system turnover to the Start-up organization, system construction punch list items will be converted to Start-up Work List Items. These system-related work activities or open items will then be tracked by the Start-up organization.

About the time each system is ready for Preoperational Testing, appropriate organizations will be requested to review their records and files and forward engineering and design open items. This information will be added to the data base such that real work items and outstanding open items associated with the system are identified. Start-up, with the help of other appropriate organizations, will be responsible to close-out or disposition each item prior to fuel load. The Open Item Evaluation Form will be used to analyze and help disposition of these items. This process will address system-related items.

About six months prior to Limerick 2 fuel load, appropriate organizations will be asked to review their records and files to identify any other open items (not system-related) which must be resolved or dispositioned for licensing purposes. This information will also be entered into COIL. Start-up, with appropriate support from other groups, will track this activity and closeout or disposition each item. The Open Item Evaluation Form will be used to analyze and help disposition these open items.

The Consolidated Open Item List will place all items on a common data base in a timely manner and track closure in support of licensing and verification of construction completion and readiness for operation.

4.1.3.5 Limerick 2 Technical Specifications

At the time of the Readiness Program Assessment, there was no program in place to develop Limerick 2 Technical Specifications.

PECo is developing a Limerick 2 Technical Specification Preparation Program Plan. Although Limerick 2 Technical Specifications will be based on Limerick 1 Technical Specifications, they will be submitted to the NRC as a separate document. The Program Plan will include specific guidelines on the following:

- How to address the interface between Limerick 1 and Limerick 2 Technical Specifications,
- What support and reference information needs to be documented, and
- Specific program elements that will facilitate Limerick 2 Technical Specification Certification.

The Plan is in its early stages of implementation and was discussed with the NRC in November 1987, for information. Submittal of the first draft of the Limerick 2 Technical Specifications to the NRC for review and approval is scheduled for April 1988.

4.1.3.6 Transition of Licensing Responsibilities

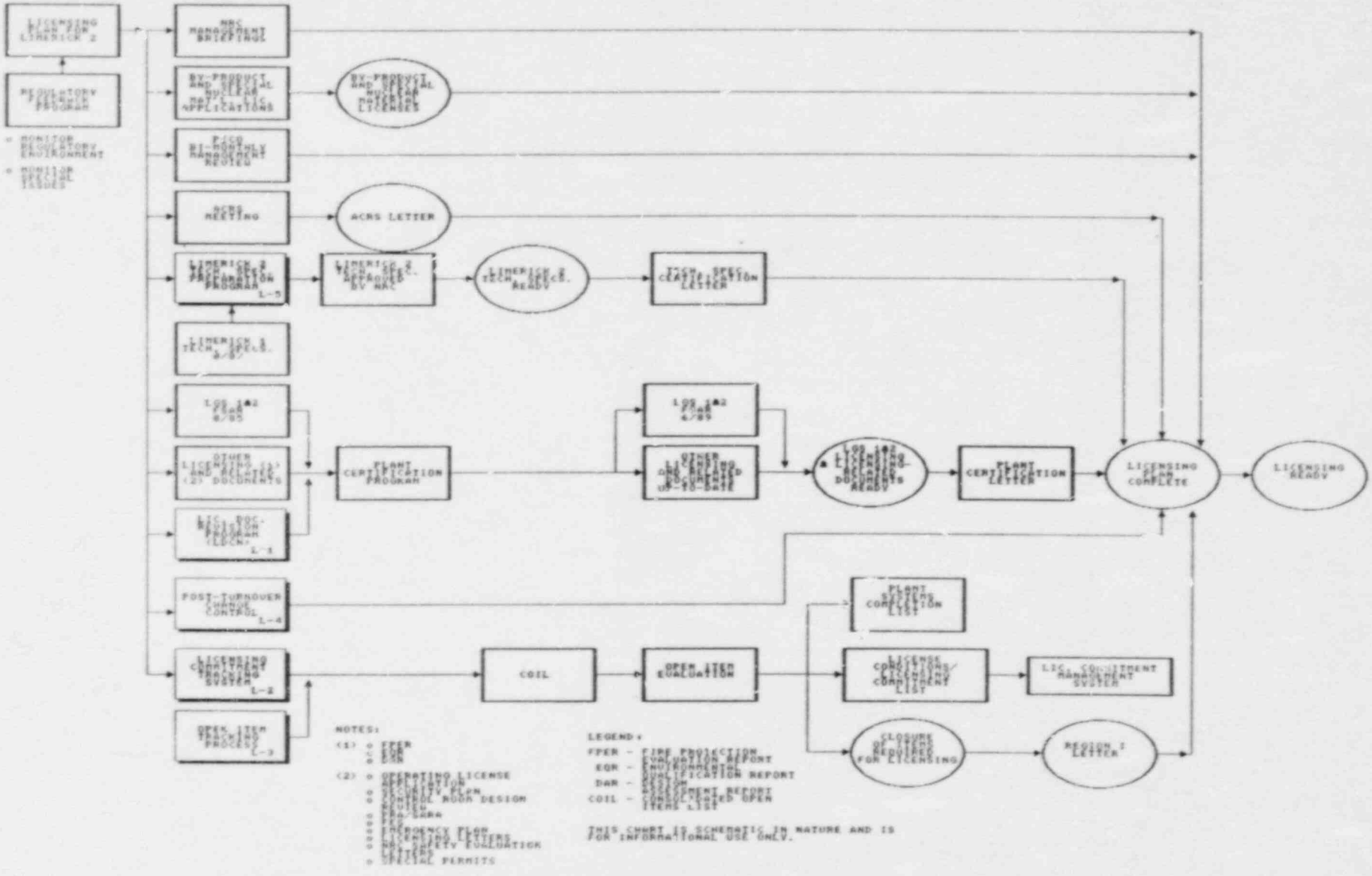
Currently, there is no program or plan for a transfer of Limerick 2 licensing responsibilities from the E&R Licensing Branch to the Nuclear Operations Licensing Section.

The need for a program or a plan to transfer licensing responsibilities will be addressed under the Organizational Readiness Program currently being developed by PECo.

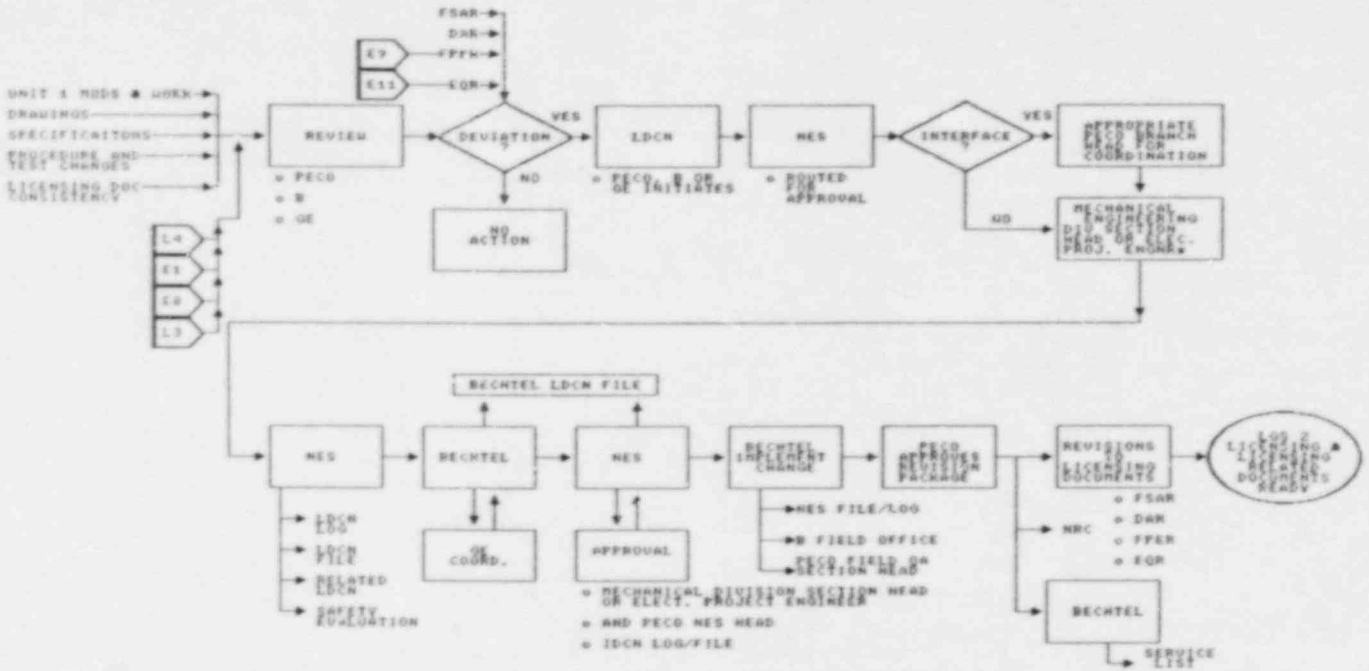
LICENSING CHARTS

L-0	LICENSING READY
L-1	LICENSING DOCUMENT REVISION PROGRAM
L-2	LICENSING COMMITMENT TRACKING SYSTEM
L-3	OPEN ITEMS TRACKING PROCESS
L-4	POST-TURNOVER CHANGE CONTROL PROCESS
L-5	UNIT 2 TECHNICAL SPECIFICATION PREPARATION PROGRAM

L-0
LICENSING READY
(SECOND TIER)



L-1
LICENSING DOCUMENT REVISION PROGRAM



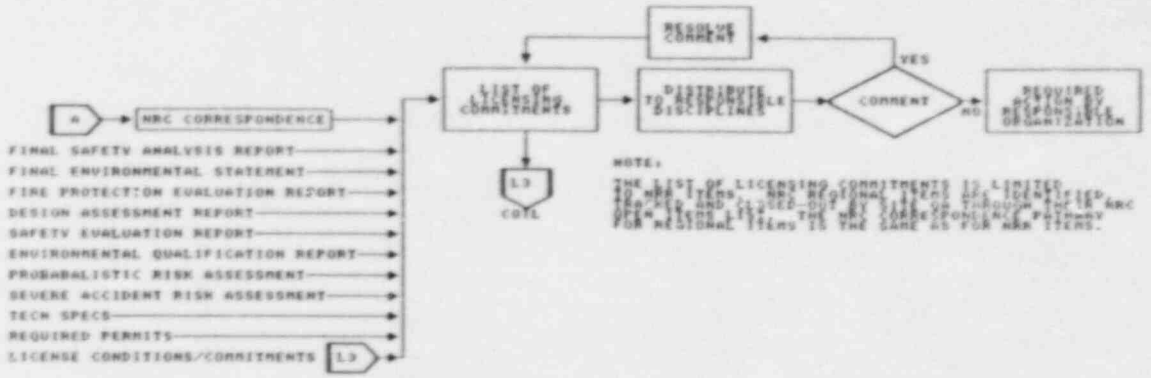
LEGEND:

LDCN = LICENSING DOCUMENT CHANGE NOTICE
FSAR = FINAL SAFETY ANALYSIS REPORT
DAR = DESIGN ANALYSIS REPORT
FPER = FINAL PROTECTION EVALUATION REPORT
EQR = ENVIRONMENTAL QUALIFICATION REPORT
PECO = PHILADELPHIA ELECTRIC COMPANY
GE = GENERAL ELECTRIC COMPANY

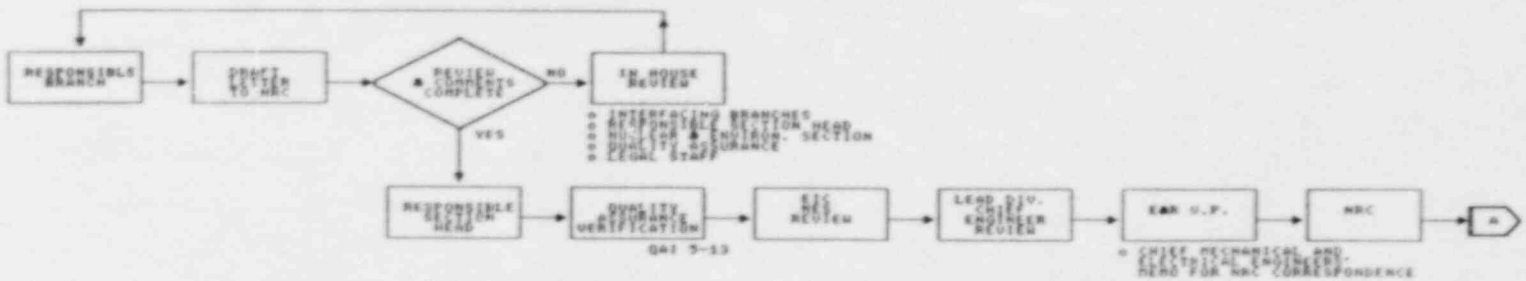
NOTE: AUDITS/SURVEILLANCES ARE PERFORMED OF THESE ACTIVITIES AS REQUIRED BY QA PROGRAM. REFER TO QA MANUAL CHART D-1 FOR THE DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

L-2
LICENSING COMMITMENT TRACKING SYSTEM

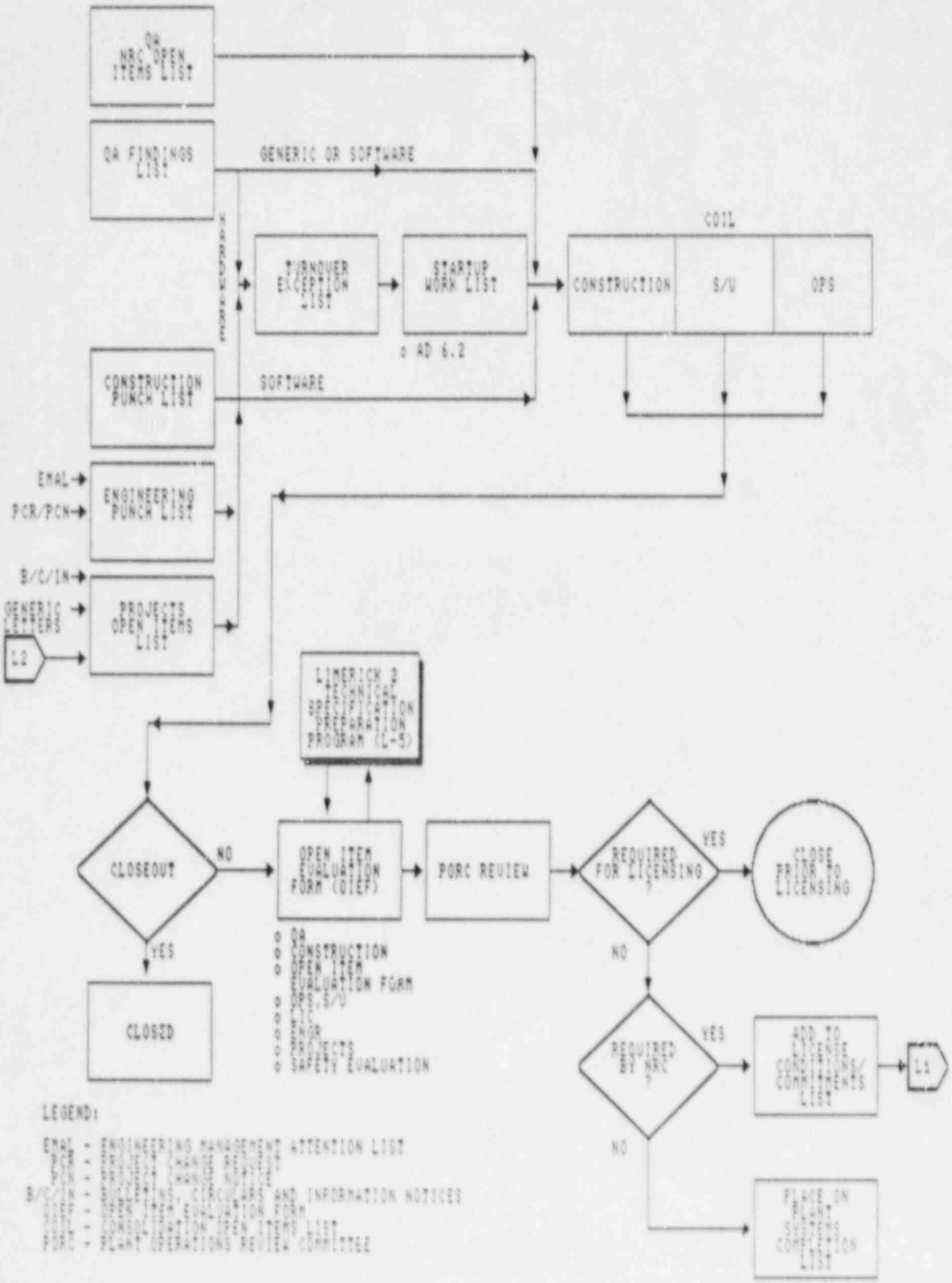


CORRESPONDANCE CONTROL PROCESS



THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

L-3
OPEN ITEMS TRACKING PROCESS

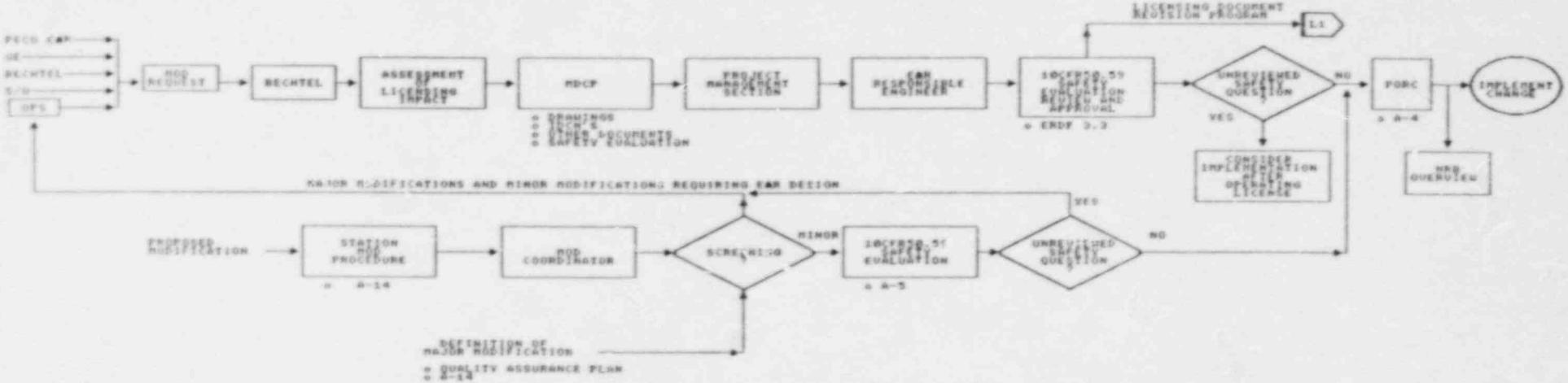


LEGEND:

EMAL - ENGINEERING MANAGEMENT ATTENTION LIST
PCR - PROCESS CHANGE REQUEST
PCN - PROCESS CHANGE NOTICE
B/C/IN - BULLETINS, CIRCULARS AND INFORMATION NOTICES
OIEF - OPEN ITEM EVALUATION FORM
SWRI - SUNSHINE REGULATION OPEN ITEMS LIST
PORC - PLANT OPERATIONS REVIEW COMMITTEE

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

L-4
POST-TURNOVER CHANGE CONTROL PROCESS
BECOMES EFFECTIVE AT SYSTEM/FACILITY TURNOVER

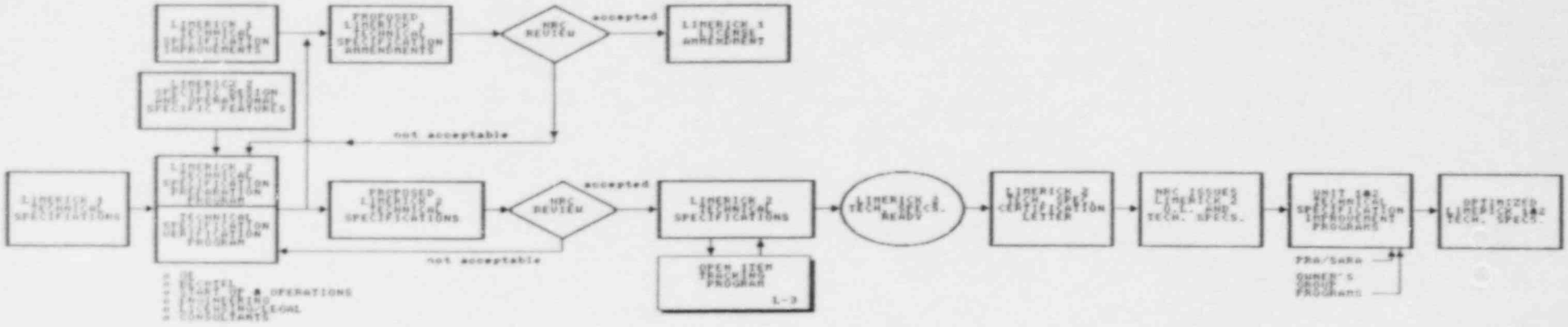


LEGEND:

MDCP - MODIFICATION DESIGN CHANGE PACKAGE
PORC - PLANT OPERATIONS REVIEW COMMITTEE
MRB - MODIFICATION REVIEW BOARD
CDCN - CYCLE/UNIT DOCUMENT CHANGE NOTICE

THIS SHEET IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

L-5
UNIT 2 TECHNICAL SPECIFICATION PREPARATION PROGRAM



NOTE:
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

4.2 QUALITY ASSURANCE

4.2.1 Characterization of Readiness Programs Assessed

The description of the assessment of the Quality Assurance/Quality Control (QA/QC) Program has been included in the technical areas of this report in so far as practical. The description which is included in this section presents an overview of the process and discusses a number of special activities such as the Quality Concerns Program.

The Readiness Program Assessment covered the relationship between quality assurance and quality control and the other activities involved with the design, fabrication, installation, construction, testing and operation of Limerick 2. The quality programs reviewed include the FSAR Chapter 17 description of the Quality Assurance Program for design and construction (Section 17.1). For the operations phase, (Section 17.2), a detailed assessment of the quality program was not done; instead a brief overview of the Nuclear Operations organization and quality programs was done to review interfaces and the potential for problems from these interfaces.

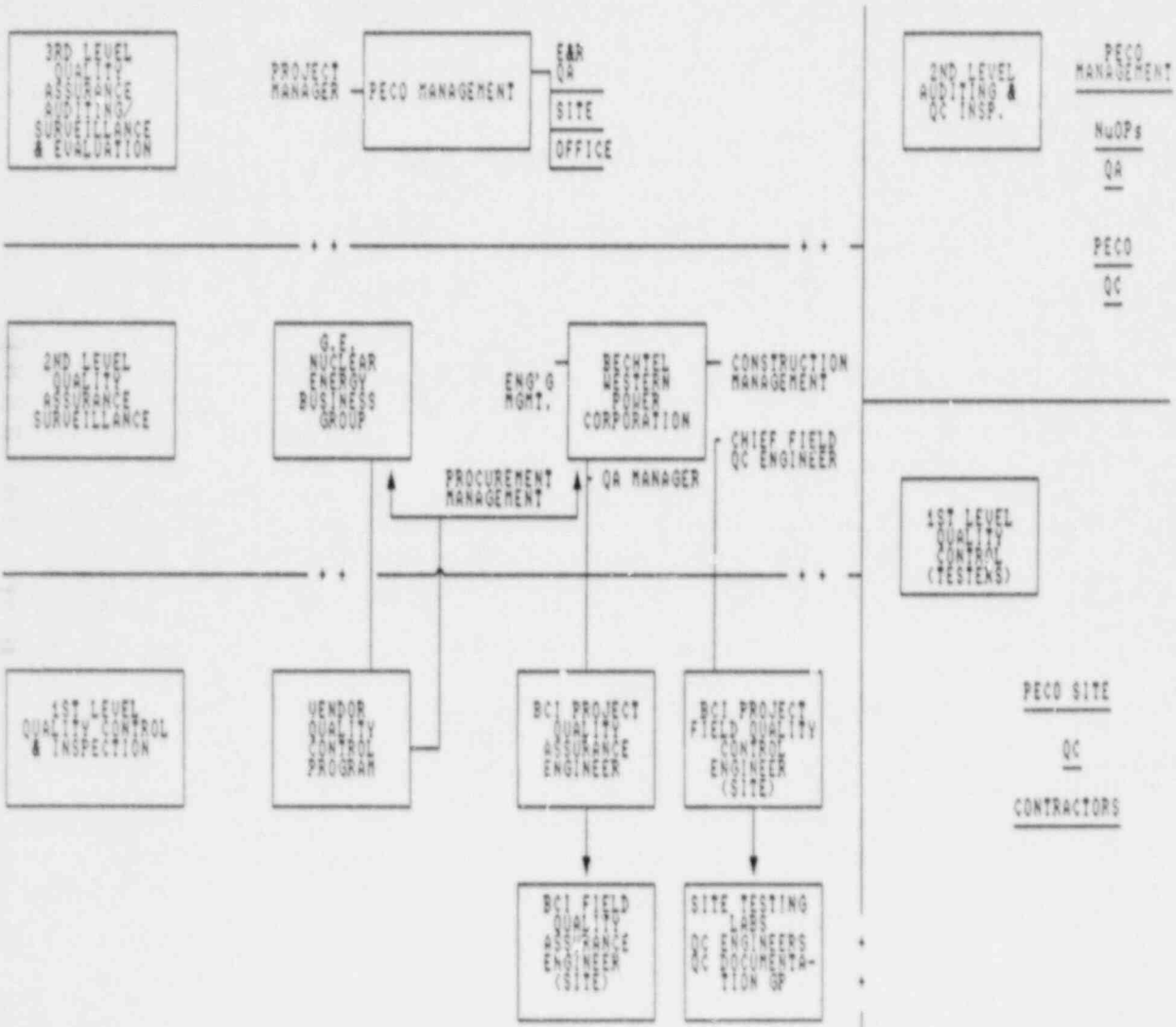
The functional responsibility for quality assurance in the various phases is shown in Figure 4-1. PECo has established and implemented a three-level Quality Assurance Program for the design and construction phases which is identified in Section 17.1 of the FSAR and described in Appendix D of the PSAR; and a two-level program for the preoperational testing and operations phases, which is described in Section 17.2 of the FSAR and Appendix D of the PSAR.

4.2.1.1 QA/QC Functional Activities (Chart Q-0)

The QA/QC Functional Activities from design through operations are depicted on chart Q-0. During the design, procurement and fabrication phases, the quality organizations' functions vary from in-line review and approval activities; through in-process and final inspection activities; to overview audit and surveillance activities. These functions are carried out in varying degrees by the General Electric Company, Bechtel and PECo quality organizations in accordance with each organization's quality program.

During the design and procurement phases, the quality organizations are primarily involved in review and approval activities for specifications, drawings, purchase orders and other design documents. In addition, vendor quality programs are reviewed, approved and audited for implementation. During the construction phase, the quality organizations continue to provide in-line review and approval activities, but become much more

FIGURE 4-1
QUALITY ASSURANCE FUNCTIONAL RESPONSIBILITY



LEGEND:

BCI - BECHTEL CONSTRUCTION INCORPORATED
NUOPS - NUCLEAR OPERATIONS
E & R - ENGINEERING AND RESEARCH

NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

involved in the acceptance of completed construction activities on a day-to-day basis as construction nears completion. The overview auditing and surveillance activities also become much more involved in the actual performance of the construction activities to provide real-time assessment and feedback for construction performance.

During the preoperational testing phase, the quality organizations become heavily involved in the in-line review and approval activity of test procedures. Because testing is considered a first-level quality control function, independent quality control inspection activities are only to cover rework, temporary equipment removal and test restoration activities. A quality review and approval of testing results is also performed to ensure that test acceptance criteria have been satisfied.

Interfaces between quality organizations, i.e. PECo Nuclear Operations, PECo Engineering and Research, Bechtel and General Electric, were examined. In addition, interfaces between quality organizations and the engineering, construction and testing organizations were reviewed. These interfaces are depicted at the working level in the various flow charts for the engineering, construction and testing organizations. Interface and coordination between the various quality organizations is provided by periodic interface meetings in which common concerns and working relationships are discussed.

The following paragraphs describe functions and activities which are shown on the QA/QC charts.

4.2.1.2 Audit/Surveillance Process (Chart Q-1)

The audit function, which provides an overview assurance that programs are in place and being effectively implemented, is performed by General Electric, Bechtel and PECo at various involvement levels and time frames during the design, construction, testing and operations phases. The audit function is preplanned and executed to ensure the adequacy of the QA Program; it provides identification and correction of deficiencies and feedback for reauditing problem areas. As part of the audit function, surveillance activities are performed on a continuing basis in response to scheduled construction, testing and operations activities. These surveillance activities provide a monitoring function and a real time feedback for adequacy and implementation of the QA Program. The combined input of the audits and surveillances provides the necessary evaluation and timely feedback for identifying problem areas and focusing necessary management and QA attention. A reaudit program assures that major problem areas are addressed on a continuing basis. Acceptance of closure of Finding Reports requires implementation of both initial corrective action and corrective action to prevent recurrence. Summary reports of the results of audits,

surveillances, findings, NRC activities, etc., are provided on a monthly basis to senior management. In addition, open Finding Reports are provided monthly to responsible organization management, as well as senior management. The responsible organizations provide monthly feedback reports on the status of open findings.

4.2.1.3 Part 21 and 50.55(e) Reports (Chart Q-2)

Deficiencies which are identified and documented, either onsite or offsite, are evaluated for reportability under 10CFR21 and/or 10CFR50.55(e) as a part of the process utilized to monitor, control and provide corrective actions for these deficiencies. This evaluation is performed through an established system of reviews after the Limerick 2 Project Manager assigns the responsibility for carrying out the evaluation to a particular organization. For those deficiencies which require extended evaluations to determine reportability, notification to the NRC and the Vice-President, Engineering and Research, is made as a "potentially" reportable item. A written report is provided to the NRC within 30 days (10CFR50.55(e)) or 5 days (10CFR21) as required by the Code of Federal Regulations. The process continues until the evaluation is complete and the item is determined to be reportable or not reportable. If the decision is that the item is not reportable, the NRC is notified if a "potential" report had been filed. This notification is documented, and the deficiency is corrected and tracked using the normal deficiency control program. If the item is determined to be reportable, the necessary report(s) are prepared and sent by the Vice-President, Engineering and Research to the NRC Regional Office. On items for which the NRC has received notification, the entire process is tracked by Quality Assurance on the site QA Open Items List for NRC closure. The item is not removed from the tracking system until the NRC closes it out in an inspection report.

4.2.1.4 NRC Bulletins and Notices (Chart Q-3)

The NRC issues Bulletins and Information Notices to PECo senior management. They are then routed to the PECo Limerick 2 Project Manager for further action. An information copy is also routed to PECo Engineering and Research Quality Assurance (E&R QA) for determination of applicability to Limerick 2 and subsequent addition to the NRC Open Items List for tracking any required response. The Project Manager screens the incoming documentation and assigns a lead PECo organization/individual the responsibility for action. Copies of the documentation are distributed by the Project Manager to appropriate organizations, including the Bechtel and General Electric Project Managers, for comment. Evaluations, comment and required action, including design changes, are coordinated by the PECo responsible group. Any required written response is reviewed/validated by E&R QA

prior to being signed by PECo senior management for transmittal to the NRC. PECo E&R QA continues to track the action required until the item is closed in a NRC inspection report. This program will be expanded in the near future to formally include NRC Generic Letters for both action and tracking purposes.

4.2.1.5 Quality Concerns Program (Chart Q-4)

PECo has recognized the possibility that individuals may develop concerns about the construction or operation of Limerick 2 and has established a program to deal with these concerns. The Quality Concerns Program has two basic parts. One is a program which interviews personnel leaving the project, both crafts and engineering personnel of the non-PECo organizations. PECo Construction Division also has implemented a similar program and other Engineering and Research Divisions intend to develop their programs. The second part of the program involves a "hotline" deficiency reporting program. This program is addressed as part of site orientation training, posted as a notice to all personnel in the various work areas and periodically addressed in the monthly site newspaper. When a safety concern is reported, Bechtel Construction Incorporated and/or PECo Quality Assurance investigates and informs the individual of the results, and follows the required corrective actions to completion. A project Quality Concerns Review Board has also been established and is chartered to provide management overview to quality concerns which originate through the Quality Concerns Program or through allegations to the NRC. This overview is designed to assure timely and adequate closure of these concerns and also assess, by monitoring the frequency and nature of these concerns, the need for revised programs or policies. All parts of the Quality Concerns Program are designed to provide and maintain confidentiality for those requesting to remain anonymous. Also included in the system are reporting requirements to appropriate levels of management and the Nuclear Review Board as part of the normal management reporting systems.

4.2.1.6 Receipt Inspection (Chart Q-5)

Bechtel Construction Incorporated under the auspices of the PECo Quality Assurance Plan, has developed and implemented a Receipt Inspection Program for ensuring that material received on site conforms to the requirements specified in the purchase order (engineering specifications and industry codes and standards). Material, upon arrival on site, is placed in a controlled "hold" area for inspection by Quality Control (QC). QC has developed generic receipt inspection instructions which provide generic inspection requirements and include, via reference, specific purchase order requirements. Material is inspected by QC for the required attributes and either released for normal storage or identified as nonconforming and segregated. Segregated material may be released only on QC concurrence after appropriate

disposition of the nonconforming condition. Documentation of the inspection results are filed as quality records under the identity of a QC Inspection Report. Material released for warehouse storage is available for construction use via a Material Withdrawal Request Control Program.

4.2.1.7 Pre-Operational Phase QA/QC Organization/Responsibility (Chart Q-6)

Start-up administrative procedure AD2.1, "Start-up Organization/ Responsibilities," establishes the PECo Start-up Group Organization and Responsibilities. The Limerick Generating Station Quality Assurance Plan (LGS QAP) Volume 1 establishes the authority and duties of PECo personnel and organizations doing quality related work during the design, construction and preoperational phase on Limerick 2. During the start-up of Limerick 2, the lead responsibility for Quality Assurance is assigned to the Nuclear Operations Quality Assurance Division (Nu Ops QA). Nu Ops QA performs an audit/surveillance function for Start-up, but delegates the remaining functions to Engineering and Research Quality Assurance (E&R QA). These delegated functions are performed under the direction of the Field Quality Assurance Section Head who has responsibility for quality-related site activities. Quality Control is performed by the E&R QA Division Quality Control Group which includes inspections of restorations, rework and installation of electrical equipment; review of start-up records; interfacing with NRC inspectors, authorized nuclear inspectors, and other auditors; providing training and overviewing personnel qualifications for start-up personnel; and providing coordination for the implementation of the overall start-up quality program.

4.2.2 Program Assessment

The results of the assessment of the Quality Assurance/Quality Control (QA/QC) program in use for the Limerick 2 Project indicate that with continued implementation of the program, the design, construction and testing of Limerick 2 will be completed in accordance with regulatory requirements and the Quality Assurance Program Description contained in Chapter 17 of the FSAR. In addition, when the established and planned activities are completed, Limerick 2 should be ready for licensing and safe operation. The assessment results also indicate that the Limerick 2 QA/QC organization is made up of well trained and experienced personnel.

The audit/surveillance programs have been directed toward the overall review of quality activities, especially with respect to the identification of root cause and resolution of problems. This has been demonstrated in the areas of hydrostatic testing and Computer Aided Design and Drafting (CADD). The audit/surveillance programs also include a reaudit program which

assures that open items are addressed on a continuing basis. The audit/surveillance programs contribute to the assurance of readiness for licensing of Limerick 2.

Application of Lessons Learned from Limerick 1 construction, start-up and operation is a very positive factor in the completion of Limerick 2. Examples of these lessons learned include the elimination of some subcontractors and increased control over the remaining subcontractors as recommended in NUREG-1055, and the methods of applying QA/QC coverage during the start-up program.

The Quality Concerns Program, which was continued from Limerick 1, has been enhanced for Limerick 2 by commissioning a Management Review Board to evaluate quality concerns. A further enhancement was the development and implementation of a procedure for exit interviews of PECo Construction Division personnel. Other PECo Divisions are preparing similar procedures and these are scheduled for implementation by March 31, 1988.

4.2.3 Open Items

4.2.3.1 Complexity of Quality Assurance/Quality Control Organization

PECo's matrix organization is exemplified in the Quality Assurance/Quality Control Area. The division of responsibility resulting from the organizational structure requires extensive interfaces, the number of which are magnified by the contractor quality program involvement. This large number of interfaces with each organization using its own system and forms, especially in the nonconformance reporting area, has created a need to ensure that each interface is clearly established and responsibilities are defined. This assessment was not scoped to explore in detail the Quality Assurance/Quality Control (QA/QC) interfaces. PECo is in the process of performing this task and issuing a procedure (QAI 1-1) which will define interface responsibilities. Additionally, consideration is being given to developing a Quality Assurance Instruction describing responsibilities between headquarters and site QA organizations. Since any failure to properly identify and control nonconforming conditions has the potential for causing problems or delays in the licensing process, PECo has undertaken the task of reducing the methods for reporting nonconformances as much as is practical. In addition, a detailed plan for consolidation of the quality organizations will be developed as part of the Peach Bottom Commitment to Excellence.

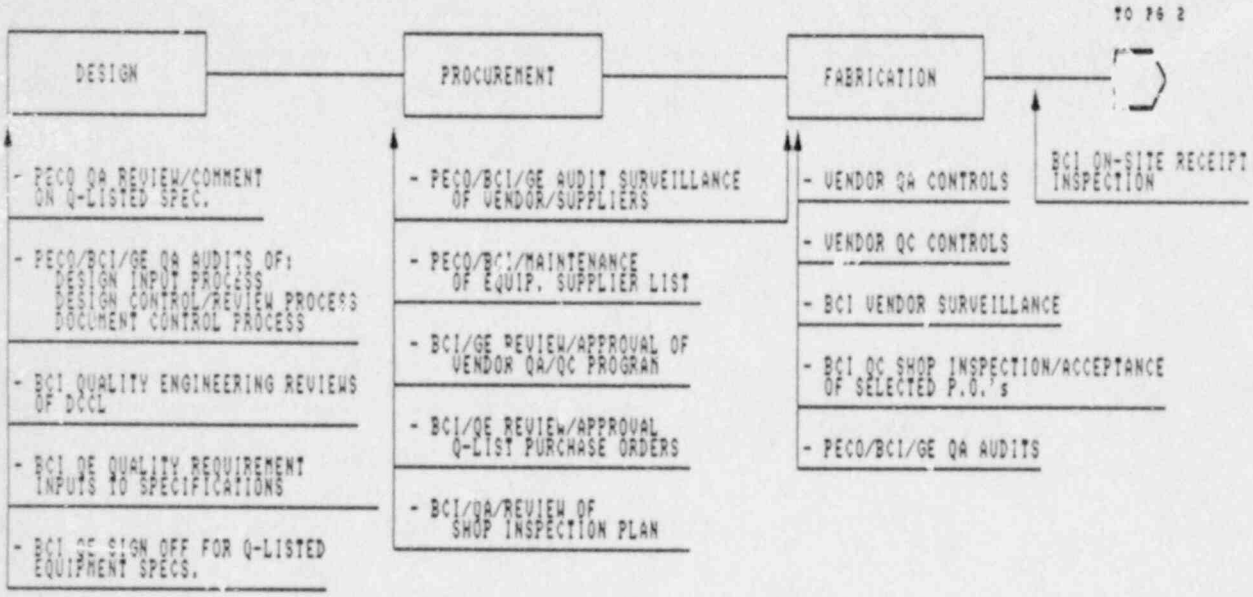
QA/QC CHARTS

Q-0	QA/QC FUNCTIONAL ACTIVITIES (3 SHEETS)
Q-1	AUDIT/SURVEILLANCE PROCESS
Q-2	PART 21 & 50.55(E) REPORTS
Q-3	NRC BULLETINS & NOTICES
Q-4	QUALITY CONCERNS PROGRAM
Q-5	QC RECEIPT INSPECTIONS
Q-6	PRE-OPERATIONAL PHASE QA/QC ORGANIZATION/ RESPONSIBILITIES

Q-0

QA/QC FUNCTIONAL ACTIVITIES

SHEET 1 OF 3



LEGEND:

DCCL - DESIGN CONTROL CHECK LIST
PO - PURCHASE ORDERS

NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

Q-0

QA/QC FUNCTIONAL ACTIVITIES

FROM PG 1

CONSTRUCTION/ INSTALLATION

TO PG 3

- BCI/QA/QC REVIEW/ APPROVAL OF CP'S
- BCI/QA REVIEW/APPROVAL OF QC I'S
- PECO QA REVIEW/ COMMENT ON CP'S & QCI'S
- BCI/QC REVIEW/APPROVAL OF WP'S (SCOPE QC IR'S)
- BCI/QC/PECO R&S QC INSPECTION OF COMPLETED WORK
  - o Y
    - SIGNS CLOSURE OF QCIR
    - SIGNS CLOSURE OF WP
  - o N
    - ISSUES IPRN'S
    - ISSUES NCR'S - APPROVE DISPOSITIONS
- BCI/PECO QA AUDIT
  - WP PROCESS
  - R & S QC PROGRAM
  - QC IR'S
  - NCR'S
  - DESIGN CHANGE PROCESS
  - UNIT 2/UNIT 1 INTERFACE
  - DOCUMENT CONTROL
  - QA RECORDS
  - AS-BUILT PROGRAM
  - HARDWARE INSTALLATIONS
  - STORAGE & LTM
  - MATERIAL CONTROL & ISSUE
  - LDCN PROCESS
  - SUBCONTRACTOR CONTROLS
- PECO QA REVIEW OF USE-AS-IS/REPAIR NCR'S

- BCI/QA/QC/ PECO R&S QC WALK DOWN OF SYSTEM TURNOVER PACKAGES
- BCI/QC/PECO R&S REVIEW/APPROVAL/INPUT TO TURNOVER PACKAGES
- BCI/PECO QA AUDIT OF BLUE TAG RELEASE PROGRAM
- PECO QA NRC OPEN ITEMS LIST MAINTENANCE
- PECO QA AUDIT OF FACILITY TURNOVER

LEGEND

BCI - BECHTEL
CP - CONSTRUCTION PROCEDURE
QCI - QUALITY CONTROL INSTRUCTIONS
WP - WORK PACKAGE
QCIR - QC INSPECTION REPORT
IPRN - IN PROCESS REWORK NOTICES
NCR - NON-CONFORMANCE REPORT
LTM - LONG TERM MAINTENANCE
LDCN - LICENSING DOCUMENT CHANGE NOTICE

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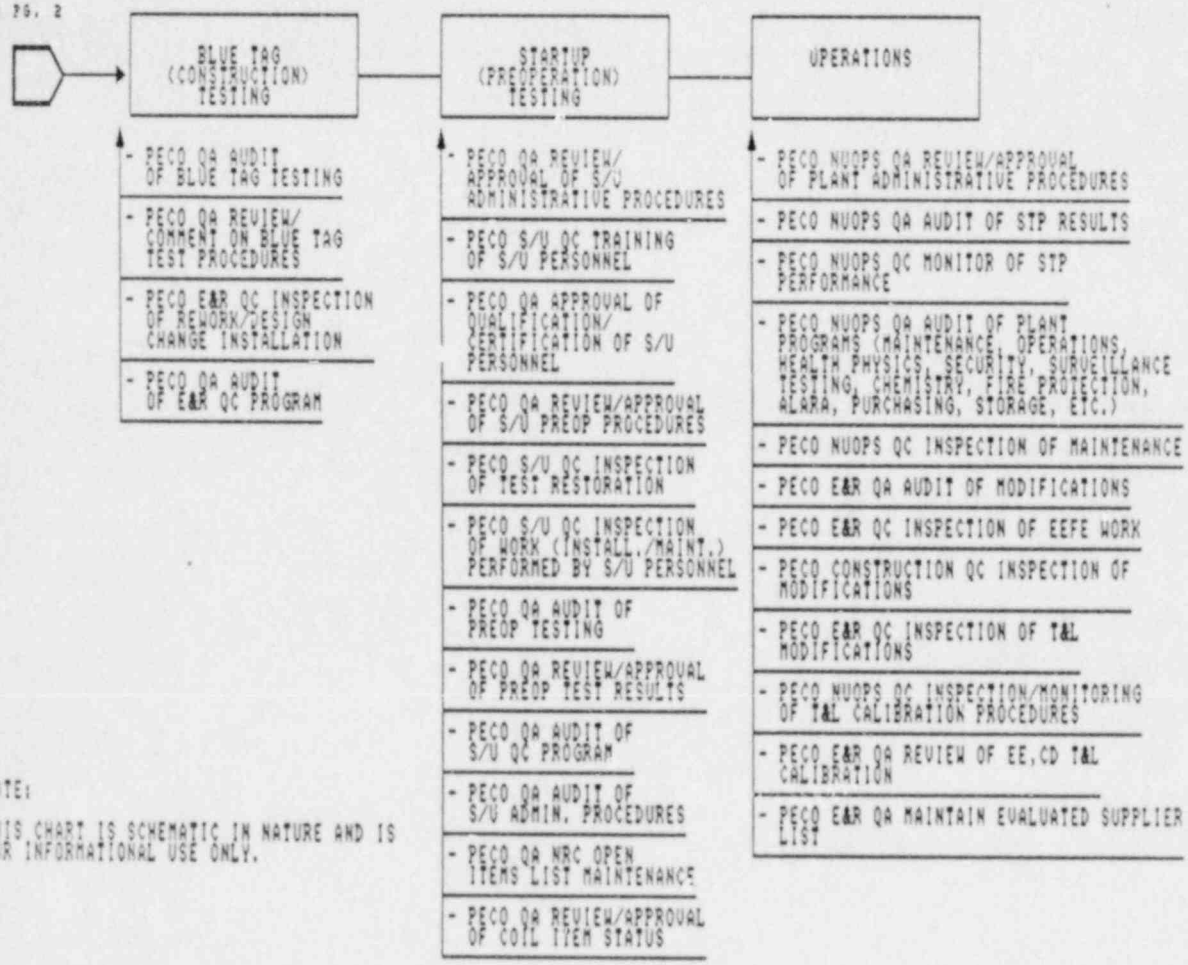
Q-0
QA/QC FUNCTIONAL ACTIVITIES

FROM PG. 2



NOTE:

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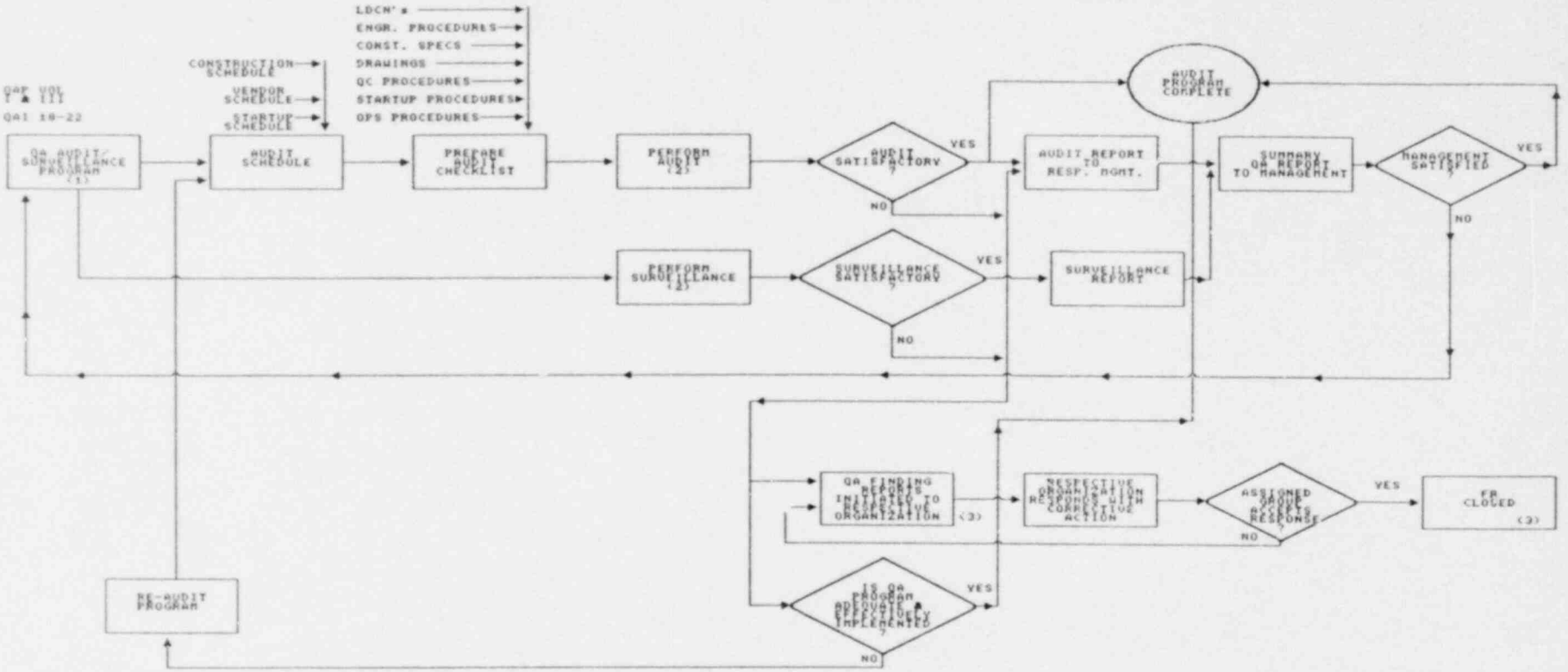
Q-1

AUDIT/SURVEILLANCE PROCESS

(QAP VOL I; III; BCI NQAMS SECT. 1 #6)



NOTES:

(1) PECO, BCI & GE CONDUCT AUDITS OF SITE AND VENDOR ACTIVITIES.

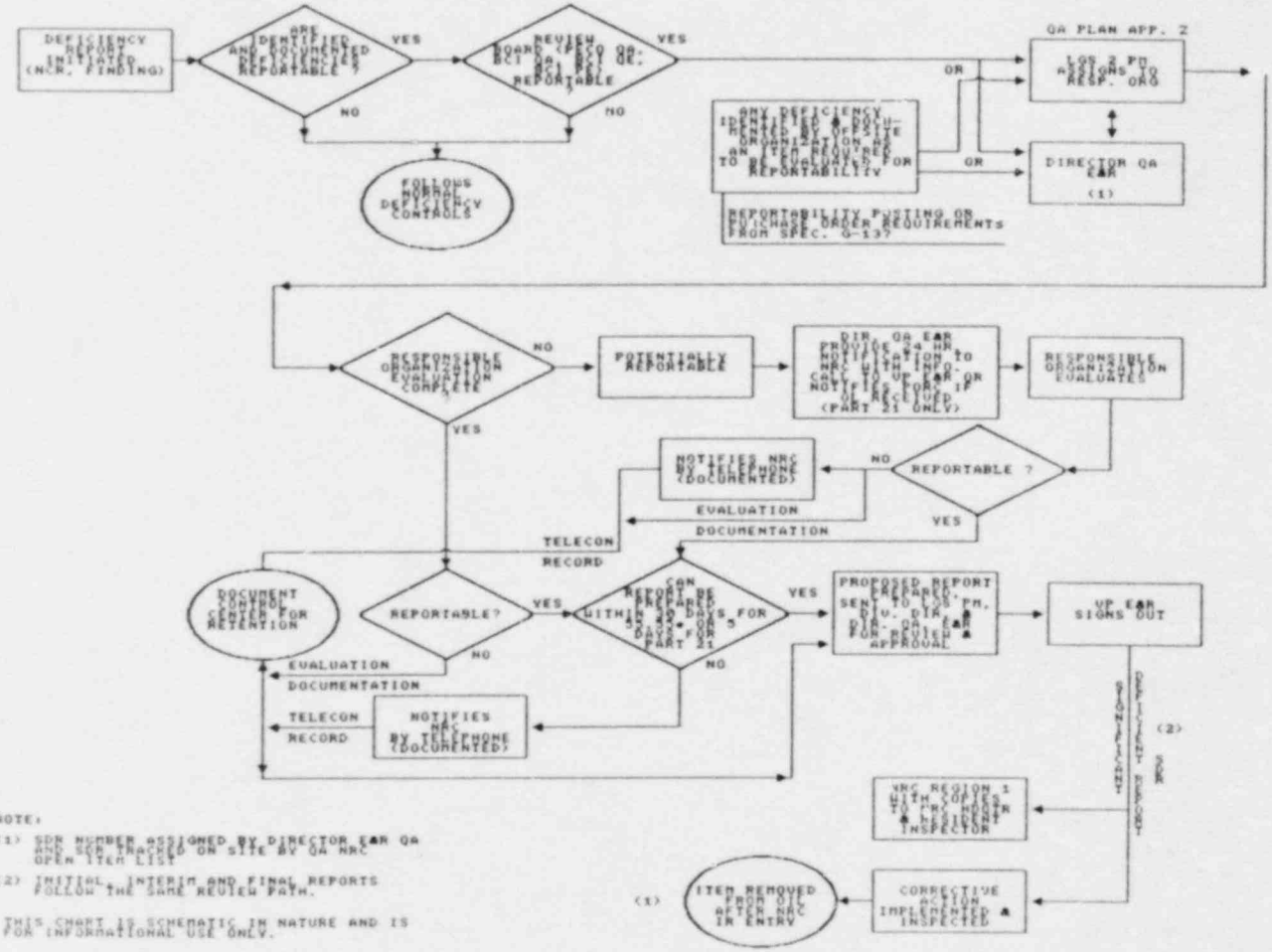
(2) AUDITS ARE SCHEDULED, SURVEILLANCES ARE UNSCHEDULED AND DO NOT USE FORMAL CHECK LIST.

(3) OPEN QA FINDINGS LIST TRACKS FR's TO CLOSURE. THIS LIST RECEIVES A MONTHLY MANAGEMENT REVIEW.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

Q-2
PART 21 & 50.55(e) REPORTS

(QAP VOL. 1 APP. 2)



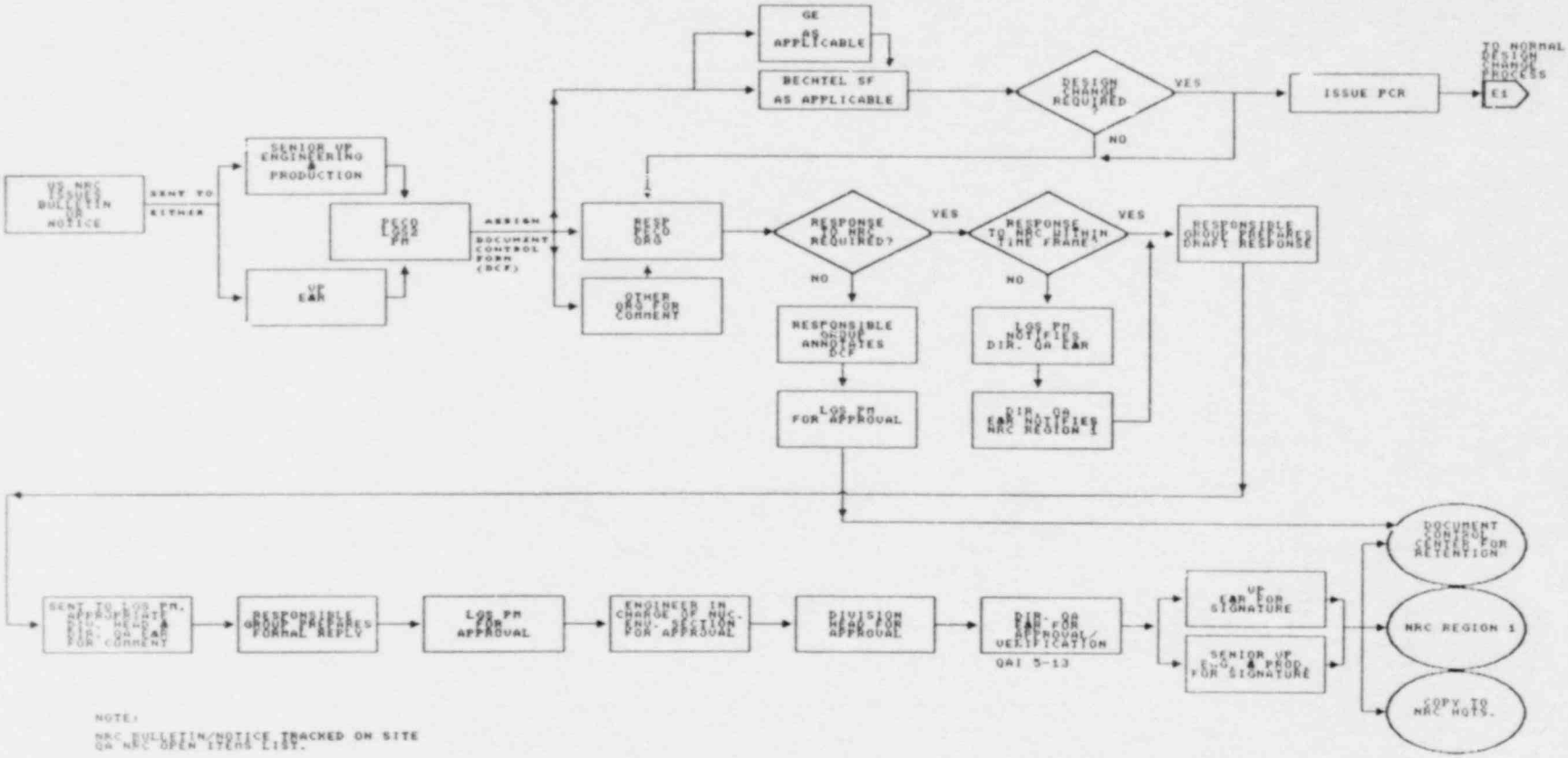
NOTE:

(1) SDR NUMBER ASSIGNED BY DIRECTOR E&R QA AND SDR TRACKED ON SITE BY QA NRC OPEN ITEM LIST

(2) INITIAL, INTERIM AND FINAL REPORTS FOLLOW THE SAME REVIEW PATH.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

Q-3
NRC BULLETINS & NOTICES
(APPENDIX X QAP VOL I)

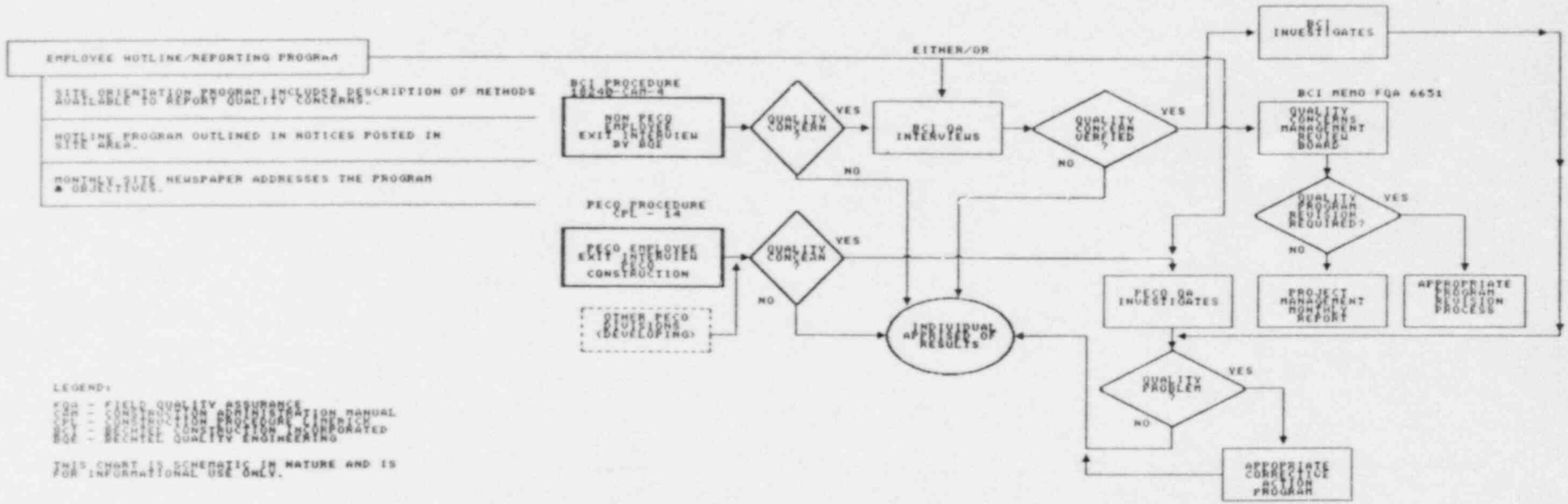


NOTE:

NRC BULLETIN/NOTICE TRACKED ON SITE QA NRC OPEN ITEMS LIST.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

Q-4
QUALITY CONCERNS PROGRAM

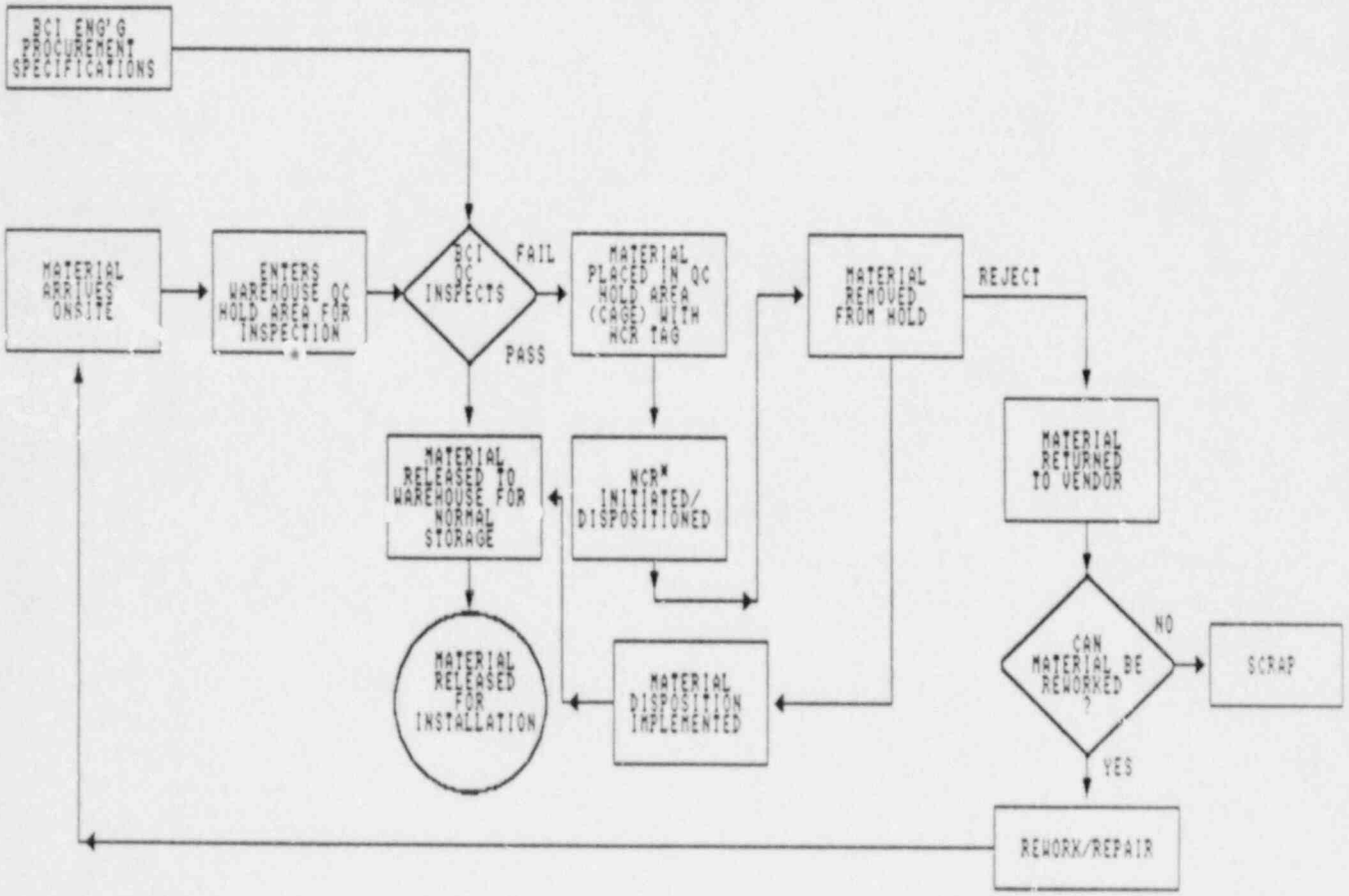


LEGEND:
FQA - FIELD QUALITY ASSURANCE
CAM - CONSTRUCTION ADMINISTRATION MANUAL
CPL - CONSTRUCTION PROCEDURAL CATALOG
BCI - BECHTEL CONSTRUCTION INCORPORATED
BQE - BECHTEL QUALITY ENGINEERING

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

4.2-16

Q-5
QC RECEIPT INSPECTIONS



NOTE:

* NCR HANDLED PER CHART # C-3

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

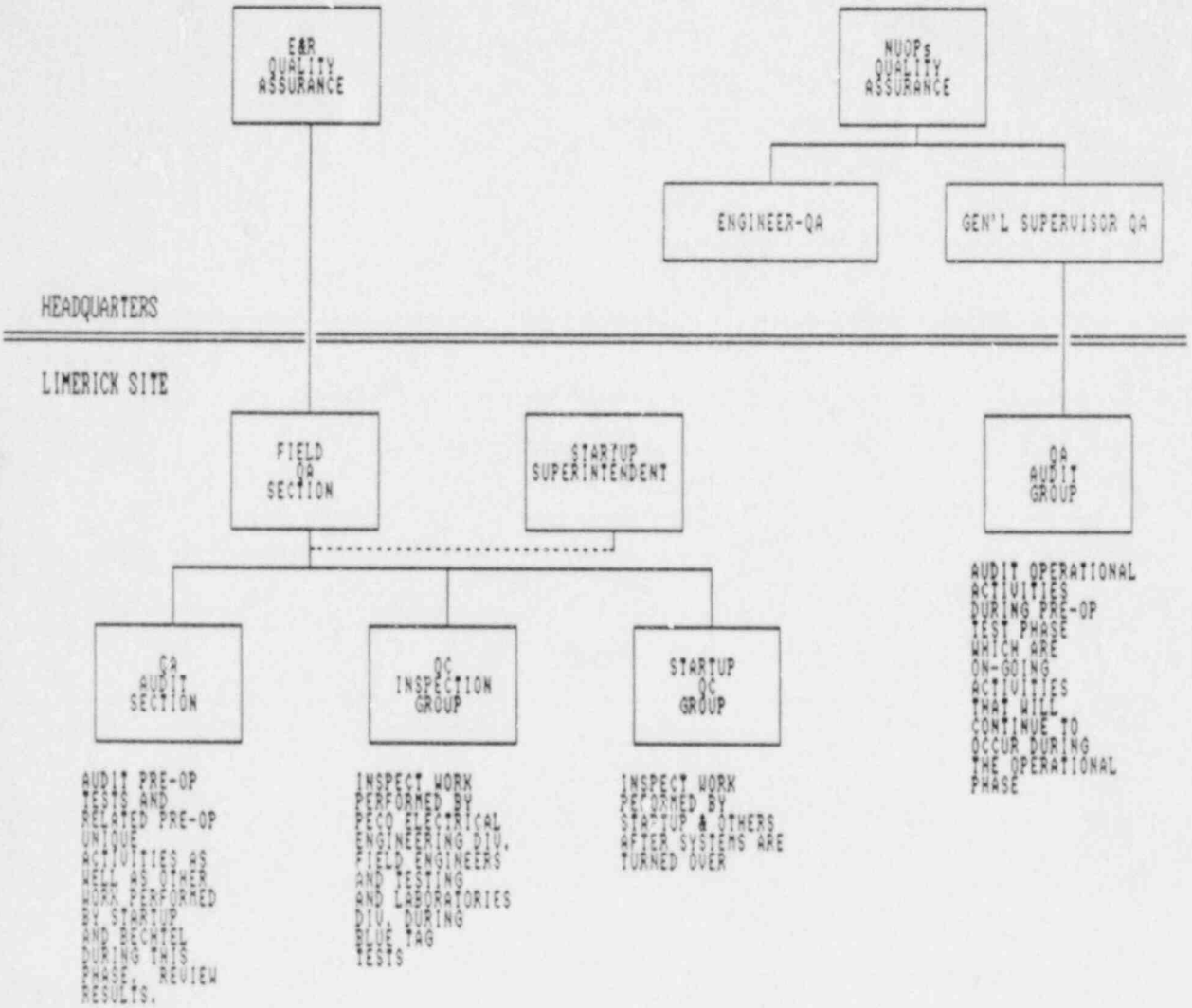
LEGEND:

BCI - BECHTEL CONSTRUCTION INCORPORATED
NCR - NONCONFORMANCE REPORT

Q-6

PRE-OPERATIONAL PHASE
QA/QC ORGANIZATIONAL/RESPONSIBILITY CHART

(AD2.1; QAP VOL. I)



LEGEND:

------- COORDINATION

E&R - ENGINEERING AND RESEARCH
NUOPs - NUCLEAR OPERATIONS

NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

4.3 ENGINEERING, DESIGN, AND ANALYSIS

4.3.1 Characterization of Readiness Programs Assessed

The Readiness Program Assessment (RPA) Engineering group examined specific programs including review of program documentation and interviews with key personnel involved in engineering, design and analysis activities. These programs are charted by Third Tier Charts E-1 through E-19. The overall interaction of these programs with each other and with the other assessment areas is shown by Second Tier Chart E-0. A brief characterization of each program, the inputs, the management control and the program interfaces is given below with reference to the appropriate charts.

Interfaces within the Engineering programs are identified on the charts. Interfaces with other functional areas are typically through the design control process (E-1) and the drawing control process (E-18); so that Engineering charts typically feed to E-1 which then identifies inputs to other functional areas.

4.3.1.1 Engineering Second Tier (Chart E-0)

This chart shows the major programs that contribute to the Engineering process. It is the responsibility of the Engineering function to assure that the design documents are complete and that regulatory requirements and commitments are considered and conformance with them is documented. The Engineering function is also to assure that adequate specifications are available, so that construction and testing are performed in accordance with the FSAR.

PECo has directed that the construction and design of Limerick 2 be maintained as much like Limerick 1 as possible. The changes to the Limerick 2 design have been kept to a minimum, controlled and documented, so that the design, licensing and operation of Limerick 2 can be confirmed in the most part by the adequacy of Limerick 1. Additional programs developed for Limerick 2 are intended to enhance the control and documentation of the design.

Most of the major civil construction was completed before the delay in construction. Thus, the designs most affected are those of the systems installed, for example large and small pipe, hangers and associated equipment, electrical cable, instrumentation and controls, and the control room. No major procurement program was necessary after construction restart since most equipment was already acquired or specified. Major equipment, such as valves, became the responsibility of Construction to install, inspect and assure operability. The remaining effort for Engineering was then focused on the overall control of the design and the design change process. The majority of design work was required for piping installation, pressure boundary components and seismic qualification.

Specific enhancements over the processes which were followed at Limerick 1 have been adopted and are based on lessons learned from construction and operation of that unit, experience at other plants, and other information. The most comprehensive of these changes in the engineering area is the Design Control Program through which the major technical programs are controlled and coordinated. The drawing control process is part of the overall document control process and helps control and document the design drawing interface between Engineering and Construction, QA/QC, Start-up and Operations. Major design changes are also evaluated for the impact on the FSAR and other licensing documents and commitments.

Major safety issues for construction of seismic and pressure boundary components are intended to be controlled and documented through the As-Built Reconciliation (ABR) Program, Pre-service Inspection (PSI) Program, Potential Interference Notification (PIN) Program, Seismic II/I Program and N5/N3 Code Stamping Program. Of these programs, the most extensively reviewed and broad-based are the ABR, PSI and the ASME Code Stamping Programs.

Hazards Analysis, ALARA/Shielding, Fire Protection and Environmental Qualification are programs which are intended to assure that Final Safety Analysis Report (FSAR) commitments are met and documented.

The G-39 program is intended to assure the safe operation of Limerick 1 during construction of Limerick 2. The Control Room Design Review/Human Factors Program is intended to assure that the control room is designed in accordance with the guidance provided by NUREG-0700, "Guidelines for Control Room Design Reviews."

Voltage Regulation, Undervoltage Study and Instrument Setpoint Index Programs are intended to assure that the instruments and electrically operated equipment are able to function as designed.

The Probabilistic Risk Assessment (PRA) Program is intended to provide assurance that changes to the plant are assessed for their safety impact using the PRA model originally developed for Limerick 1. The Engineering Walkdowns will be performed to provide a final assurance that the installation has met system and safety design objectives. The Design Closure Plan is an extensive review program intended to assure that the elements of design and licensing have been considered and appropriately closed out.

4.3.1.2 Design Control Program (Charts E-1 and E-18)

The Design Control Program, including Drawing Control and the elements of the Software Completion activities are depicted by Charts E-1 and E-18. The heart of the Design Control Program is the Project Change Request/Project Change Notice (PCR/PCN)

process which is controlled by the Bechtel "Project Change Request Procedure". The procedure defines the requirements for identification, preparation, processing and approval of PCRs. The PCR is used to obtain approvals to proceed with engineering and applies to all proposed engineering work. Chart E-1 shows the ways by which changes and deviations are identified and dispositioned by the Engineering organizations; the interaction with General Electric for items in its scope; the role of PECo in the specification review and approval process; the interaction with the drawing control process; and the interaction with the Licensing Document Control Notice (LDCN) system. Most of the other Engineering programs described below are performed in accordance with the Design Control Program.

4.3.1.3 N-5 and N-3 Programs (Chart E-2)

PECo has put in place the N-5 and N-3 Programs to centralize control and to assure adequate attention to the ASME Boiler and Pressure Vessel Code and Pennsylvania Boiler Law requirements. Those interrelated programs are shown by Chart E-2. The N-5 Program consolidates all the activities required to have the pressure piping systems qualified to ASME Boiler and Pressure Vessel Code Section III requirements for construction of nuclear power plant facilities. It is led by Bechtel Construction and receives input from the As-Built Reconciliation (ABR) Program. The program assembles the required ASME data packages for Authorized Nuclear Inspector approval, code stamping and tagging of ASME class pressure piping. The N-3 program assembles the N-5 packages by system, as defined by the Piping and Instrument Diagrams (P&IDs) and the Design Specifications, and prepares the submittal to the Pennsylvania Bureau of Labor and Industry for its certification of compliance with State and ASME requirements.

The process is controlled by the N-5 group which prepares preliminary packages in advance and adds the data packages after hydrostatic testing. The P&ID's are used to establish the system numbers by which the N-5 packages are tracked. These packages are extensively reviewed, first by an independent reviewer in the N-5 group, then by Bechtel Construction Engineering, Hydrostatic Test Engineering, Quality Control and the Authorized Nuclear Inspector (ANI). This package is put on hold until the as-built stress reconciliation is complete, at which time this information is included in the package for final certification by the Bechtel Project Construction Manager and the ANI. The PECo Engineering and Research role is informal review of N5 packages; review of N3 packages; problem resolution between Construction, QC, and vendors; identifying missing paperwork; or determining whether there are NRC or other deviations to resolve.

4.3.1.4 Engineering Walkdowns List Development (Chart E-3)

Engineering Walkdowns will be used to confirm engineering completeness and design closure. The purpose of this effort is to

assure Limerick 2 construction implementation is in accordance with design and licensing commitments. This process is shown by Chart E-3.

The overall effort is not a formalized program identified in a formal specification written to control a design process. This effort began with a letter with wide distribution throughout the Engineering function in Bechtel and PECo to start the process. Specific walkdowns will be selected, focusing the responsibility for the walkdowns and assuring that the number, extent and reasons for the walkdowns are established, planned, and documented. Bechtel Project Engineering has the lead in establishing the initial list of walkdowns and finalizing the responsibility for the walkdown and schedule.

4.3.1.5 G-39 Program Impact of Unit 2 Construction on Unit 1 Safety (Chart E-4)

General Specification G-39 "General Project Requirements for Unit 2 Construction Control During Unit 1 Operation for Limerick Generating Station," specifies controls on Limerick 2 construction activities to assure they do not affect the safe operation of Limerick 1. The process is shown by Chart E-4. The program is implemented by construction procedures.

A safety evaluation has been prepared for Limerick 1 establishing the basis for Limerick 2 construction. Requirements and limitations for Limerick 2 construction to preserve the safety of Limerick 1 are identified; these limitations are described for Limerick 2 construction control in Specification G-39. If additional requirements are identified as a result of construction activities, the G-39 specification may be revised to reflect these additional requirements. The safety evaluation is reviewed to determine if a revision is required to support a change to G-39. If a change to the safety evaluation is required, then the G-39 revision, and related construction, is not approved until the safety evaluation, and any consequential Technical Specification revisions are written, reviewed by the Plant Operations Review Committee (PORC) and , if necessary, submitted to and approved by the NRC. The G-39 revision is then submitted to PORC for approval before implementation by Construction.

4.3.1.6 As-Built Reconciliation (ABR) Program (Charts E-5 & E-5.1)

The As-Built Reconciliation (ABR) Program is intended to assure that safety-related small and large pipe is in conformance with the design. This program is shown by Charts E-5 and E-5.1. The ABR program is led by Bechtel Project Engineering. The program includes many lessons learned from Limerick 1 construction including the use of a two-step reconciliation process for piping located outside of containment. This simplifies and speeds seismic analysis. Interdisciplinary area reviews are also to be used to minimize the potential for interferences. The

controlling document is Specification P-366-2. Interfaces are with Construction and Quality Assurance/Quality Control. This program provides input to the N-5 Program for piping qualification.

The ABR Program consists of two phases: the "as-building" phase and the "stress reconciliation" phase. The "as-building" phase includes construction reconciliation with the piping and hanger layout drawings until a reasonable level of work is complete and inspected to revised as-built drawings. Engineering involvement in this phase is to review Field Change Requests (FCR) and Field Change Notices (FCN) to assure the drawings reflect requirements of the specifications and accurately document the as-built condition and, if so, approve them. The "stress reconciliation" phase includes revision of the seismic stress analysis to the extent required to document the system stresses under seismic loading and to identify any required piping or hanger location revisions. Pipe location revisions are to be identified as early as possible since moving the pipe either delays or requires repeating the hydro testing. Hanger location revisions are to be identified later and are to be sufficiently well controlled so as to avoid major revisions.

Piping and hanger locations are controlled as a function of size and location. Two-dimensional isometric drawings are used to identify quadrants and determine priorities in locating piping, instrumentation, electrical raceway and HVAC (termed commodities, or bulk commodities). The location of large pipe has the highest priority and is assigned a specific quadrant. The other commodities are assigned quadrants so that layout of large pipe can proceed independently of other commodity layouts. Interference concerns need only to be dealt with if a commodity exceeds its assigned quadrant in a specific area.

Large piping and gravity supports inside containment are specified to be the same as Limerick 1 with only minor exceptions, so that the piping response inside containment is the same for both units. Layout of large pipe outside containment and gravity hangers only are to be released, constructed and reconciled. Once this is complete, the seismic hangers are to be released after optimizing the required hanger location.

Load balancing is to be done before ABR and normally prior to Quality Control (QC) inspection per P-2.00 (QCIR). Actual hanger loads are to be checked against design values and where they are out of tolerance, must be reconciled. Changes are to be documented in hanger guidance documents.

In the event a change occurs or QC inspection is done before the ABR, procedures require reconciliation via a Field Change Request (reference: P-366-2). Systems are not turned over until ABR and QC inspections are complete, so that all hanger balancing is completed prior to turnover.

4.3.1.7 Design Closure Program (Chart E-6)

The Design Closure Program is intended to coordinate existing programs in the design area to assure that the design function is complete. The Design Closure Program is shown in Chart E-6. Design closure consists of assuring several areas in the design function are complete. The three principle areas are ASME and seismic design, hazards analysis and ALARA concerns. Engineering walkdowns are to be performed in several areas as a formal commitment and as good practice. Several other areas requiring finalization are identified as well as areas of coordination with other functions.

Closure items are identified that are the responsibility of other functional areas but interface with the Engineering function. These areas include:

- o Construction: turnovers, work package closure, room walkdowns, and punchlist;
- o Quality Assurance: open findings and action requests, nonconformance reports (NCR's);
- o Start-up: Start-up Work List, Test Review Board (TRB) test acceptance, PORC review of test exceptions;
- o Operations: surveillance, Technical Specification operability and individual department readiness.

Piping construction reconciliation and documentation include several programs for integrity of pressurized systems and address seismic concerns. These programs include completion of the as-built systems.

The hazards considerations in Engineering are individual programs that include HELB/MELB, Heavy Loads, Seismic II/I, Fire, Rotary Missiles, Tornado and Site Flooding.

4.3.1.8 PSI and Initial ISI (Chart E-7)

The Pre-Service Inspection Program is led by PECo Mechanical Engineering Division (MED). As the Licensee, PECo is responsible to assure that the ASME code components are in conformance with applicable requirements. The PSI and Initial In-service Inspection (ISI) process is shown by Chart E-7. This program is managed and coordinated by the PECo Mechanical Engineering Division. Based on a 1984 SALP finding, lessons learned from Limerick 1, and broad-based input from Engineering, Construction, QA/QC and Maintenance, a number of improvements were made to the specifications and procedures by Engineering and Research. Performance of examinations of each pipe system, as the construction is completed, and automated welding and testing, including computerized and video recording of inspection data, are the most notable examples of upgrades to the inspection process.

The controlling document is specification M-369, "Nuclear Safety-Related Specification for Non-Destructive Examination of Nuclear, Q-listed Systems and Components Performed for the Philadelphia Electric Company." PECo MED is to review and approve all PSI/ISI related documents from Bechtel, General Electric, and other subcontractors. Coordination with the PECo Maintenance Department is to include documentation and initial ISI testing concurrently. Assessment of differences from design requires use of the QA/QC nonconformance reports.

Construction welding and preparation is to be tracked daily by the PSI group and implementation of Specification P-505 is to be through an automated data base. As soon as a weld is ready, the PSI inspection is to be scheduled, allowing construction time for scaffolding and assembly of other equipment. The initial ISI examinations are to be performed at the same time and weld reference lines are to be marked to improve future testing and comparison of data.

Issue resolution and disposition is to be coordinated by PECo Engineering and Research. For specification changes and issues involving Bechtel welds, Bechtel Materials and Quality Services (M&QS) is responsible. For GE welds, GE engineering is responsible. For difficult issues, PECo Engineering and Research may call in consultants such as EPRI.

4.3.1.9 Hazards Analysis (Chart E-8)

The Hazards Analysis Program is to coordinate the review of all FSAR Hazards Analysis requirements through Specification G-23, "Specification for Separation Program for Limerick Generating Station Units 1 and 2." The overall process is shown by Chart E-8. This program is led by Bechtel Project Engineering. Table 4.3-1 outlines the elements of the program and the areas of concern for each hazard. Principal issues beyond original design include consideration of changes either required by Construction or initiated by Engineering. The process is to be controlled through the design control process.

4.3.1.10 Fire Protection (Chart E-9)

There are two aspects of fire protection that are shown on Chart E-9. Fire suppression system design, installation, and testing is done by a subcontractor, Viking, with oversight by Bechtel. The controlling document for fire suppression systems is Specification M-49, "Specification for Fire Protection Systems for the Limerick Generating Station Units 1 and 2 Philadelphia Electric Company." The other aspect of fire protection is the Fire Barrier Review Program which is controlled under Specification G-35, "General Requirements for Fire Barrier Review Program."

TABLE 4.3-1

Items and concerns covered by Hazards Analysis

A. Moderate Energy Line Break (MELB)
   i. Spray
   ii. Flooding
   iii. Jet effects for specific cases
   iv. Temperature & Humidity effects

B. High Energy Line Break (HELB)
   i. Jet Effects
   ii. Compartment Pressurization
   iii. Temperature Effects
   iv. Humidity Effects
   v. Flooding/Spray

C. Heavy Loads
   i. Potential damage to impacted components and effects on safe shutdown.
   ii. Floor Structural Capability
   iii. Equipment Structural/Retention Capability

D. Rotary Missiles
   i. Rotary equipment (turbine, pumps, HVAC fans)

E. Fire
   i. Separation
   ii. Safe Shutdown Capability
   iii. Combustibles
   iv. Fire Barriers
   v. Fire Suppression

F. Seismic II/I Safety Impact
   i. Structurally capable items
   ii. Collapse effects of Seismic II items

Information concerning safe shutdown and fire suppression will be used to develop changes to the Fire Protection Evaluation Report (FPER). Amendments to the FPER are controlled by Licensing Document Change Notices. The FPER is scheduled to be amended to include Limerick 2 information in April 1988.

4.3.1.11 Control Room Design Review (CRDR)/Human Factors (Chart E-10)

The process is shown by Chart E-10 and is to be implemented by the Design Control Program shown by Chart E-1. Human factors improvements were made on Limerick 1 in accordance with NUREG-0700, "Guidelines for Control Room Design Reviews" and NUREG/CR-1580, "Human Engineering Guide to Control Room Evaluation" and additional modifications were made to the base design. Based on operational transparency (the principle of minimizing potential for maloperation caused by unit-to-unit differences in the layout of switches, controls, and displays to the operator), Project Change Notices were issued to make the equivalent changes to Limerick 2 panels. Differences that may occur in the front panel arrangements between Limerick 2 and Limerick 1 must be reviewed in accordance with NUREG-0700.

4.3.1.12 Equipment Qualification (EQ) and Dedication Programs (Chart E-11)

The Equipment Qualification (EQ) Program and the related dedication of commercial grade parts for Limerick 2 is shown by Chart E-11. The EQ and Dedication Program are under development for Limerick 2 but will be based primarily on Limerick 1. The controlling document governing the overall program is Specification G-22, "General Project Requirements for the Equipment Qualification Program for the Limerick Generating Station, Units 1 and 2, Philadelphia Electric Company." Included in the program are General Electric, Philadelphia Electric Company and Bechtel, as shown in Table 4.3-2.

Documents are to be revised to reflect Limerick 2 requirements as necessary. It is intended that a room-by-room, level-by-level verification of equipment for compliance with the dynamic qualification requirements of active components will be accomplished. The target for completion is six months prior to fuel load. For safety-related equipment in harsh environments, it is intended that for equipment unique to Limerick 2, new Equipment Qualification Report Records (EQRRs) will be issued and included in the amended Equipment Qualification Report via Licensing Document Change Notices. Where equipment is the same in both units but at a different location (i.e., possibly subjected to a different harsh environment) an evaluation will be made and the EQRR will be revised as necessary to encompass both units.

TABLE 4.3-2

TABLE OF RESPONSIBILITY FOR EQUIPMENT QUALIFICATION AND DEDICATION PROGRAMS

GENERAL ELECTRIC (GE)

- dynamic qualification of GE supplied equipment
- dedication of commercially available parts for GE supplied equipment

PHILADELPHIA ELECTRIC

- Limerick 1 program, environmental qualification of GE supplied equipment per Specification M-171
- qualification of soft parts for GE supplied equipment per Specification M-171, Appendix B of the Equipment Qualification Report, Replacement and Spare Parts Program

BECHTEL

- dynamic qualification of non-GE equipment per Specification G-22
- environmental qualification of non-GE equipment per Specification M-171
- qualification of soft parts for non-GE equipment per Specification M-171
- dedication of commercially available parts for non-GE equipment per Specification G-29
- qualification records per E-1415 Appendix A and B

4.3.1.13 ALARA/Shielding (Chart E-12)

The engineering process for ALARA/Shielding is shown by Chart E-12. The overall ALARA requirements are given in Specification G-40, "Specification for Review of Facility and Equipment Design for As Low As Reasonably Achievable (ALARA) In-Plant Radiation Exposure for Philadelphia Electric Company Limerick Generating Station Units 1 & 2." The design for Limerick 2 is based on Limerick 1 and is documented by Radiation Zone and Shielding Drawings.

Bechtel Project Engineering included ALARA consideration in the design by use of a Project ALARA Coordinator (PAC) and Discipline Area Representatives (DARs). The PAC and DAR's developed an ALARA Review Plan for use in the ALARA field walkdowns at the end of construction. The field walkdowns started in August 1987 and are scheduled to be completed by May 1988. Walkdowns are to be documented by Field Walkdown ALARA Design Review Sheets specified by G-40. Deviations from design are to be handled by Nonconformance Reports (NCR).

Improvements in design based on operating experience in Limerick 1 or other means of reducing radiation exposure will be documented by the ALARA Change Notice (ACN). ACNs will be sent to PECo Engineering for review and approval. If an ACN is approved, a Project Change Request will be initiated to implement the change.

4.3.1.14 Voltage Regulation Study (Chart E-13)

This process is led by Bechtel Project Engineering and is shown by Chart E-13. The study is intended to meet the intent of the Branch Technical Position PSB-1, as stated in the FSAR.

In order to ensure the adequacy of the plant electrical distribution system voltage regulation, a voltage regulation study is performed as a part of the electrical system design. Calculation 8031-6300 E.2C summarizes the design criteria adopted for the study. Results for the voltage regulation study (voltage drops for various equipment and devices) are to be reviewed to assure they are within the design criteria limits. Unacceptable voltage drops are to be reviewed and design modifications are made to correct the situation. The voltage regulation study for Limerick 2 has been completed and verified to be acceptable. Field modifications based on Limerick 1 were incorporated.

Additional voltage regulation studies are to be performed to verify the adequacy of the bus voltages for both units during operation. Based on the results of these studies, certain modifications may be required affecting both Limerick 1 and Limerick 2 designs and are to be implemented under the appropriate (Operations or Construction) program.

4.3.1.15 Undervoltage Study (Chart E-14)

This process is led by Bechtel Project Engineering and is shown by Chart E-14. On Limerick 1, the voltage drops for certain power and control circuits were found to be of such magnitude that the utilization voltages at the terminals of the motors or devices were outside the operating range specified in the Bechtel equipment specification and the FSAR. Five hundred thirty-four deficiencies of this type were reported and corrected. To prevent recurrence of similar problems on Limerick 2, an enhanced process was developed which is intended to give the maximum allowable cable lengths for power and control circuits. Initial calculation and field as-built conditions are reviewed and documented by summary sheets to be kept in the electrical discipline "blue binders."

4.3.1.16 Probabilistic Risk Assessment (PRA) (Chart E-15)

The Probabilistic Risk Assessment (PRA) Program is led by the PECo Mechanical Engineering Division (MED) and is shown by Chart E-15. The program was developed starting in 1980 for Limerick 1 and common. Copies of approved Project Change Requests (PCR) routed through MED via Document Control Forms (DCF) are sent to the PRA group by the responsible section head for consideration in updating the PRA. To date, no PCRs evaluated have resulted in changes that would change the plant PRA model between the two units (e.g. the model intended to represent Limerick 1 also can be used to represent Limerick 2). Should such differences occur, the MED intends to keep a log of such differences for future action. The PRA is only for one unit and does not, as of yet, model the potential for interaction between the units. It is intended to model such unit interactions conservatively in the limited areas where they can occur. Human factors modeling is being added to the PRA including the Anticipated Transient Without Scram procedures and containment vent procedures. There is a PRA Advisory Board chaired by PECo with consultants from NUS, IT Corporation, and ERIN Engineering.

4.3.1.17 Seismic II/I (Chart E-16)

This program is intended to assure that equipment not required to withstand a major seismic event will not fail or otherwise cause concern for seismic category I piping and equipment which is required to function during a seismic event to maintain the safety of the plant.

This process is led by Bechtel Project Engineering (BPE) and is shown by Chart E-16. The controlling document currently being developed for Seismic II/I will be Specification M-400-2, "Specification for Safety Impact Review Program for the Limerick Generating Station Unit 2" which is based on Specification M-400. Implementation is to be by the M-109 "R.G. 1.29 Compliance Area Plans" drawing series.

Original design and design modifications are based on Limerick 1 design, experiences, changes and Lessons Learned. The Limerick 1 modifications are tracked and incorporated into the Limerick 2 design through the Project Change Request/Project Change Notice (PCR/PCN) process. This is intended to assure relatively consistent and acceptable Seismic II/I design and to provide assurance that no extensive design changes will be required.

Once the design is installed and Quality Control has accepted the as-built configuration of the piping to Specification P-366-2, the II/I walkdown is to be performed and documented. The walkdowns are to be performed about ten weeks prior to room turnover by BPE and Bechtel Construction Engineering (BCE). Further resolution of design inconsistencies is to be through Nonconformance Reports (NCR).

4.3.1.18 Potential Interference Notification Program (Chart E-17)

The Potential Interference Notification (PIN) program was developed to formalize the process for identifying specific locations where the same or different commodities interfere. The program diagram is shown by Chart E-17. The PIN program is controlled by Specification M-400-2 and is to be implemented by construction using procedure CP-G-7. The PINs are to be logged and tracked on a computer so that close-out can be assured.

If the interference is specifically identified for thermal effects, the major function of the PIN form is to request notching of the piping insulation. If a potential interference results in a recommended insulation notch, the heat load is to be evaluated to conform to Specification M-500 "Specifications for Environment Conditions for Nuclear Piping for Limerick Generating Station, Units 1 and 2." This is intended to maintain temperature requirements for ambient and accident conditions in the plant and containment.

For other potential interferences, the PIN is intended to identify either a corresponding Field Change Request (FCR) or Field Change Notice (FCN). The PIN is also to identify physical contact or potential for impact as result of a seismic event or pipe break. The results of these PINs are to be sent to the Seismic II/I program as early information. The PIN notices are to be resolved and to be passed to PECo Nuclear Operations at facility turnover for retention for future reference and to document the resolution of specific interferences.

4.3.1.19 Drawing Control Process (Chart E-18)

The drawing control process is a specific portion of the overall document and design control processes, and is to provide sufficient control over the drawings to assure design integrity. The diagram for this process is shown in Chart

E-18. The drawing control process is not intended to be a full description of the document control processes which are relatively involved and detailed. The drawing control process can contribute substantially to the overall effectiveness and to software completion for the project.

Key elements of software completion are depicted in Charts E-1, "Design Control Program;" E-6, "Design Closure Program;" and E-18, "Drawing Control Process." The controlling document for supplier software completion is Specification G-5, "General Project Requirements for Documentation Required from Suppliers for the Limerick Generating Station Units 1 and 2 for the Philadelphia Electric Company."

The original engineering drawings are to be logged and distributed to the functional groups by the Document Control Group. The controlled copies of the drawings are to be included in work packages (See Chart C-2) and the "stick files" which are to be maintained by Document Control. Approximately 30 stick files are to be maintained.

Changes that are initiated by Engineering or vendors are to be controlled by the Design Control documents and are to be issued to the functional groups through document control. Any field requested changes are to be tracked and controlled by the Drawing Control Group and distributed to Engineering for approval. Approved changes are then to be made and re-issued to the field from Document Control. This is intended to assure, for instance, that a Construction requested change, once approved and implemented, is distributed to other functional areas, and that other affected functional areas have up-to-date drawings with the same revision level.

4.3.1.20 Instrument Setpoint Index (Chart E-19)

This program is performed by PECo Electrical Engineering Division (EED) and is shown by Chart E-19. The Instrument Setpoint Index is treated as a controlled document and is used by Start-up and Operations It is controlled and issued by the EED based on General Electric instrument data sheets and Bechtel supplied process setpoints and tolerance sheets with instrument inaccuracies included. Limerick 1 setpoint index is used as the baseline document. The EED is in the process of formalizing a procedure to define responsibilities and quality assurance related requirements for the index for Limerick 2.

4.3.1.21 Difference Control Program (No Chart)

A Difference Control Program was initiated by Engineering prior to the restart of construction on Limerick 2. The goal of this program was to make Limerick 1 and 2 the same by the time Limerick 2 was licensed. To do this a Project Change Request (PCR) program was undertaken and administered by Engineering. This program established procedures and controls by which the

Limerick 1 modifications were reviewed and PCRs generated on those design changes implemented in Limerick 1 to produce similar changes in Limerick 2 design. Changes were reviewed and approved in order to maintain similarity between the units.

As a follow-up to this program, a committee has been established to review the modifications implemented on Limerick 1, as well as the Limerick 2 PCRs. This committee has representation from Engineering, Limerick 1 staff, and Limerick 2 Start-up personnel. The committee's function is to review modifications from Unit 1 and PCRs from Unit 2 to verify similarity of design and to identify any plant differences. Identified differences are then reviewed by Nuclear Operations and Engineering management to verify that these differences are acceptable and intended. If the difference is unacceptable, appropriate changes to the Limerick 2 design are to be processed. If acceptable, a plant difference form (part of the Start-up Administrative Manual) is to be generated to document this difference. This information is to be provided to the Nuclear Training Section to be used for operator cross-training, to the procedures writing group to make appropriate procedure revisions, and to the Preventive Maintenance Group in order to verify appropriate maintenance and Preventive Maintenance (PM) procedures.

A second concurrent activity designed to identify plant differences is being implemented by the Procedure Revision Group. This group is developing Limerick 2 unique and common procedures for both units from the existing Limerick 1 procedure based on the Limerick 1 and Limerick 2 drawings. Differences which affect the operation are to be identified and documented on a plant differences form and to be processed as described above.

A third activity being implemented to identify plant differences involves cross-checking the Limerick 1 Equipment Data Sheets and PM requirements against Limerick 2 Equipment Data Sheets and equipment turnover records. Each system start-up engineer is required to check Limerick 2 equipment which is to be turned over against the Limerick 1 Equipment Data Sheets. Any identified differences are to be recorded on a plant difference form and processed as identified above. In addition, the correct Limerick 2 Equipment Data Sheet and PM requirements are to be generated. The existing PM and procedures will also be checked for applicability and, if necessary, appropriate changes will be made.

4.3.2 Program Assessment

The Readiness Program Assessment (RPA) for Engineering focused on the following major questions:

1) Are there processes in place that guide, direct, and control construction of the plant systems such that the installation

can be done in accordance with design specifications and that construction can be reflected and documented in the design?

2) Are there processes in place that can effectively manage installation so that design changes can be incorporated in an effective manner, problem and issue resolutions can be adequately addressed, and sufficient management attention can be brought to bear?

3) Are there processes in place that address and document the design for FSAR and other licensing concerns?

4) Are there processes in place that address the changes between Limerick 1 and Limerick 2?

The Readiness Program Assessment Team conducted interviews with PECo and Bechtel engineering personnel and participated in specific interviews in which Engineering, Construction, Quality Assurance/Quality Control, Licensing, Start-up, and Operations were involved. The Readiness Program Assessment also observed several meetings and teleconferences in which many of the processes were implemented in a current "communications intense" problem solving mode, with PECo, Bechtel, General Electric (GE), and other vendors.

There is a systematic and well-structured engineering program that is integrated not only between functional areas but with the vendors as well. Many engineering programs at Limerick 2 were strengthened over previously existing Limerick 1 programs. This was evident in the coordination and consolidation of the program management and reporting structure.

For example, crucial inspection and documentation gathering was moved from the critical path to be performed in parallel with other ongoing activities. This enhancement is intended to systemically improve problem solution management by having inspections and problem identification early in the schedule, allowing sufficient time to develop adequate resolutions. This structure also tends to minimize the need for upper management attention, particularly by moving problem resolution off the critical path, thereby minimizing the occurrence of crisis mode responses.

In addition to individual programs and program integration enhancements, overview programs that effectively assure complete consideration of critical issues have been implemented. Based on these responsive programmatic enhancements, there is reasonable assurance of complete and effective design management.

The design control process has evolved over the design and construction period of the Limerick Generating Station. Although there are complex interrelationships among the

programs contributing to design control, an experienced Engineering team is completing a design which is substantially the same as an existing licensed design.

The RPA Project Team found that personnel interviewed in the various organizations involved in the engineering, design, and analysis areas showed understanding of the overall process in their discipline area, and understood their interface responsibilities in a consistent manner. There were no disconnects noted by the Team within the Engineering functional area or with the major interfaces with the other functional areas. This is consistent with what is expected from an experienced Engineering team. The working relation between Engineering, QA/QC, Construction and other groups showed a consistently beneficial interaction.

The overall design control process, implemented properly, can assure response to licensing commitments on the following bases:

- The plant is built in accordance with design documentation;
- Engineering, design, and analysis procedures and products meet the NRC Regulations and other commitments made to the NRC by the licensee;
- The FSAR reflects the design and describes how the design meets regulatory commitments; and
- The "as-built" plant configuration is assessed and accurately reflected in the final design documents.

4.3.3 Open Items

The following open items were observed in the Engineering functional area.

4.3.3.1 Engineering Walkdown

The Engineering Walkdown list is being finalized. It is out for review and comment and is expected to be finalized by the end of 1987.

4.3.3.2 Design Closure Plan

The Design Closure Plan is not finalized but appears to address major areas of design assurance. The Design Closure Plan is expected to be finalized by the end of 1987.

4.3.3.3 Instrument Setpoint Index

The Instrument Setpoint Index procedure for Limerick 2 is being developed by the PECo Electrical Engineering Division and should include the elements of independent verification of accurate

transcription of source information, index configuration control, and traceability to source information. The Instrument Setpoint Index procedure is expected to be completed by April 1988, and no later than required to support the Setpoint Index Development.

4.3.3.4 Fire Protection Evaluation Report Information

The Fire Protection Evaluation Report (FPER) has been formatted for Limerick 2 but does not include the Limerick 2 information. The Limerick 2 information is expected to be included and completed by April of 1988.

4.3.3.5 Equipment Qualification Program

The Equipment Qualification (EQ) Program is not yet complete but is intended to be done on the same basis as that licensed for Limerick 1. EQ is expected to be completed by six months prior to fuel load. Fuel load is currently scheduled for August of 1989.

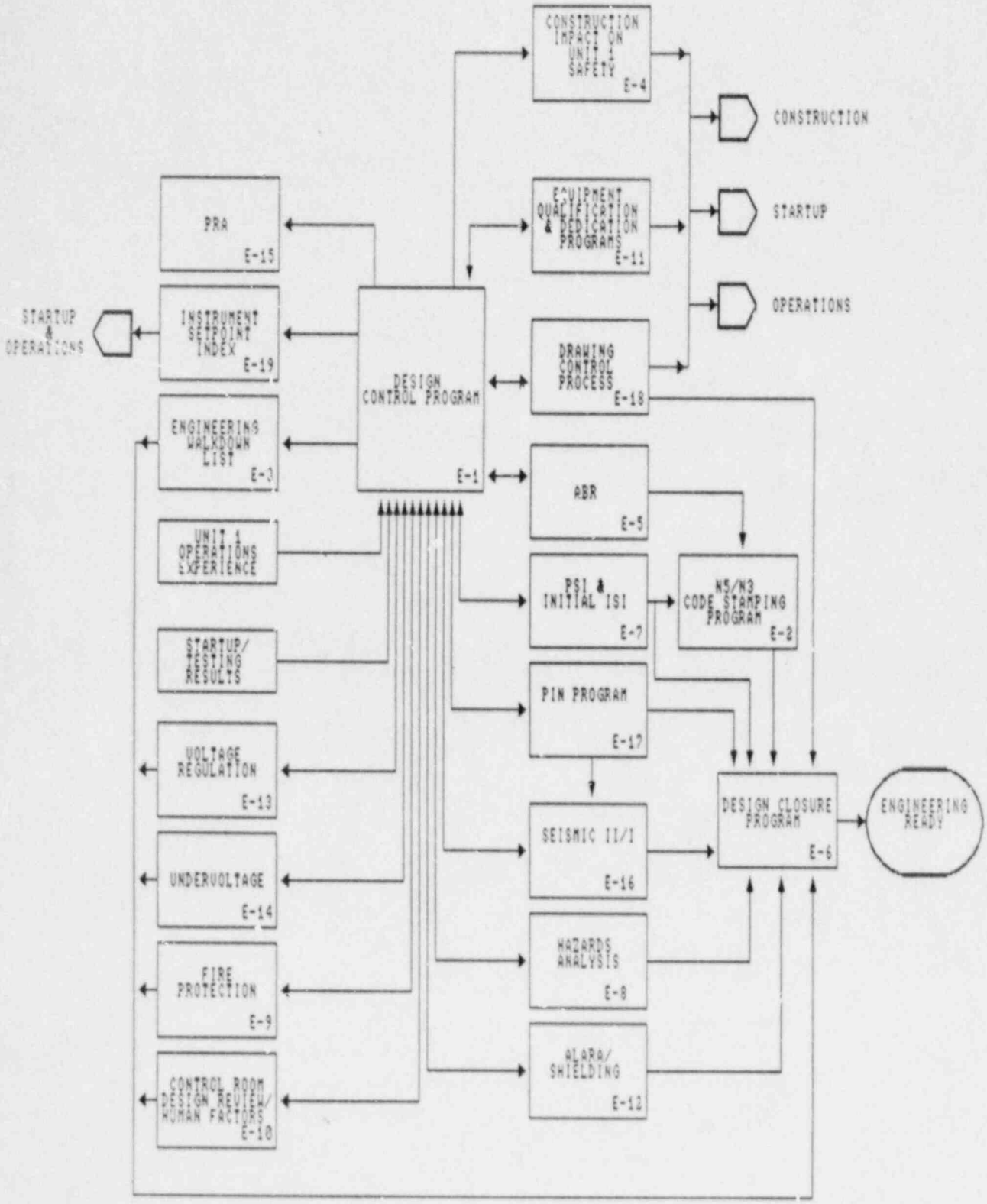
4.3.3.6 Voltage Regulation Studies

Additional voltage regulation studies are to be performed to verify the adequacy of the bus voltages for both units in operation. Based on the results of these studies, certain modifications may be required and could affect both Limerick 1 and Limerick 2 designs. These modifications will be implemented under the appropriate safety evaluation, configuration control, and notification programs. These studies are expected to be completed by the end of 1987.

ENGINEERING

E-0	ENGINEERING (2ND TIER)
E-1	DESIGN CONTROL PROGRAM
E-2	N-5/N-3 CODE STAMPING PROGRAM
E-3	ENGINEERING WALKDOWN LIST DEVELOPMENT PROCESS
E-4	IMPACT OF UNIT 2 CONSTRUCTION ON UNIT 1 SAFETY
E-5	AS-BUILT RECONCILIATION FOR PIPING AND SUPPORTS
E-5.1	STRESS RECONCILIATION FOR ABR
E-6	DESIGN CLOSURE PROGRAM
E-7	PSI AND INITIAL ISI
E-8	HAZARDS ANALYSIS
E-9	FIRE PROTECTION
E-10	CONTROL ROOM DESIGN REVIEW/HUMAN FACTORS
E-11	EQUIPMENT QUALIFICATION AND DEDICATION PROGRAMS
E-12	ALARA/SHIELDING
E-13	VOLTAGE REGULATION
E-14	UNDERVOLTAGE
E-15	PROBABILISTIC RISK ASSESSMENT
E-16	SEISMIC II/I
E-17	PIN PROGRAM
E-18	DRAWING CONTROL PROCESS
E-19	INSTRUMENT SETPOINT INDEX

E-0
ENGINEERING
(2ND TIER)

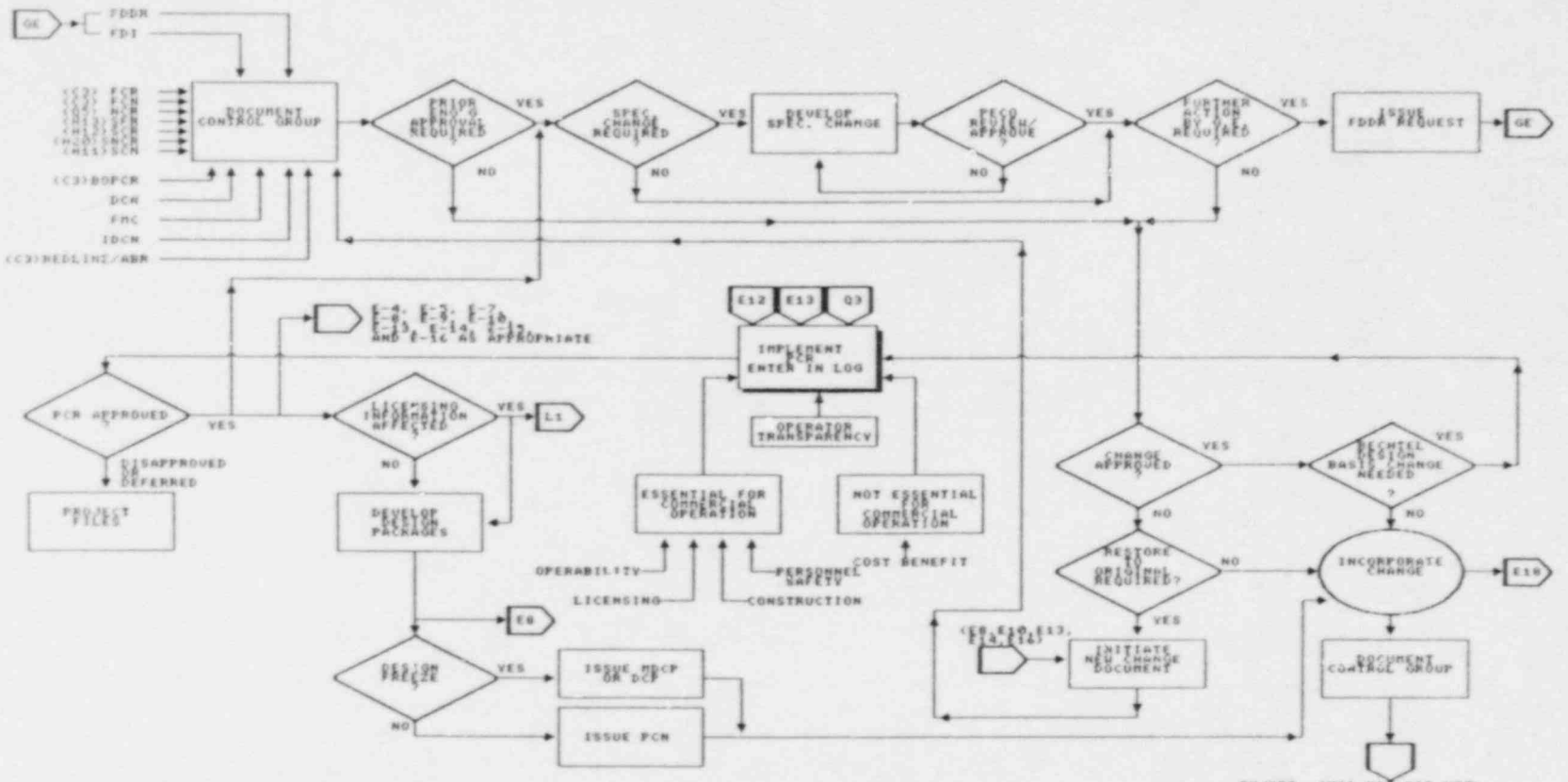


NOTE:

←→ INDICATES ITERATIVE PROCESS

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-1
DESIGN CONTROL PROGRAM



LEGEND:

- DCN - DESIGN CHANGE NOTICE (EDP 4.47, EDPI 4.73.2)
- PCN - PLANT CHANGE NOTICE (EDP 4.42, SPEC. G-15)
- FNC - FIELD NONCONFORMANCE REPORT (G-5, PROCEDURE EDP 15-3.00)
- IDCN - INTERFACE DESIGN CHANGE NOTICE (G-6, PROCEDURE EDP 55-3.28)
- FCR - FIELD CHANGE REQUEST (EDP 4.42.4)
- FCNR - FIELD CHANGE NOTICE (EDP 4.42.5)
- NCR - NONCONFORMANCE REPORT (EDP 4.42.6)
- SCR - SUPPLIER CHANGE NOTICE (EDPI 4.21.1)
- SCN - SUPPLIER CHANGE REQUEST (EDPI 4.21.2)
- DCR - DESIGN CHANGE REQUEST (EDPI 4.73.1)
- FECO - FIELD ENGINEERING CHANGE ORDER (EDP 4.43, SPEC. G-26)
- ECO - ENGINEERING CHANGE ORDER (EDPI 4.70.2)
- DR - DEVIATION REPORT (EDPI 4.70.1)
- BDPCR - BEFORE-THE-FACT CONDITION REPORT
- MDCP - MODIFICATION DOCUMENT CHANGE PACKAGE
- REDLINE - MODIFICATION DOCUMENT IDENTIFYING AS-BUILT CONDITION (CHANGE DOCUMENT)
- ABN - AS-BUILT RECONCILIATION

NOTE:

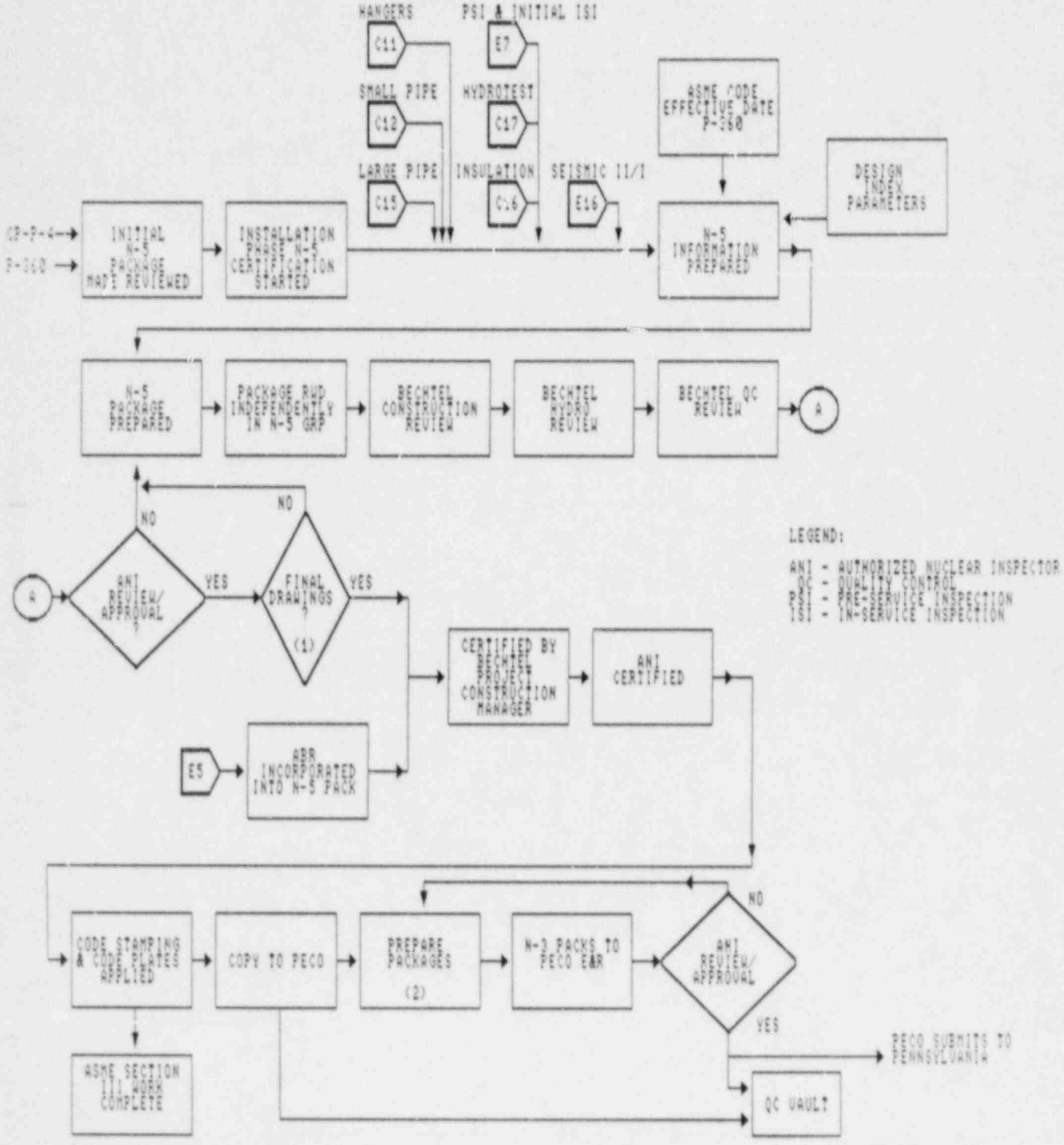
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

SUPPORTS: (H11,H12,H13,H20)
CONST: (Q4)
QA: (Q5)

E-2

N-5/N-3 CODE STAMPING PROGRAM



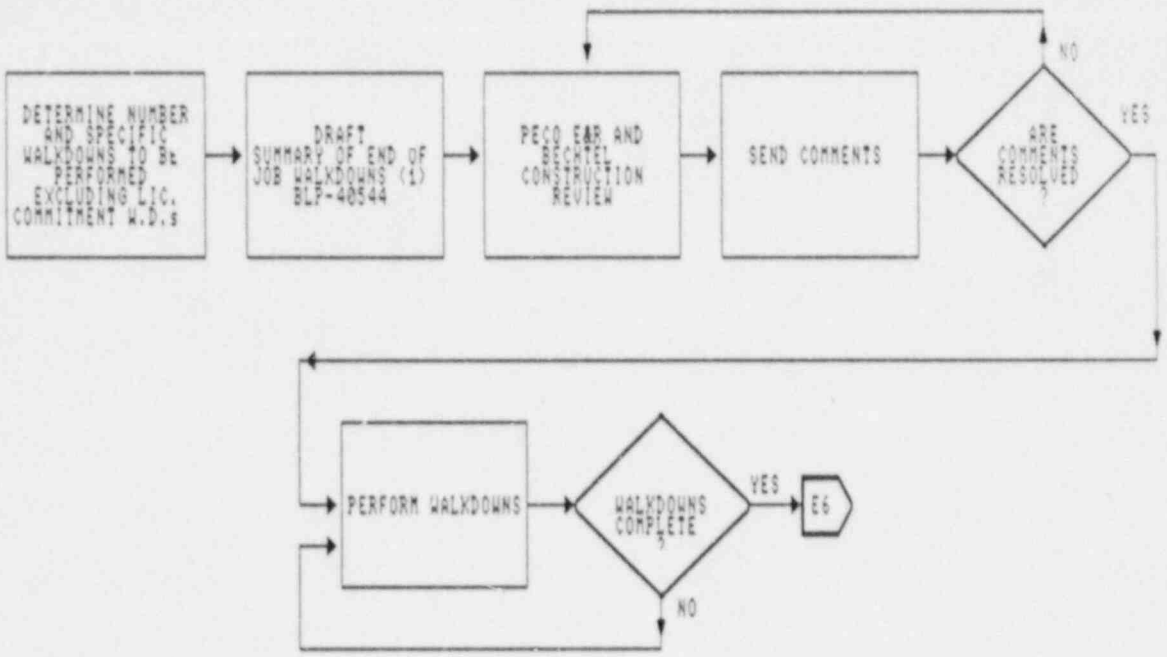
NOTES:

(1) IF DRAWINGS ARE NOT FINAL, AS SUBMITTED, FINAL DRAWINGS ARE INSERTED BY N-5 GROUP AND REVIEWED BY QC, ENGINEERING ETC.

(2) N-3 PACKAGES PREPARED BY BECHTEL N-5 GROUP BUT ARE FINALIZED/APPROVED AND SUBMITTED BY PECO E&R.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-3
ENGINEERING WALKDOWN LIST DEVELOPMENT PROCESS



NOTE (1)

WALKDOWNS CONSIDERED:

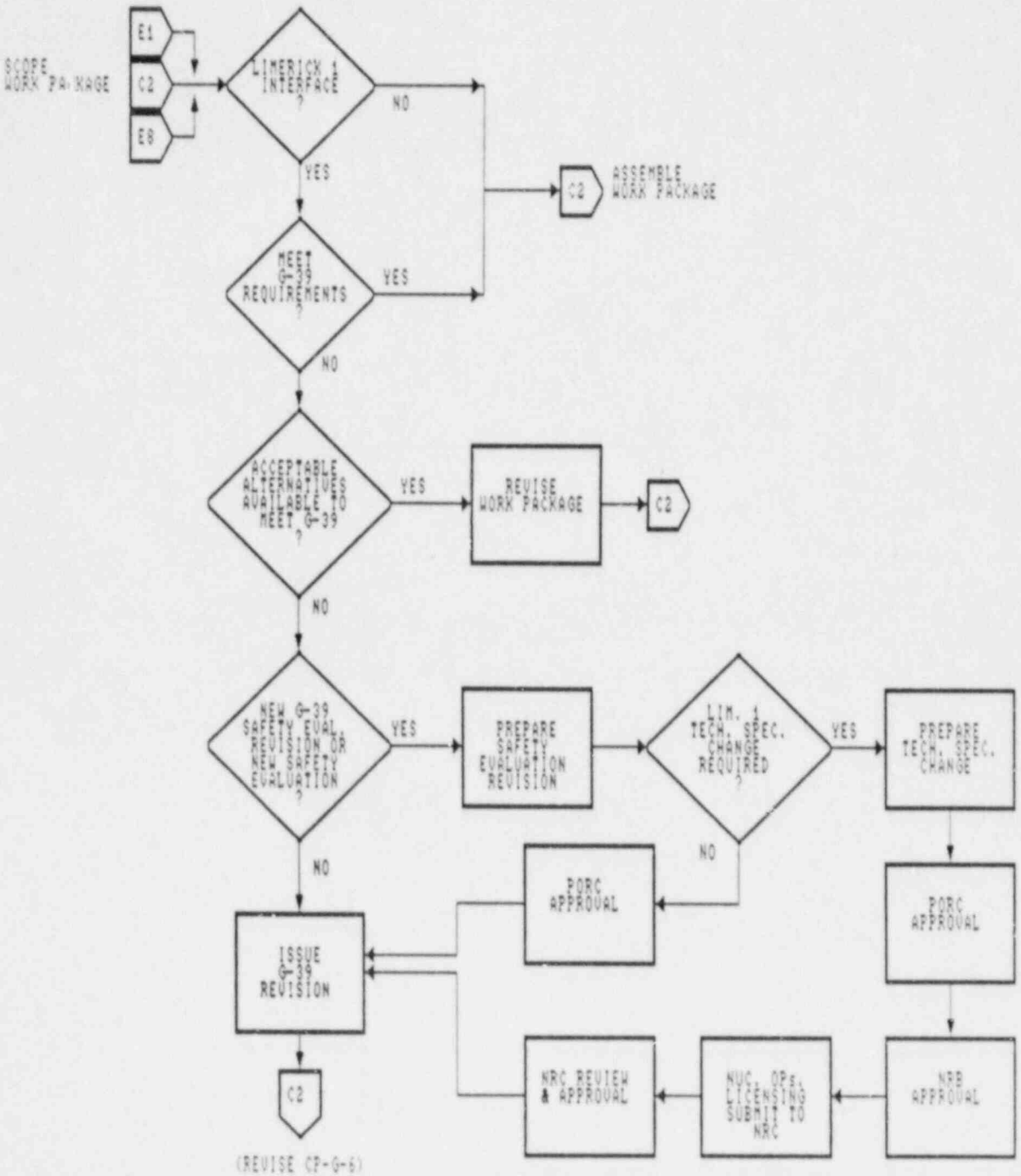
1 HIGH ENERGY LINE BREAK & SEPARATION CONFORM
2 SAFETY IMPACT II/I CONSTRUCTION PROCEDURE CONFORMANCE
3 SMOKE & FIRE DETECTION
4 FIRE BARRIER
5 STRESS & THERMAL INTERFERENCE
6 SEISMIC CATEGORY I EQUIPMENT SEPARATION - CIVIL
7 STRUCTURAL STEEL ADEQUACY
8 EQUIPMENT DYNAMIC QUALIFICATION - CIVIL
9 FIRE PROTECTION APPENDIX R.
10 ALARA SHIELDING PENETRATION
11 DRYWELL MAIN STEAM TUNNEL INSULATION
12 LIGHTING CONSTRUCTION ROOM TURNOVER
13 SITE FLOODING
14 TEMPORARY CABLES
15 RACEWAY INSTALLATIONS FOR GROUND FAULT RETURN PATH
16 WALKDOWNS

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-4

IMPACT OF UNIT 2 CONSTRUCTION ON UNIT 1 SAFETY

SPECIFICATION - G - 39, PROCEDURE CP - G- 6



NOTE:

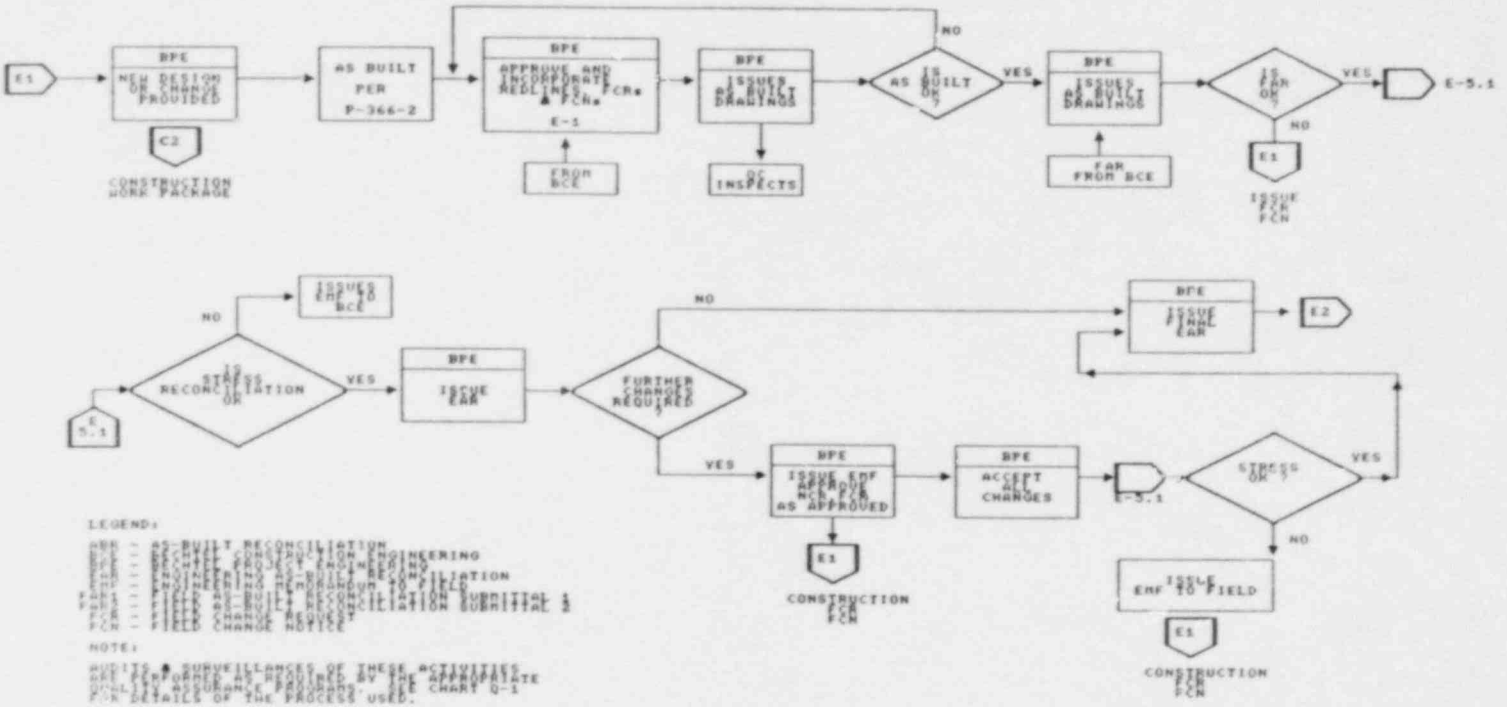
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART G-1 FOR DETAILS OF THE PROCESS USED.

LEGEND:

PORC - PLANT OPERATIONS REVIEW COMMITTEE
NRB - NUCLEAR REVIEW BOARD

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-5
AS-BUILT RECONCILIATION FOR PIPING AND SUPPORTS



LEGEND:

ABR = AS-BUILT RECONCILIATION
BCE = BECHTEL CONSTRUCTION ENGINEERING
BPE = BECHTEL PROJECT ENGINEERING
ENF = ENGINEERING NEED FOR RECONCILIATION
FAR = FIELD AS-BUILT RECONCILIATION
FCN = FIELD CHANGE NOTICE
FCR = FIELD CHANGE REQUEST
FINAL = FIELD AS-BUILT RECONCILIATION SUBMITTAL 2
INIT = FIELD AS-BUILT RECONCILIATION SUBMITTAL 1

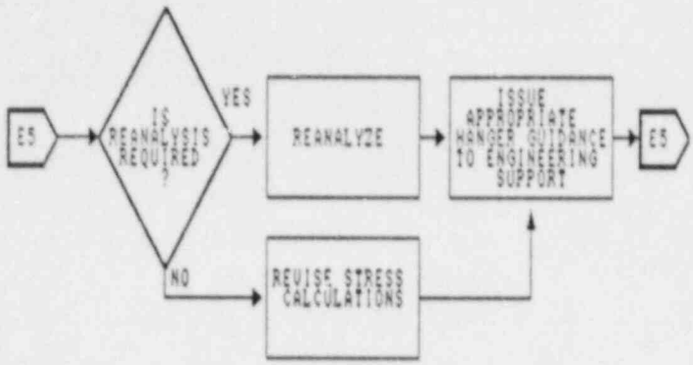
NOTE:

AUDITS▲ SURVEILLANCES OF THESE ACTIVITIES MAY BE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

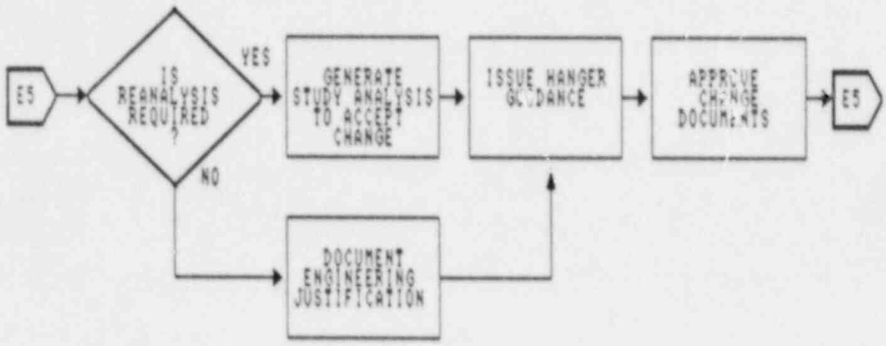
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-5.1
STRESS RECONCILIATION FOR ABR

PIPES



HANGERS



NOTE:

(1) FCN/FCR
AFTER FAR SUBMITTAL
PRIOR TO EAR

(2) EAR SUBMITTAL 1 IS PRODUCED WITH FURTHER CHANGES INITIATED BY ENGINEERING USING EMFs, UNTIL FINAL EAR IS PRODUCED.

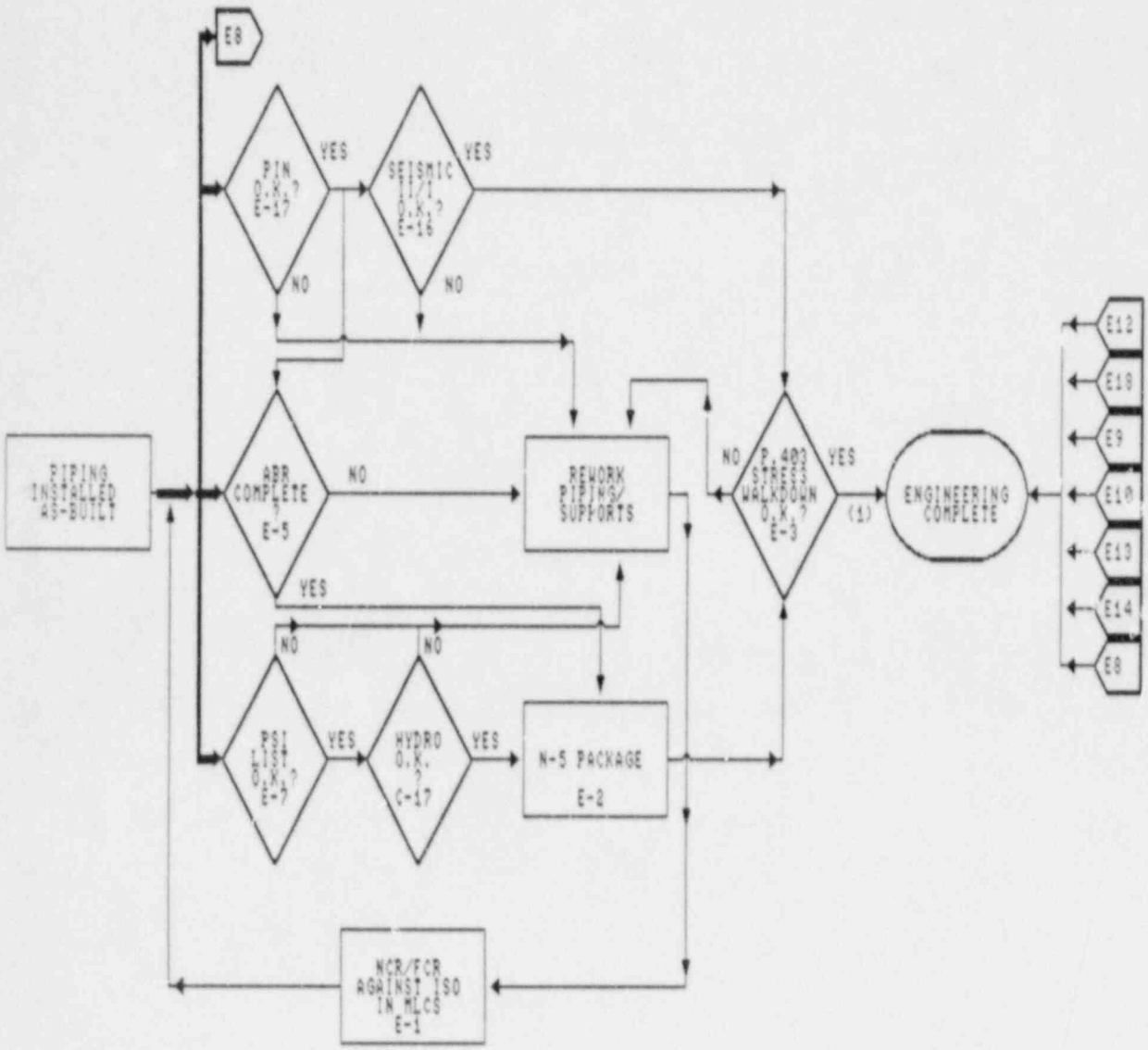
(3) AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

(4) THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

ABR - AS-BUILT RECONCILIATION
BCE - BECHTEL CONSTRUCTION ENGINEERING
BPE - BECHTEL PROJECT ENGINEERING
EAR - ENGINEERING AS-BUILT RECONCILIATION
EMF - ENGINEERING MEMORANDUM TO FIELD
FAR1 - FIELD AS-BUILT RECONCILIATION SUBMITTAL 1
FAR2 - FIELD AS-BUILT RECONCILIATION SUBMITTAL 2
FCR - FIELD CHANGE REQUEST
FCN - FIELD CHANGE NOTICE

E-6
DESIGN CLOSURE PROGRAM



NOTE:

(1) E-1, E-2, E-3, E-5, E-7, E-16, AND E-17 ARE PART OF THE INTERACTIVE PROCESS FOR DESIGN CLOSURE FOR PIPING SYSTEMS.

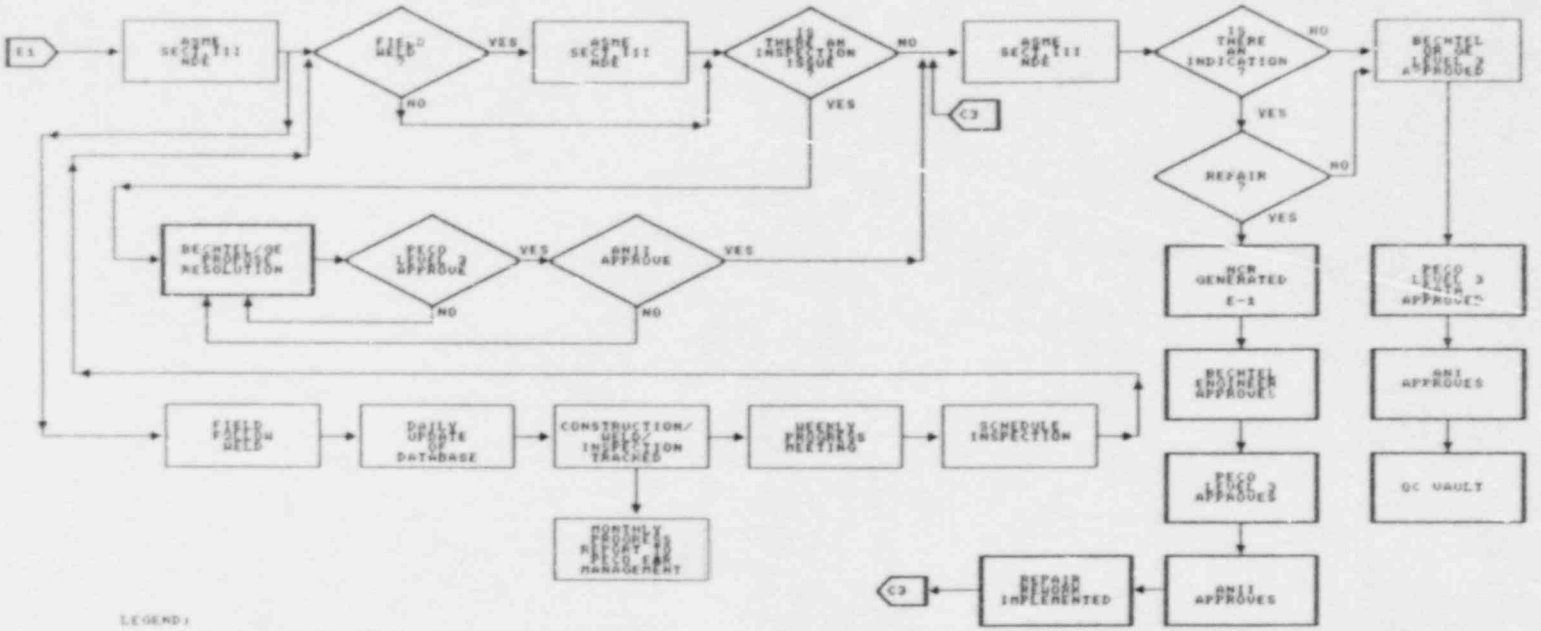
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

PIN - POTENTIAL INTERFERENCE NOTICE
II/I - SEISMIC II/I
NCR - NONCONFORMANCE REPORT
FCR - FIELD CHANGE REQUEST
ABR - AS-BUILT RECONCILIATION
PSI - PRESERVICE INSPECTION
HYDRO - HYDRO TEST
ISO - ISOMETRIC DRAWING USED FOR CONSTRUCTION
MLCS - MANAGEMENT LABOR CONTROL SYSTEM

E-7
PSI AND INITIAL ISI
(WELD ACCEPTANCE)



LEGEND:

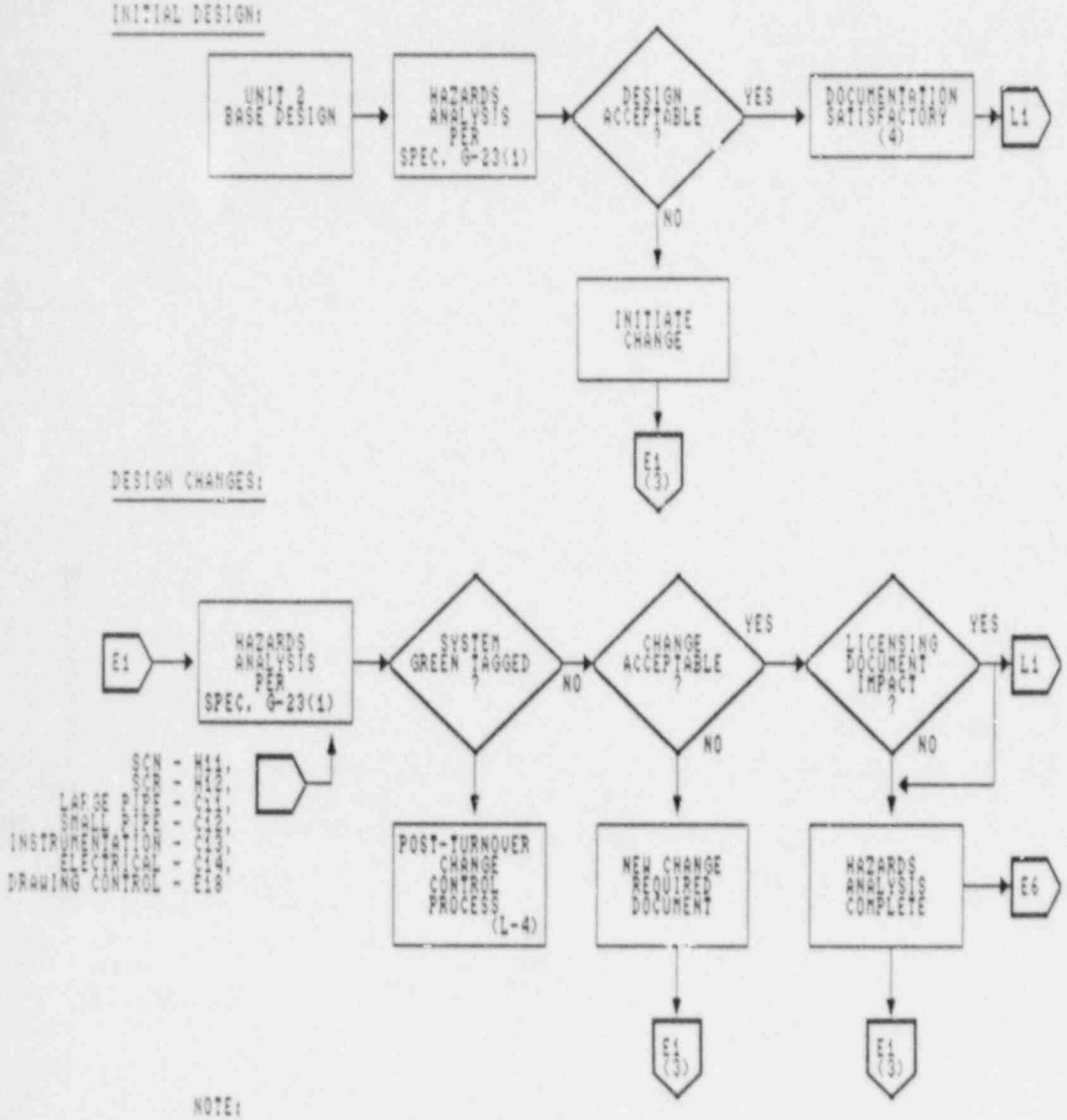
ASME SECT. - AMERICAN SOCIETY OF MECHANICAL ENGINEERS
BOILER AND PRESSURE VESSEL CODE SECTION
MT - MAGNETIC PARTICLE TEST PER APPLICABLE ASME SECT.
PT - LIQUID PENETRANT TEST PER APPLICABLE ASME SECT.
VT - VISUAL EXAMINATION PER APPLICABLE ASME SECT.
NCR - NONCONFORMANCE REPORT
NDE - NONDESTRUCTIVE EXAMINATION
LEVEL 3 - NDE CERTIFICATION GRADE LEVEL 3
ANII - AUTHORIZED NUCLEAR INSPECTOR
ASI - ASME SERVICE INSPECTOR
ISI - IN-SERVICE INSPECTION
IWA - IN-SERVICE INSPECTION

NOTE:

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART G-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-8
HAZARDS ANALYSIS
(SPEC. G-23)



NOTE:

(1) HAZARDS ANALYZED INCLUDE:

- o HELB - HIGH ENERGY LINE BREAK
- o MELB - MODERATE ENERGY LINE BREAK
- o HEAVY LOADS
- o SEISMIC II/I
- o FIRE
- o ROTARY MISSILES

(2) LICENSING DOCUMENTATION IS REQUIRED AT THIS POINT. THE PROCESS IS OTHERWISE THE SAME.

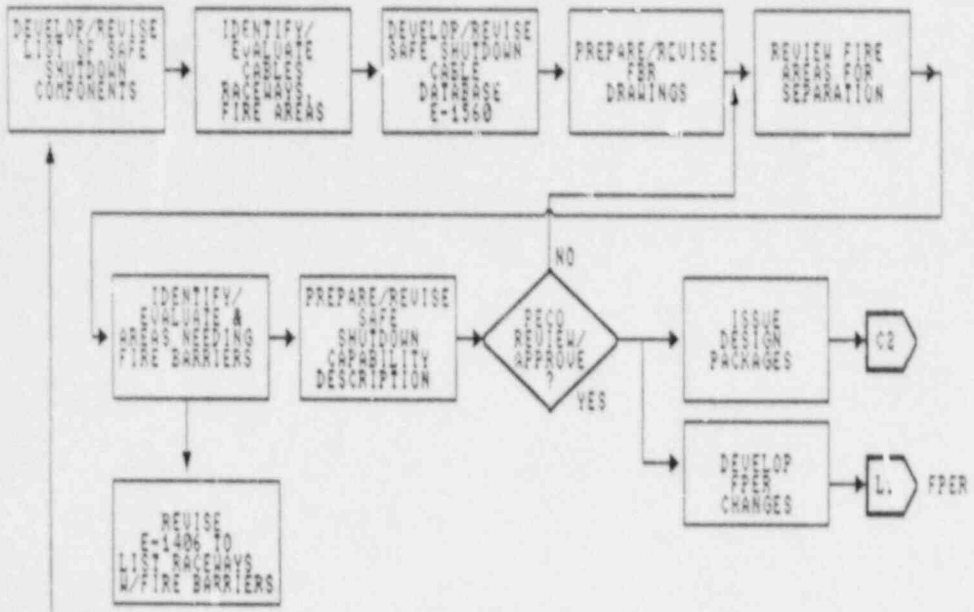
(3) INTERFACES TO OTHER PROGRAMS ARE THROUGH E1. THEY INCLUDE PROGRAMS SUCH AS LARGE(C-11) AND SMALL (C-12) PIPE, INSTRUMENTATION (C-13), ELECTRICAL (C-14), FRA (C-15), THE SCR (M-11), SCN (M-12), AND THE DRAWING CONTROL PROCESS (M-18).

(4) THIS IS A DOCUMENTATION STEP AND DOES NOT AFFECT CONSTRUCTION OR STARTUP IMPLEMENTATION UNLESS A CHANGE IS REQUIRED, SINCE IT IS DONE ESSENTIALLY IN PARALLEL.

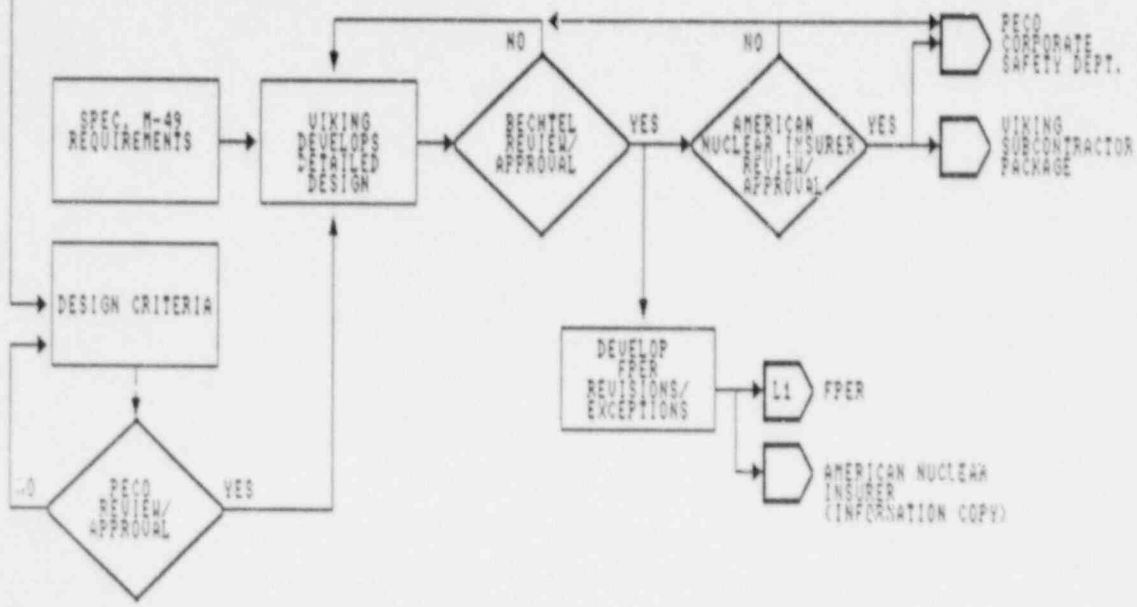
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

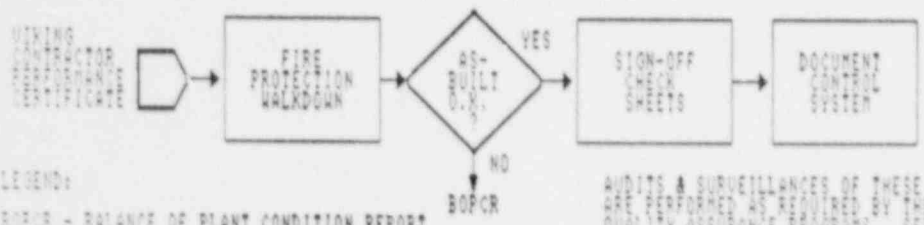
E-9
FIRE PROTECTION

FIRE BARRIER REVIEW PROGRAM-SPEC. G-35



FIRE SUPPRESSION SPEC. M-49





LEGEND:

BOP/R - BALANCE OF PLANT CONDITION REPORT
FPER - FIRE PROTECTION EVALUATION REPORT
FBR - FIRE BARRIER REVIEW

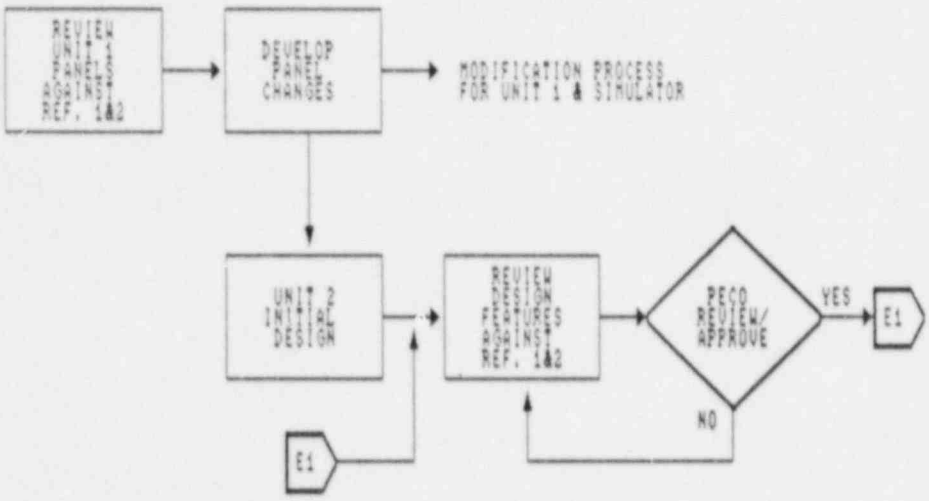
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-10

CONTROL ROOM DESIGN REVIEW/ HUMAN FACTORS

(PLD-5900-K)



REFERENCES:

1. NUREG/CR-1580, "HUMAN ENGINEERING GUIDE TO CONTROL ROOM EVALUATION"
2. NUREG-0700, "GUIDELINES FOR CONTROL ROOM DESIGN REVIEWS"

NOTE:

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

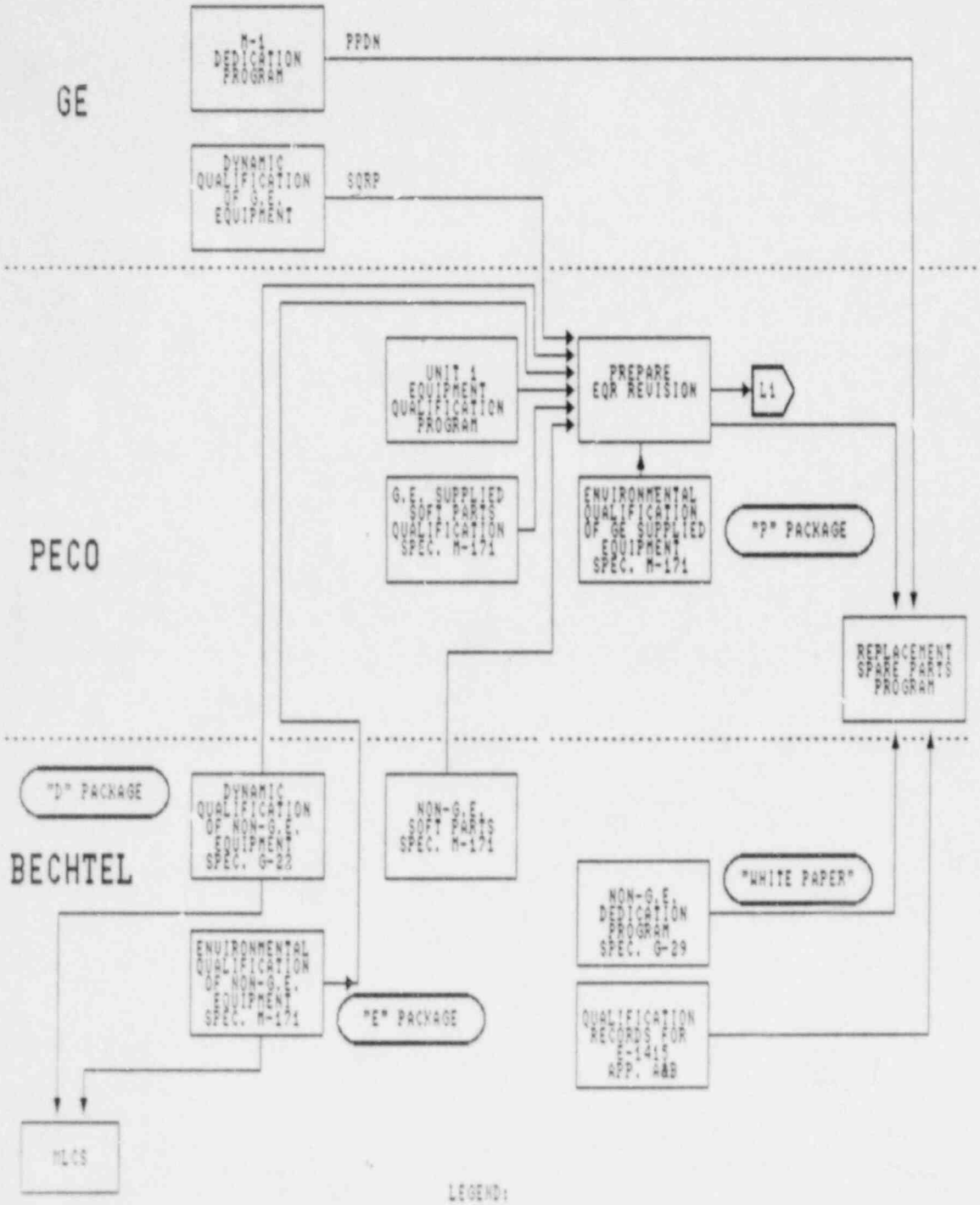
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-11

EQUIPMENT QUALIFICATION AND DEDICATION PROGRAMS

(SPEC.'S M-171 , G-22, & G-29)

(E-1415 APPENDIX A&B)



NOTE:

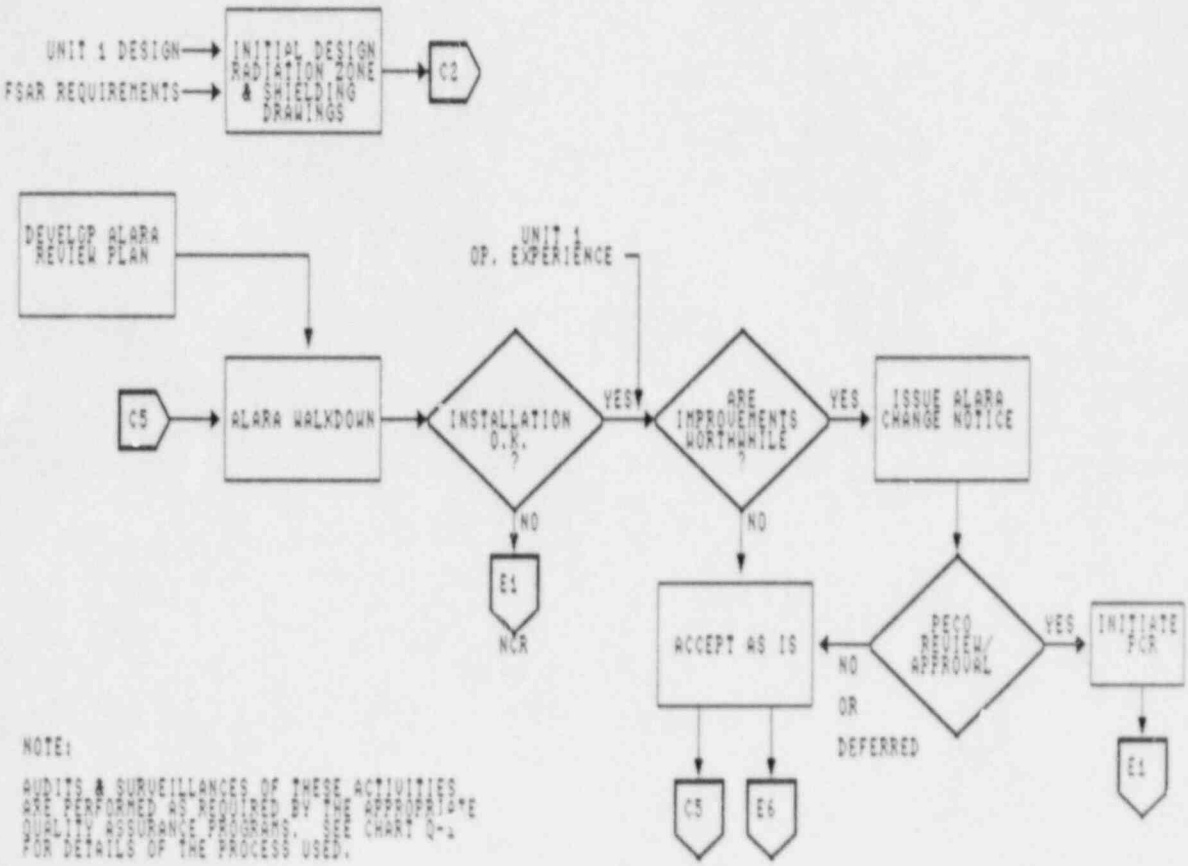
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

"D" PACKAGE - DYNAMIC QUALIFICATION PACKAGE
"E" PACKAGE - ENVIRONMENTAL QUALIFICATION PACKAGE
"P" PACKAGE - PECO QUALIFICATION PACKAGE
EQR - EQUIPMENT QUALIFICATION REPORT
MLCS - MATERIAL AND LABOR CONTROL SYSTEM
PPDN - G.E. PURCHASE PART DRAWING NUMBER
SQRP - G.E. SEISMIC/NEW LOADS QUALIFICATION FOR NSSS COMPONENTS
"WHITE PAPER" - RESIDUAL DESIGN JUSTIFICATION FOR USE OF COMMERCIALLY AVAILABLE PARTS

E-12
ALARA/SHIELDING
(SPEC. G-48)



NOTE:

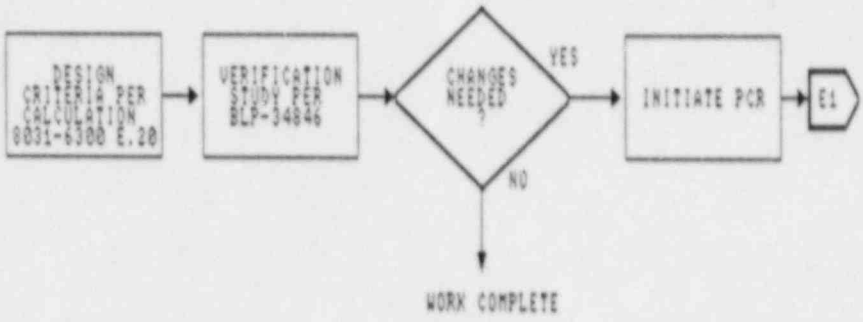
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

ALARA - AS LOW AS REASONABLY ACHIEVABLE
PCR - PROJECT CHANGE REQUEST
FSAR - FINAL SAFETY ANALYSIS REPORT

E-13
VOLTAGE REGULATION
(FSAR SECTION 8.1.6.3.6)



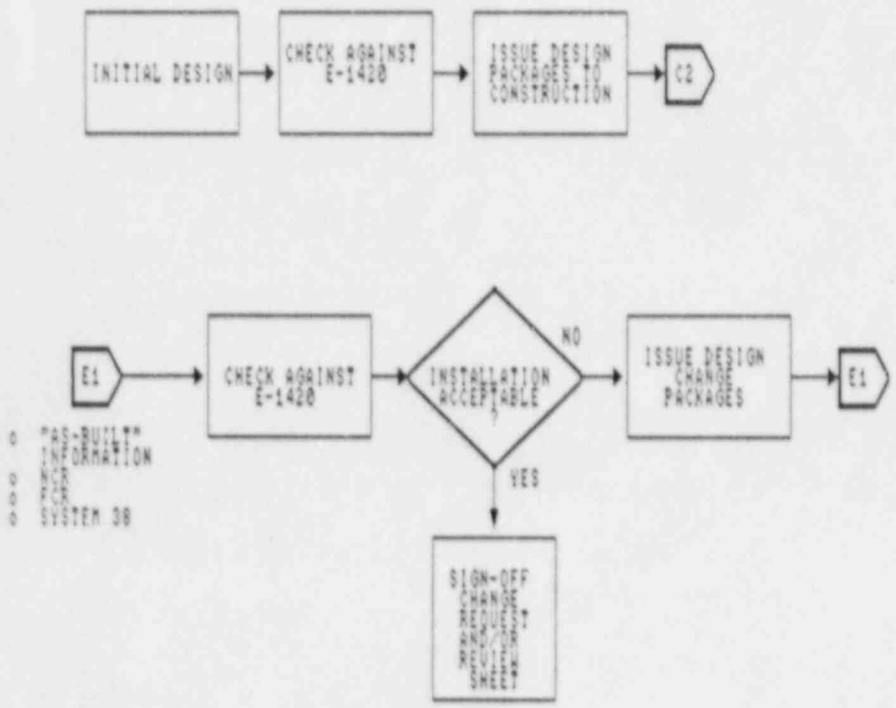
NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

PCR - PROJECT CHANGE REQUEST

E-14
UNDERVOLTAGE
(DRAWING E--1420)



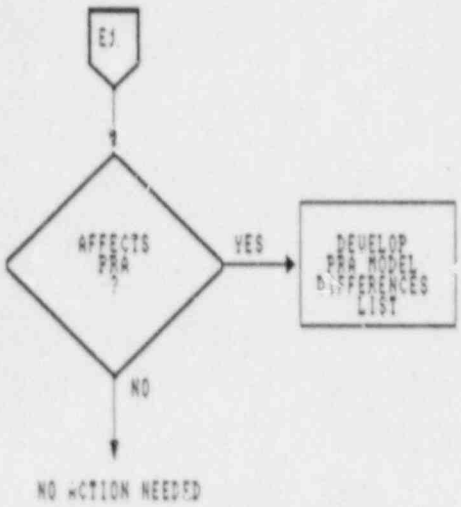
LEGEND:

NCR - NONCONFORMANCE REPORT
FCR - FIELD CHANGE REQUEST
SYSTEM 38 - COMPUTER DATABASE WITH DESIGN AND AS-BUILT INFORMATION

NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-15
PROBABILISTIC RISK ASSESSMENT

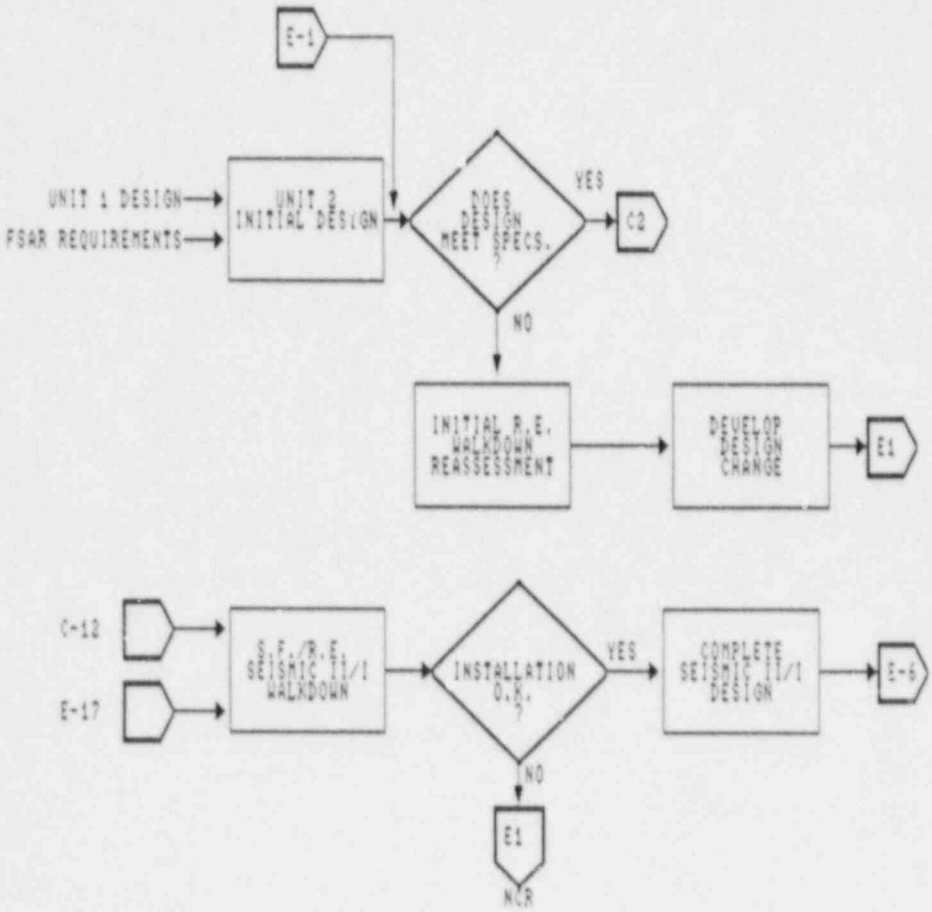


NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-16
SEISMIC II/I

(SPEC. M-109, M-400-2)
(PROCEDURES CP-G-7, CP-T-2)



NOTE:

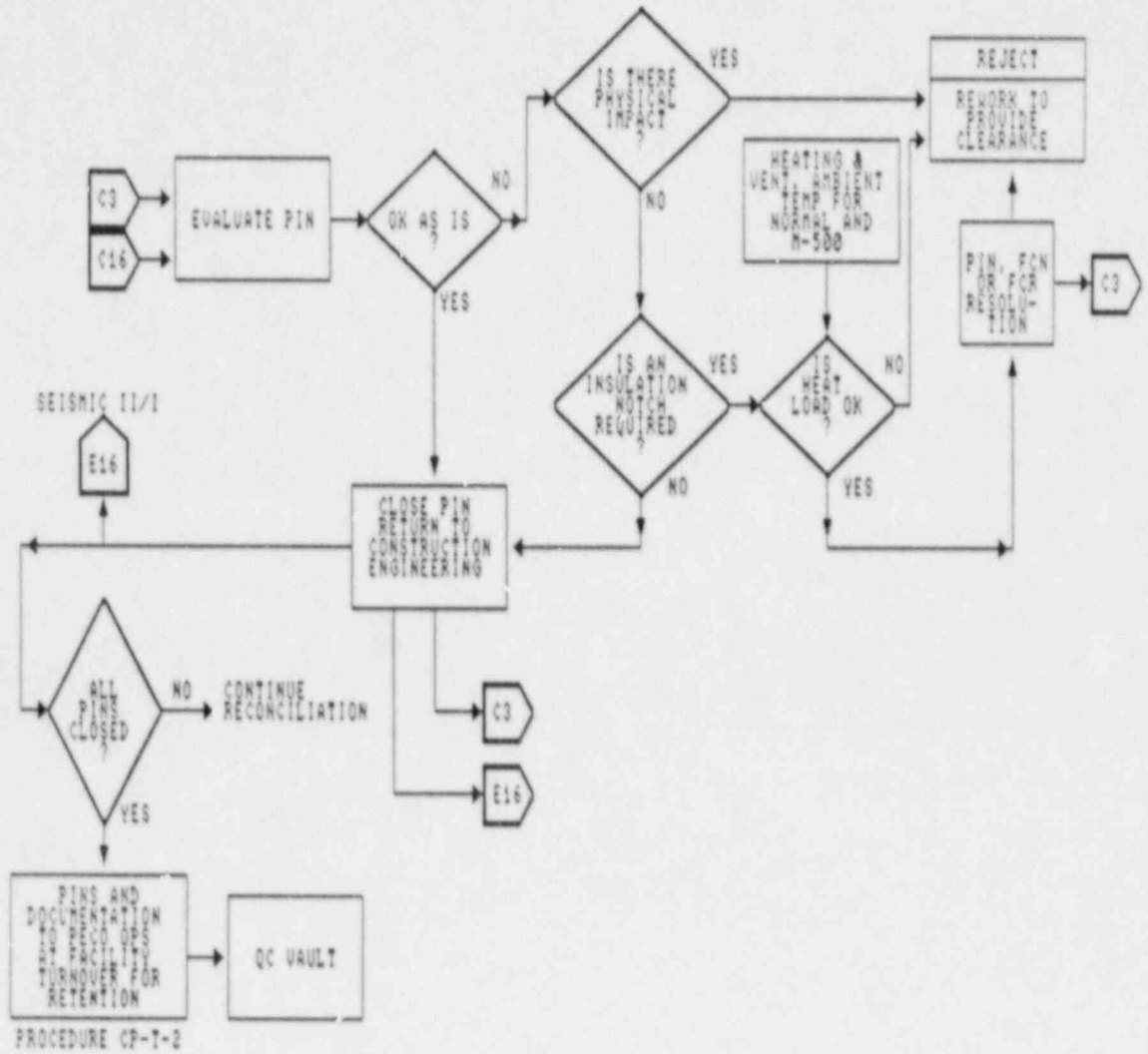
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

S.F./R.E. = SAN FRANCISCO RESPONSIBLE ENGINEER

E-17
PIN PROGRAM
CP-G-7



LEGEND:

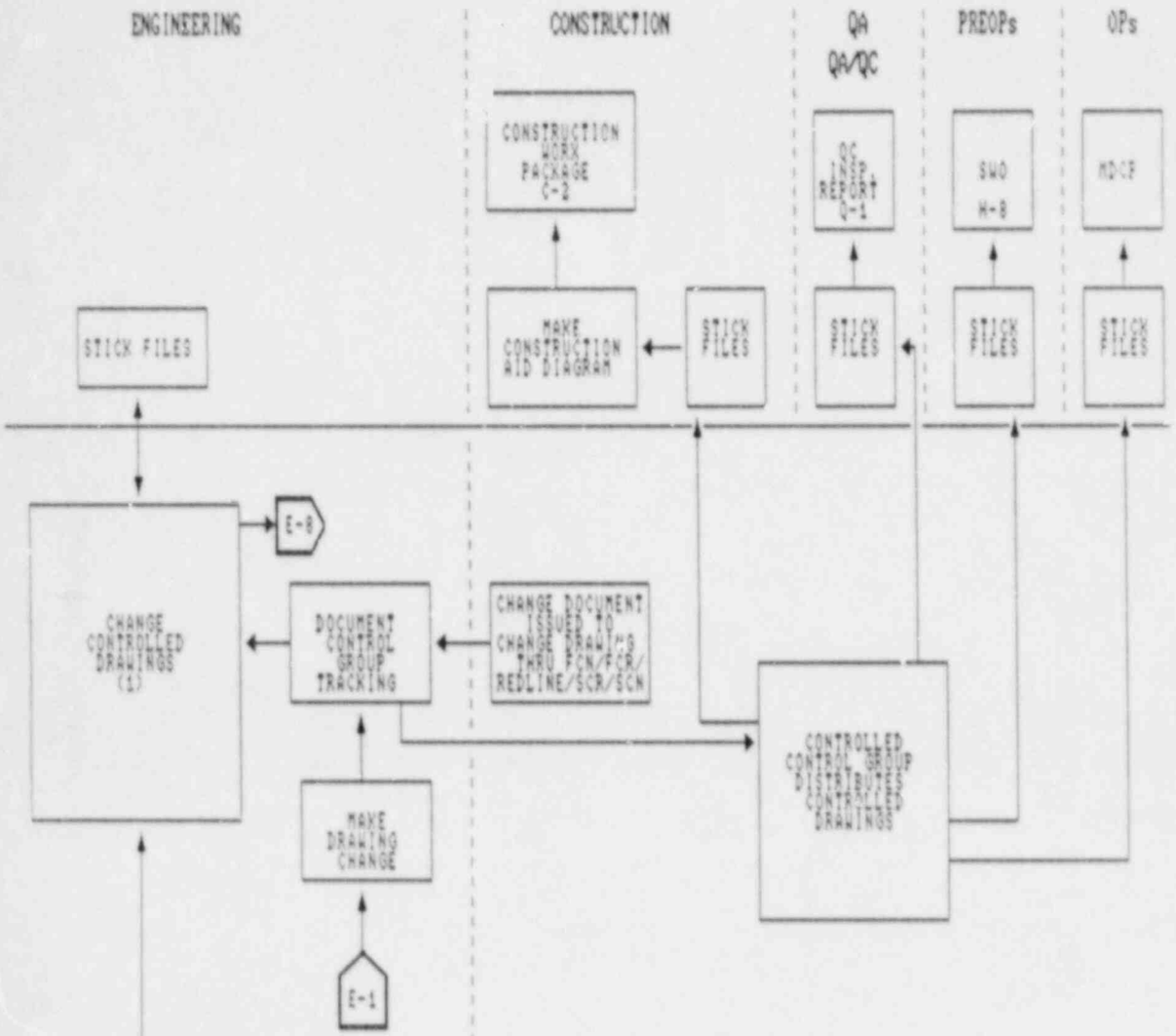
PIN - POTENTIAL INTERFERENCE NOTIFICATION (PROCEDURE CP-G-7)
FCR - FIELD CHANGE REQUEST
FCN - FIELD CHANGE NOTICE
QC - QUALITY CONTROL
TEMP - TEMPERATURE
VENT - VENTILATION

NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-18

DRAWING CONTROL PROCESS



LEGEND:

STICK FILES - 3D FILES OF DRAWINGS CONTROLLED AS DOCUMENT CONTROL
FCN - FIELD CHANGE NOTICE
FCR - FIELD CHANGE REQUEST
SCR - START-UP CHANGE REQUEST
QC - QUALITY CONTROL
SWO - START-UP WORK ORDER
MDCP - MODIFICATION DESIGN CHANGE PACKAGE

NOTE:

1. CONTROLLED DRAWINGS

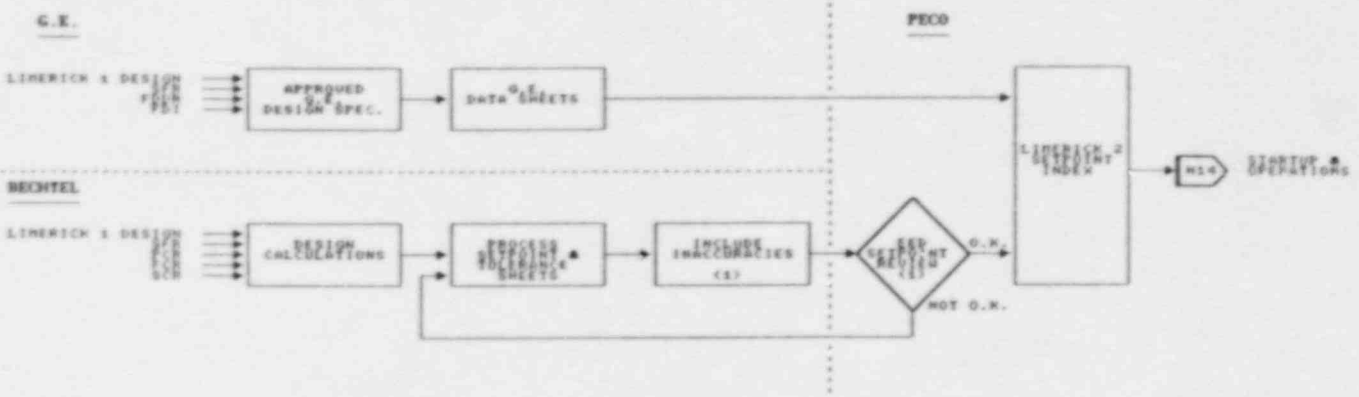
LAYOUTS	SCHEMATICS
3D FILES	SINGLE LINE DWG
2D FILES	CONNECTION DIAGR.
RACEWAY LAYOUTS	INSTRUMENT INDEX/CALIBRATION
INSTRUMENT LAYOUTS	I&C POINT INDEX
P&IDs	G.E. DRAWINGS
	VENDOR DRAWINGS

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-E FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

E-19

INSTRUMENT SETPOINT INDEX



LEGEND:

NOTE:

(1) PROCEDURE IS BEING DEVELOPED FOR SETPOINT INDEX.

4.4 CONSTRUCTION

4.4.1 Characterization of Programs Assessed

Each of the process steps contributing to the construction effort is described in this section. This description includes the input to the work, the process of the activity, the management control and the interfaces to complete the work satisfactorily.

4.4.1.1 Construction (Chart C-0)

On February 3, 1986, PECo resumed the construction of Limerick 2. At that time, the unit's construction was approximately 30% complete, including all major structures except the Limerick 2 Diesel Generator Building. Major fabricated material (HVAC, large pipe and interior building steel structures) were in storage. These facilities and fabrications were constructed and procured concurrently with the earlier Limerick 1 design and construction and with configuration control in existence at the time of Limerick 1 construction. Limerick 1 was completed and licensed in time to achieve commercial operation in February 1986.

The PECo policy of maintaining the Limerick 2 design the same as Limerick 1 allowed the Limerick 2 design to be in an advanced stage prior to construction restart. Furthermore, this policy ensures the adequacy of the Limerick 2 design for licensing and operation based upon the actual licensing and operation of Limerick 1. A number of significant lessons learned during the construction of Limerick 1 have been implemented in the construction of Limerick 2 since 1986. One of the most significant of these lessons is the implementation of a work package (or similarly defined workscope) process. This prepackaging of all documents required by the crafts to perform specific work tasks is formalized in approximately 31,300 commodities work packages as shown in Table 4.4-1.

TABLE 4.4-1*
Commodities Work Packages

Civil/Structural	1,700
Large Pipe	1,600
Large Pipe Hangers	8,100
Small Pipe	5,600
Small Pipe Hangers	6,700
Instrument Tubing	700
Local Mounted Instruments	400
Hydro Test Packages	800
Raceway	2,500
Pull Cards	2,000
HVAC Duct, Hangers, Plenums	1,500
TOTAL	31,300

* Taken from James J. Clarey paper, entitled, "Limerick Station, Second Unit: Success without Restraints."

In addition, special purpose work packages to overhaul valves and perform repairs and maintenance are developed and issued as necessary.

The Limerick 2 construction effort is divided into eight management areas as shown in Figure 4.4-1 with each area being managed by the organization shown in Figure 4.4-2. The construction process is depicted in Construction Second Tier Chart, C-0, which shows the eleven commodity work packages identified in Table 4.4-1 and other necessary plan elements. This chart describes, from a process flow perspective, the construction process from the initial construction work package development to the interim turnover to the PECo Construction organization and final turnover to PECo Nuclear Operations.

Another significant enhancement which has facilitated the planning and supervision of Limerick 2 construction is the Material Labor Control System (MLCS). This user-friendly, computer-based information and status program has been expanded beyond the several discipline-specific data bases used during Limerick 1 construction. This program is used throughout bulk construction and well into system turnover to track status of plant commodities and systems.

Other significant lessons learned from Limerick 1 construction have been incorporated into the major process steps. These are discussed with each process step.

The interpretation of standards, specifications and commitments (including those in the FSAR) during construction is performed by Bechtel Project Engineering (BPE). The construction activity interfaces with BPE to obtain design input for the construction work packages. This information is transferred to Bechtel Construction Engineering (BCE) through the document control process for drawings and specifications. The interface between BPE and BCE continues throughout bulk construction and testing, blue tag testing and system and facility turnover to resolve construction problems, including those resulting from Nonconformance Reports, In-Process Rework Notices, Field Change Requests, and closeout programs such as stress reconciliation notices.

BCE interfaces with BPE to complete and turn over plant facilities to PECo Construction and eventually to PECo Nuclear Operations. BCE also interfaces with the PECo Start-up organization and BPE to complete and turn over plant systems.

The Construction organization and activities are integrated with Quality Control (QC) activities. The QC activities, although part of the construction effort, obtain functional direction from the Bechtel Project QC organization and technical input from BPE. A graded quality assurance program is provided by PECo's

FIGURE 4.4-1

MANAGEMENT AREA DEFINITIONS

MGMT AREA	CONTROL AREA/DESCRIPTION
1	CONTROL AREA 7 REACTOR ELEVATION 1
	CONTROL AREA 14 CONTAINMENT DRYWELL
2	CONTROL AREA 1 REACTOR CORE SPRAY ROOMS
	CONTROL AREA 2 REACTOR WEST RHR ROOMS
	CONTROL AREA 3 REACTOR EAST RHR ROOMS
	CONTROL AREA 4 REACTOR HPCI AND RCIC ROOMS
	CONTROL AREA 5 REACTOR ELEV. 177' AND 201' EXCLUDING CORE SPRAY, RHR AND HPCI/RCIC
	CONTROL AREA 6 REACTOR ELEV. 217' EXCLUDING RHR ROOMS
3	CONTROL AREA 8 REACTOR FUEL POOL COOLING AREA EL. 283' - 308'
	CONTROL AREA 9 REACTOR WATER CLEANUP AREA ELEV. 239'-300'
	CONTROL AREA 10 REACTOR ELEVATION 283' EXCLUDING FUEL POOL COOLING AND REACTOR WATER AREAS
	CONTROL AREA 11 REACTOR ELEVATIONS 313' AND 332'
	CONTROL AREA 12 REACTOR BUILDING STEAM CHASE
4	CONTROL AREA 13 CONTAINMENT WETWELL

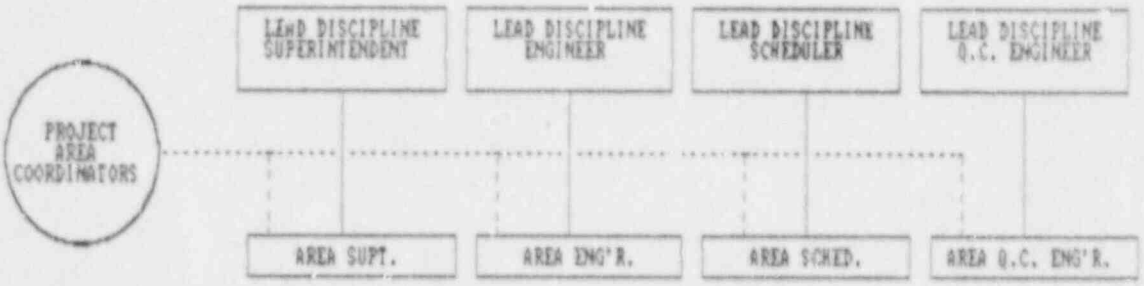
MGMT AREA	CONTROL AREA/DESCRIPTION
5	CONTROL AREA 15 TURBINE CONDENSATE PUMP ROOM
	CONTROL AREA 16 TURBINE AIR EJECTOR ROOMS
	CONTROL AREA 17 TURBINE TSS PHASE BUS AREA
	CONTROL AREA 18 TURBINE NORTH OF CONDENSERS
	CONTROL AREA 19 TURBINE SOUTH OF CONDENSERS
	CONTROL AREA 20 TURBINE EAST OF CONDENSERS
	CONTROL AREA 21 TURBINE AIR COMPRESSOR AREA
	CONTROL AREA 22 TURBINE LUBE OIL AREA
	CONTROL AREA 23 TURBINE OPERATING DECK
6	CONTROL AREA 24 TURBINE AUX. ELEVATION 200'
	CONTROL AREA 25 TURBINE AUX. ELEVATION 217'
	CONTROL AREA 26 TURBINE AUX. ELEVATION 239'
	CONTROL AREA 27 TURBINE AUX. ELEVATION 269'
	CONTROL AREA 28 TURBINE AUX. ELEVATION 302'
7	CONTROL AREA 29 DIESEL GENERATOR BUILDING & YARD
8	CONTROL AREA 30 UNIT 1 AND COMMON AREAS

* TAKEN FROM JAMES J. CLAREY PAPER, ENTITLED, " LIMERICK STATION'S SECOND UNIT: SUCCESS WITHOUT RESTRAINTS."

FIGURE 4.4-2

MANAGEMENT AREA MATRIX ORGANIZATION

TYPICAL ALL DISCIPLINES - CIVIL
MECHANICAL
PIPING
HVAC
ELECTRICAL



* TAKEN FROM JAMES J. CLAREY PAPER, ENTITLED, "LIMERICK STATION'S SECOND UNIT: SUCCESS WITHOUT RESTRAINTS."

Reliability and Safety (R&S) group for non-Q systems and facilities. The R&S activities are also well integrated into the construction activities and are overviewed by PECo Engineering and Research Quality Assurance.

The Engineering activity is responsible for assuring that regulatory requirements and commitments are accounted for in design documents. Through procedural control, assurance is provided that construction and start-up activities will be performed in accordance with these design documents and that the plant will be constructed and tested in accordance with the FSAR.

Throughout construction, the philosophy of safety system and component inspection by the lead construction engineers and in-process inspection by QC prior to QC final inspection is employed to assure work package completion to the requirements of design drawings, specifications and standards. This approach allows rework (to achieve design configuration) to be accomplished during the construction effort rather than after the craft work is complete.

Each of the process steps shown in the Construction Third Tier Charts and processes which did not require charting, are described in this section. This description includes the inputs to the work, the process of the activity, the management control and the interfaces to complete the work satisfactorily.

4.4.1.2 Material and Labor Control System (Chart C-1)

The Material and Labor Control System (MLCS) is a data base maintained on the on-site computer. The MLCS is utilized as a project control tool to monitor engineered and non-engineered materials from conception through installation and plant start-up. (It also serves as a common data base for the collection of expended labor man-hours and procurement data; this function is not discussed here.) The MLCS typically includes identification lists and construction status of equipment, valves, instruments, pipe isometrics, raceways, conduits and cables. The MLCS allows work packages to be identified for these commodities as well as the related construction drawings issued by BPE.

The MLCS is maintained and operated by the MLCS group. The system can be accessed and updated. Updating of the MLCS is based on the concept of a single-source input, in which each discipline has a single individual authorized to update the data base. The disciplines and the major input categories are shown in Chart C-1. Large amounts of input and large reports are done offline in a batch environment. The MLCS can be accessed from Bechtel-San Francisco, and the job-site and has the capability of processing large inputs/outputs in an offline batch mode.

The major advantage of the MLCS over the method used for Limerick 1, where several independent data bases were used, is that it provides a single source of information that can be utilized by all disciplines. Through the single-source concept (both input and data base) the work process becomes more efficient and duplication of record keeping and maintenance is minimized. Additionally, a single data base provides more accurate and complete data regarding construction status and remaining work.

Chart C-1 shows the major inputs and outputs. The initial inputs to the MLCS comes from Bechtel Project Engineering (BPE) in San Francisco (EE 553 (Raceway and Cables), Mechanical & Equipment Index, Instrument Index, large and small pipe data bases). Bechtel Construction Engineering (BCE) provides the initial input for civil and HVAC commodities. The MLCS is continuously updated and frequently backed up (two to three times a week; tapes are kept in a steel cabinet on-site as well as off-site). Data checks are performed by BPE. As discussed before, the MLCS contains sufficient information so that tracking of systems or equipment is possible, as well as tracking of work packages and the various documents used for repairs and rework.

The file structure that is used to update, maintain, and access the MLCS, including the "association" files that allow access to sorted information (by system or equipment), is discussed in detail in the MLCS User's Guide.

The MLCS is a management tool that has proved to be very effective. The official condition of facilities and systems is maintained in walkdown reports, punch lists and other documents.

4.4.1.3 Work Package Definition, Preparation, and Issue (Chart C-2)

The purpose of the Work Package is to provide the crafts with a controlled package of fixed scope, which contains all information that is necessary for performing and completing construction work activities. Table 4.4-1 shows the distribution of the number of work packages among the commodities.

The Bechtel Discipline Construction Engineer has the responsibility for the preparation, issue and control of work packages, as well as for interfaces with other disciplines. His responsibilities, as well as those for the Lead Discipline Construction Engineer, the Discipline Construction Superintendent, and others, are described in the discipline construction procedures as tabulated on Chart C-2.

This Limerick 2 work package concept, which was not used for construction of Limerick 1 and which was derived from the lessons learned from Limerick 1, allows for efficient scoping and control of the construction process.

The major steps associated with the definition, preparation, and issue of work packages are shown in Chart C-2. Also shown are

the input points for processing rework, Field Change Notices, Design Change Notices, and Nonconformance Reports; Material and Labor Control System updates; and the Bechtel Quality Control involvement for Q-Listed and/or ASME-regulated items.

4.4.1.4 Construction NCR/IPRN/BOPCR Processing (Chart C-3)

During the construction process, inspections of installation activities are performed by various groups. These inspections are keyed on either in-process hold points or completion of installation. If, during the course of or as a result of the inspection, an item is found which does not conform with specified requirements (acceptance criteria), the inspection organization is required to document the discrepancy. For quality related activities, documentation is in the form of either: an In-process Rework Notice (IPRN) for those discrepancies which further construction processing can correct; or a Nonconformance Report (NCR) for those discrepancies which need an engineering disposition. For non-quality related activities, documentation is in the form of a Balance-of-Plant Condition Report (BOPCR).

IPRNs initiated as a result of inspection activities are dispositioned by the Bechtel Construction Engineer to achieve reconciliation of the hardware with the Engineering approved design documents. Likewise, NCRs are dispositioned by the Bechtel Project Engineer and receive an approval from appropriate groups such as Quality Control and the Authorized Nuclear Inspector. Note that for ASME Section XI items, the NCR also receives an approval by the Authorized Nuclear Inservice Inspector and PECo Engineering. BOPCRs for non-quality related work are dispositioned by the appropriate Engineering group, normally the Bechtel Construction Engineer. If any hardware work is required, the dispositioned document is returned to the work package for implementation prior to reinspection.

4.4.1.5 Work Package Closeout (Chart C-4)

Chart C-4 shows the generic steps for closing out work packages and the routing of documentation to the various freeze files. Freeze files are for work packages "frozen" after all work is complete, they are removed only with approval of the Lead Discipline Engineer. Other processing of documentation is shown in the applicable discipline charts. It should be noted that closeout involves reviews by the lead construction engineer and Quality Control (for Q-listed or ASME components) of work performed, as-builts and inspection documentation. Additionally, work package closeout is indicated in the Material Labor and Control System.

4.4.1.6 Civil (Chart C-5)

The civil work package is controlled by Bechtel Procedure CP-C-9. The civil chart describes the civil work completed under the current work package design and configuration control system. Civil work completed prior to the construction restart was performed under the design and configuration system in place at that time. The chart begins with the entry of a work package to a construction discipline and ends as a completed, Quality Control accepted work package.

4.4.1.7 HVAC (Chart C-6)

The HVAC activity for Bechtel and its subcontractor is covered by the Bechtel Procedure, CP-M-3. The HVAC chart includes the functional activities of Bechtel as well as those of Schneider, the HVAC subcontractor. The chart also includes leak testing but does not include the process by which HVAC was completed prior to restart. The purpose of the chart is to show the flow of design input, review and approval, inspection, fabrication and installation of HVAC components.

Input to the HVAC work package includes Bechtel Project Engineering developed drawings and specifications and the determination of on-site or offsite fabrication. The output of this activity is the close-out of the work package for leak testing and system release to the insulation subcontractor.

4.4.1.8 Valves (Chart C-7)

The preparation, disassembly and packing of all Limerick 2 permanent valves is procedurally controlled by CP-M-4. The valve program is under the direction of the Lead Pipe Construction Engineer (LPCE) and is implemented through the on-site Bechtel valve shop.

All valves are removed from storage through a material request and receive at least a visual examination for any obvious damage and for cleanliness. The LPCE is responsible for providing technical direction and vendor instructions with the valve for installation. Valve installation is controlled by Bechtel Project Engineering prepared specifications (8031-P-301-2 and P-311-2). All valve disassembly and reassembly, for whatever reason, is initiated and documented by a Valve Disassembly/ Reassembly Record (VDRR). Rework, whether performed in the Bechtel valve shop or in place, requires that a Quality Control inspection be performed and documented for Q-listed and ASME valves.

Limitorque valves are handled as discussed above. PECo Field Engineering performs Motor-Operated Valve Analysis and Testing System (MOVATS) tests for all Motor-Operated Valves.

4.4.1.9 Mechanical Equipment - WP-A and MRP (Chart C-8)

The Mechanical Equipment Installation Procedure for rotating equipment is performed in three phases in accordance with Work Packages A, B, and C. These phases are A, Installation; B, Pre-Alignment; and C, Final Alignment. This is intended to avoid alignment problems that were encountered during the start-up of Limerick 1 where no intermediate alignment steps were performed. The three-phased approach assures that all rotating equipment is properly aligned when it is finally turned over to Start-up.

The installation of mechanical equipment within the scope of Work Package A is guided by Procedure CP-M-1. The Lead Mechanical Engineer and the appropriate superintendent are directly responsible for planning the equipment installation. The assigned Mechanical System Engineer and superintendent are responsible for properly implementing the installation procedure as outlined in the work package.

The scope of Work Package A includes stationary and rotating equipment. The scope includes moving the equipment to its installed location, installing it, conducting a preliminary alignment and grout/fastening it to its foundation.

The installation process for Work Package A is shown in Chart C-8. The work package is prepared by Construction Engineering and issued to the Bechtel Control Area Supervisor for installation. The Lead Mechanical Engineer or his designee will sign off the work package when the installation process is complete.

Modification/Rework Packages (MRP) are used to identify specific work activities outside the general scope of work packages A, B, and C. They may identify one specific work activity (e.g., General Electric Field Deviation Disposition Request) or a logical grouping of activities (several Nonconformance Reports, Field Deviation Disposition Requests, Field Change Requests, disassembly tasks, etc.). MRPs follow the same procedural process as Work Package A.

4.4.1.10 Mechanical Equipment WP-B (Chart C-9)

The scope of Work Package B includes rotary equipment only. The scope of work encompasses piping up and final alignment. If the piping is already bolted up, the equipment is freed from piping (to check for nozzle loading) and then realigned and connected. The piping up and final alignment is guided by Procedure CP-M-1. The Lead Mechanical Engineer and Mechanical System Engineer have similar responsibilities as outlined for Work Package A.

The chart for Work Package B is shown in Chart C-9. Work Package B undergoes the same basic process as Work Package A. The major

difference is that Construction Engineering and Quality Control (or PECo Reliability and Safety) are present to witness final alignment and piping-up. If minor rework is required to achieve final alignment, no paperwork is needed. Major rework or repair, such as pipe/weld cutting or hanger adjustment, requires the issuance of Nonconformance Reports, Balance of Plant Condition Reports, or Field Change Requests.

The process that leads from closure of Work Package B to the issuance of Work Package C is also shown in Chart C-9. After Work Package B is closed, the equipment is released for Blue Tag Testing (Procedure CP-T-3) and the testing is performed. When Blue Tag Testing is finished, the equipment can either be Pink Tagged or a Bechtel Construction Engineer can issue a Blue Tag Return Request (BTRR, Procedure CP-T-4). The Start-up Engineer can request the Construction Engineer, prior to turnover, to leave equipment uncoupled (e.g., for turbine-driven pumps and pumps with internals removed for flushing, etc.). The need to recouple is added to the exception list. In that case, the uncoupled equipment is Pink Tagged. Start-up will then issue a Start-up Work Order (SWO) to construction for coupling. This SWO triggers Work Package C. Generally, Start-up requests the turnover of small equipment after the driver has been coupled to the driven pump. In this case, PECo Field Engineering returns the equipment to construction (via the BTRR) for coupling and final alignment check.

4.4.1.11 Mechanical Equipment - WP-C (Chart C-10)

The scope of Work Package C includes rotary equipment only. Work Package C is used to guide the coupling of the driver to the driven equipment (pump, etc.) and final turnover to Start-up. The coupling is guided by Procedure CP-M-1. The Lead Mechanical Engineer and the Mechanical Systems Engineer have similar responsibilities as outlined for Work Package A.

4.4.1.12 Large Pipe (2 1/2" and Above) (Chart C-11)

The procedure for control of the construction of large pipe (2-1/2" and above) is CP-P-2. The construction process is shown in Chart C-11. The Lead Large Pipe Construction Engineer prepares these work packages in accordance with the predetermined pipe spools and the engineering requirements. All large pipe is inspected by the Reliability and Safety Group for cleanliness prior to construction.

The As-built Reconciliations Program, as shown in Chart C-11, is conducted by Bechtel Project Engineering prior to the Bechtel Quality Control inspection. Quality Control inspects the final spool using the as-built drawings that have been prepared by Bechtel Project Engineering.

4.4.1.13 Small Pipe (2" and Smaller Non Q, Non ASME and Temp. <300°F) (Chart C-12)

Procedures for controlling the construction and installation of small pipe are described in Procedure CP-P-1. These work packages are prepared under the primary direction and management of the Lead Small Pipe Construction Engineer. Small pipe systems, which are in Q-listed systems, under ASME Section III control or are for systems with greater than 300°F, follow the same processing as large pipe and are shown in Chart C-11. Small pipe (2" and smaller, non-Q, non-ASME and temperatures less than 300°F) are depicted graphically in Chart C-12.

4.4.1.14 Instrumentation (Chart C-13)

Permanent plant instrumentation, including devices that are not totally electrical (thermocouples, Resistence Temperature Detectors, etc.), and in-line devices (thermowells, control valves, orifice plates, etc.) are procedurally controlled by Procedure CP-J-1. Work packages to provide for this installation are described in this procedure and are prepared by the Lead Construction Instrument Engineer. This process is depicted in Chart C-13 and includes instrument tubing systems.

4.4.1.15 Electrical (Chart C-14)

The electrical activities described on Chart C-14 are controlled by Procedures CP-E-1, CP-E-2, and CP-E-3. These procedures cover electrical panel modifications, cable installation and terminations and electrical raceways.

The Lead Electrical Construction Engineer prepares the raceway and electrical panel installation work packages. The cable pull work packages and termination cards come from the EE 553 program. Design criteria and drawing information are fed into the EE 553 program by Bechtel Project Engineering. The configuration and construction status is maintained current in the Material Labor and Control System (MLCS). Design changes, approved Field Change Requests (FCRs) and Field Change Notices (FCNs) are logged immediately in the MLCS. At six month intervals the EE 553 data base is compared to the MLCS status to reflect the updated FCN and FCR information. The EE 553 program is independently reconciled by Project Engineering to all design changes.

4.4.16 Hangers (Chart C-15)

The processes used to control the installation of large pipe supports and for small pipe supports in hanger critical systems are described in Procedure CP-P-3. Small pipe supports in non-critical systems are described in Procedure CP-P-1.

The Limerick 2 construction process features two activities that resulted from lessons learned in Limerick 1. Both of these involve Bechtel Project Engineering review of as-constructed piping to reduce unnecessary hangers (Hanger Reduction Program) and design seismic hangers to the as-built piping configuration. These will reduce significantly the number of hangers and rework associated with piping and piping support installation.

4.4.1.17 Insulation (Chart C-16)

The procedure controlling insulation is CP-G-7. This work is under the primary direction and management of the Lead Insulation Engineer for insulation work and the Lead Piping Engineer for identification and resolution of interferences. This work process is depicted in Chart C-16.

Insulation is generally applied to piping. In addition, a small amount of the HVAC system is also insulated. The insulation is performed by a subcontractor or by Bechtel Construction, each to work packages as shown in chart C-16.

4.4.1.18 Hydro Testing (Chart C-17)

The Hydro testing process is described in Procedure CP-M-2. This process controls the construction phase pressure testing of Q-listed, ASME code systems and balance of plant piping, instrument lines, tanks and pressure vessels. It does not include the reactor pressure vessel and associated piping. This process is depicted in Chart C-17. The status of hydro testing is tracked on the Material and Labor Control System.

4.4.1.19 Blue Tag Testing (Chart C-18)

The purpose of Blue Tag testing is to verify that all electric and pneumatic equipment is ready to be turned over to Start-up for pre-operational testing. Blue Tag testing for any rotating equipment is performed in an uncoupled state, i.e., the driver is not connected to the driven equipment.

Blue Tag testing is performed by PECo Field Engineering under the jurisdictional responsibility of Construction. Blue Tag testing is performed under the Electrical Engineering Division's Unique Divisional Procedures (UDP), which cover electrical checkout and I&C calibration and loop check.

The major steps of Blue Tag testing are depicted in Chart C-18. Details of the testing process are shown in Start-up Charts "Field Engineering Tests" (Chart H-4) and, "Perform I&C Calibration and Loop Checks" (Chart H-5). If any test results are unacceptable or a test record verification rejects the test results, a rework notice or an Equipment Problem Report is issued. Disposition of both is also shown on Chart C-18. When

the test record is verified as completed by the Lead Field Engineer, the field engineering files are sent to the Nuclear Records Management System. An independent review of pre-operational test prerequisites is performed by the Test Review Board, which is composed of members from the plant staff, Engineering, and other disciplines. When the Start-up Superintendent accepts the turnover package, the equipment is transferred to the jurisdiction of PECo Start-up (Pink Tag). The final punch list, developed during the final Blue Tag test walk down, now becomes the Start-up Work List (SWL) which is under the control of Start-up.

4.4.1.20 System Turnover (Chart C-19)

Procedure CP-T-1 establishes the requirements for reviewing and inspecting systems for hardware and software completeness prior to turnover to PECo Start-up.

The Systems Coordination Group coordinates activities between Construction, Start-up and Operations on items dealing with systems for turnover and post-turnover. The Discipline Construction System Engineer is responsible for the daily activities, such as coordinating work completion through supervision, Procurement, Project Engineering, and Quality Control. He must also: ensure timely completion of Field Change Notices, Design Change Notices, Field Change Requests, Balance of Plant Condition Reports, etc.; develop and maintain the system status punch list; ensure Blue Tag releases per procedure CP-T-3; and sign and date the original Punchlist/Exemption File signifying satisfactory completion of punch list items.

A major improvement over Limerick 1 is the use of a work package concept and the availability of the Material and Labor Control System (MLCS), which allows use of up-to-date information on system status, including schedule and man-hour information.

The system turnover process is depicted in Chart C-19. It begins with the scoped system definition (prepared by Start-up) and continues until turnover of the system to PECo Start-up (Pink Tag) for pre-operational testing. The chart also shows the preparation of the final punchlist, which is developed from the walkdown observations with support from the MLCS, and the transformation of that punch list into the Start-up Work List. The Start-up Work List is then maintained by the Start-up Group.

The process of Blue Tag release is governed by Procedure CP-T-3. The process of Blue Tag testing is discussed in Section 4.4.1.19, Blue Tag Testing.

4.4.1.21 Facility Turnover (Chart C-20)

The facilities turnover activities are described in Procedures CP-T-2 and CP-T-6, and are depicted in Chart C-20. This chart shows the work activities for the turnover of plant facilities to PECo Construction including the configuration control activity associated with this turnover.

The process starts 16 weeks in advance of interim turnover to PECo Construction and continues through the various stages of walkdowns and turnovers to the final turnover by Bechtel to PECo Nuclear Operations.

4.4.1.22 Load Adjustment Work Package (Chart C-21)

The purpose of load adjustment is to ensure that actual hanger loads agree with the loads used in the design calculations. Load adjustment is controlled by procedure CP-P-3 and is under the primary direction of the Pipe Hanger Construction Engineer.

All piping (from anchor point to anchor point) and all associated hangers must be complete prior to load adjustment. The primary inputs to the work package are controlled copies of the appropriate hanger drawings and a Load Adjustment Worksheet. Any changes to hanger configuration are controlled and documented.

4.4.1.23 Subcontractor Construction (Chart C-22)

Contractor installations such as fire protection, Reactor Pressure Vessel internals, special coatings, cooling towers and penetration seals are procedurally controlled by procedure CP-F-1 and shown on Chart C-22. This procedure does not include HVAC or Insulation subcontractors which are discussed in their respective sections.

Under the primary direction of the Lead Subcontract Administrator, subcontractors work under their own QA/QC programs including subcontractor inspections. Bechtel Construction and PECo independently provide audit and surveillance of the subcontractors' QA programs. Deviations from design are identified by the contractor to Bechtel Construction Engineering on Supplier Deviation Disposition Requests for disposition. These are processed by the Lead Subcontract Engineer to the appropriate construction or design organization.

4.4.1.24 Quality Control Program for "R" and "S" Listed Components (No Chart)

In addition to the 10 CFR 50, Appendix B, Quality Assurance Program, the PECo Construction Division maintains a Quality Control Program for Reliability and Safety (R and S)-listed components. The R and S review includes inspection of specific

attributes to the as-built drawings. The R and S program provides a "graded" quality assurance program for components and systems important to plant reliability and operations efficiency. "R" listed components are those non-Q-listed plant components "whose integrity and operability are required for plant reliability and availability." "S"-listed components are "those non-Q-listed components, which are either difficult or impossible to maintain while the plant is in operation or whose failure could result in a release of radioactive material in the plant."

These requirements correspond to guidance from Regulatory Guide (RG) 1.143, "Design Guidance for Radioactive Waste Management Systems, Structures and Components Installed in Light-Water-Cooled Nuclear Power Plants" and RG 1.29, "Seismic Design Classification." Regulatory Guide 1.29 provides guidance in considering the potential for non-seismically qualified components to degrade seismically qualified (Q-Listed) components.

4.4.1.25 Welding and Non-Destructive Examination (No Chart)

Welding is controlled as a special process in accordance with approved procedures. Administrative control of welding activities on site is established by Procedures CP-W-1 and CP-W-2. The Lead Construction Welding Engineer has the primary responsibility for implementing these procedures. CP-W-1 includes the following major control areas: Organizational Responsibilities, Welder Qualification and Control Welding Specification, Control and Documentation, Independent Review, and Inspection Activities.

All welding is performed to procedures which are based on engineering specifications, codes and standards and qualified by a staff group member of Materials and Quality Services. All welders are trained and qualified in accordance with appropriate code and procedural requirements prior to any welding on permanent plant equipment. Only qualified welders are issued filler metal from controlled weld rod issue rooms. The welding activity itself is administratively controlled through the use of a "Weld Request Form" initiated by the responsible construction engineer and reviewed by both the Welding Engineer and Quality Control (QC). Processing of the weld request form allows Engineering to identify specific welding parameters and establish required hold points. QC also identifies the required Non-Destructive Examination (NDE) for each individual welding activity.

NDE is also controlled as a special process in accordance with approved procedures. These procedures are developed to meet the technical requirements of the ASME or American Welding Society (AWS) codes. The NDE procedures are implemented by QC personnel

who are qualified and certified in accordance with Society of Nondestructive Testing SNT-TC-1A requirements. SNT-TC-1A, "NTS Personnel Qualification and Certification Standard Recommended Practice," is a guideline for NDE requirements (NTS-Non-destructive Testing Standards). The application of NDE to welding provides the final acceptance criteria for welds required to meet ASME and AWS code technical requirements.

4.4.1.26 Quality Control Inspection Instructions and Reports (No Chart)

Quality control activities during the construction phase are planned, controlled, executed and documented in accordance with approved procedures. A set of Project level generic procedures, Project Special Provisions (PSP), provide the overall program requirements and format for developing specific generic Quality Control Instructions (QCIs). These generic instructions are developed for each inspection activity which is performed on a continuing basis (e.g., welding inspection, piping installation inspection, pipe support installation inspection etc.). Included as part of the generic instruction is a standard inspection report form which provides content and format requirements for each individual inspection report document. QC Inspection Reports (QCIRs) are initiated and scoped in relation to the construction work package which requires the QC inspection activity. This identification to the work package provides a definitive association with the completion of work activities and the corresponding acceptability of the hardware. The QCIR becomes the quality documentation representing acceptance of the as-built condition to the Engineering approved design requirements.

4.4.2 Program Assessment

The RPA for construction focused on the following major questions.

1. Is a process in place for "translating" design requirements, specifications and drawings into construction directions and requirements?

2. Is a process in place that can provide documented assurance that the installation accurately reflects the design?

3. Are the above processes sufficiently integrated to support the conclusion (when properly executed) that the constructed plant is complete and is accurately reflected in the configuration documents?

The RPA conducted many interviews with Bechtel and PECo construction personnel and reviewed Bechtel's construction procedures to arrive at an assessment.

At the time of Limerick 2 delay, substantial portions of the civil construction and HVAC and pipe fabrication had been completed. Configuration control of the initial construction and during the Limerick 2 delay was maintained to the same specifications and procedures that were used for Limerick 1, which was subsequently licensed. Additionally, all Limerick 2 facilities and systems, including those constructed prior to the delay, will be subjected to the walkdowns, testing and turnover requirements of the current construction procedures. The construction activity since restart has been performed to documented procedures for all phases up through system turnover. These procedures were reviewed and incorporated in the process charts developed in this Readiness Program Assessment.

Construction work since the restart in February of 1986 has been controlled using a discrete work package approach or equivalent. This method has enhanced management control, planning and organization of the work. Each work package is governed by documented procedures that define the process, scope and special features of that discrete work element. The result of this work package approach is a well defined construction process that can be managed and monitored. Construction problems can be isolated and resolved. This process enhances the ability to clearly show that the construction was performed completely and in a deliberate, controlled manner, providing assurance of construction completion and readiness.

A major contributor to the assurance of readiness to operate Limerick 2 results from having completed those portions of the design needed to support the construction work flow prior to restart. The full scope of the construction work and interrelated construction interfaces was understood at the outset of work package preparation and has required fewer design changes during the construction process.

A number of lessons learned in Limerick 1 construction have been factored into the Limerick 2 construction completion program. These are designed to improve the Start-up phase of Limerick 2 without materially altering its design. Most notable among these formal programs which address lessons learned from Limerick 1 are:

- Equipment alignment work packaging during construction;
- The hanger reduction program;
- Valve rework program improvements; and
- Earlier conversion from bulk commodity tracking to system tracking and, therefore, system closeout work earlier in the process.

Another improvement is the user-friendly computer data base called the Material and Labor Control System (MLCS). This system has been widely used to maintain bulk construction status and to monitor system open items. The system has been a substantial enhancement over several non-interactive data bases. As is the

case for the work package approach, this MLCS management tool has allowed construction management personnel to focus on construction problems and construction planning in a more orderly manner to facilitate construction completeness. This system will enhance the proof of construction completion and readiness.

The Reliability and Safety (R and S) inspection function for non-Q List items is a method of addressing important-to-operations items with a graded quality program. It has been used extensively to assure various systems (i.e., rad waste, fire protection, main turbine-generator, and other systems/components important to operations) are constructed and tested in accordance with the design requirements. In addition, ALARA concerns not related to civil structures are addressed by this program.

The conclusion of this assessment is that PECo and Bechtel have developed a systematic and well integrated construction program. There are strong programatic and procedural links between Engineering, Construction, and Quality Assurance/Quality Control. The work package approach when combined with the Material and Labor Control System provides a valid approach to assessing the remaining work. Walkdowns in the turnover process and start-up testing provide the assurance that construction is complete. An audit or sampling program was not done as part of this assessment. However, the consistent understanding of procedures by the many personnel interviewed is a good indicator of program implementation. Full execution of the construction work using these documented processes and procedures will assure that construction is completed in conformance with design documents, thereby providing the basis for the conclusion that the as-built facilities and systems conform to the FSAR and other regulatory commitments.

4.4.3 Open Items

4.4.3.1 Facility Turnover to Enhance Configuration Control

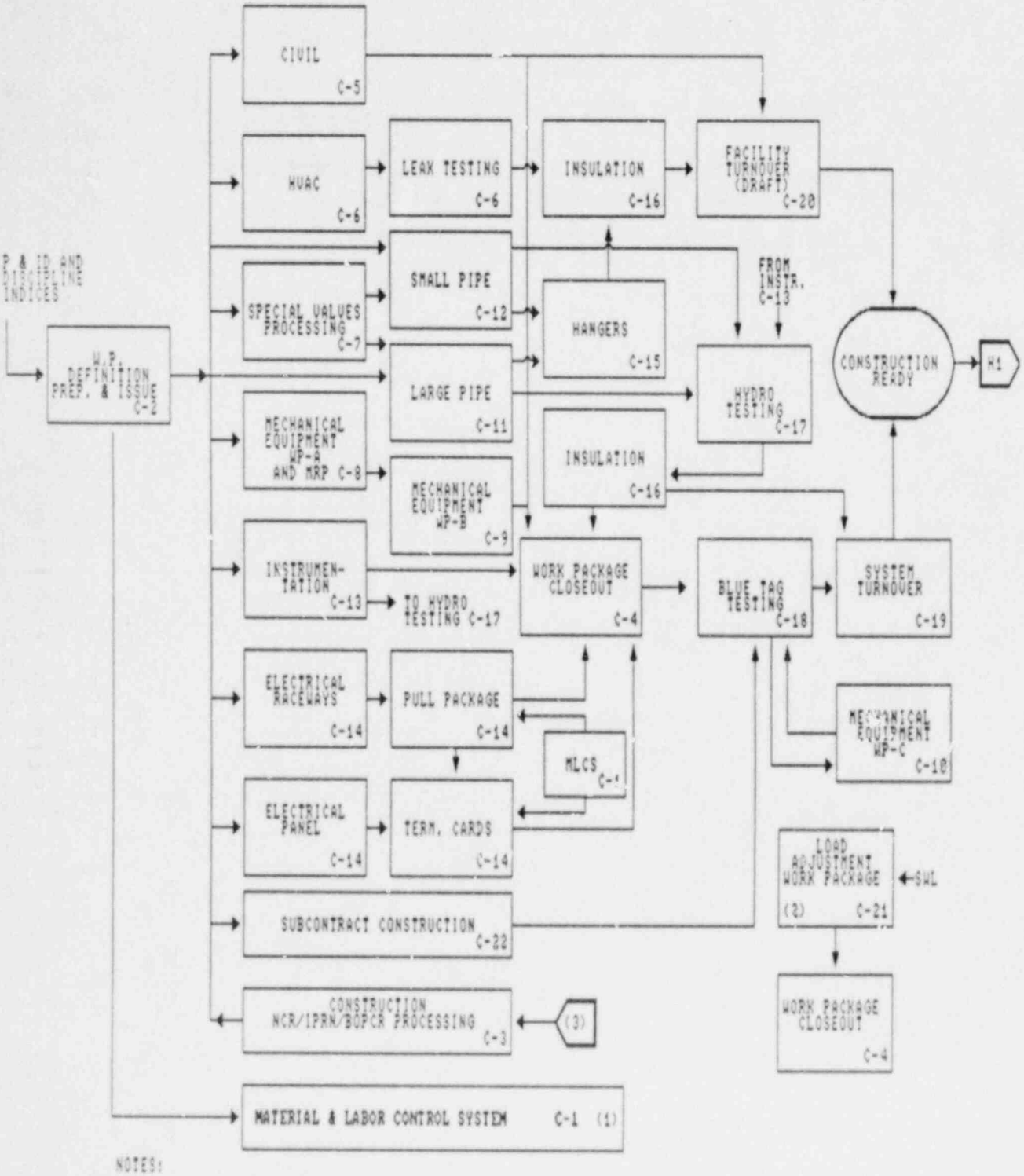
The facility turnover process, as depicted in Chart C-20, represents the planned facility turnover to PECo Nuclear Operations. This chart is a depiction of the turnover process described in CP-T-6 draft, dated August 12, 1987. A final walkdown is performed just prior to interim turnover to PECo Construction. From this point onward, Facility Configuration Control is invoked. Any trades work requires a Facility Configuration Control Form and subsequent inspections and walkdowns. In addition, housekeeping walkdowns are conducted. However, substantial start-up work and other controlled work will be conducted during this interim turnover period. It is planned that when CP-T-6 is issued for use, it will require a second walkdown just prior to transfer from PECo Construction to Nuclear Operations to inspect for facility-related items such as

cleanliness; damage to items such as insulation, paint and lighting; and missing items, such as fire extinguishers and first aid kits. This walkdown will employ a checklist which is a subset of the one provided in the Facility Configuration Control Program.

CONSTRUCTION READINESS CHARTS

C-0	CONSTRUCTION (2ND TIER)
C-1	MATERIAL AND LABOR CONTROL SYSTEM (MLCS)
C-2	WORK PACKAGE DEFINITION, PREPARATION AND ISSUE
C-3	CONSTRUCTION NCR/IPRN/BOPCR PROCESSING
C-4	WORK PACKAGE CLOSEOUT
C-5	CIVIL
C-6	HVAC
C-7	SPECIAL VALVE PROCESSING
C-8	MECHANICAL EQUIPMENT WP-A AND MRP
C-9	MECHANICAL EQUIPMENT WP-B
C-10	MECHANICAL EQUIPMENT WP-C
C-11	LARGE PIPE (2 1/2" AND ABOVE)
C-12	SMALL PIPE (2" AND SMALLER NON-Q, NON-ASME AND TEMP. <300° DEGREES F)
C-13	INSTRUMENTATION
C-14	ELECTRICAL
C-15	HANGERS
C-16	INSULATION
C-17	HYDRO TESTING
C-18	BLUE TAG TESTING
C-19	SYSTEM TURNOVER
C-20	FACILITY TURNOVER
C-21	LOAD ADJUSTMENT WORK PACKAGE
C-22	SUBCONTRACT CONSTRUCTION

C-0
CONSTRUCTION
(2ND TIER)



NOTES:

(1) THE INTERFACES WITH THE MLCS ARE SHOWN IN THE DETAILED CHARTS C-2 THROUGH C-22

(2) THIS WORK IS PERFORMED DURING THE STARTUP PHASE

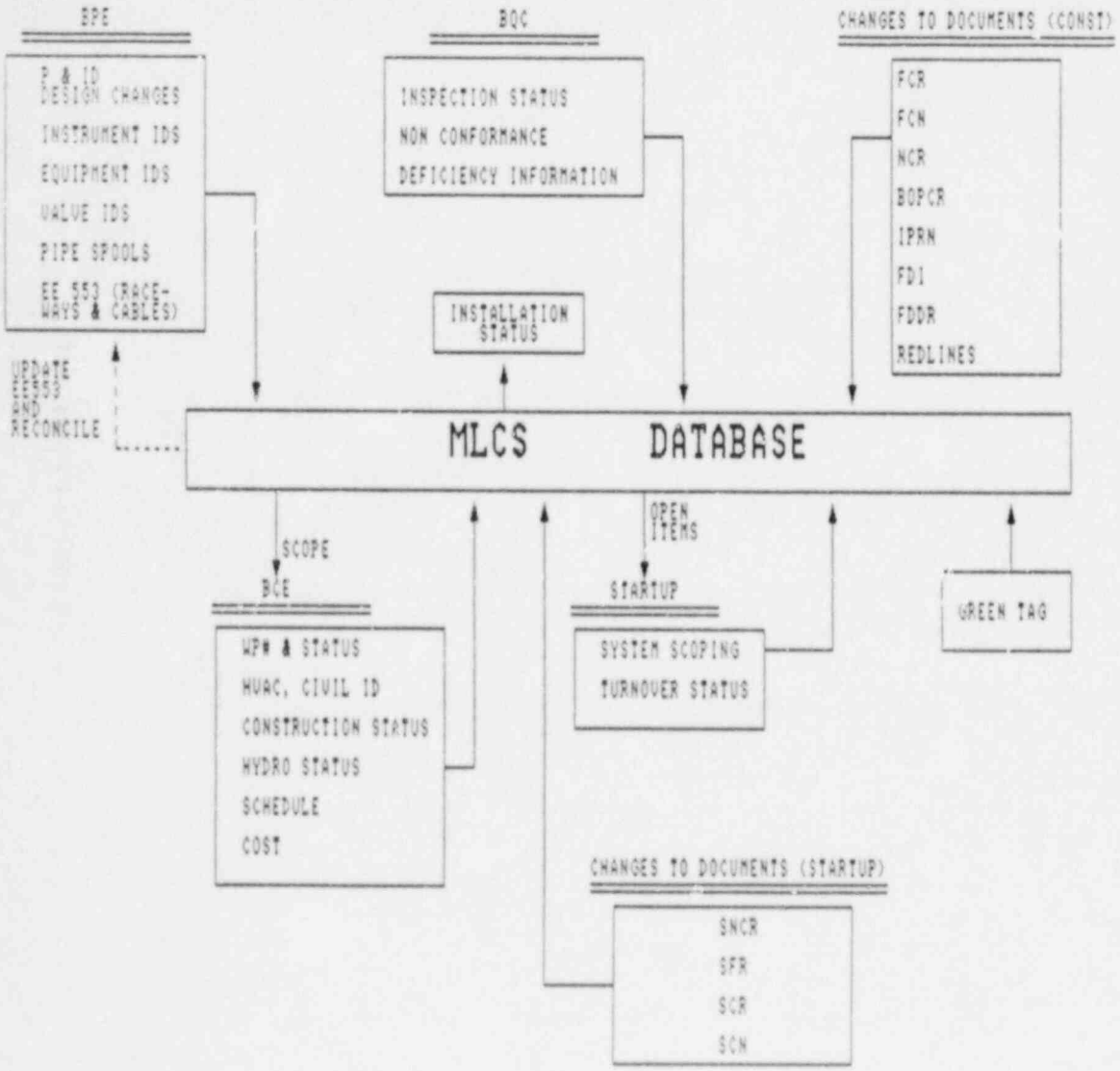
(3) INPUT FROM ALL OTHER CHARTS EXCEPT, C-1, C-2, C-4, AND C-22

INCLUDED ARE ACTIVITIES COVERED BY CP-C-0, AS APPLICABLE.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-1

MATERIAL & LABOR CONTROL SYSTEM (MLCS)



LEGEND:

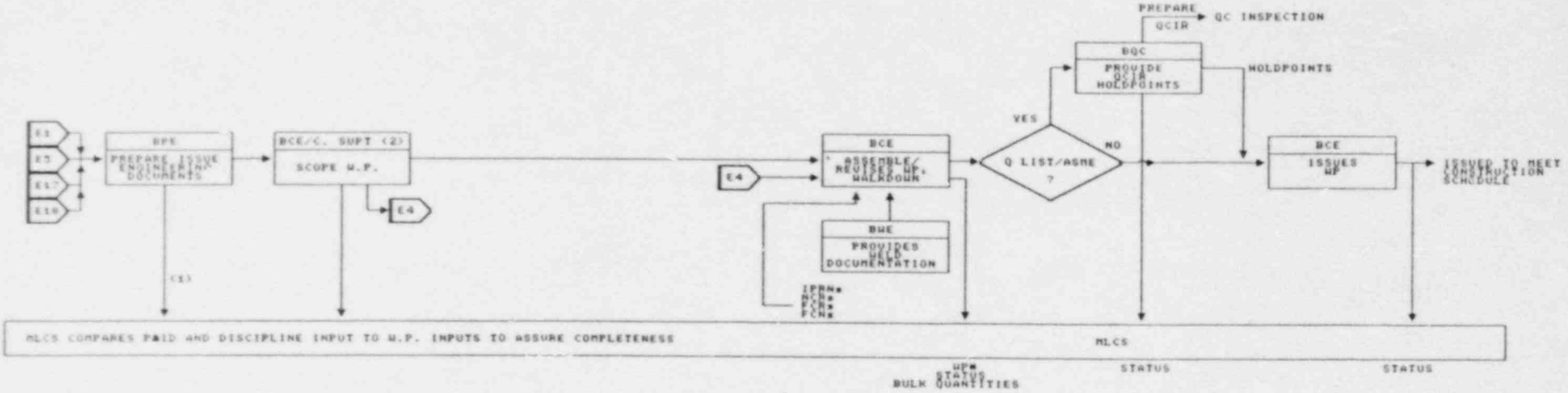
BPE - BECHTEL PROJECT ENGINEERING
B&E - BECHTEL CONSTRUCTION ENGINEERING
BQC - BECHTEL QUALITY CONTROL
EE - ENGINEERING IDENTIFICATION NUMBERS
P&ID - PIPING & INSTRUMENTATION DIAGRAM

NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-2

WORK PACKAGE DEFINITION, PREPARATION & ISSUE (3)



NOTES:

(1) FOR CIVIL & HVAC CONSTRUCTION; ENGINEERING INPUTS ALL MLCS DATA

(2) NOT FOR PIPE OR HANGERS; INSTRUMENTATION

(3) FOR DETAILS SEE THE DISCIPLINE PROCEDURES

LEGEND:

BCE - BECHTEL CONSTRUCTION ENGINEERING
BPE - BECHTEL PROJECT ENGINEERING
BWE - BECHTEL WELDING ENGINEER
BQC - BECHTEL QUALITY CONTROL
C. SUPT. - CONSTRUCTION SUPERINTENDENT
IPRN - IN PROCESS REWORK NOTICE
NCR - NON CONFORMANCE REPORT
FCR - FIELD CHANGE REQUEST
DCN - DESIGN CHANGE NOTICE
FCN - FIELD CHANGE NOTICE
QCIR - QUALITY CONTROL INSPECTION REPORT
MLCS - MATERIAL LABOR CONTROL SYSTEM

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

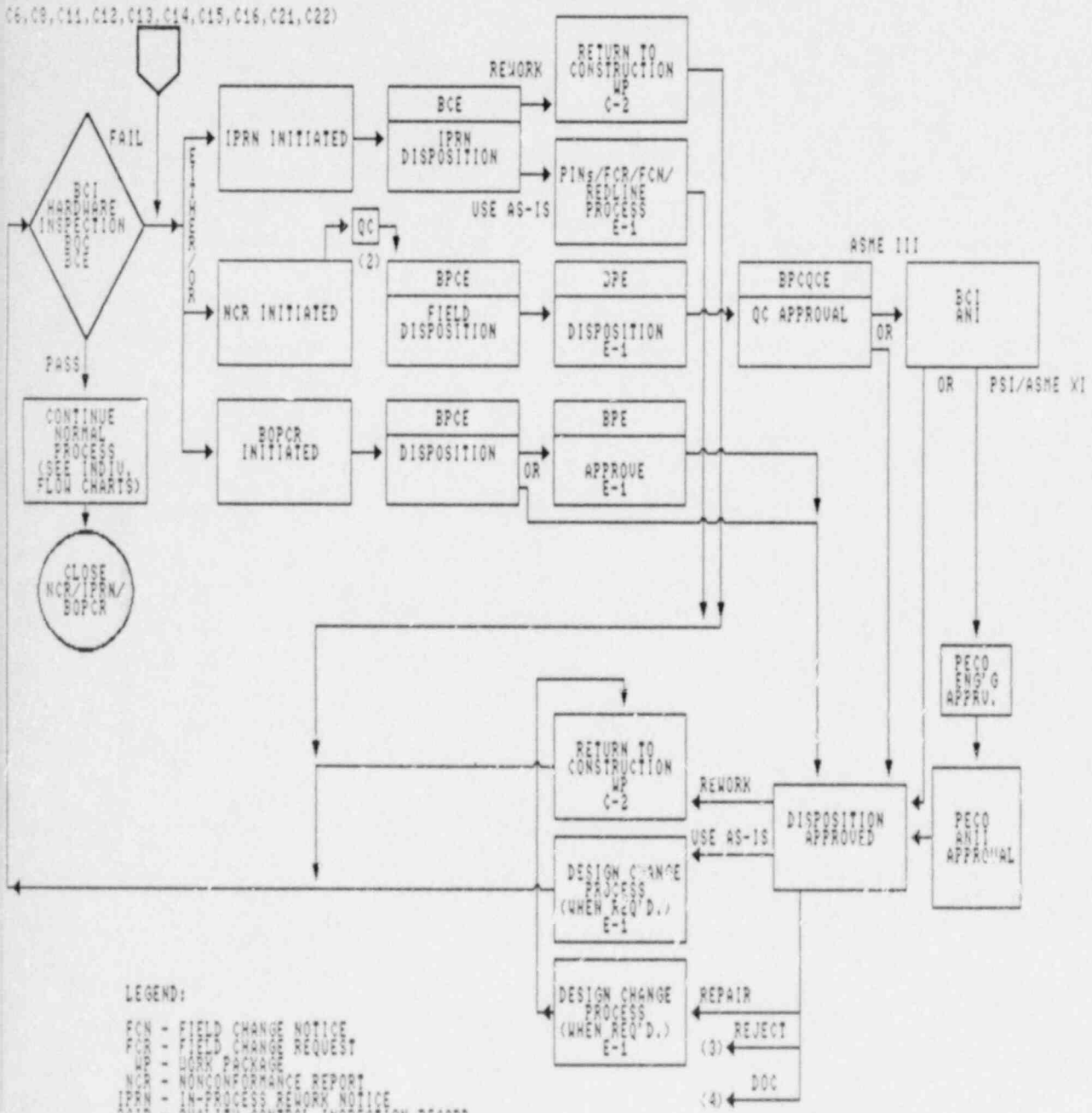
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

DISCIPLINE	APPLICABLE PROCEDURES
CIVIL	CP-C-9
ELECTRICAL	CP-E-1, CP-E-2, CP-E-3
HVAC	CP-M-3
INSTRUMENTATION	CP-J-1
MECHANICAL	CP-M-1
PIPE, HANGERS	CP-P-1, CP-P-2, CP-P-3
INSULATION	CP-Q-7
HYDROTESTING	CP-M-2
EXPANSION ANCHORS	CP-C-3

C-3

CONSTRUCTION NCR/IPRN/BOPCR PROCESSING

(PSP G-3.1/CP-D-3/CP-D-1)



LEGEND:

FCN - FIELD CHANGE NOTICE
FCR - FIELD CHANGE REQUEST
WP - WORK PACKAGE
NCR - NONCONFORMANCE REPORT
IPRN - IN-PROCESS REWORK NOTICE
QCIR - QUALITY CONTROL INSPECTION RECORD
ASME - AMERICAN SOCIETY OF MECHANICAL ENGINEERS
ANI - AMERICAN NUCLEAR INSPECTOR
AUTHORIZED NUCLEAR INSERVICE INSPECTOR
BOPCR - BALANCE OF PLANT CONDITION REPORT
PECO - PECO ENERGY
BPCE - BECHTEL PROJECT CONSTRUCTION ENGINEER
BPCQCE - BECHTEL PROJECT CONSTRUCTION QUALITY CONTROL ENGINEER
BCI - BECHTEL CONSTRUCTION, INC.
BQC - BECHTEL QUALITY CONTROL
PSI - PRESERVICE INSPECTION

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

NOTE:

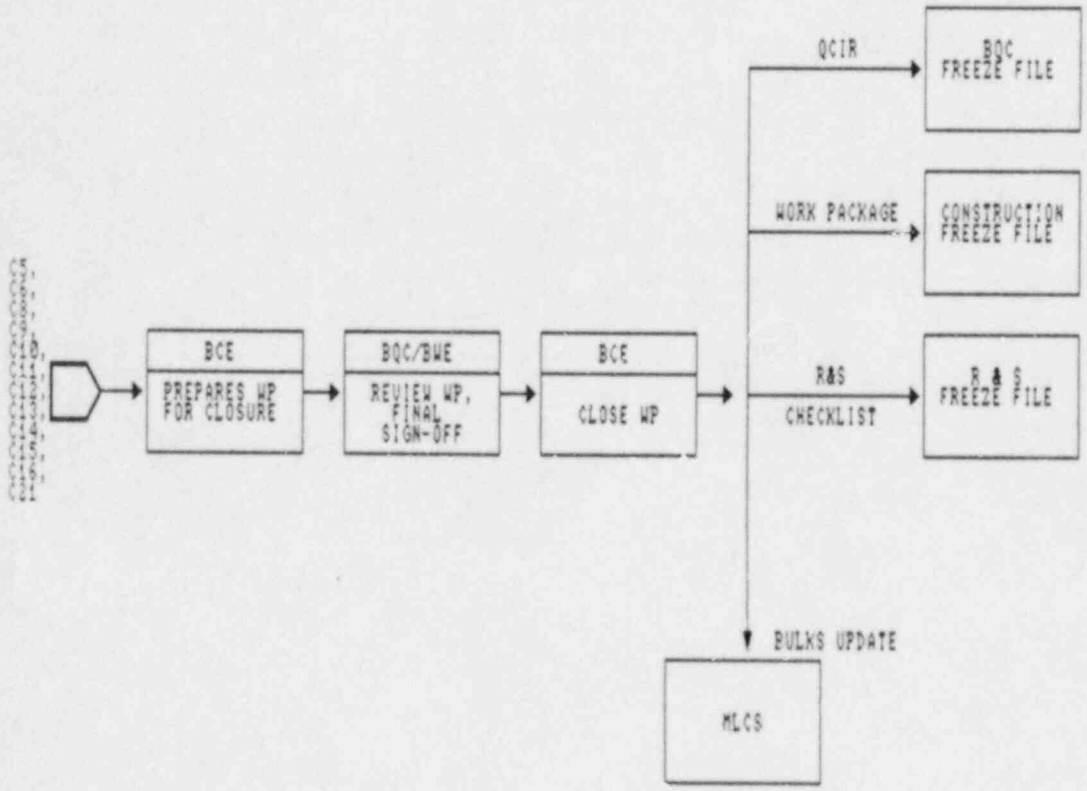
(1) A PERCENTAGE OF USE-AS-IS/REPAIR NCRs ARE REVIEWED BY PECO ENGINEERING AND PECO QA IN ACCORDANCE WITH QAI 15-1 TO ENSURE TECHNICAL AND QUALITY REQUIREMENTS ARE FULLY ADDRESSED.

(2) THE BPCQCE PERFORMS AN INITIAL EVALUATION FOR FURTHER REVIEW FOR REPORTABILITY SEE CHART Q-2.

(3) REJECT REQUIRES REPLACEMENT OF COMPONENT.

(4) DOC MEANS A VENDOR DOCUMENT DEFICIENCY THAT CAN BE RESOLVED BY COMPLETING THE DOCUMENTATION.

C-4
WORK PACKAGE CLOSEOUT



NOTES:

FOR FURTHER STEPS SEE THE APPLICABLE DISCIPLINE CHARTS.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

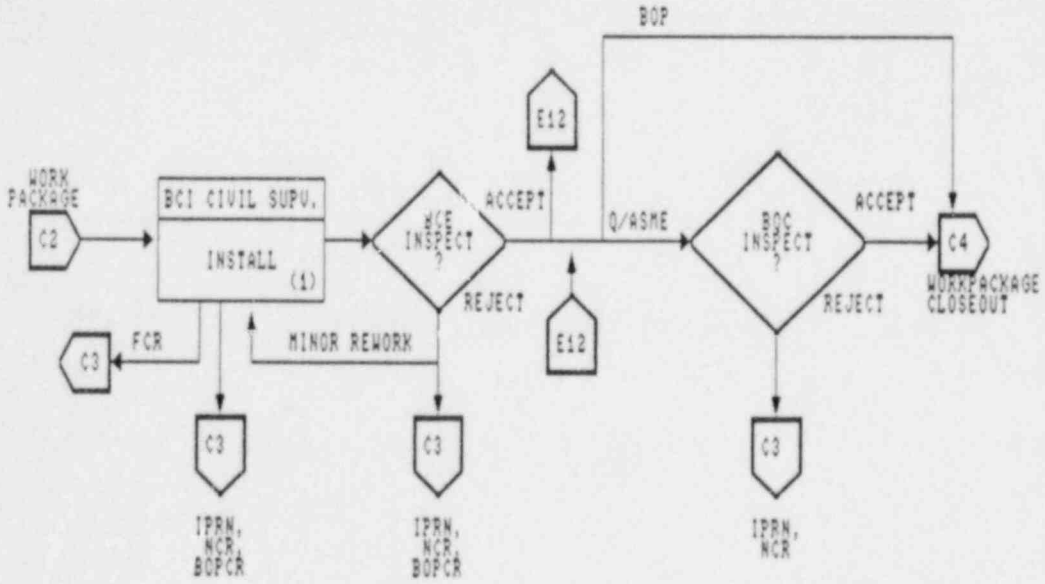
LENGEND:

BCE - BECHTEL CONSTRUCTION ENGINEER
BQC - BECHTEL QUALITY CONTROL
BWE - BECHTEL WELDING ENGINEER
R&S - RELIABILITY AND SAFETY (PECO)
QCIR - QUALITY CONTROL INSPECTION REPORT
BQA - BECHTEL QUALITY ASSURANCE
MLCS - MATERIAL AND LABOR CONTROL SYSTEM

C-5

CIVIL

(PROCEDURE CP-C-9)
(MATERIAL PROCUREMENT PER CP-F-1&2)
(DWGS & DESIGN CHANGES PER CP-D-1,3,7&9)



NOTE:

.1) IN PROCESS INSPECTION FOR CIVIL SPECS. IS BY BCE & BQC

INCLUDED ARE ACTIVITIES COVERED BY CP-C-1 AND CP-C-2.

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

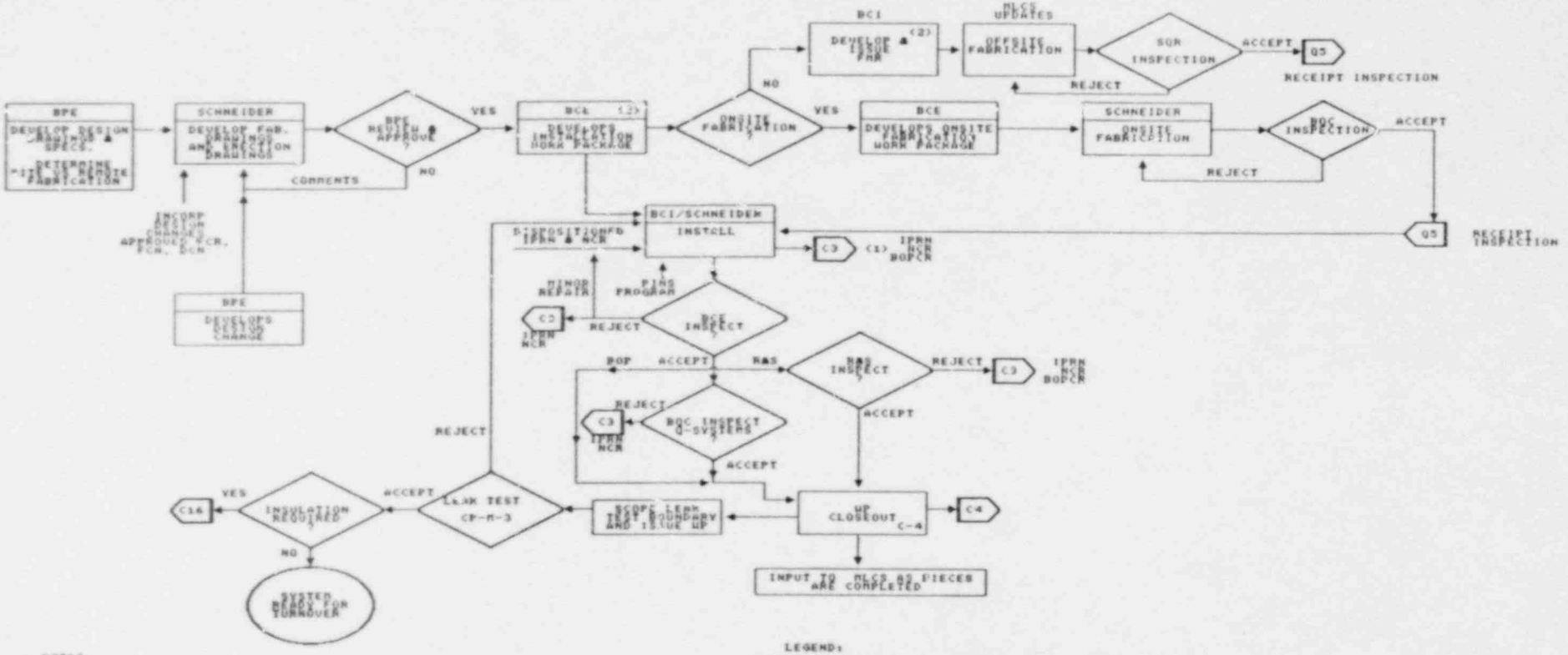
LEGEND:

WP - WORK PACKAGE
BCI - BECHTEL CONSTRUCTION
BCE - BECHTEL CONSTRUCTION ENGINEERING
BQC - BECHTEL QUALITY CONTROL
FCR - FIELD CHANGE REQUEST
IPRN - IN PROCESS REWORK NOTICE
NCR - NON CONFORMANCE REPORT
BOPCR - BALANCE OF PLANT CONDITION REPORT
BOP - BALANCE OF PLANT

C-6

HVAC

(PROCEDURE CP-M-3)



NOTES:

(1) IN PROCESS INSPECTION OF WELDING, CLEANESS & CONFIGUNATION

(2) VENDOR SURVEILLANCE NOT REQUIRED FOR NON Q-LIST ITEMS (SEE CP-A-1)

(3) MAJORITY OF INSTALLATION CAN PROCEED DO TO EXISTING INVENTORY OF EJCTWORK.

INCLUDED ARE ACTIVITIES COVERED BY CP-C-1, AS APPLICABLE.

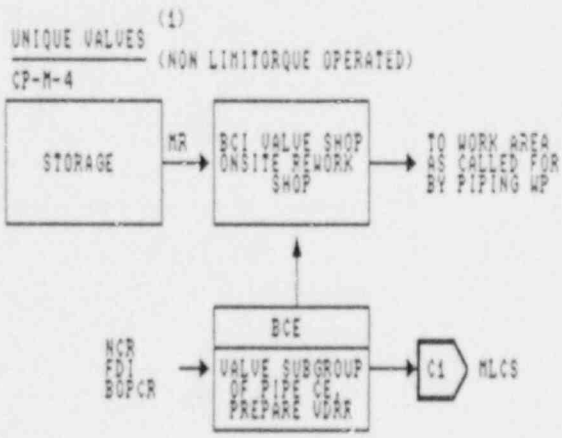
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY PROCEDURES. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

BPE - BECHTEL PROJECT ENGINEERING
BCA - BECHTEL CONSTRUCTION ENGINEER
BCE - BECHTEL CONSTRUCTION
M - MATERIAL CONTROL SYSTEM
C - CONSTRUCTION CHANGE NOTICE
WP - WORK PACKAGE
FCN - FIELD CHANGE NOTICE
BQP - BECHTEL QUALITY PROCEDURE
BQC - BECHTEL QUALITY CONTROL
QA - QUALITY ASSURANCE
I - INSPECTION
VCR - VENDOR CHANGE NOTICE
DCN - DESIGN CHANGE NOTICE
PCO - PROJECT CHANGE ORDER
FWR - FIELD WORK REQUEST
NCR - NON CONFORMANCE REPORT
FMR - FIELD MATERIAL REQUISITION

C-7
SPECIAL VALVE PROCESSING



LIMITORQUE OPERATED VALVES FM-4 PROGRAM

NOTE:

(1) VALVES 2 1/2" AND LARGER AND/OR Q/ASME VALVES

INCLUDED ARE ACTIVITIES COVERED BY CP-M-5.

LEGEND:

VDRR - VALVE DISASSEMBLY/REASSEMBLY RECORD
WP - WORK PACKAGE
NCR - NON CONFORMANCE REPORT
BOPCR- BALANCE OF PLANT CONDITION REPORT
FDI - FIELD DEVIATION INFORMATION
MR - MATERIAL REQUEST
MLCS - MATERIAL & LABOR CONTROL SYSTEM
BCI - BECHTEL CONSTRUCTION INTERNATIONAL
FE - FIELD ENGINEER

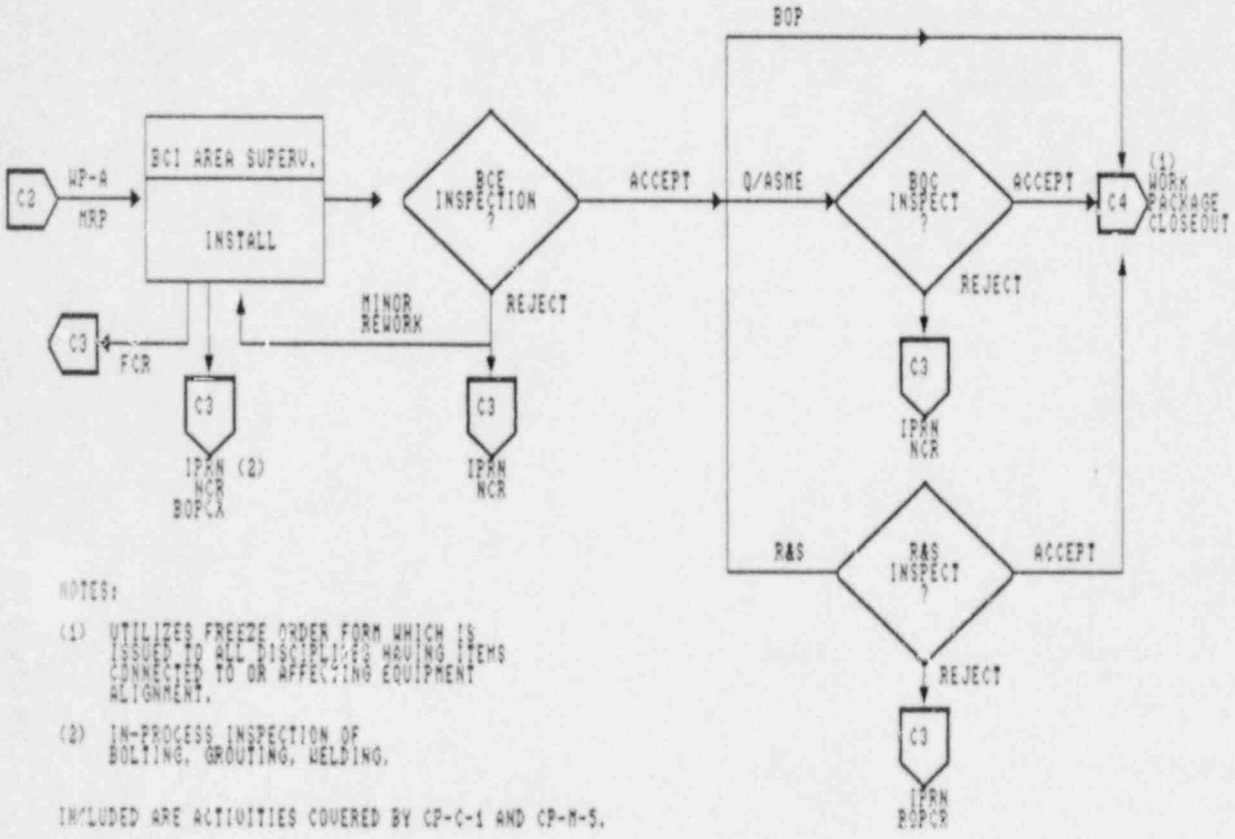
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-8

MECHANICAL EQUIPMENT WP-A AND MRP

(PROCEDURE CP-M-1)



NOTES:

(1) UTILIZES FREEZE ORDER FORM WHICH IS ISSUED TO ALL DISCIPLINES HAVING ITEMS CONNECTED TO OR AFFECTING EQUIPMENT ALIGNMENT.

(2) IN-PROCESS INSPECTION OF BOLTING, GROUTING, WELDING.

INCLUDED ARE ACTIVITIES COVERED BY CP-C-1 AND CP-M-5.

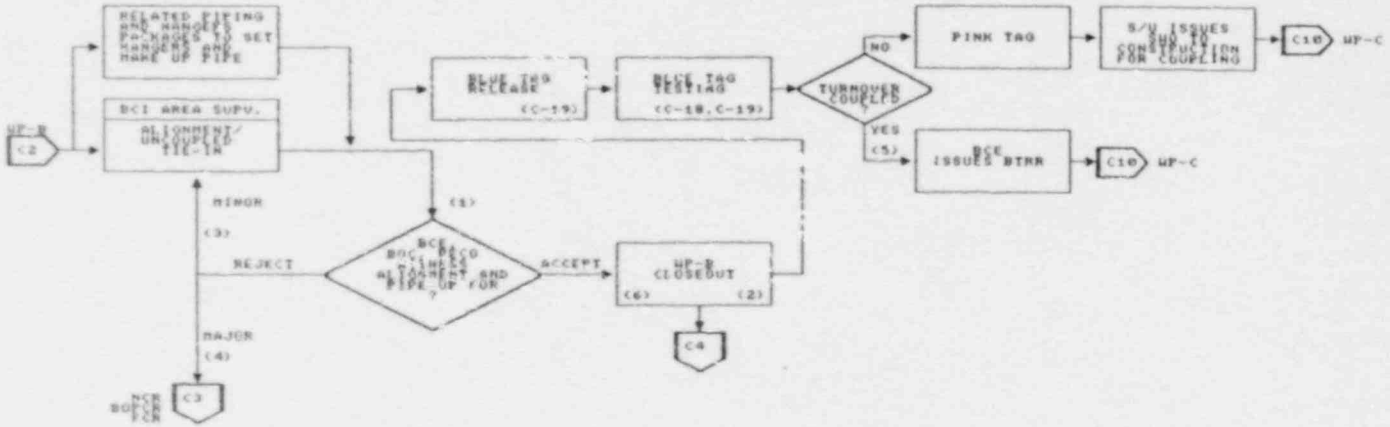
LEGEND:

WP - WORK PACKAGE
MRP - MODIFICATION/REWORK PACKAGE
BCI - BECHTEL CONSTRUCTION
BCE - BECHTEL CONSTRUCTION ENGINEERING
BQC - BECHTEL QUALITY CONTROL
R&S - RELIABILITY & SAFETY (PECO)
IPRN - IN-PROCESS REWORK NOTICE
BOPCR - BALANCE OF PLANT CONDITION REPORT
NCR - NONCONFORMANCE REPORT
FCR - FIELD CHANGE REQUEST
BOP - BALANCE OF PLANT

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-9
MECHANICAL EQUIPMENT WP-B
(PROCEDURE CP-M-1)



NOTES:

(1) BCE AND BQC INSPECTIONS ARE SIMULTANEOUS.

(2) COMPLETED WP-B ALLOWS RELEASE FOR BLUE-TAG TESTING.

(3) "MINOR" INCLUDES REALIGNMENT, TLEAKING HANGERS, ETC.

(4) "MAJOR" IF PROPER ALIGNMENT REQUIRES CUTTING PIPE/WELD (NCR, BOPCR) OR HANGER WORK IS REQUESTED THROUGH A FCR

(5) DURING SYSTEM TURNOVER AT MELDOWN 8 WEEKS PRIOR TO BLUE TAG RELEASE, IF AN ITEM IS REQUESTED BY STARTUP TO BE COUPLED PRIOR TO TURNOVER TO STARTUP IT WILL BE NO (S) ON EXCEPTION LIST.

(6) UTILITIES FREEZE ORDER FORM WHICH IS ISSUED TO ALL DISCIPLINES HAVING ITEMS CONNECTED TO OR AFFECTING EQUIPMENT ALIGNMENT.

INCLUDED ARE ACTIVITIES COVERED BY C[illegible] AND CP-M-2.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

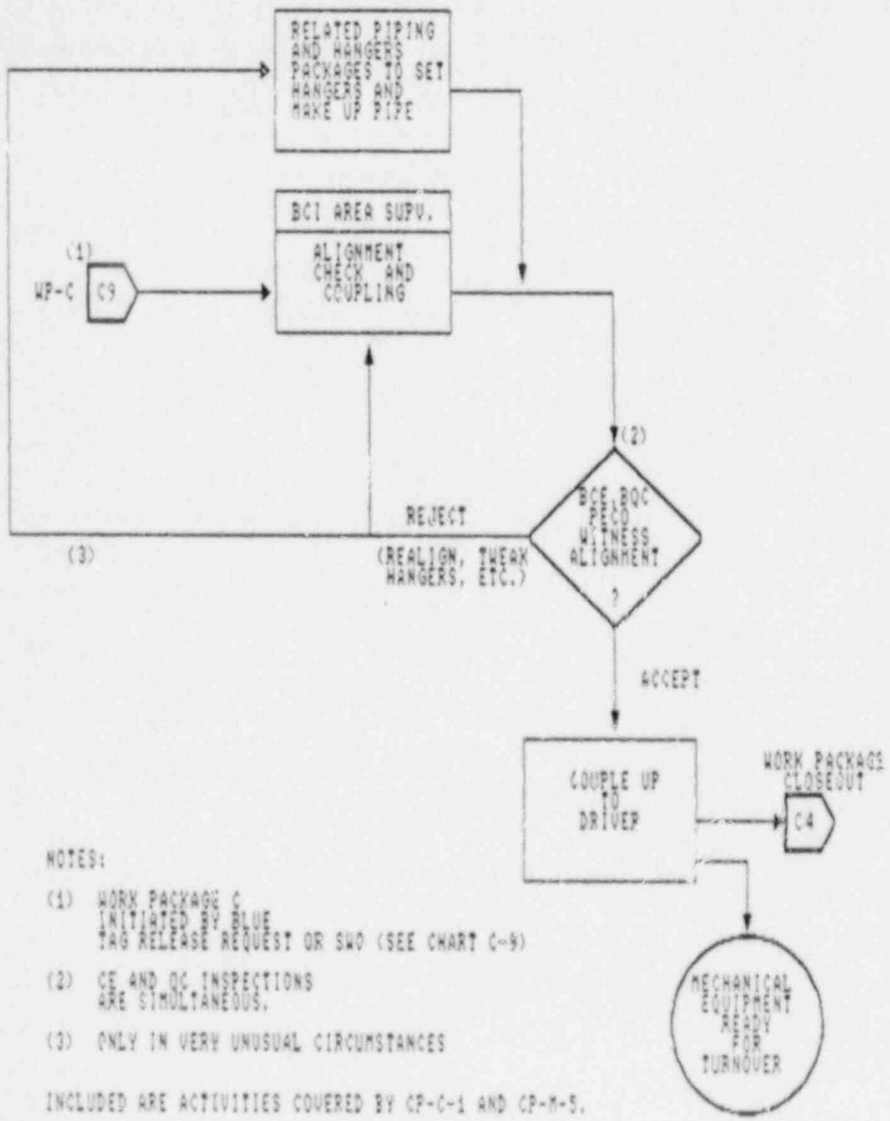
WP	=	WORK PACKAGE
BCI	=	BECHTEL CONSTRUCTION
BCE	=	BECHTEL CONSTRUCTION ENGINEERING
BQC	=	BECHTEL QUALITY CONTROL
BTRR	=	BLUE TAG RELEASE REQUEST
NCR	=	NONCONFORMANCE REPORT
BOPCR	=	BALANCE OF PLANT CONDITION REPORT
FCR	=	FIELD CHANGE REQUEST
SWO	=	STARTUP WORK ORDER

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

C-10

MECHANICAL EQUIPMENT WP-C

(PROCEDURE CP-M-1)



NOTES:

(1) WORK PACKAGE C INITIATED BY BLUE TAG RELEASE REQUEST OR SWO (SEE CHART C-9)

(2) CE AND QC INSPECTIONS ARE SIMULTANEOUS.

(3) ONLY IN VERY UNUSUAL CIRCUMSTANCES

INCLUDED ARE ACTIVITIES COVERED BY CP-C-1 AND CP-M-5.

LEGEND:

WP - WORK PACKAGE
BCI - BECHTEL CONSTRUCTION
BCE - BECHTEL CONSTRUCTION ENGINEERING
BQC - BECHTEL QUALITY CONTROL
BTRR - BLUE TAG RELEASE REQUEST
SWO - STARTUP WORK ORDER

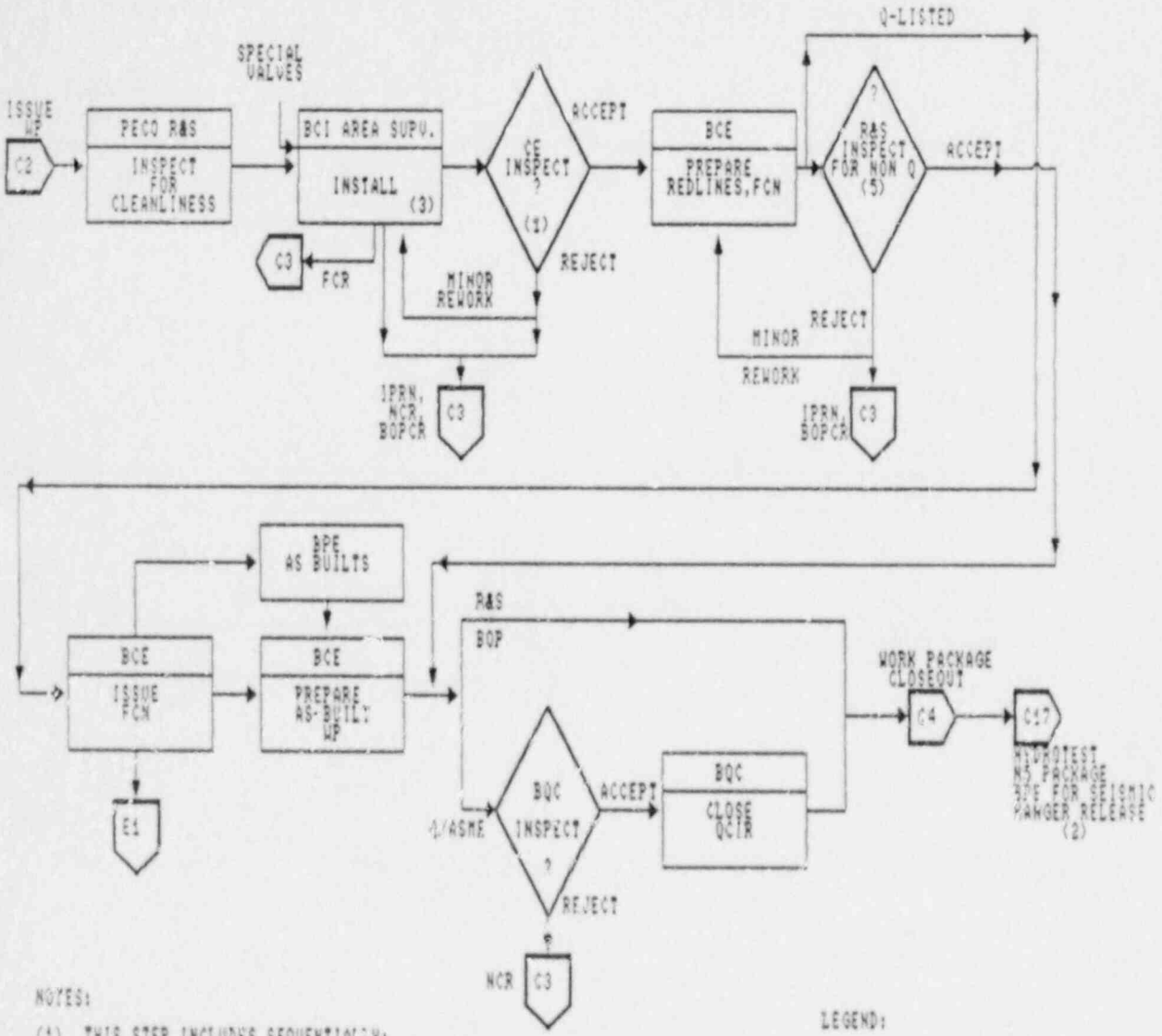
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-11

LARGE PIPE (2 1/2" AND ABOVE)

(PROCEDURE CP-P-2) (4)



NOTES:

(1) THIS STEP INCLUDES SEQUENTIALLY:
(A) INSPECTION OF WELDS BY WELDING ENGINEER
(B) INSPECTION OF WELDS BY QUALITY CONTROL (FOR Q)
(C) INSPECTION OF CONFIGURATION BY CONSTRUCTION ENGINEER

(2) WHEN THE ISOMETRIC(s) ARE INSTALLED FOR AN ENTIRE "ANCHOR-TO-ANCHOR" PROBLEM (MAY INCLUDE MULTIPLE WPs) & GRAVITY HANGERS INSTALLED, AS-BUILT CONFIGURATION IS PROVIDED TO BPE VIA FIELD AS-BUILT RECONCILIATION (FAR)

(3) IN PROCESS INSPECTIONS FOR WELDING, FITUPS, CONFIGURATION, CLEANLINESS

(4) SMALL PIPE THAT IS Q, ASME OR T)300 F FOLLOWS THIS FLOW CHART AND IS CONTROLLED BY CP-P-1

(5) PECO R&S SYSTEMS ONLY

LEGEND:

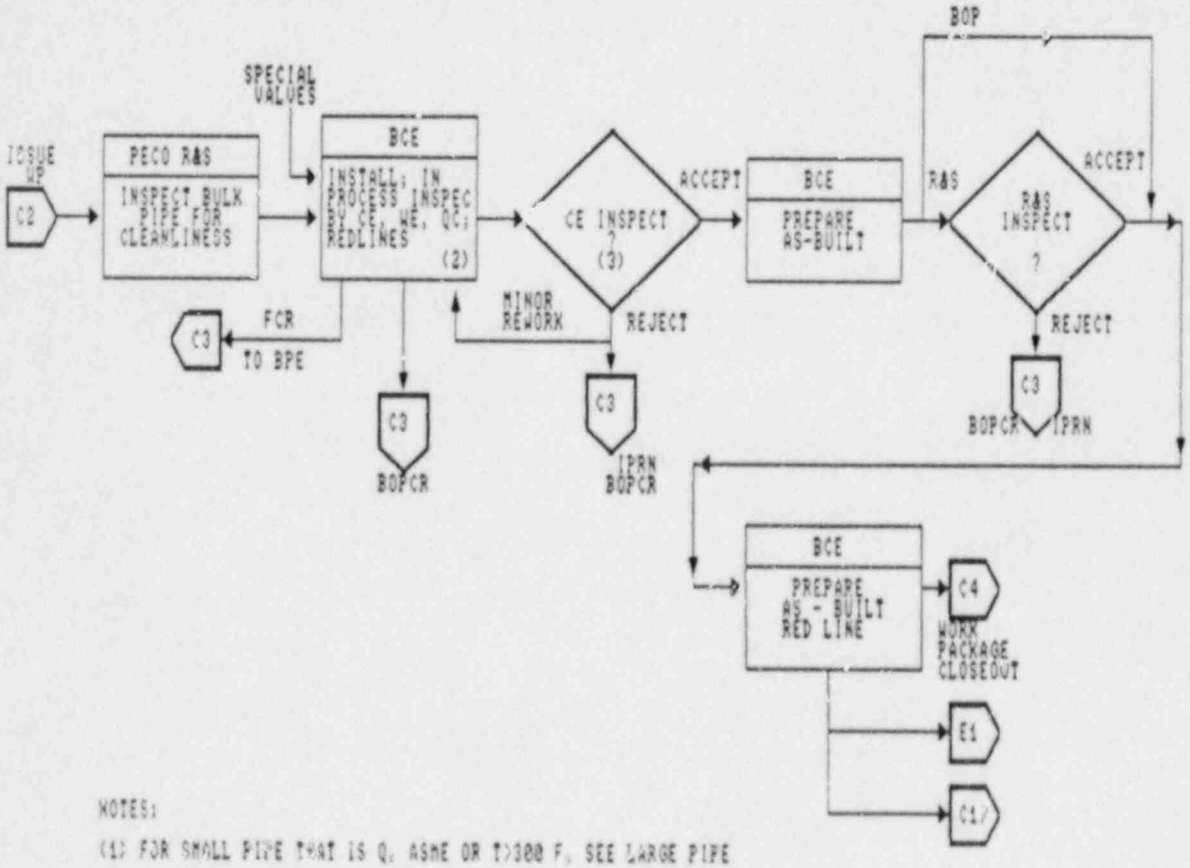
WP - WORK PACKAGE
BCI - BECHTEL CONSTRUCTION
BCE - BECHTEL CONSTRUCTION ENGINEERING
BQC - BECHTEL QUALITY CONTROL
R&S - RELIABILITY & SAFETY (PECO)
FCR - FIELD CHANGE REQUEST
FCN - FIELD CHANGE NOTICE
NCR - NON CONFORMANCE REPORT
BOPCR - BALANCE OF PLANT CONDITION REPORT
IPRN - IN PROCESS REWORK NOTICE
BPE - BECHTEL PROJECT ENGINEER
QCIR - QUALITY CONTROL INSPECTION REPORT
BOP - BALANCE OF PLANT

INCLUDED ARE ACTIVITIES COVERED BY CP-C-1, CP-P-6 AND CP-W-2.

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-12
SMALL PIPE
(2" AND SMALLER NON-Q, NON-ASME AND TEMP.<300° F)
(PROCEDURE CP-P-1) (1)



NOTES:

(1) FOR SMALL PIPE THAT IS Q, ASME OR T>300 F, SEE LARGE PIPE

(2) IN PROCESS INSPECTIONS FOR WELDING, FITUPS, CONFIGURATION, CLEANLINESS

(3) THIS STEP INCLUDES SEQUENTIALLY:

(a) INSPECTION OF WELDS BY WELDING ENGINEER
(b) INSPECTION OF CONFIGURATION BY CONSTRUCTION ENGINEER

LEGEND:

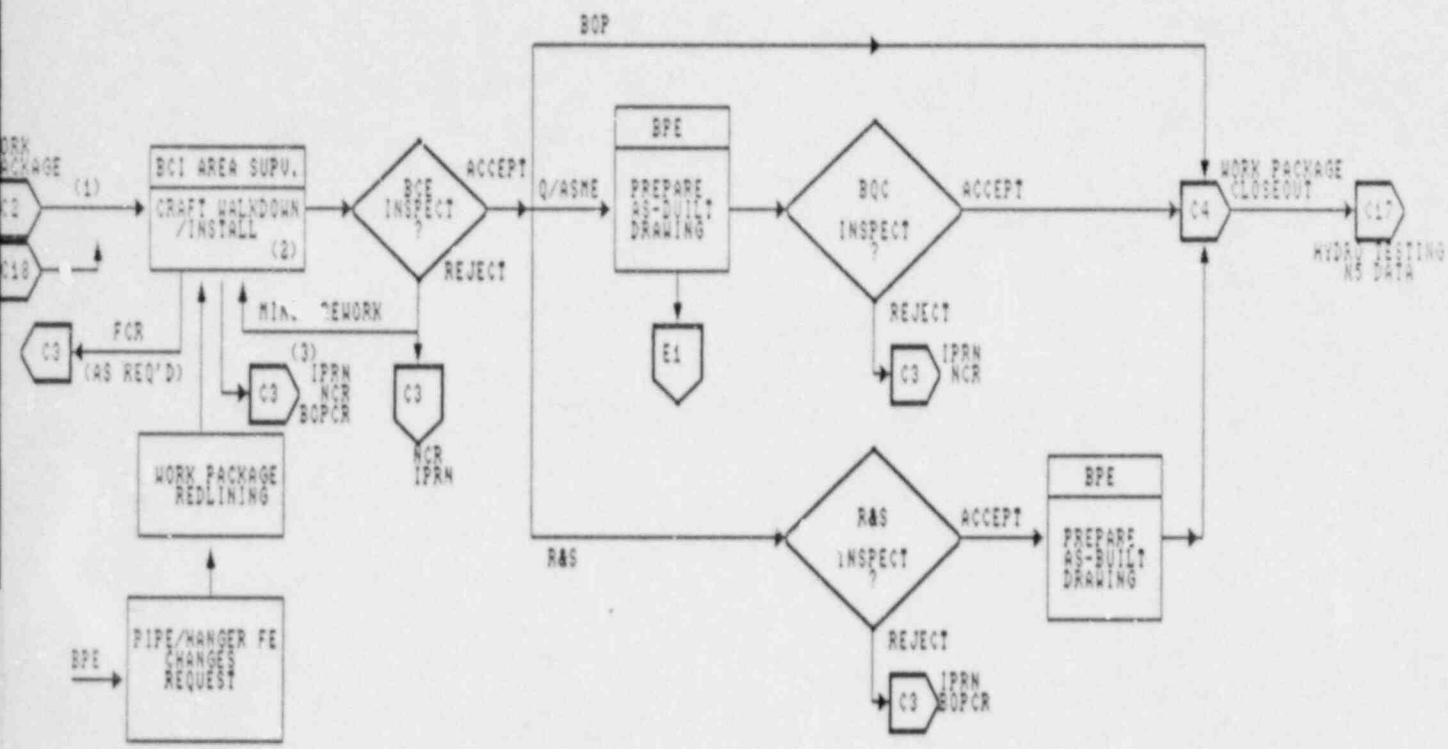
WP - WORK PACKAGE
BCE - BECHTEL CONSTRUCTION
BQC - BECHTEL QUALITY CONTROL
R&S - RELIABILITY & SAFETY (PECO)
WE - WELD ENGINEER
BPE - BECHTEL PROJECT ENGINEER
BOP - BALANCE OF PLANT

FCR - FIELD CHANGE REQUEST
FCN - FIELD CHANGE NOTICE
NCR - NON CONFORMANCE REPORT
BOPCP - BALANCE OF PLANT CONDITION REPORT
IPRN - IN PROCESS REWORK NOTICE

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-13
INSTRUMENTATION
(PROCEDURE CP-J-1)



NOTES:

(1) FOUR TYPES OF WPs:

- MOUNTING
- PROC. LINES - MONITORING
- PROC. LINES - INSTRUMENTATION
- FAB OR OTHER SPEC. WORK

(2) USE M-838 SPEC (TUBING COOKBOOK)

(3) INTERMEDIATE AS-BUILT REVISION (CHANGES AFTER INSTALLATION)

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

WP - WORK PACKAGE
BCI - BECHTEL CONSTRUCTION INC.
BCE - BECHTEL CONSTRUCTION ENGINEER
BQC - BECHTEL QUALITY CONTROL
R&S - RELIABILITY & SAFETY (PECO)
BPE - BECHTEL PROJECT ENGINEER
BOP - BALANCE OF PLANT
FCR - FIELD CHANGE REQUEST
NCR - NON CONFORMANCE REPORT
BOPCR - BALANCE OF PLANT CONDITION REPORT
IPRN - IN PROCESS REWORK NOTICE
FE - FIELD ENGINEER (PECO)

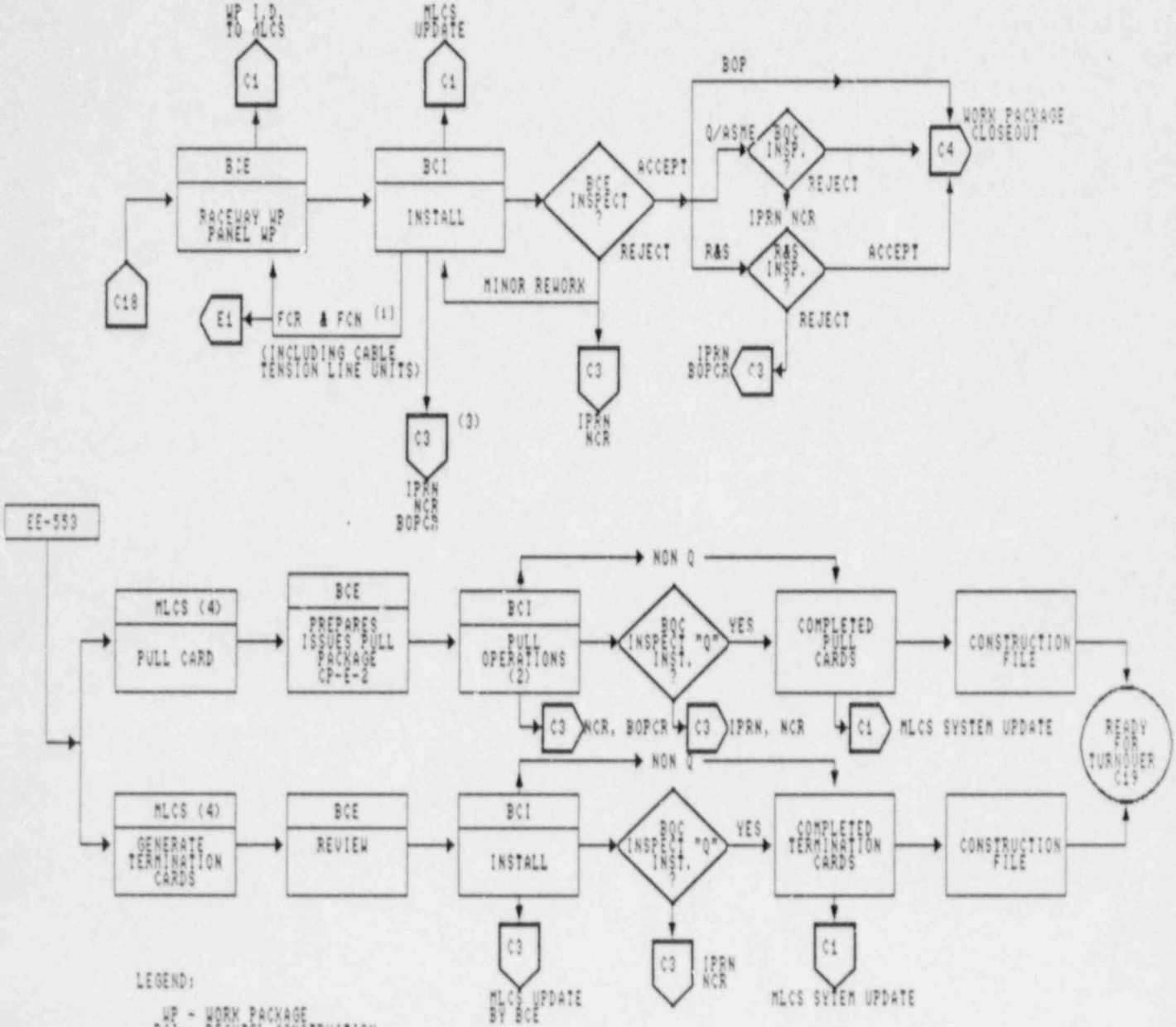
C-14

ELECTRICAL

PANELS: CP-E-1

CABLE & TERMINATIONS: CP-E-2

CONDUIT/CABLE TRAY: CP-E-3



LEGEND:

WP - WORK PACKAGE
BCI - BECHTEL CONSTRUCTION
BCE - BECHTEL CONSTRUCTION ENGINEERING
BOC - BECHTEL QUALITY CONTROL
R&S - RELIABILITY & SAFETY (PECO)
FCR - FIELD CHANGE REQUEST
FCN - FIELD CHANGE NOTICE
NCR - NONCONFORMANCE REPORT
BOPCR - BALANCE OF PLANT CONDITION REPORT
IPRN - INPROCESS REWORK NOTICE
MLCS - MATERIAL & LABOR CONTROL SYSTEM
BOP - BALANCE OF PLANT

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

NOTES:

(1) IF CALCULATIONS SHOW A TENSION PROBLEM: ISSUE A FCR TO MODIFY A RACEWAY.

(2) IF CABLE IS OVERTENSIONED, ISSUE A NCR OR BOPCR, AS REQUIRED.

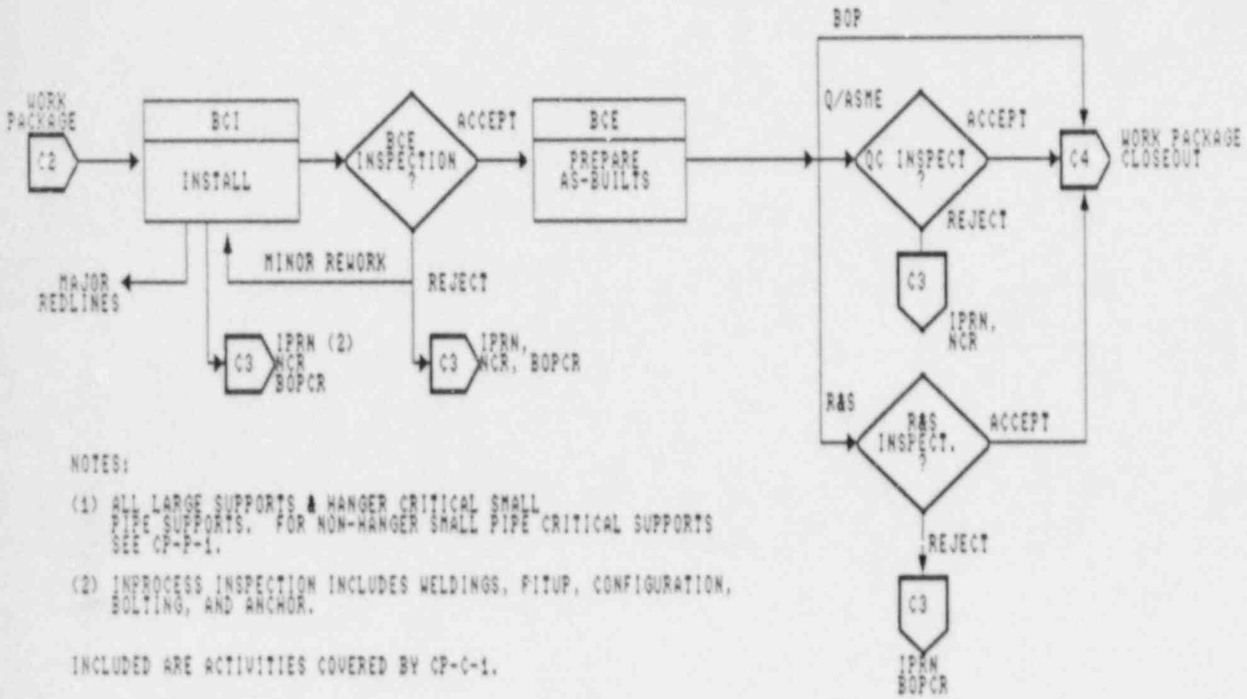
(3) IN-PROCESS INSPECTION INCLUDES WELDING CONFIGURATION, CABLE PULL, NCR & TERMINATION

(4) MLCS IS FED FROM EE-553 (BCI-DESIGN) INCLUDING RACEWAY & PANEL I/C

INCLUDED ARE ACTIVITIES COVERED BY CP-C-1, CP-E-4 AND CP-E-6.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-15
HANGERS
(PROCEDURE CP-P-3) (1)



NOTES:

(1) ALL LARGE SUPPORTS & HANGER CRITICAL SMALL PIPE SUPPORTS. FOR NON-HANGER SMALL PIPE CRITICAL SUPPORTS SEE CP-P-1.

(2) INPROCESS INSPECTION INCLUDES WELDINGS, FITUP, CONFIGURATION, BOLTING, AND ANCHOR.

INCLUDED ARE ACTIVITIES COVERED BY CP-C-1.

LEGEND:

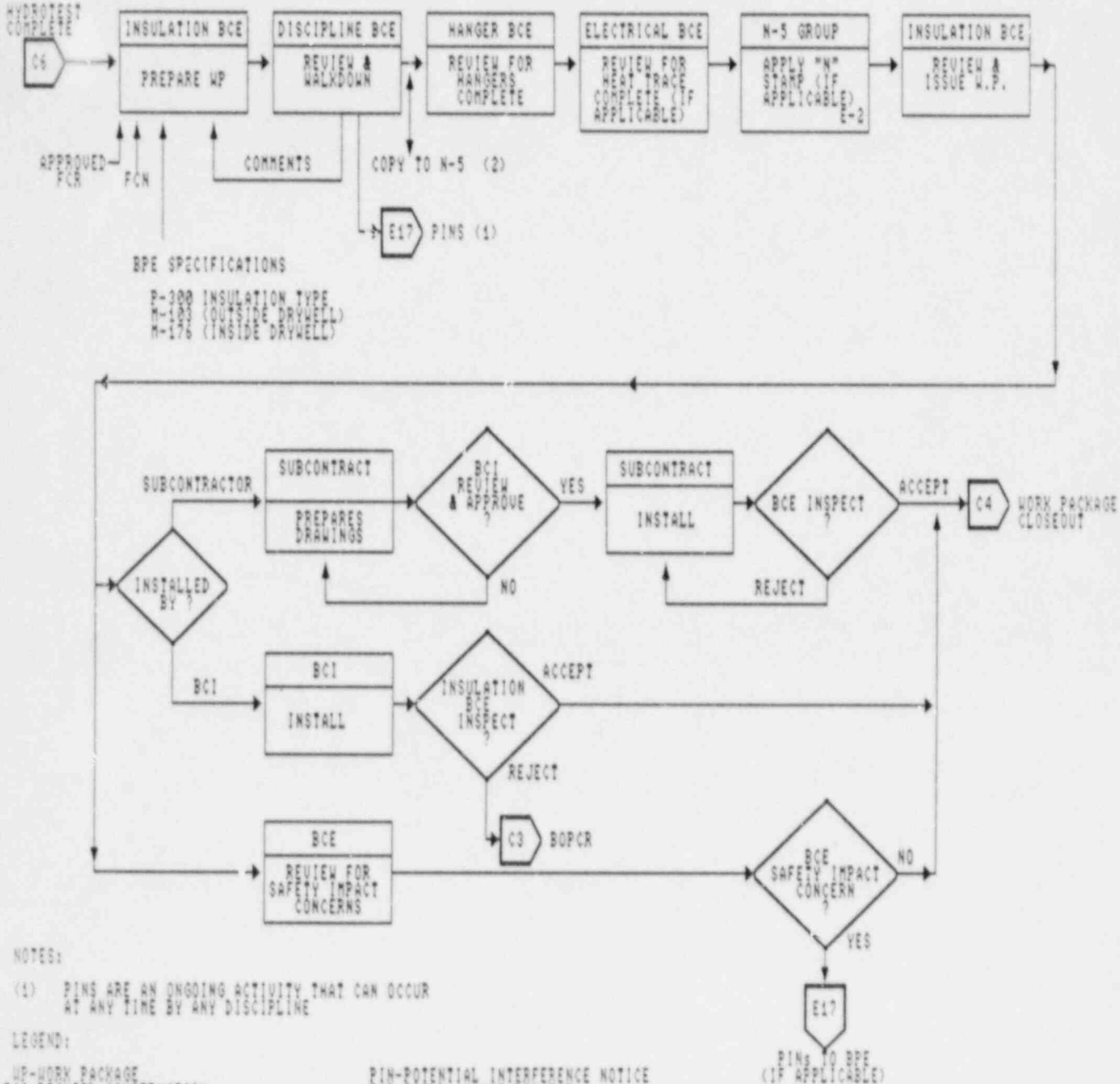
WP - WORK PACKAGE
BCI - BECHTEL CONSTRUCTION
BCE - BECHTEL CONSTRUCTION ENGINEERING
BQC - BECHTEL QUALITY CONTROL
R&S - RELIABILITY & SAFETY (PECO)
BOP - BALANCE OF PLANT
FCR - FIELD CHANGE REQUEST
FCN - FIELD CHANGE NOTICE
NCR - NONCONFORMANCE REPORT
BOPCR - BALANCE OF PLANT CONDITION REPORT
IPRN - INPROCESS REWORK NOTICE

NOTE:

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

C-16
INSULATION
(PROCEDURE CP-G-7)



NOTES:

(1) PINS ARE AN ONGOING ACTIVITY THAT CAN OCCUR AT ANY TIME BY ANY DISCIPLINE

LEGEND:

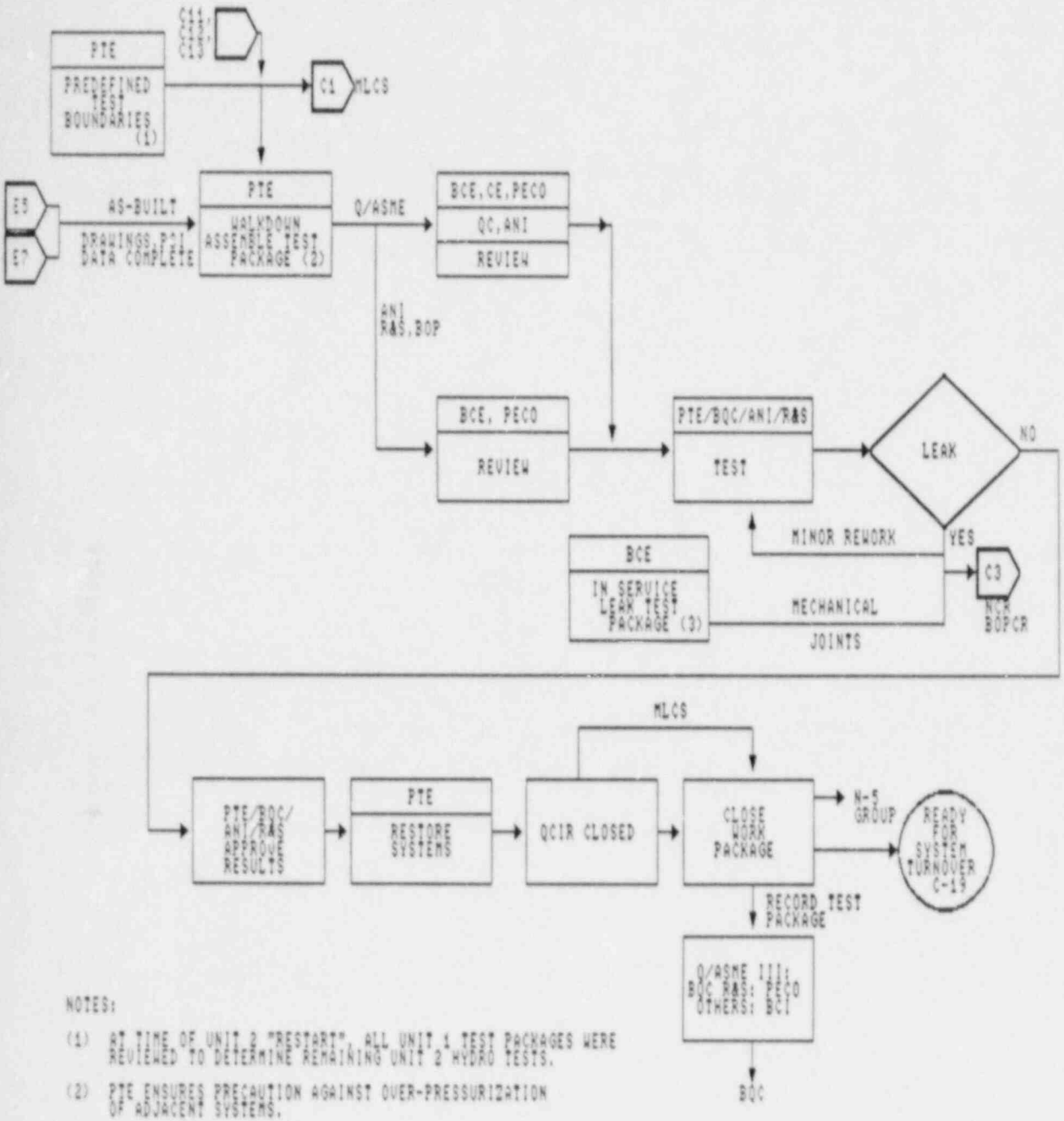
WP-WORK PACKAGE
BCI-BECHTEL CONSTRUCTION
BCE-BECHTEL CONSTRUCTION ENGINEERING
BQC-BECHTEL QUALITY CONTROL
BSC-BECHTEL SAFETY & SAFETY (BECO)
BPE-BECHTEL PROJECT ENGINEERING

PIN-POTENTIAL INTERFERENCE NOTICE
FCR-FIELD CHANGE REQUEST
FCN-FIELD CHANGE NOTICE
NCR-NONCONFORMANCE REPORT
BOPCR-BALANCE OF PLANT CONDITION REPORT
IPRN-INPROCESS REWORK NOTICE
MLCS-MATERIAL & LABOR CONTROL SYSTEM

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-17
HYDRO TESTING
(PROCEDURE CP-M-2)



NOTES:

(1) AT TIME OF UNIT 2 "RESTART", ALL UNIT 1 TEST PACKAGES WERE REVIEWED TO DETERMINE REMAINING UNIT 2 HYDRO TESTS.

(2) PTE ENSURES PRECAUTION AGAINST OVER-PRESSURIZATION OF ADJACENT SYSTEMS.

(3) IF A PERMANENT MECHANICAL POINT LEAKS DURING TESTING AND TORQUING OF JOINT PER CP-M-5 DOES NOT STOP LEAKAGE, IT SHALL BE NOTED ON MLCS SYSTEM AND AN INSERVICE TEST PACKAGE SHALL BE GENERATED (THE HYDRO TEST IS NOT TERMINATED).

LEGEND:

WP - WORK PACKAGE	ANI - AUTHORIZED NUCLEAR INSPECTOR
BCI - BECHTEL CONSTRUCTION	FCR - FIELD CHANGE REQUEST
BCE - BECHTEL CONSTRUCTION ENGINEERING	FCN - FIELD CHANGE NOTICE
BQC - BECHTEL QUALITY CONTROL	NCR - NONCONFORMANCE REPORT
R&S - RELIABILITY & SAFETY (PECO)	BOPCR - BALANCE OF PLANT CONDITION REPORT
PTE - PRESSURE TEST ENGINEER	IPRN - INPROCESS REWORK NOTICE
BOP - BALANCE OF PLANT	MLCS - MATERIAL & LABOR CONTROL SYSTEM
QCIR - QUALITY CONTROL INSPECTION REPORT	PSI - PRESERVICE INSPECTION

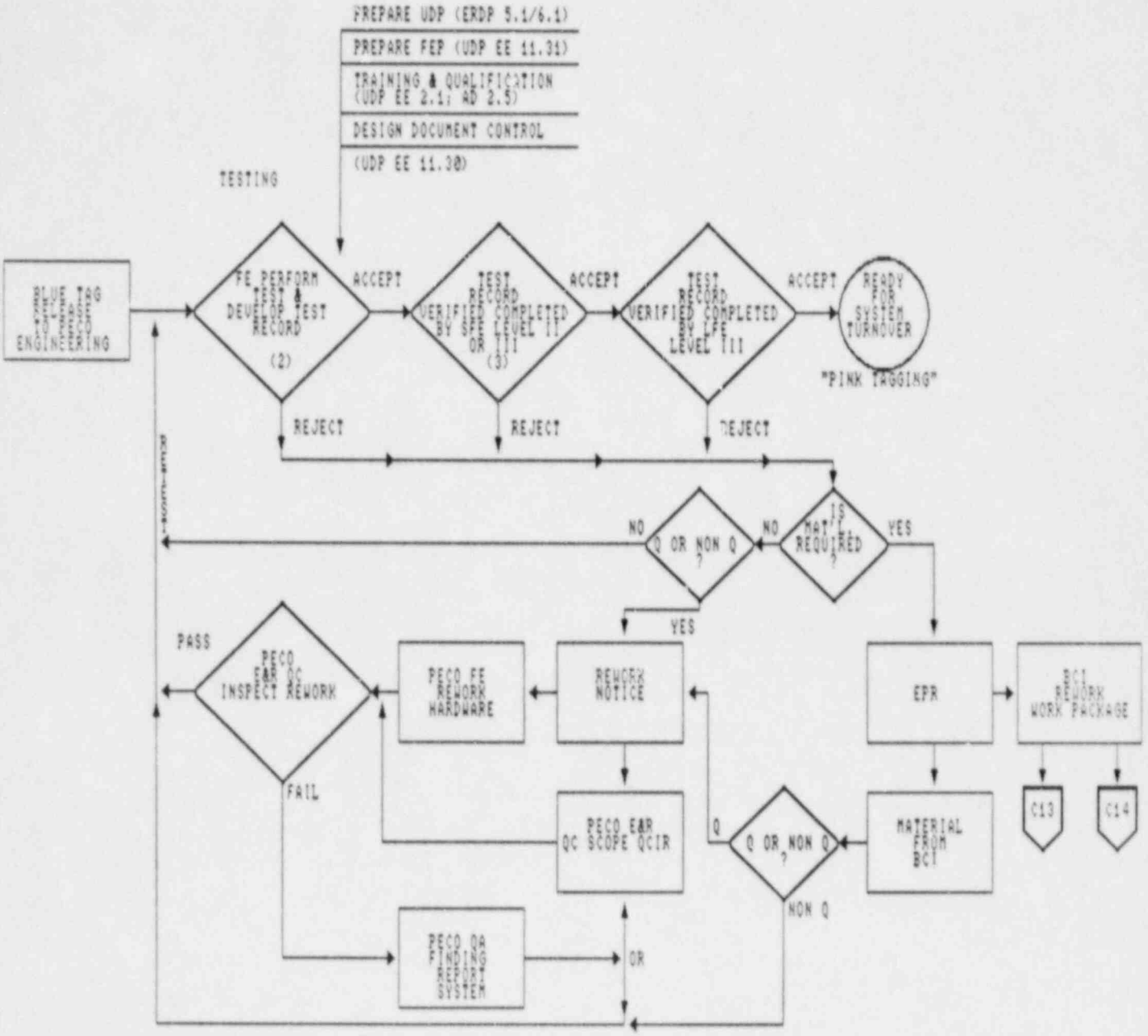
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-18

BLUE TAG TESTING

(PROCEDURE UDP EE 11.11) (1)



NOTE:

(1) COVERS ELECTRICAL CHECKOUT AND I&C CALIBRATION AND LOOP CHECK

(2) FOR DETAILED FLOW CHARTS OF TESTS SEE THE FOLLOWING FLOW CHARTS:
1. TECHNICAL TESTS (H-3)
2. I&C & LOOP CHECKS (H-5)
3. FIELD ENGINEERING TESTS (H-4)

(3) PECO FE ARE QUALIFIED TO N45.2.6

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

UDP - UNIQUE DIVISION PROCEDURES
FEP - FIELD ENGINEERING PROCEDURES
ERDP - ENGINEERING & RESEARCH DEPARTMENTAL PROCEDURE
AD - ADMINISTRATIVE PROCEDURE
SFE - SYSTEM FIELD ENGINEER
LFE - LEAD FIELD ENGINEER
T/O - TURNOVER
EPR - EQUIPMENT PROBLEM REPORT
E&R - ENGINEERING AND RESEARCH
FE - FIELD ENGINEER
BCI - BECHTEL CONSTRUCTION ENGINEER
QCIR - QUALITY CONTROL INSPECTION REPORT

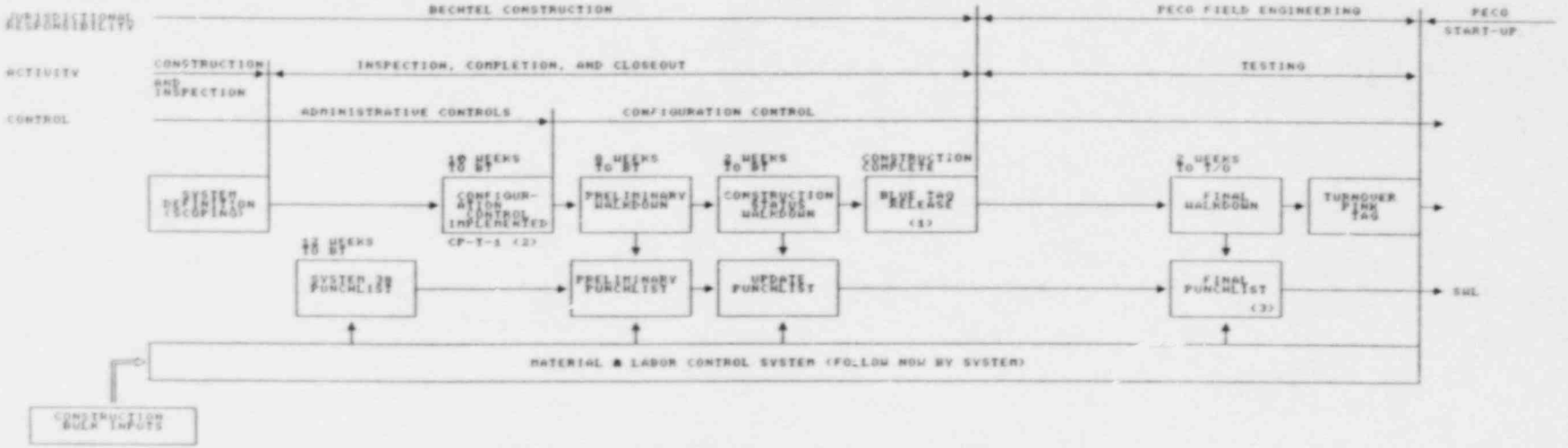
C-19

SYSTEM TURNOVER

99 SYSTEMS

183 TOTAL SYSTEMS AND SUBSYSTEMS

(PROCEDURE CP-T-1)



NOTES:

(1) FOR BLUE TAG TESTING PROCEDURE SEE FLOWCHART "BLUE TAG TESTING". C-18

(2) TO BE DECIDED ON A CASE BY CASE BASIS

(3) THE FINAL PUNCHLIST IS ALSO CALLED THE CONSTRUCTION COMPLETION (CWC)

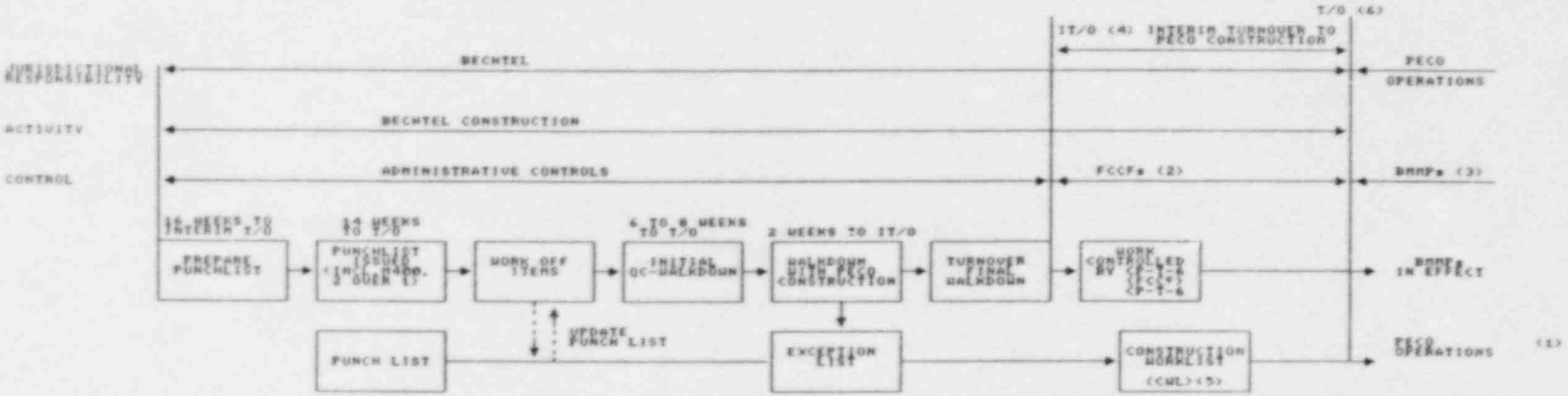
LEGEND:

BT = BLUE TAG
T/O = TURNOVER
SWL = STARTUP WORK LIST

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART C-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-20
FACILITY TURNOVER
(DRAFT)
72 PACKAGES



NOTE:

(1) TURNOVER TO PECO OPERATIONS RESPONSIBILITIES FROM CWL ITEMS TO PECO OPERATIONS EXCEPTION LIST AT OR NEAR FUEL LOAD

(2) CP-T-6 -- PROCEDURE FOR FACILITY CONFIGURATION CONTROL AND TURNOVER (T/O) TO PECO OPERATIONS FOR LIMERICK GENERATING STATION

(3) BMMPs -- BECHTEL MAINTENANCE AND MODIFICATION PROCEDURES

(4) IT/O -- INTERIM TURNOVER TO PECO CONSTRUCTION INVOLVES FACILITY STATUS AND EXCEPTION FORMAL CONCURRENCE BY PECO CONSTRUCTION AND INSTITUTION OF ACF FCCF (QA CONFIGURATION CONTROL FORM) CONTROL MONITORED BY PECO CONSTRUCTION

(5) USE CWL TO TRACK INCOMPLETE FACILITY ITEMS

(6) T/O BECHTEL TO PECO OPERATIONS

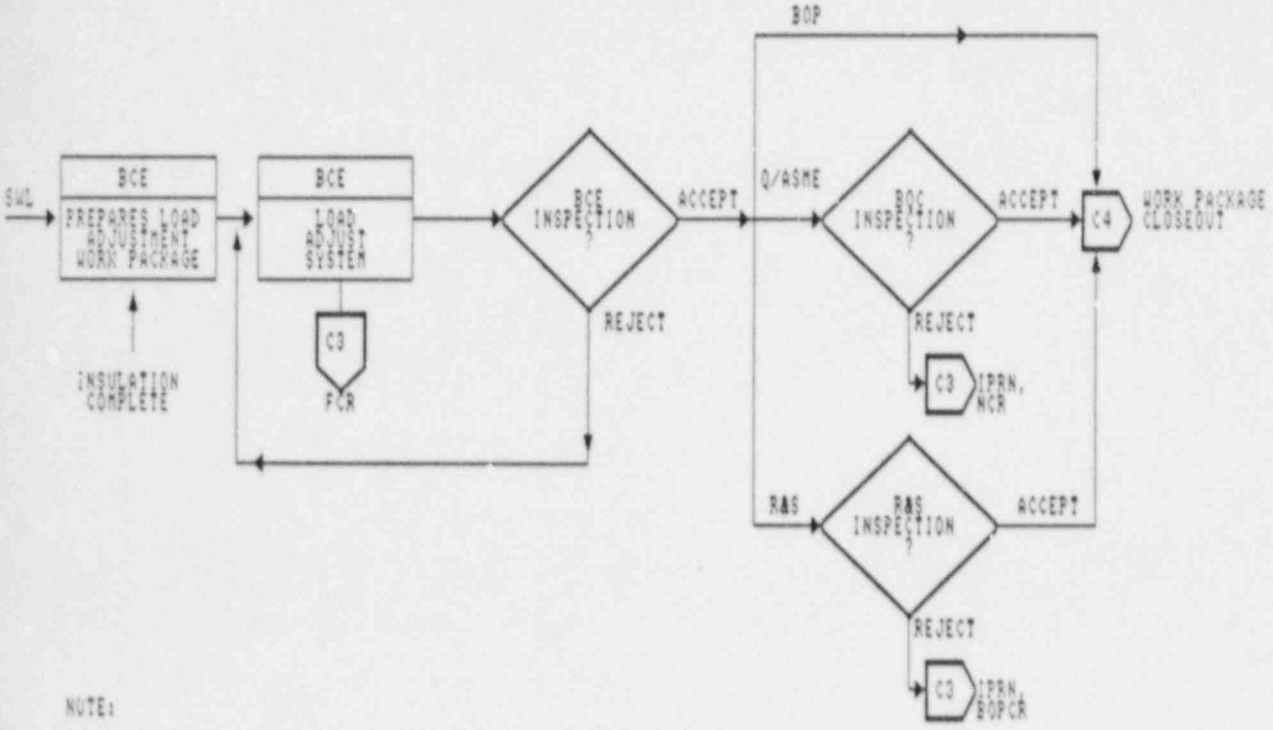
AUDITS A SURVEILLANCE(S) OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART D-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-21

LOAD ADJUSTMENT WORK PACKAGE (1)

(PROCEDURE CP-P-3)



NOTE:

(1) CONDUCTED DURING STARTUP; INITIATED BY STARTUP WORK LIST (SWL)

LEGEND:

BCE = BECHTEL CONSTRUCTION ENG'G
BQC = BECHTEL QUALITY CONTROL
R&S = RELIABILITY & SAFETY (PECO)
SWL = STARTUP WORK LIST
FCR = FIELD CHANGE REQUEST
NCR = NONCONFORMANCE REPORT
BOPCR = BALANCE OF PLANT CONDITION REPORT
IPRN = INPROCESS REWORK NOTICE
BOP = BALANCE OF PLANT

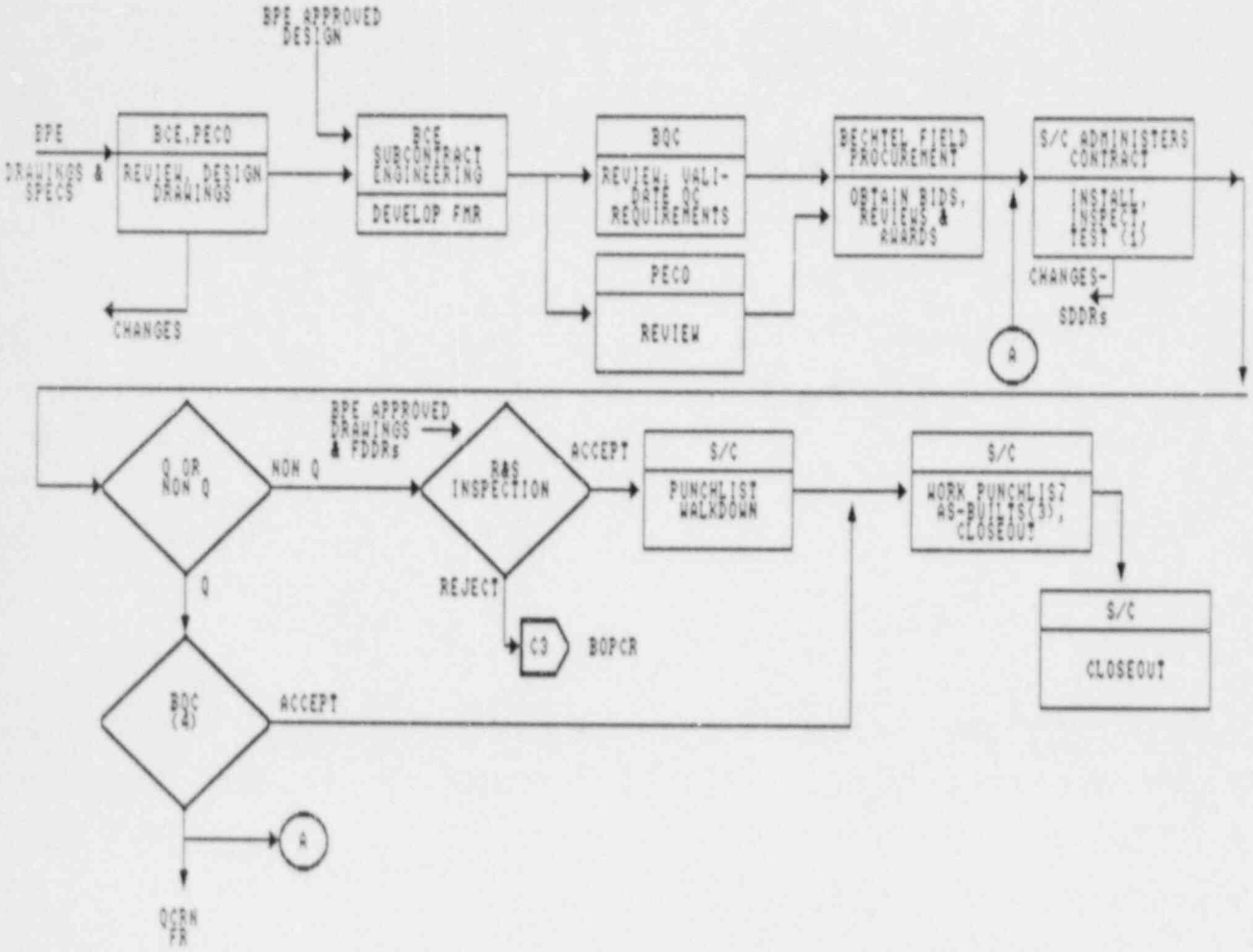
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

C-22

SUBCONTRACT CONSTRUCTION

(PROCEDURE CP-F-1) (2),(4)



NOTES:

(1) WITNESSED BY BCE, R&S

(2) INCLUDES FIRE PROTECTION, REACTOR PRESSURE VESSEL INTERNALS, PENETRATION SEALS

(3) AS-BUILTS NOT REQUIRED FOR PAINTING & INSULATION

(4) BQA & PECO QA PROVIDE QUALITY SURVEILLANCE & AUDIT, AS REQUIRED.

LEGEND:

FMR - FIELD MATERIAL REQUEST
S/C - SUBCONTRACTOR
FDDR - FIELD DEVIATION DISPOSITION REQUEST
SDDR - SUPPLIER DEVIATION DISPOSITION REQUEST
BPE - BECHTEL PROJECT ENGINEER
BCE - BECHTEL CONSTRUCTION ENGINEER
BOPCR - BALANCE OF PLANT CONDITION REPORT
R&S - RELIABILITY AND SAFETY (PECO)
BQC - BECHTEL QUALITY CONTROL
QCRN - QUALITY CONTROL REWORK NOTICE
FR - FINDING REPORT

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

4.5 HARDWARE AND ORGANIZATIONAL READINESS

4.5.1 Characterization of Readiness Programs Assessed

Following the design construction of the plant, the final step in the readiness program will be the testing and placing of equipment into operation. Therefore, the readiness plans of the PECo Start-up and Operations Groups were of special interest during the Readiness Program Assessment.

The RPA Team examined both hardware and software readiness. For hardware, the Team looked at how the systems, components, and structures were being processed and how their operability status was being controlled. For software (or organizational readiness), the Team examined how the PECo staff, procedures, special plans and organizations were getting ready for two-unit operation.

4.5.1.1 Hardware Readiness Overview (2nd Tier) (Chart H-1)

After structures, systems, and components are assembled, they are subjected to testing to demonstrate their readiness for operation. Limerick 2 utilizes a multi-faceted testing program consisting of blue tag tests, technical tests, pre-operational tests and power ascension testing as appropriate. Once the hardware has been tested, it is important to control hardware status through pre-operational and power ascension testing phases. At LGS, the testing and status control processes are well-defined by procedures, owing in part to lessons learned from Limerick 1. The hardware status control program consists of:

- Blue Tag, Pink Tag, and Green Tag turnover processes in which hardware configuration is carefully examined and nonconforming conditions are identified;
- Blue Tag, Pink Tag, Green Tag, 2/1 Isolation Tag, and Out-of-Service Tag administrative controls which establish "ownership" of hardware and which establish necessary management review processes to authorize work on the hardware;
- Controlled processes such as the Start-up Work List (SWL), the Pre-operational Test exception record, and STP-99 for tracking nonconformances, test completion and test exceptions; and
- Controlled processes for resolving nonconforming conditions and initiating design changes such as the Start-up Work Order (SWO), Start-up Change Request (SCR), Start-up Field Report (SFR), Rework Notices, and Start-up Change Notice (SCN) processes.

In reviewing the hardware readiness program, it was found that some topics required greater detail in order to illustrate the organizational interfaces. In these cases, more explicit subcharts (H-2 through H-20) were prepared. These subcharts are indicated by a shaded box on the overview Chart (H-1). It should also be noted that the facility readiness process is understandably different from the systems readiness process, and the two take separate paths to completion. For a more detailed explanation of the facility readiness process, the reader should see to Section 4.4 of this report.

There are many organizational interface areas in the hardware readiness process:

- Each turnover function involves interfaces between Construction, Start-up and Operations;
- Deficiency resolution involves interfacing between the Start-up, Operations, Construction and Engineering groups;
- Quality Assurance and Quality Control interfaces occur throughout the hardware readiness process in the form of reviews and audits as indicated on the subcharts H-2 to H-20; and
- The Licensing Group is involved with respect to commitment inputs and feedback for FSAR updates, when required.

4.5.1.2 Facility Turnover to Start-up (Chart H-2)

The Bechtel Construction Group transfers facilities to the PECo Construction Group directly. The PECo Construction Group then releases each facility to the PECo Operations Group for testing and operation. Additional information regarding this process can be found in Section 4.4 of the report.

4.5.1.3 2/1 Tie-ins Resolved (Chart H-3)

The processes used to control Limerick 2 isolations from Limerick 1 and common equipment and subsequent restorations during the construction and Start-up of Limerick 2 are depicted on this chart.

Procedures AD 6.5 (Start-up Group) and A-97 (Operations Group) govern the isolation processes. There is also a 2/1 Tie-in Committee which is responsible for reviewing, planning and scheduling mechanical isolations and the tagging process.

4.5.1.4 Field Engineering Tests (Chart H-4)

Often, certain electrical and pneumatic checks and tests are performed on components to prepare them for pre-operational testing by the Start-up group. PECo refers to this process as

"Blue Tag Testing." This chart depicts the Field Engineering aspects of blue tag testing. Unique Divisional Procedures (for example Field Engineering Procedures) are used to govern Blue Tag testing.

4.5.1.5 Perform I & C Calibration and Loop Check (Chart H-5)

Another two elements of the Blue Tag testing program are the Instrumentation and Control System (I&C) Calibrations and Loop Checks. These processes are depicted on Chart H-5.

4.5.1.6 Construction Turnover to Start-up (Chart H-6)

This subchart depicts the hardware turnover process from the Construction Group to the Start-up Group. Much of the turnover work is executed by the Start-up System Engineer for the particular system, however, final acceptance of the turnover package is decided by the PECo Plant Manager. Start-up Administrative procedure AD 6.1 describes the administrative control process for turnover deficiencies. Turnover approval responsibilities are defined in the procedure as well.

4.5.1.7 Establish Start-up Preventative Maintenance Program (Chart H-7)

The preventative maintenance program is depicted in Chart H-7. This program takes on special importance due to PECo's plans to retain systems under the Start-up Group's ownership as long as possible. A preventative maintenance coordinator has been assigned for Limerick 2.

4.5.1.8 Initiate Start-up Work Order (Chart H-8)

The Start-up Work Order (SWO) is used to control the status of equipment belonging to the Start-up Group. The SWO is used when equipment requires work other than normal pre-operational testing. This additional work, may be supervised by either Bechtel Construction or PECo Start-up. The SWO covers items such as:

- Incorporation of design changes,
- Completion of construction exceptions,
- Repair or replacement of damaged equipment,
- Replacement of consumable materials or components,
- Equipment maintenance,
- Correction of deficiencies, and
- Flush modifications.

The central coordinating authority for SWOs is the Start-up System Engineer. Start-up Administrative Procedure AD 6.4 governs the use of the SWO.

4.5.1.9 Initial System Operation Checkout (Technical Tests) (Chart H-9)

Technical Tests are used by the Start-up Group to check initial operation of some systems and mechanical components. A portion of these tests, will be used as pre-operational test prerequisites. Procedure development is a software input to the main test sequence path of the chart. Quality Assurance and Test Review Board (TRB) review of these tests and their procedures, as appropriate, is planned and is also depicted on the chart.

4.5.1.10 Resolve Start-up Deficiency or Exception (Chart H-10)

Decision points and possible resolution mechanisms arise when a deficiency is encountered by the Start-up Group. Such deficiencies may include:

- Material deficiencies,
- Component failures,
- Test exceptions,
- Design problems, and
- Construction inadequacies.

The decision process depicted in the chart is typical of that which the Start-up System Engineer would use in determining a solution during the Start-up phase. There are five subcharts indicating resolution processes for which there is a greater level of detail provided (i.e., SWO, SFR, SCN, SCR, TCN). During the resolution process, interfacing may be required with the Construction, Engineering or Quality Assurance/Quality Control Groups. The individual resolution processes are controlled by Start-up Administrative Procedures as indicated on the chart or the respective subcharts.

4.5.1.11 Initiate Start-up Change Notice (SCN) (Chart H-11)

The Start-up Change Notice (SCN) is a specialized process used to implement limited types of changes during pre-operational testing. The SCN is a document issued by the Start-up Group to make a change to selected electrical design drawings as defined in Start-up Administrative Procedure AD 6.12. The Start-up Group may implement these changes prior to concurrence by Project Engineering, therefore use of the SCN is strictly defined by procedure. H-11 is a subchart of H-10.

4.5.1.12 Start-up Change Request (SCR) (Chart H-12)

The Start-up Change Request (SCR) is used by the Start-up Group to request a Bechtel Project Engineering review and disposition of design changes. Project Engineer approval of the SCR is required to incorporate the requested design revision. For example, the SCR is used when the Start-up Group has a clear idea for the resolution of a problem. If a change in design criteria, design concepts, FSAR commitments, change in ASME

components or change to GE design documents is necessary, a Start-up Field Report (SFR) is used instead. Start-up Administrative Procedure AD 6.13 governs the SCR process. Additionally, a Start-up Work Order may be required to finally disposition the SCR. Chart H-12 is a subchart of Chart H-10.

4.5.1.13 Initiate Start-up Field Report (SFR) (Chart H-13)

The Start-up Field Report (SFR) is used by the Start-up Group to request Bechtel Project Engineering or GE review and resolution of design questions and problems. The SFR provides a mechanism for evaluation of reportability to the NRC and is also differentiated from the Start-up Change Request (SCR) in that it may be used when the Start-up Group does not have a straightforward recommendation for resolution or when the design intent is questioned. Interfaces with Construction, Engineering and Quality Assurance/Quality Control are required. Start-up Administrative Procedure AD 6.3 governs the SFR process. A Start-up Work Order (SWO) is usually required to finally disposition the SFR. Chart H-13 is a subchart of Chart H-10.

4.5.1.14 Pre-Operational Test Procedure Ready (Chart H-14)

The process of preparation, submittal and approval of pre-operational test procedures is well-developed and governed by several different procedures. A Procedure Writer's Guide directs the Start-up System Engineer in the initial preparation of the procedure. Start-up Administrative Procedure AD 8.1P establishes pre-operational test procedure format and content. Start-up Administrative Procedure AD 8.2P describes the initial development of pre-operational test procedures and establishes the requirements for controlling the review, approval, revision and administrative controls associated with pre-operational procedures. The acceptance criteria for the pre-operational tests are taken from the appropriate section of the Limerick Generating Station FSAR and are referenced in the test procedures to ensure compatibility with the design intent. Test Review Board review requirements are delineated in Start-up Administrative Procedure AD 2.4. The Limerick Plant Manager has final approval authority for all pre-operational procedures.

4.5.1.15 Perform Pre-Operational Test (Chart H-15)

The control of test changes and test exceptions which are encountered during pre-operational testing is depicted in Chart H-15. The Test Review Board is responsible for ensuring that test changes and test exception resolutions meet the intent of the test and the FSAR or other commitments. Start-up Administrative Procedure AD 8.3P governs the implementation of pre-operational tests, starting with an approved procedure and culminating with endorsement of test results. The Limerick Plant Manager has final approval authority for all pre-operational tests performed.

4.5.1.16 System Turnover From Start-up to Operations (Chart H-16)

Systems and components are released or turned over from PECo Start-up to PECo Operations under the guidelines of Start-up Administrative Procedure AD 6.6. After completion of the Pre-operational Test phase, or when required to continue testing under PECo Operations control. For some systems, this turnover will be delayed to avoid unnecessarily burdening the Operations staff. The Limerick Plant Manager has final approval authority for all turnovers to PECo Operations.

4.5.1.17 Power Ascension Procedures (Chart H-17)

The Limerick Power Ascension Program is governed by Start-up Test Procedures (STP). General Electric representatives will develop these procedures under the direction of the PECo Operations Group. Operations Administrative Procedure A-200 defines the format and content of STPs, while A-201 establishes the requirements for controlling the formal review, revision, approval and copy control. The desirability of a Start-up Test Procedure Writer's Guide (similar to that used for pre-operational test procedures) has been recognized. The Plant Operations Review Committee has final review authority for all Start-up Test Procedures.

4.5.1.18 Start-up Test Program (Chart H-18)

The Start-up Test Program is divided into phases and test plateaus concluding with the full power warranty run. STP-99 is the administrative procedure used by the Plant Operations Review Committee to track test changes and exceptions at the conclusion of each testing plateau. This procedure is a tool with which the management controls the testing status and final hardware readiness.

4.5.1.19 Perform Individual Power Ascension Tests (Chart H-19)

The "Perform Individual Power Ascension Tests" Chart outlines the general sequence and potential divergences during the performance of a power ascension test or Start-up Test. Start-up Test changes and exceptions are carefully controlled to ensure valid completion and approval of the test and, consequently, final system readiness. Operations Administrative Procedure A-202 governs the implementation of Start-up Tests. The Plant Operations Review Committee has final review authority for all Start-up Tests. The power ascension test program is based on one successfully completed at Limerick 1, and thus provides a high level of assurance that the systems are ready to perform their intended safety functions. Chart H-19 is a subchart of Chart H-18.

4.5.1.20 Start-up NCR Process (Chart H-20)

The Start-up Nonconformance Report (SNCR) is used by the Start-up Group to document the control of items (materials, parts or components) which do not conform to requirements. The SNCR is intended to identify, segregate, provide disposition and notify responsible organizations of nonconforming items. Start-up Administrative Procedure AD 1.2 establishes the methods for preparing and processing the SNCR. Interfaces with Quality Assurance/Quality Control, Construction and Engineering may occur during the SNCR process.

4.5.2.1 Organizational Readiness Overview (2nd Tier) (Chart 0-1)

In addition to preparing Plant hardware for two-unit operation, there is also a need to prepare the software (organization) for two-unit operation. This organizational readiness consists of:

- Getting Limerick Generating Station procedures are ready;
- Getting staffing levels up to the two-unit requirements;
- Redefining responsibilities, where necessary;
- Providing additional training, where necessary;
- Revising the various Station plans (e.g., the Emergency Plan, Security Plan, In-Service-Inspection Plan, etc.); and
- Restructuring the department interfaces to support Limerick 2 as an operating unit rather than a unit under construction.

The areas of preparation are depicted on the Second Tier overview chart, O-1, and in greater detail on Third Tier Charts O-2 through O-11. The overview chart and individual subcharts are derived from discussions with the plant staff and are intended to be illustrations of the type of considerations that must be addressed by PECo managers in order to evolve from a single-unit site to a two-unit site organization. An overall Organizational Readiness Program is currently under development by PECo. These charts will be used as input to the formulation of that action plan for organizational readiness but are not intended to be the final plan themselves.

4.5.2.2 Operating Organization Ready (Chart 0-2)

The two Limerick units will have a common operations staff with all operators qualified on both plants. Considerable attention has been given to operator staffing requirements, and this is reflected in current hiring goals and in the budget. This review

of shift and non-shift personnel needs should result in the operating organization being fully staffed and qualified for two-unit operation.

4.5.2.3 Training Program Ready (Chart 0-3)

Management has focused attention on the identification of differences in operator responsibilities between Limerick 1 and Limerick 2. Appropriate lesson plans will be developed and incorporated into the training program for requalifying operators and in initial training for new operators and instructors. Training Group interaction with the NRC concerning the particulars of two-unit operator licenses has begun and is well organized to support the Limerick 2 readiness schedule.

4.5.2.4 Management and Technical Support Organization Ready (Chart 0-4)

The "Management and Technical Support Organization Ready" Chart displays the basic, systematic review process that must be undertaken by each major PECo department or division which supports nuclear generation. Each department must be reviewed to determine the impact of Limerick 2's operating, licensing and other commitments and requirements. Expansion or evolution of the specific organizations will be necessary to ensure readiness of Limerick 2.

4.5.2.5 Review and Audit Organization Ready (Chart 0-5)

The "Review and Audit Organization Ready" Chart displays the basic, systematic review process to ensure that the FSAR requirements for on-site and off-site review and audit are met. PECo plans to retain a single Plant Operations Review Committee (PORC) for the Limerick site. A thorough review of the additional requirements for the committee and its members will enable the PORC to address the review and audit needs of Limerick 2 without detracting from appropriate attention to Limerick 1. The Nuclear Review Board performs corporate level review and authorizes audit functions for all four PECo reactor plants.

4.5.2.6 Emergency Planning Ready (Chart 0-6)

PECo intends to review the Limerick Generating Station Emergency Plan and Implementing Procedures to ensure readiness for two-unit operation at Limerick. The need for plan revisions, training changes, resource or facility revisions, and implementing procedure changes should be systemically reviewed. This systematic review process is scheduled to begin during the annual Emergency Plan and Implementing Procedure reviews in October 1987.

4.5.2.7 LGS Procedures Ready (Chart 0-7)

Operating procedures are being developed as they are needed in the Limerick 2 start-up sequence. Limerick 2 procedures will be developed based on Limerick 1 procedures which have been revised to include human factors considerations. The plant administrative procedures are subject to ongoing revision processes. A thorough review of LGS procedures is scheduled to assure procedural readiness for Limerick 2.

4.5.2.8 Physical Security Ready (Chart 0-8)

Changes to the physical layout of the plant could necessitate a change to the existing Limerick Generating Station Security Plan. Key to this process is ensuring that the proper inputs reach the Security Group, which can then act to maintain physical security readiness. The LGS Security Group has anticipated the evolution it must undergo for two-unit operation.

4.5.2.9 Radiation Protection Ready (Chart 0-9)

Chart 0-9 depicts some of the considerations in preparing the Radiation Protection Organization for two-unit operation. For example, some Limerick 2 tie-ins with radioactive systems on Limerick 1 may occur before Limerick 2 is licensed. Though these and other requirements of two-unit operation have been considered, a systematic review by the Limerick Generating Station Health Physics Group of their organization, procedures, facilities and equipment is scheduled under the Organizational Readiness Program.

4.5.2.10 Special Programs Ready (Chart 0-10)

There are several special programs in place at Limerick Generating Station and within the PECo Headquarters organization which may be affected by the evolution toward two-unit operation. Plan revisions, training changes, resource allocation, or implementing procedure changes may be necessary and must be in effect at the appropriate time to ensure readiness for two-unit operation.

4.5.2.11 Nuclear Operations QA/QC Organization Ready (Chart 0-11)

The Nuclear Operations Quality Assurance/Quality Control Organization will undergo changes in its responsibility and execution as Limerick Generating Station progresses toward two-unit operation. A systematic review of the requirements of this evolution is shown in the chart.

4.5.3 Program Assessment

4.5.3.1 Hardware Readiness

Once Limerick 2 design and construction have been essentially completed, the systems, structures and components will be turned over to PECo Start-up and Operations groups. These organizations are responsible for testing the hardware to ensure that it meets the design intent of the Final Safety Analysis Report (FSAR) and all applicable PECo and regulatory requirements. They are also responsible for controlling the "as-built" configuration and "as-tested" status of the hardware to ensure its proper functioning when placed in service.

Taken as a whole, the testing program and the status control program should ensure that plant hardware meets the design intent of the FSAR and that it will remain in that condition until called upon to perform. The RPA Team found that detailed procedures have been developed by PECo to guide the plant personnel in the execution of these functions. These procedures are based on a proven approach, namely, that used to establish Limerick 1's readiness for operation. The experiences of other power plants, INPO, and the NRC have also been incorporated into the procedure development processes to ensure that the PECo approach to plant readiness remains at the state-of-the-art level in quality. Additionally, the procedures and their execution are reviewed by PECo management to ensure their adequacy and completeness in meeting the intent of the PECo and regulatory requirements. Lastly, the PECo Quality Assurance Group audits the procedures, their execution and the management review process to further assure the soundness of the PECo readiness approach. Considering the strengthening which has occurred since Limerick 1 was licensed, these elements should clearly demonstrate hardware readiness for operation if completely implemented. Due to greater experience levels of the Limerick 2 staff, there is increased assurance that the programs will, in fact, be properly executed.

4.5.3.2 Organizational Readiness

Many of the Organizational Readiness activities were determined to be underway at the time of the Readiness Program Assessment, however, in almost all cases they were found to be managed in an "ad hoc" or "as-needed" manner. This approach to Organizational Readiness can be successful and can meet all NRC requirements as was demonstrated by Limerick 1's licensing process. However, PECo management recognizes the desirability of strengthening their approach and making it more systematic. A foundation for preparing the various organizations for two-unit operation was developed by PECo and ERCI/IEAL during the course of the interviews and is depicted on charts O-1 through O-11. An Organizational Readiness Program is under development by PECo and is intended to complete this process, and to provide a clear link between the individual organizations and their licensing commitments.

4.5.4 Open Items

4.5.4.1 Specific Programs

The overall programs needed to get plant hardware ready for licensing and operation are well developed and well documented. Thus, there is good assurance of hardware readiness if the existing programs are fully executed. The LGS Unit 2 preoperational testing program differs from the Unit #1 program in that data developed during tests performed prior to the preoperational test is used in lieu of specific preoperational test steps. When this data is used to satisfy acceptance criteria, the entire documentation package will be reviewed by the Test Review Board during the pre-operational test results approval cycle.

If the test approach significantly differs from Limerick 1, the original LGS FSAR and other licensing commitments will be reviewed and modified as appropriate.

There are two specific programs where minor strengthening is possible:

1) There is a need to coordinate the facility turnover process with many of the Start-up activities (e.g., filter testing with room painting, fuel receipt with fuel storage area readiness, etc.). The facility turnover process should also be coordinated with the tie-in of Limerick 2 systems to Limerick 1 systems in order to accommodate radiation protection and security concerns. However, current Start-up scheduling tools primarily address systems readiness and do not presently include facility considerations. PECo is developing a facility turnover schedule which will support the overall Start-up schedule and unit tie-in outage schedule. These facility turnovers will be incorporated into the integrated project schedule to ensure adequate coordination.

2) The plans at Limerick 2, are to transfer completed systems to the Start-up Group's jurisdiction and to hold those systems as long as possible before turnover to Operations. Thus, the Start-up preventative maintenance program takes on added importance. The need to strengthen some aspects of this program was identified due to the fact that environmental conditions are different during Start-up (e.g., there are extended shutdowns of components, greater than normal dust conditions, etc.). More frequent inspections (quarterly) of electrical component cleanliness are being added to the Start-up Preventive Maintenance Program. Additionally, directives will be issued to System Start-up Engineers to reinforce recognition of their responsibility to identify and correct environmental conditions which are detrimental to equipment performance or reliability.

4.5.4.2 Organizational Readiness

There is also a need to formally prepare PECo organizations for a second operating unit at the site. The changes needed to accomplish the transition from a single unit to a two-unit station affect off-site as well as on-site organizations. Although many of the organizational changes will not be required to be in place for a year or more, the need for management to promptly identify, coordinate and document some of the changes exists today.

The Organizational Readiness issue can be summarized in three points:

1) There is no overall program to systematically review and appropriately modify, as necessary, the various PECo organizations that are needed to support licensing and two-unit operation at Limerick. The final organization should match that described in the FSAR.

2) No organization or individual has been assigned the responsibility for developing an overall organizational readiness program for Limerick 2.

3) No mechanism exists for coordinating and integrating organizational developments and commitments in the overall company with the Limerick 2 Start-up schedule (e.g., the Commitment to Excellence program at Peach Bottom).

It should be noted that currently, organizational changes are handled on an ad-hoc basis. In view of the Commitment to Excellence program and the desire for proactive management involvement at Limerick, however, an ad-hoc methodology may not be desirable.

In recognition of this concern, PECo will:

- designate an individual to develop the Organizational Readiness Program;
- form an Organizational Readiness Coordinating Committee to implement the program; and
- develop a unique action plan for each support organization.

Selected Organizational Readiness charts from the Readiness Program Assessment will be used for guidance in this effort.

It is anticipated that the action plans will identify specific tasks, responsibilities and completion schedules and will address staffing, qualification and training requirements as well as various plans, programs and implementing procedures

under the control of that organization. The action plans are to be developed by the responsible PECo managers and the Organizational Readiness Coordinating Committee. PECo also intends to verify organizational compliance with Licensing Documents.

TABLE 4.5

START-UP AND OPERATIONS
ABBREVIATIONS

Abbreviation		Reference Document
ANII	AUTHORIZED NUCLEAR INSERVICE INSPECTOR...	
BOPCR	BALANCE OF PLANT CONDITION REPORT.....	
CFOM	CONSTRUCTION FIELD OFFICE MEMORANDUM.....	
CHAMPS	COMPONENT HISTORY AND MAINTENANCE PROGRAM	
CRN	CONTROL ROOM NOTICE.....	
DCN	DESIGN CHANGE NOTICE.....	EDP 4.47
DCP	DESIGN CHANGE PACKAGE.....	
EMF	ENGINEERING MEMO TO FIELD.....	
EPE	ELECTRIC PRODUCTION ENGINEERING.....	
EPR	EQUIPMENT RELEASE FORM.....	
ERF	EQUIPMENT RELEASE FORM.....	AD 2.2 (App A)
FCCF	FACILITY CONFIGURATION CONTROL FORM.....	CP-T-6 (p. 6 and Exhibit 1)
FCN	FIELD CHANGE NOTICE.....	AD 3.2 (sec 1.1.d)
FCR	FIELD CHANGE REQUEST.....	AD 3.2 (sec 1.1.d)
FDDR	FIELD DEVIATION DISPOSITION REQUEST.....	AD 6.1 (sec 4.5.H)
FEP	FIELD ENGINEERING PROCEDURES.....	
FMC	FIELD MODIFICATION CONTROL.....	EDPI 4.62.2
FME	FIELD MEMO TO ENGINEERING.....	
HP	HEALTH PHYSICS.....	
IDCN	INTERIM DESIGN CHANGE NOTICE.....	EDPT 4.47.0
ITR	ISOLATION TAG REMOVAL.....	
MDCP	MODIFICATION DESIGN CHANGE PACKAGE.....	

START-UP AND OPERATIONS
ABBREVIATIONS

Abbreviation		Reference Document
MLCS	MATERIAL AND LABOR CONTROL SYSTEM.....	
MRF	MAINTENANCE REQUEST FORM.....	
NCR	NONCONFORMANCE REPORT.....	AD 1.2
NRB	NUCLEAR REVIEW BOARD.....	
OVF	OPERATION VERIFICATION FORM.....	A-26,App 3.
NRMS	NUCLEAR RECORDS MANAGEMENT SYSTEMS.....	AD 3.1 (p. 5)
OEAC	OPERATING EXPERIENCE ASSESSMENT COMMITTEE	
OPAB	PROTECTED AREA BOUNDARY.....	
PAP	POWER ASCENSION PROGRAM.....	A-200 thru 204
PCN	PROJECT CHANGE NOTICE.....	EDPI 4.73.1
PCR	PROJECT CHANGE REQUEST.....	EDPI 4.73.1
PER	PRODUCT EXPERIENCE REPORT.....	
PORC	PLANT OPERATIONS REVIEW COMMITTEE.....	A-4
PSCL	PLANT SYSTEMS COMPLETION LIST.....	A-221
PSUE	PROJECT START-UP ENGINEER.....	
QAF	QUALITY ASSURANCE FINDING.....	
QAR	QUALITY ACTION REPORT.....	
RDC	REQUEST FOR DRAWING CHANGE.....	A-14, App 2
SCG	SYSTEMS COORDINATION GROUP.....	
SCN	START-UP CHANGE NOTICE.....	AD 6.12
SCR	START-UP CHANGE REQUEST.....	AD 6.13
SFR	START-UP FIELD REQUEST.....	AD 6.3
SLC	START-UP LETTER TO CONSTRUCTION.....	
SLE	START-UP LETTER TO ENGINEERING.....	AD 3.1 (sec 5.3)
SSE	START-UP SYSTEM ENGINEER.....	AD 2.1 sec 4.2.d
ST	START-UP TEST.....	A-200 thru 204
STP	START-UP TEST PROCEDURE.....	A-200 thru 201

Table 4.5 Cont.

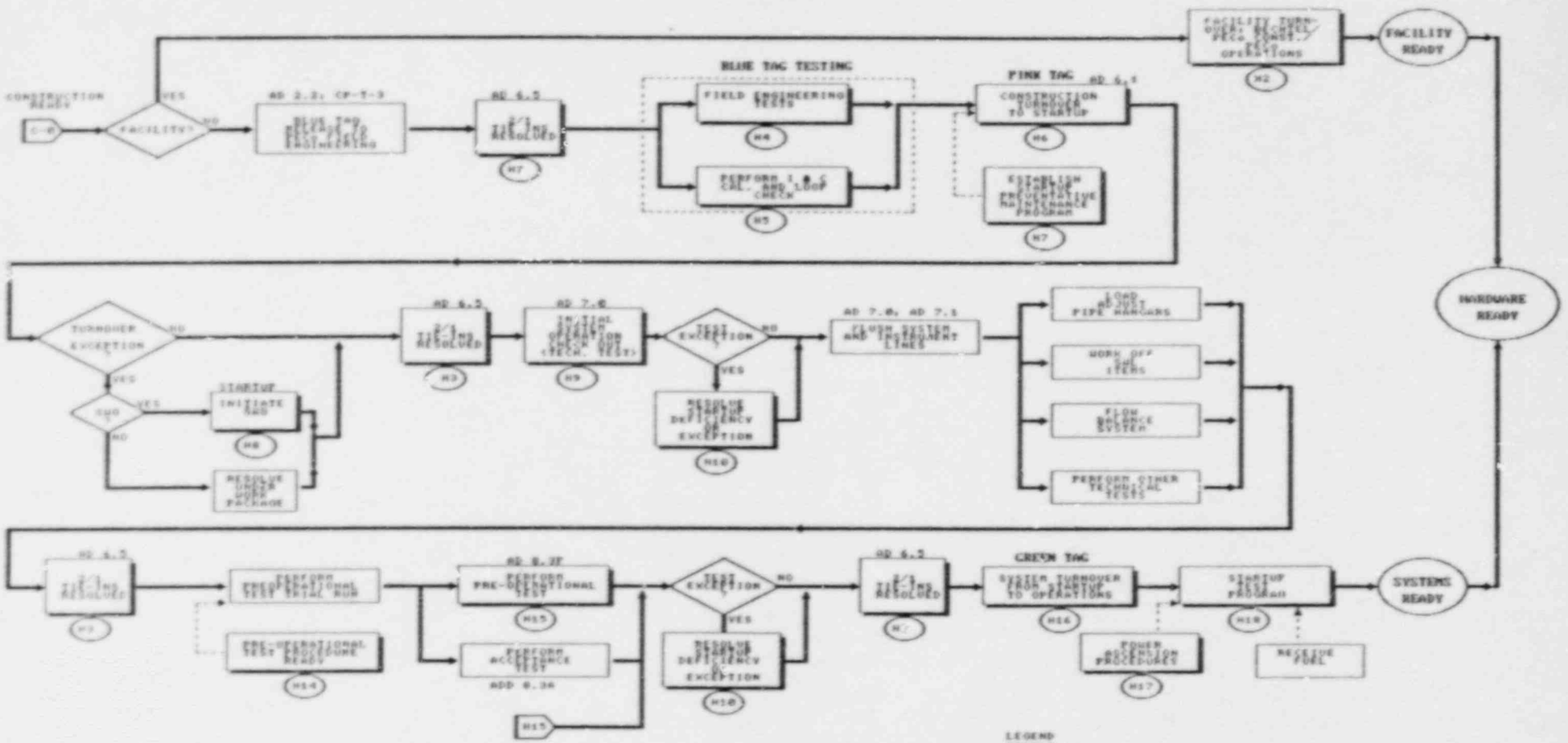
START-UP AND OPERATIONS
ABBREVIATIONS (Cont.)

Abbreviation		Reference Document
STCN	START-UP TEST CHANGE NOTICE.....	A-202 (sec 4.10 and Form 1)
SWL	START-UP WORK LIST.....	AD 6.2
SWLA	START-UP WORK LIST ADDENDUM.....	AD 6.2
SWO	START-UP WORK ORDER.....	AD 6.4
TCN	TEST CHANGE NOTICE.....	AD 8.3 (sec 5.3.c.1)
TEF	TURNOVER EXCEPTION FORM.....	AD 6.1 (sec 5.4.g)
TER	TEST EXCEPTION REPORT.....	A-202 (sec 4.8 and Form 3)
TRB	TEST REVIEW BOARD.....	AD 2.4
UDP	UNIQUE DIVISIONAL PROCEDURE.....	AD 2.2 (p.11)

HARDWARE READINESS CHARTS

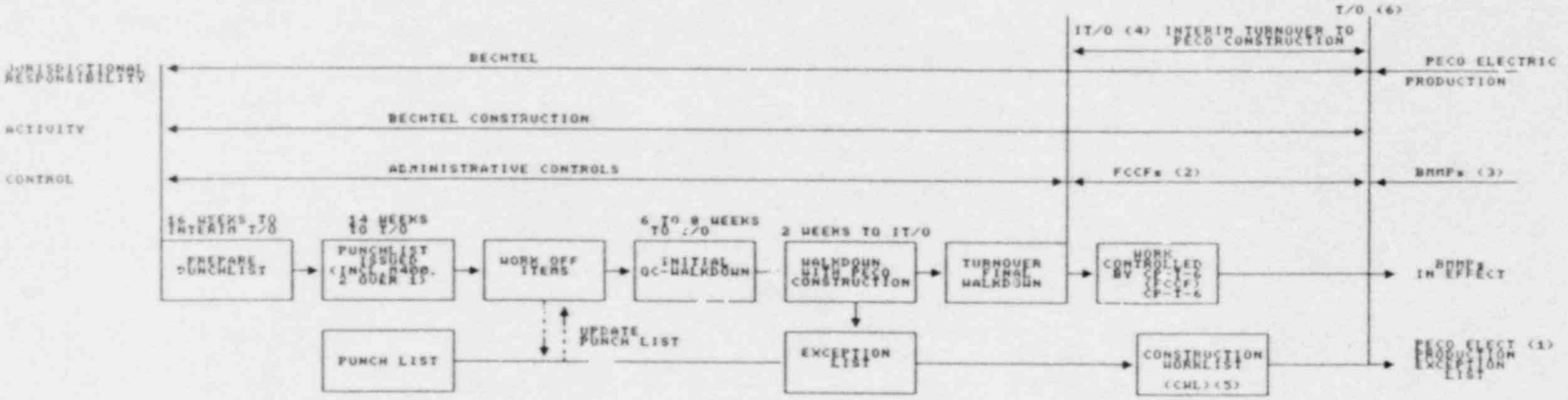
H-1	HARDWARE READINESS OVERVIEW
H-2	FACILITY TURNOVER
H-3	2/1 TIE-INS RESOLVED
H-4	FIELD ENGINEERING TESTS
H-5	PERFORM I & C CALIBRATION AND LOOP CHECK
H-6	CONSTRUCTION TURNOVER TO STARTUP
H-7	ESTABLISH STARTUP PREVENTATIVE MAINTENANCE PROGRAM
H-8	INITIATE STARTUP WORK ORDER (SWO)
H-9	INITIAL SYSTEM OPERATION CHECKOUT (TECHNICAL TESTS)
H-10	RESOLVE STARTUP DEFICIENCY OR EXCEPTION
H-11	INITIATE STARTUP CHANGE NOTICE (SCN)
H-12	INITIATE STARTUP CHANGE REQUEST (SCR)
H-13	INITIATE STARTUP FIELD REPORT (SFR)
H-14	PREOPERATIONAL TEST PROCEDURE READY
H-15	PERFORM PREOPERATIONAL TEST
H-16	SYSTEM TURNOVER FORM STARTUP TO OPERATIONS
H-17	POWER ASCENSION PROCEDURES
H-18	STARTUP TEST PROGRAM
H-19	PERFORM INDIVIDUAL POWER ASCENSION TESTS (STP'S)
H-20	STARTUP NCR PROCESS

H-1
HARDWARE READINESS OVERVIEW



NOTE: CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

H-2
FACILITY TURNOVER



NOTE:

(1) TURNOVER TO PECO ELECTRIC PRODUCTION RESPONSIBILITIES FROM CWL ITEMS TO PECO ELEC. PROD. EXCEPTION LIST AT OR NEAR FUEL LOAD

(2) CP-T-6 -- PROCEDURE FOR FACILITY CONFIGURATION CONTROL AND TURNOVER T/O TO PECO ELECTRIC PRODUCTION FOR LIMERICK GENERATING STATION

(3) BMMPs -- BECHTEL MAINTENANCE AND MODIFICATION PROCEDURES

(4) IT/O -- INTERIM TURNOVER TO PECO CONSTRUCTION INVOLVES FACILITY STATUS AND EXCEPTION FORMAL CONCURRENCE BY PECO CONSTRUCTION AND INSTITUTION OF QCI FCCF (QA CONFIGURATION CONTROL FORM) CONTROL MONITORED BY PECO CONSTRUCTION

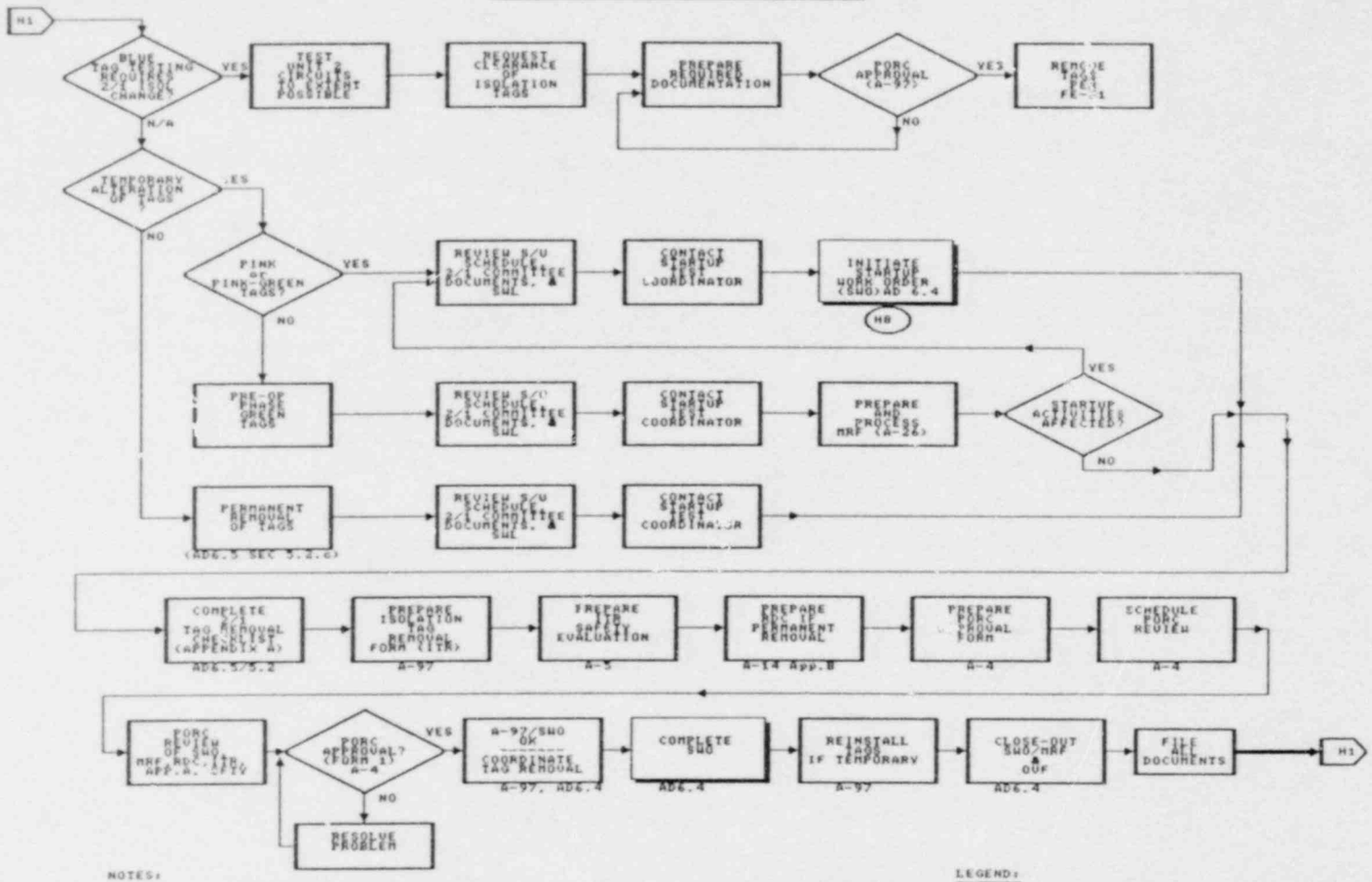
(5) USE CWL TO TRACK INCOMPLETE FACILITY ITEMS

(6) T/O BECHTEL TO PECO ELECTRIC PRODUCTION

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

2/1 TIE-INS RESOLVED



NOTES:

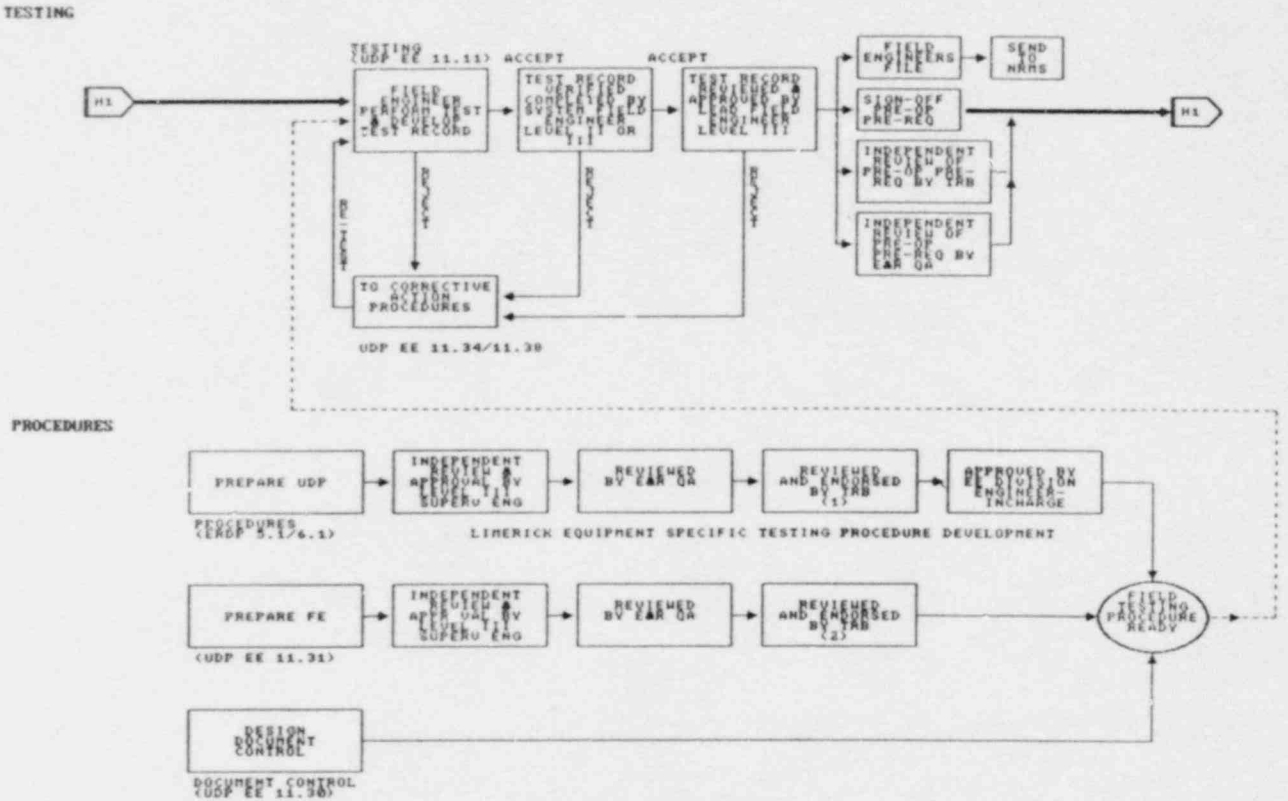
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

ITR - ISOLATION TAG REMOVAL
NRF - MAINTENANCE REQUEST FORM
OOF - OPERATION OUT OF SPECIFICATION FORM
PORC - PLANT OPERATIONS REVIEW COMMITTEE
RDC - REQUEST FOR DRAWING CHANGE
SWZ - STARTUP WORK SCHEDULE
SWO - STARTUP WORK ORDER

H-4
FIELD ENGINEERING TESTS



NOTES:

1. ONLY FOR THOSE UDP'S NEEDED TO SATISFY TEST PREREQUISITES
2. ONLY FOR FE'S NEEDED TO SATISFY TEST PREREQUISITES

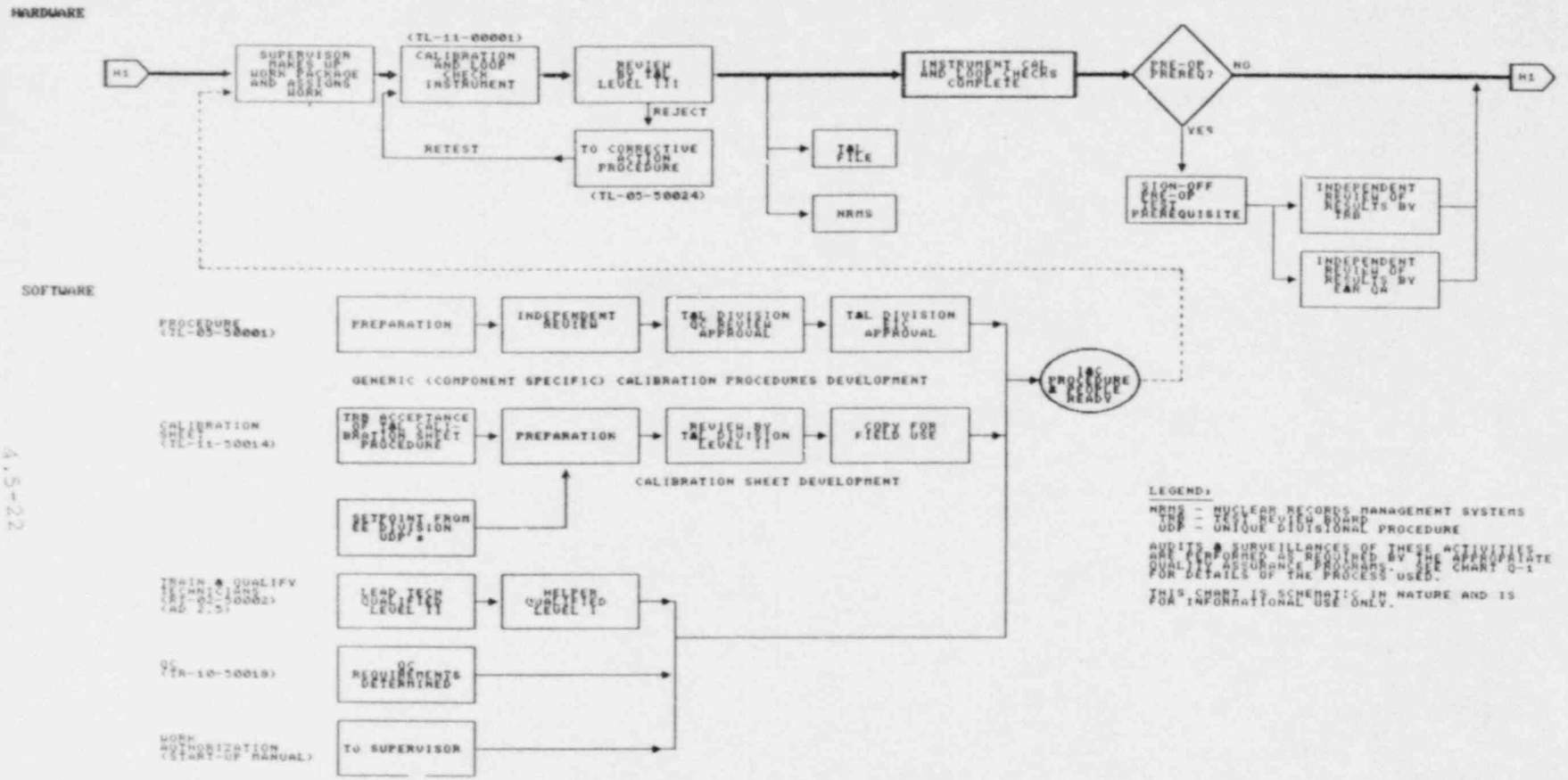
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

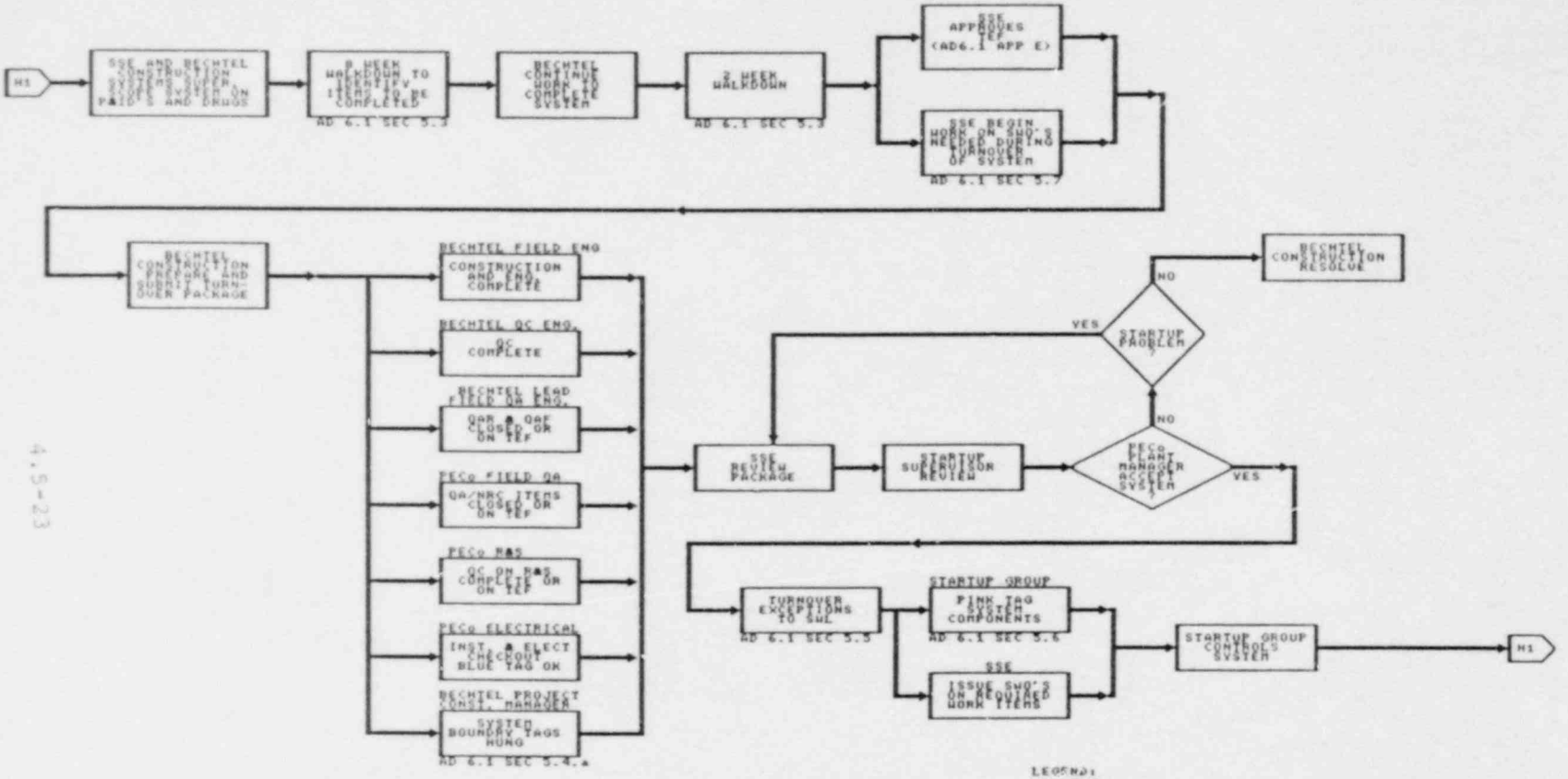
FE - FIELD ENGINEERING PROCEDURE
NRMS - NUCLEAR RECORDS MANAGEMENT SYSTEMS
TAB - TEST REVIEW BOARD
UDP - UNIQUE DIVISIONAL PROCEDURES

H-5
PERFORM I & C CALIBRATION AND LOOP CHECK



4.5-22

H-6
CONSTRUCTION TURNOVER TO STARTUP



NOTES:

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

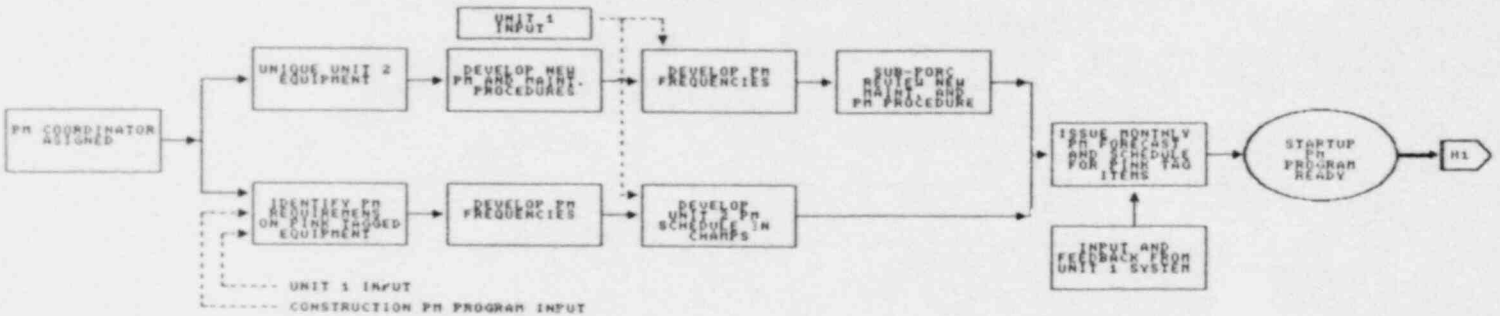
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

QAR - QUALITY ACTION REPORT
QAF - QUALITY ASSURANCE FINDING
R&S - RELIABILITY AND SPECIAL
SWE - STARTUP SYSTEM ENGINEER
SWO - STARTUP WORK ORDER
TCF - CONSTRUCTION TURNOVER PACKAGE
TEF - TURNOVER EXCEPTION FORM

4.5-23

H-7
ESTABLISH STARTUP PREVENTATIVE MAINTENANCE PROGRAM



NOTES:

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

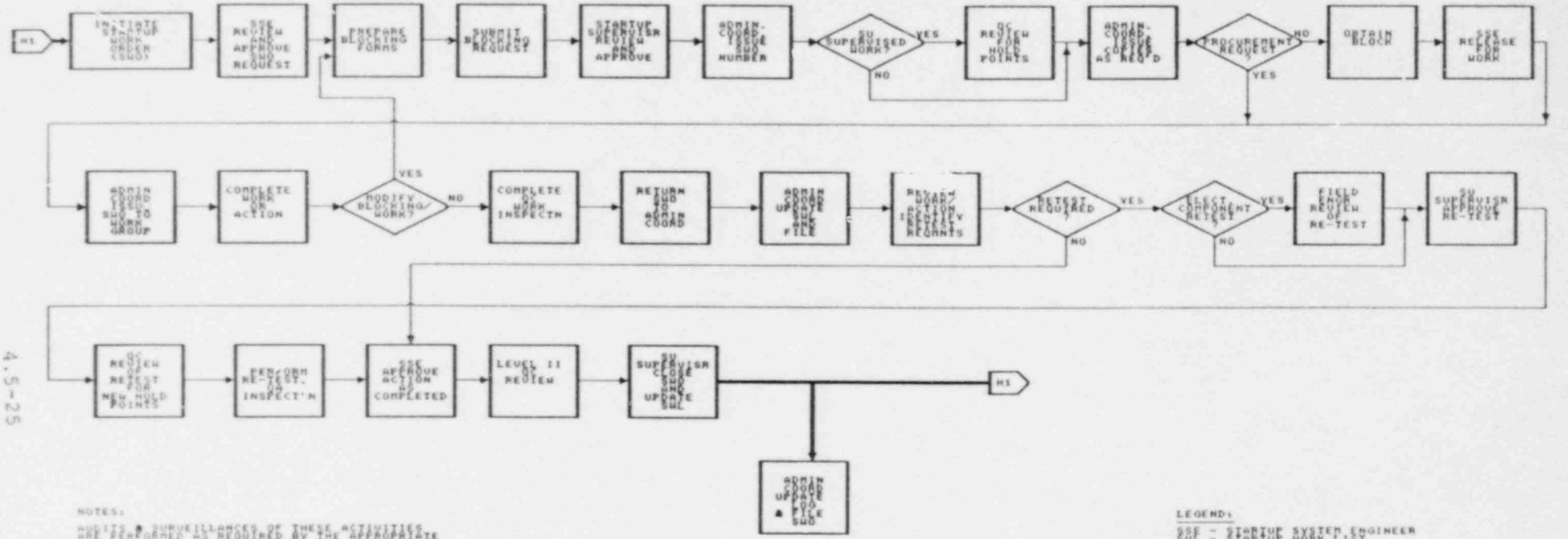
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

PORC - PLANT OPERATIONS REVIEW COMMITTEE

H-8
INITIATE STARTUP WORK ORDER (SWO)

(AD 6.4, Rev 3)



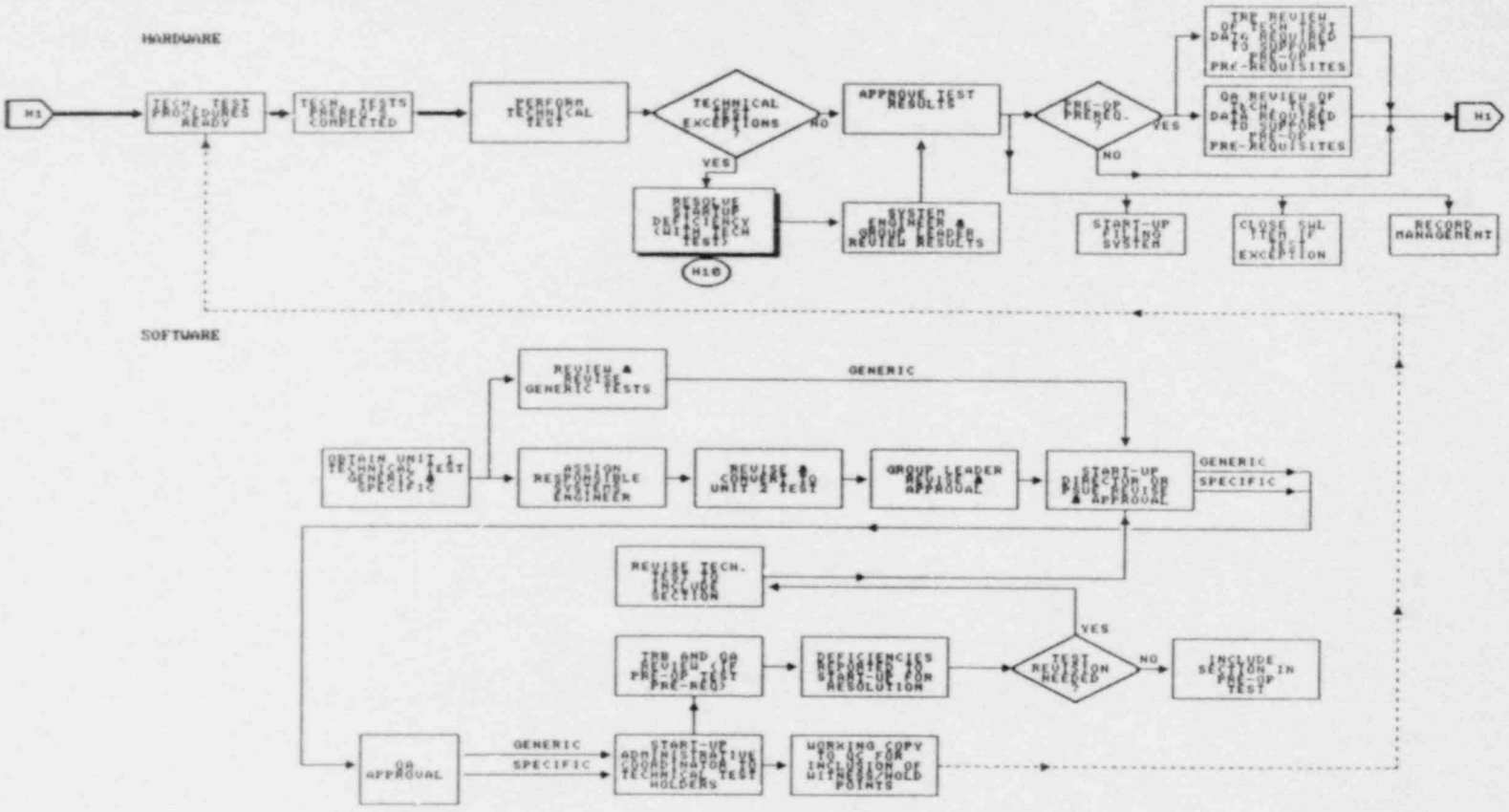
NOTES:

1. QA/QC SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.
2. THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

SSE = STARTUP SYSTEM ENGINEER
SWO = STARTUP WORK ORDER

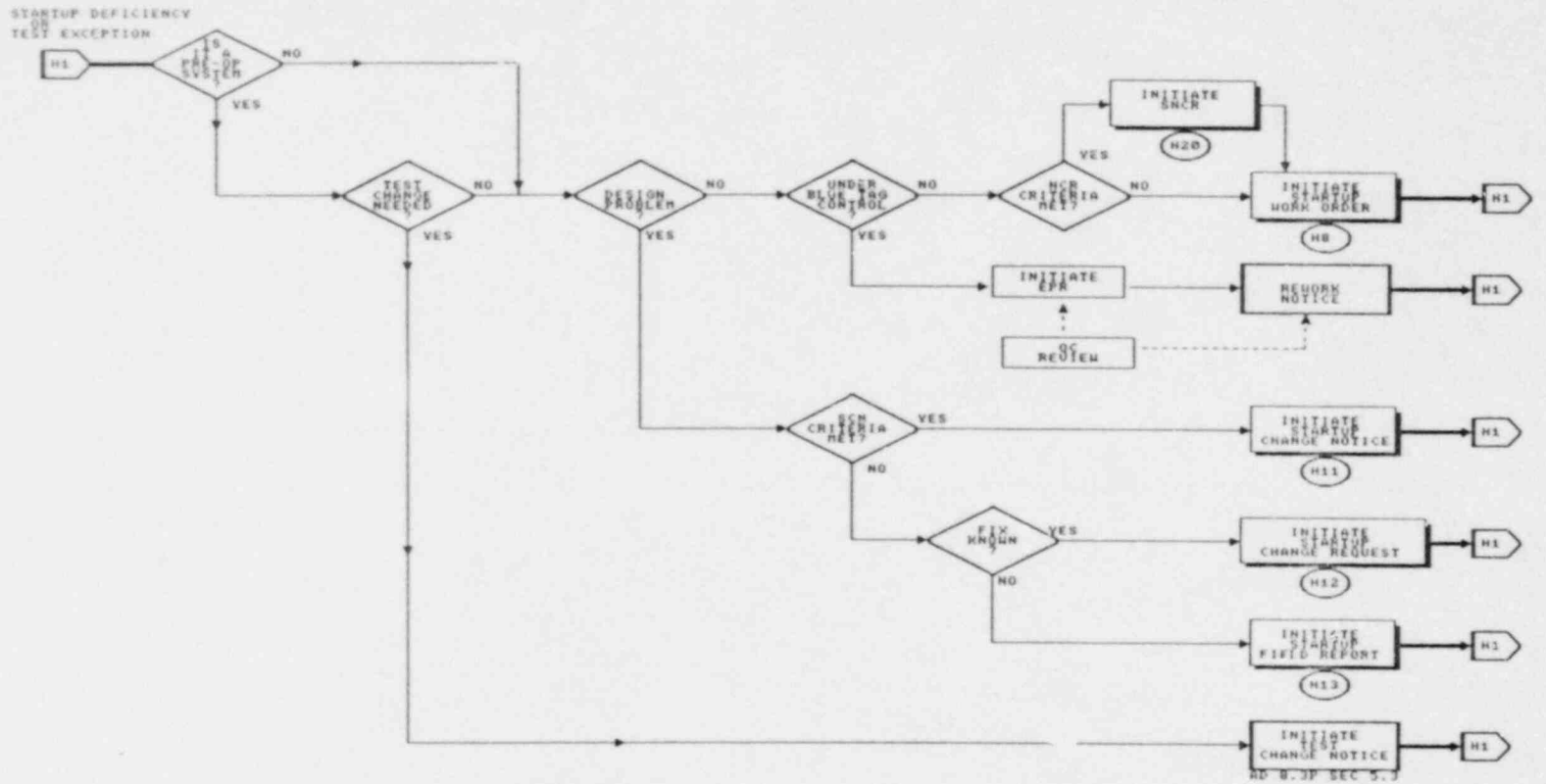
H-9
INITIAL SYSTEM OPERATION CHECKOUT (TECHNICAL TESTS)



NOTE:
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:
PSUE - PLANT STARTUP ENGINEER
SUL - STARTUP WORK LIST
TRB - TEST REVIEW BOARD

H-10
RESOLVE STARTUP DEFICIENCY OR EXCEPTION



NOTES:

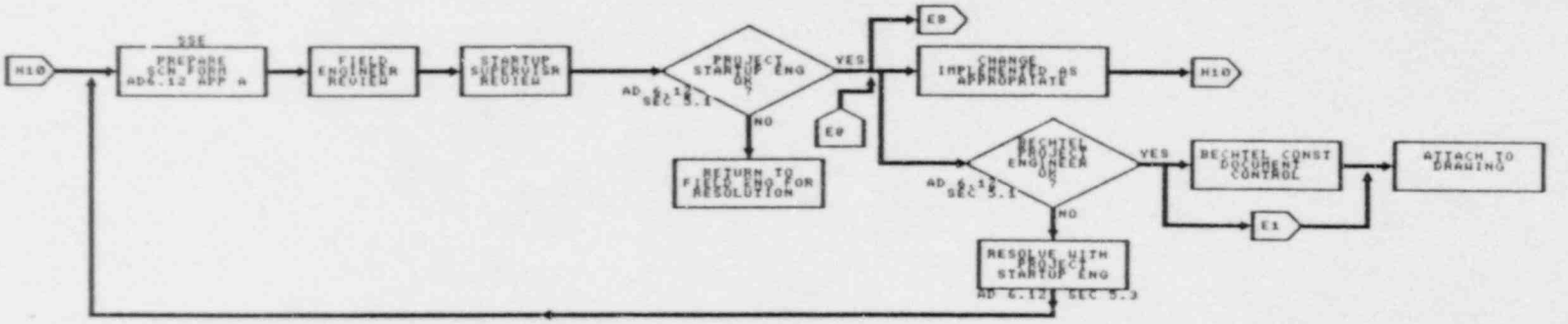
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART G-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

EPR - EQUIPMENT PROBLEM REPORT
SNCR - STARTUP NONCONFORMANCE REPORT

H-11
INITIATE STARTUP CHANGE NOTICE (SCN)



NOTES:

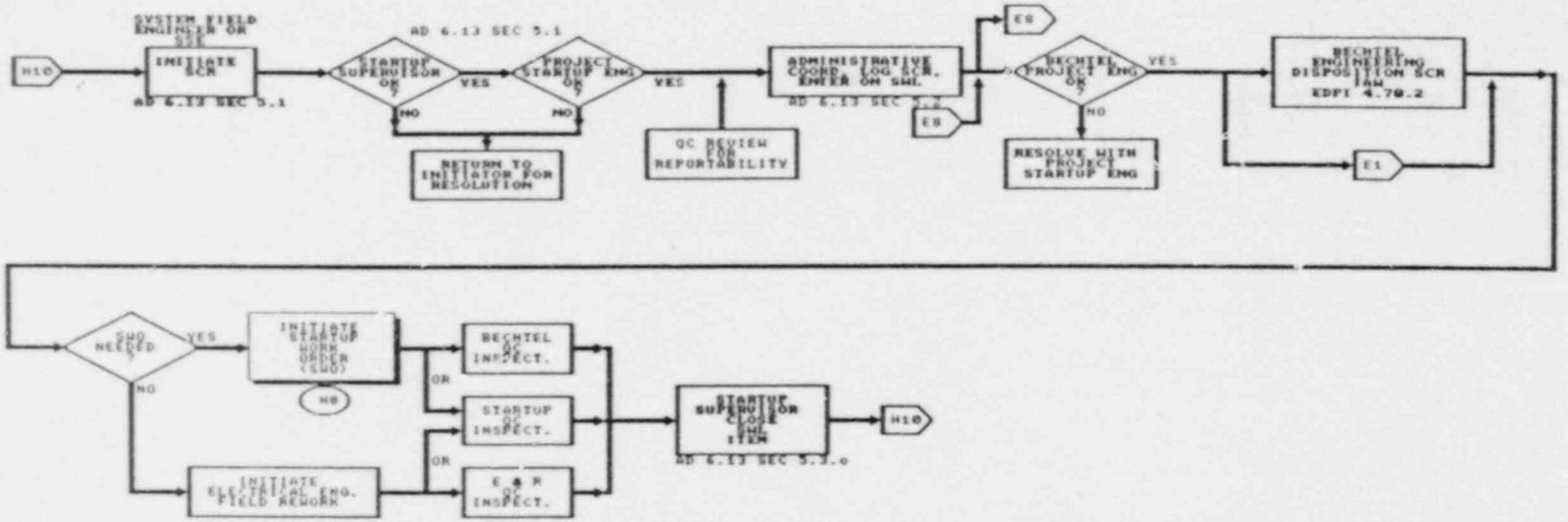
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-? FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND

SSE - STARTUP SYSTEM ENGINEER

H-12
INITIATE STARTUP CHANGE REQUEST (SCR)



NOTES:

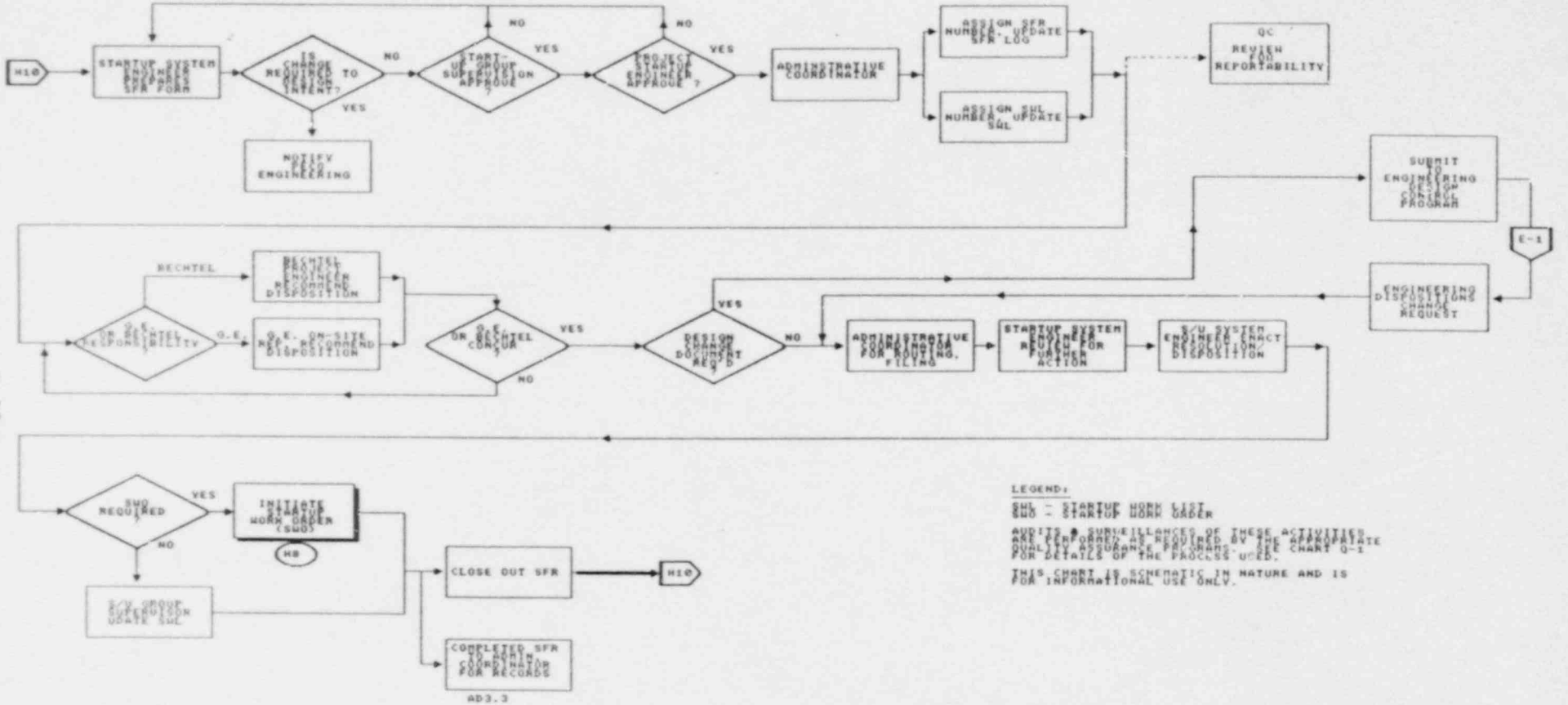
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE CONFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART G-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

E&R = ENGINEERING AND RESEARCH
SSE = STARTUP SYSTEM ENGINEER
SWL = STARTUP WORK LIST
SWO = STARTUP WORK ORDER

H-13
INITIATE STARTUP FIELD REPORT (SFR)



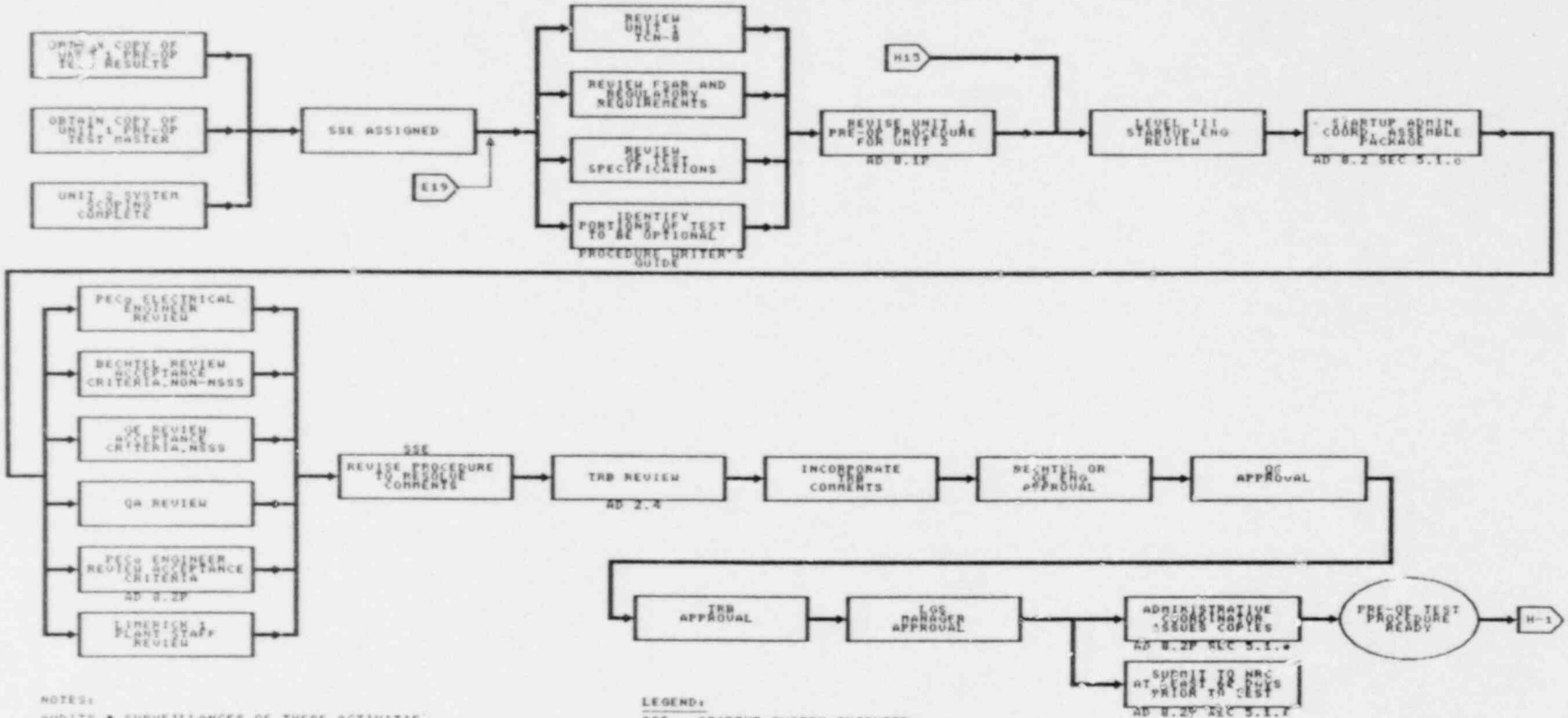
LEGEND:

SWL = STARTUP WORK LIST
SWO = STARTUP WORK ORDER

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

H-14
PRECPERATIONAL TEST PROCEDURE READY



NOTES:

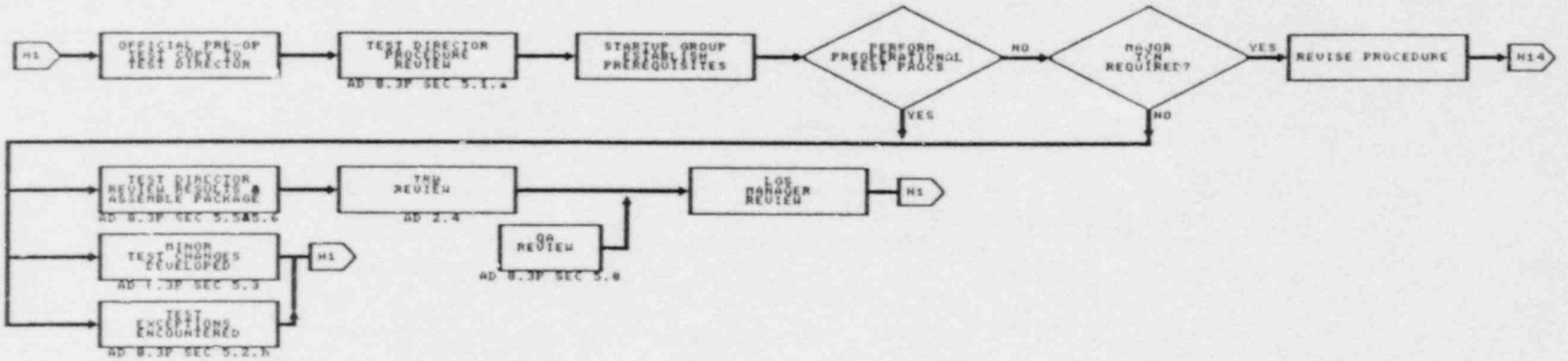
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART G-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

SSE = STARTUP SYSTEM ENGINEER
TRB = TEST REVIEW BOARD

H-15
PERFORM PREOPERATIONAL TEST



NOTES:

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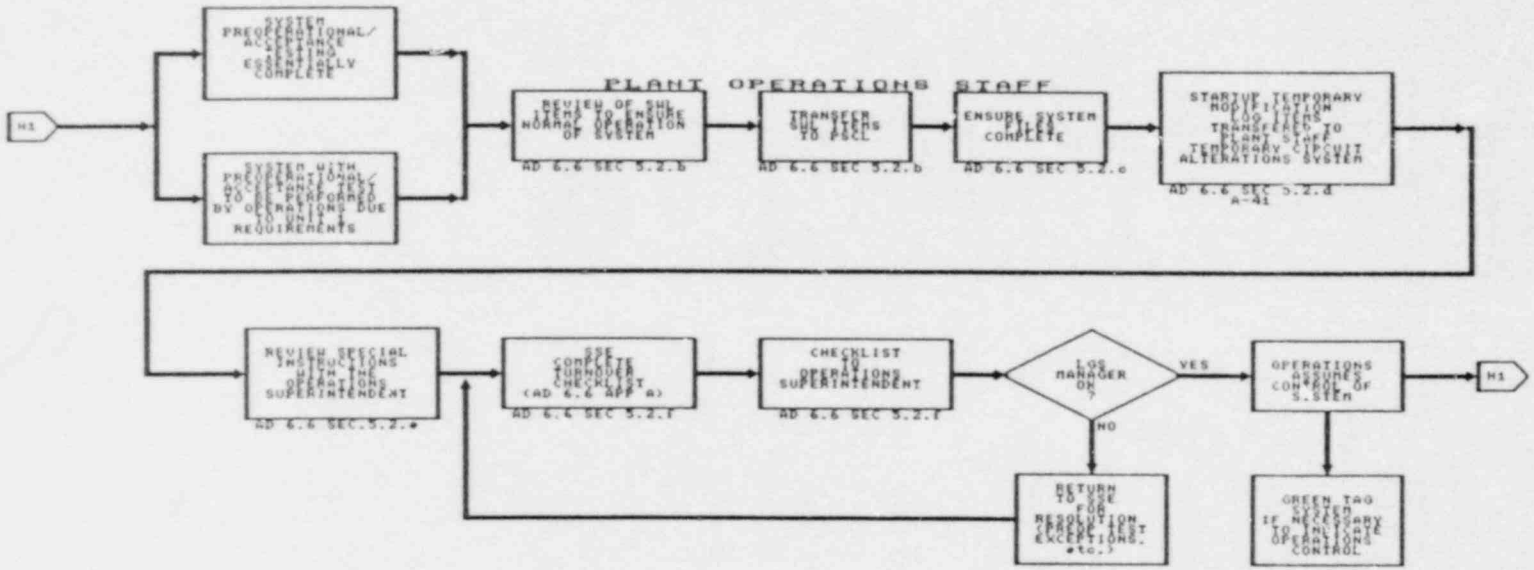
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

H-16
SYSTEM TURNOVER FROM STARTUP TO OPERATIONS



NOTES:

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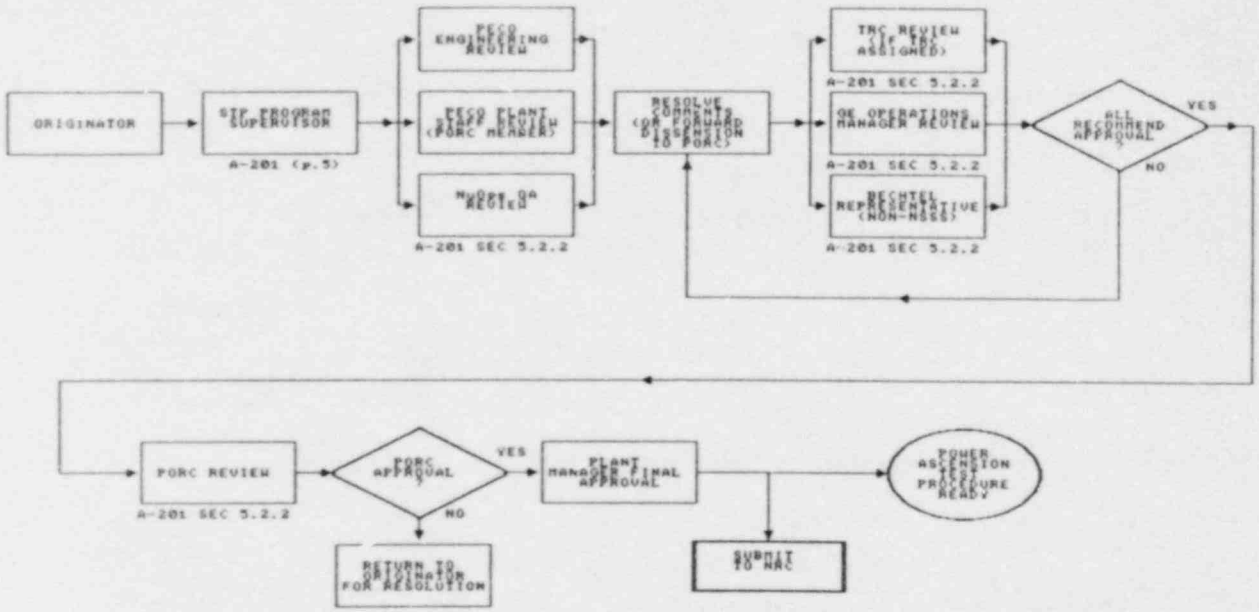
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

SAE = STARTUP SYSTEM ENGINEER
SUL = STARTUP WORK LIST

4.5-133

H-17
POWER ASCENSION PROCEDURES



NOTES:

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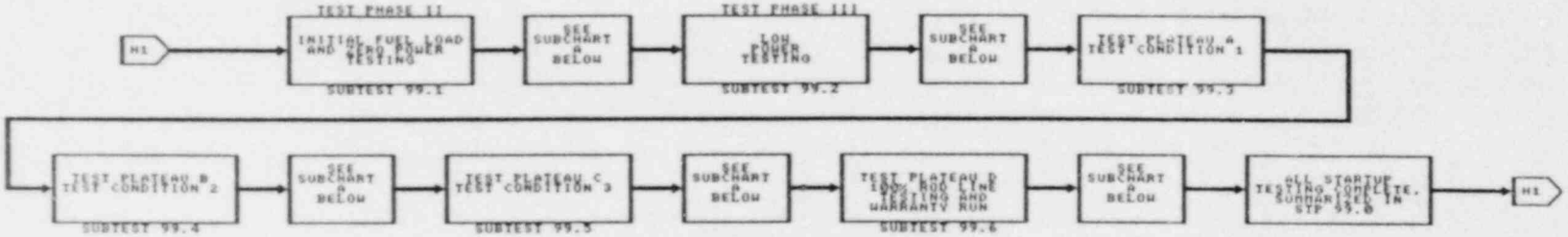
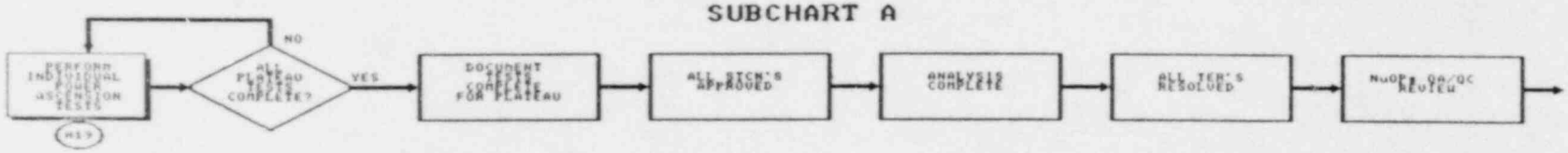
LEGEND:

PORC = PLANT OPERATIONS REVIEW COMMITTEE
TRC = TEST REVIEW COMMITTEE

H-18
STARTUP TEST PROGRAM
STP-99



SUBCHART A



NOTES:

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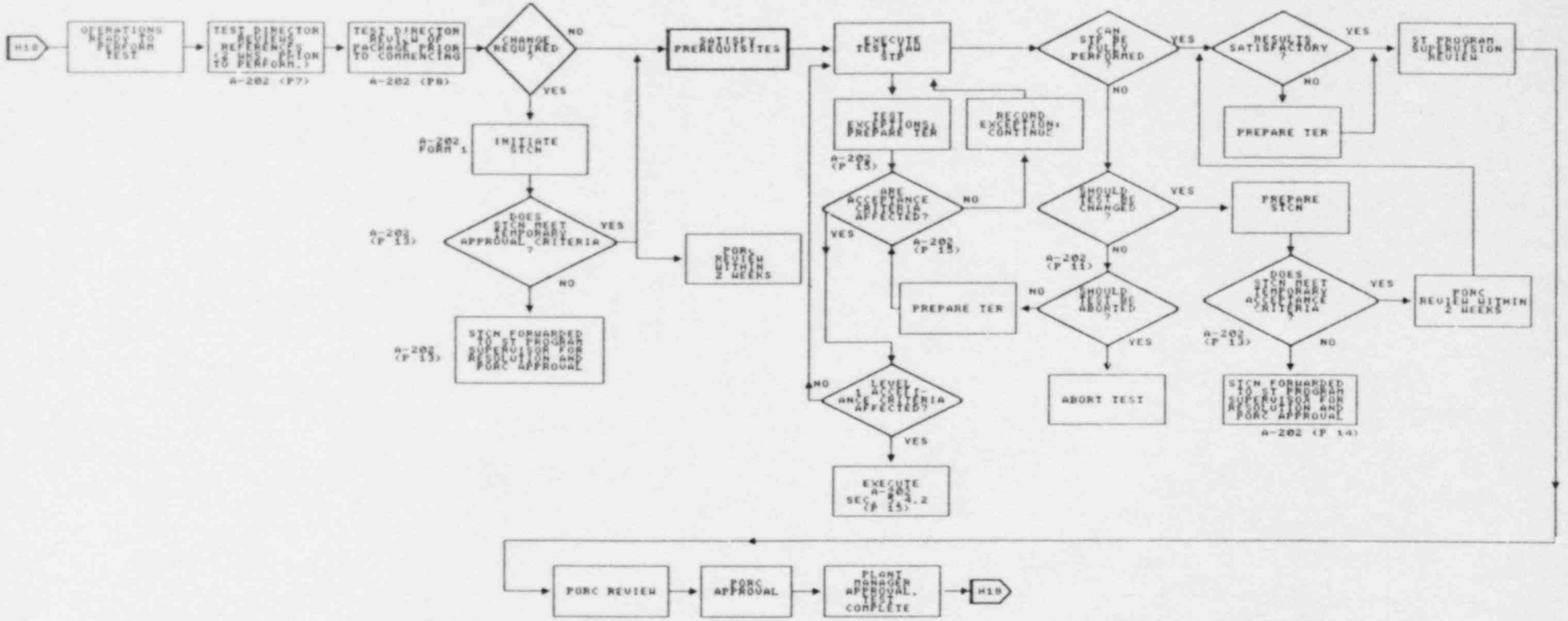
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

ISCN - STARTUP TEST CHANGE NOTICE
STP - STARTUP TEST PROCEDURE
TER - TEST EXCEPTION REPORT

4.5-35

H-19
PERFORM INDIVIDUAL POWER ASCENSION TESTS
(STP'S)



NOTES:

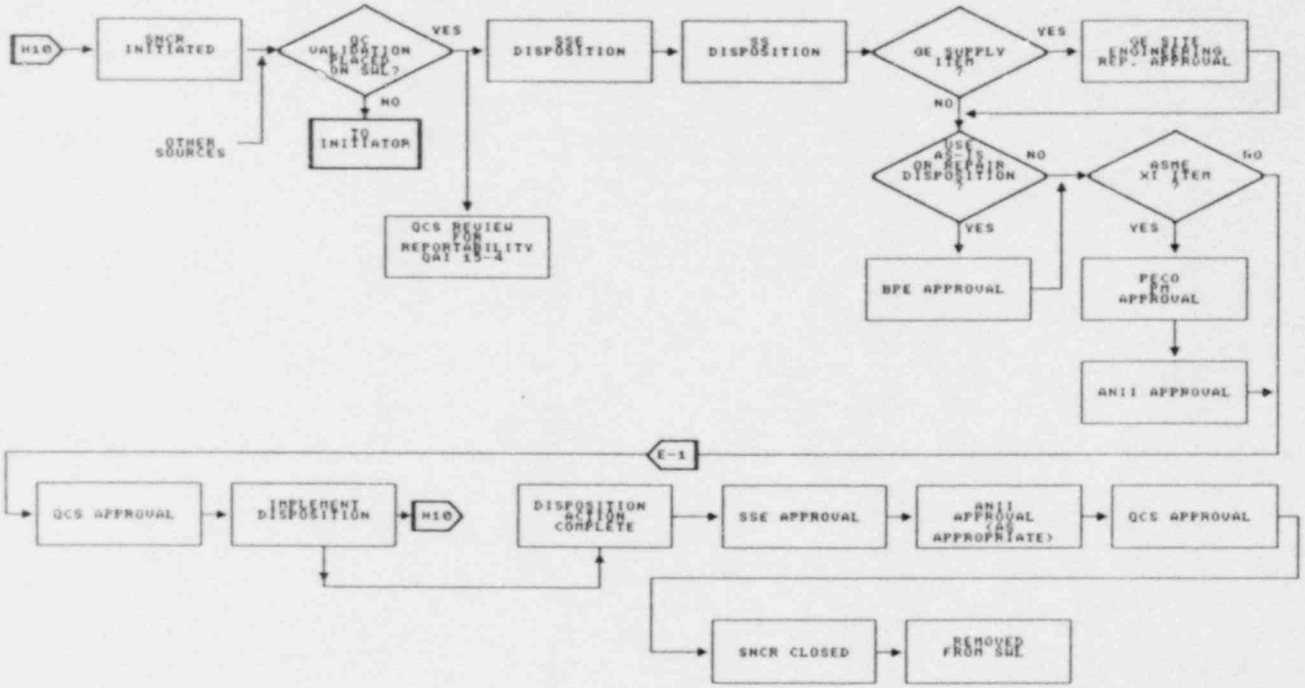
AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAMS. SEE CHART G-1 FOR DETAILS OF THE PROCESS USED.

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

PORC - PLANT OPERATIONS REVIEW COMMITTEE
ST - STARTUP TEST
STCN - STARTUP TEST CHANGE NOTICE
STP - STARTUP TEST PROCEDURE
TER - TEST EXCEPTION REPORT

H-20
STARTUP NCR PROCESS
(AD 1.2)



NOTE:
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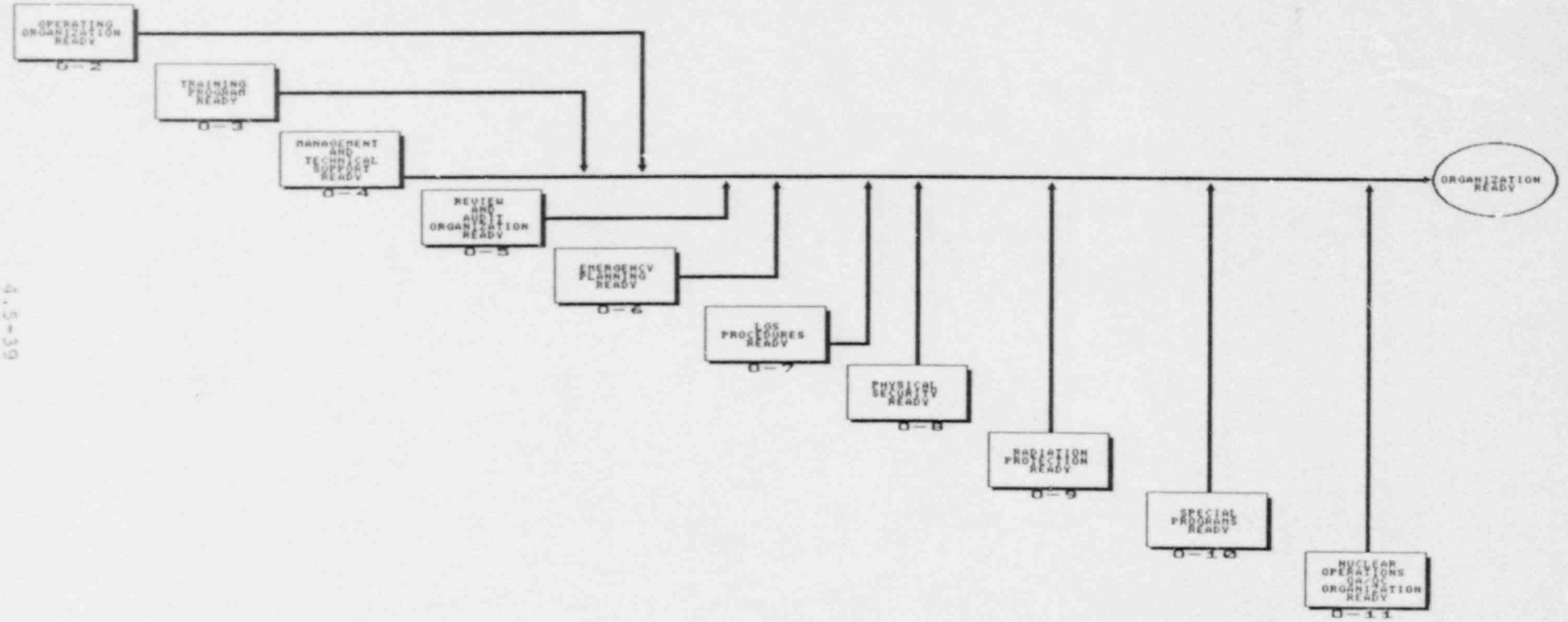
LEGEND

SSE - SYSTEM STARTUP ENGINEER
SS - STARTUP SUPERINTENDENT
QCS - QUALITY CONTROL SUPERVISOR
BPE - BECHTEL PROJECT ENGINEER
PECO PM - PECO PROJECT MANAGER
ANII - AUTHORIZED NUCLEAR INSERVICE INSPECTOR
SNCR - STARTUP NCR
SUL - STARTUP WORK LIST

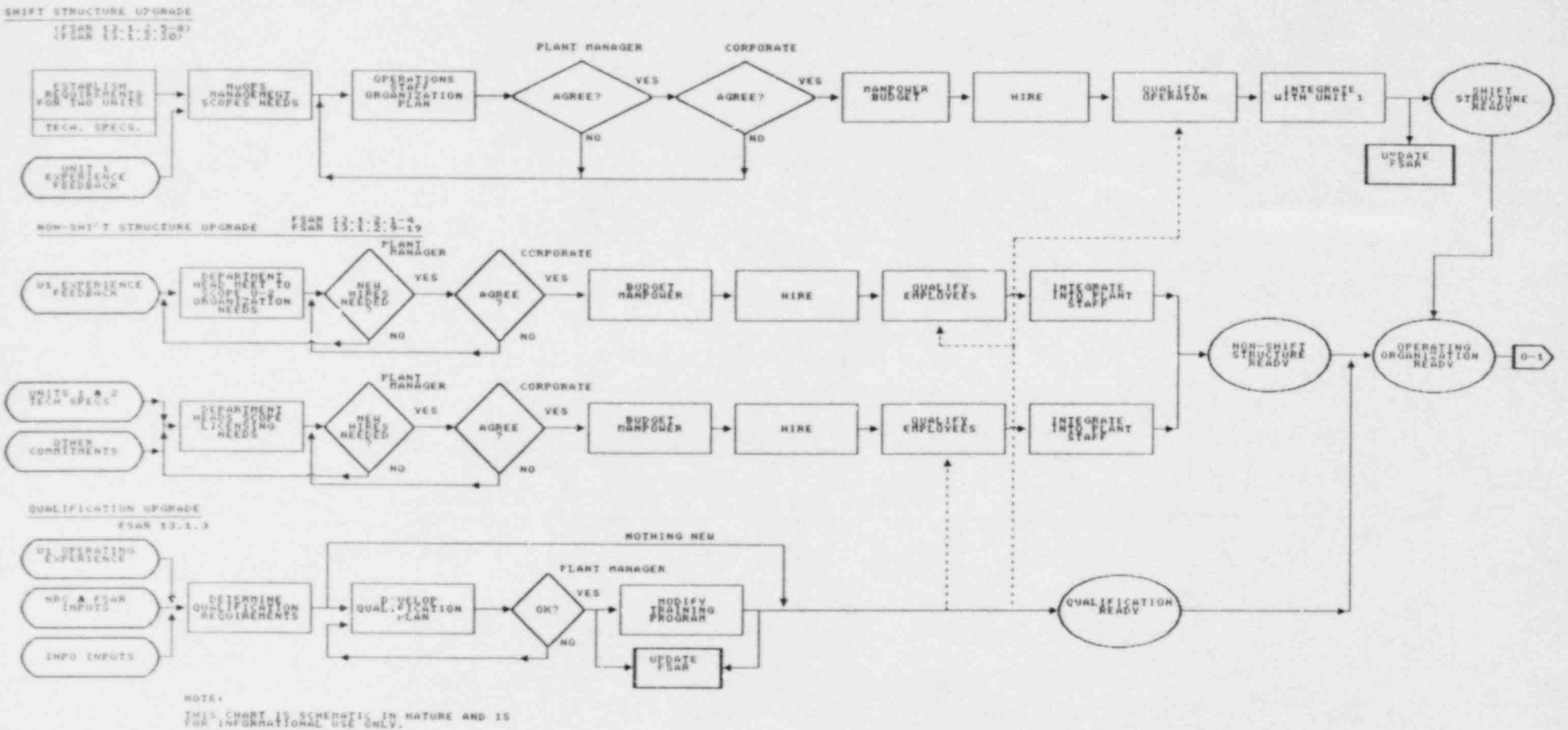
ORGANIZATIONAL READINESS CHARTS

O-1
ORGANIZATIONAL READINESS OVERVIEW



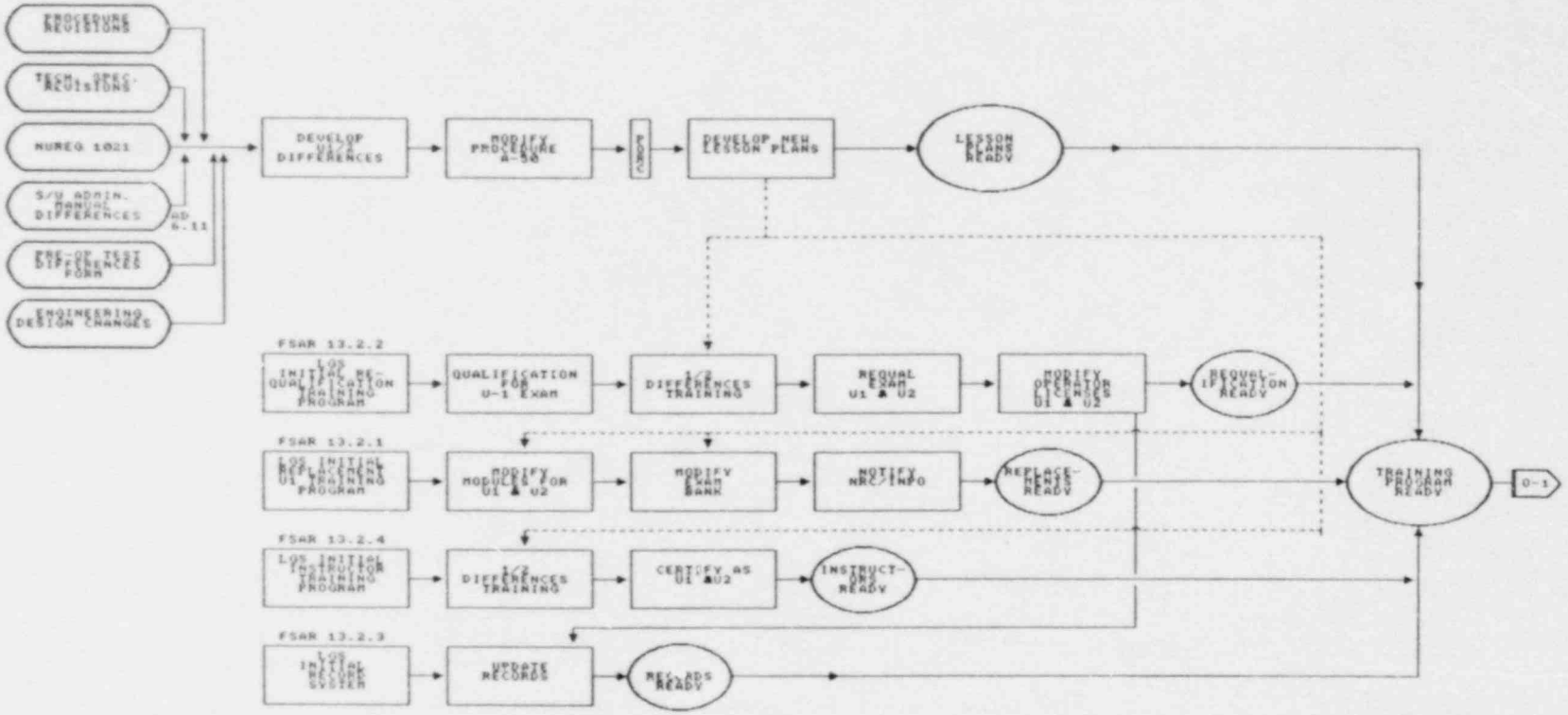
NOTE:
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

O-2
OPERATING ORGANIZATION READY
(FSAR 13.1.2)



NOTE:
THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

O-3
TRAINING PROGRAM READY
(FSAR 13.2)



NOTES:

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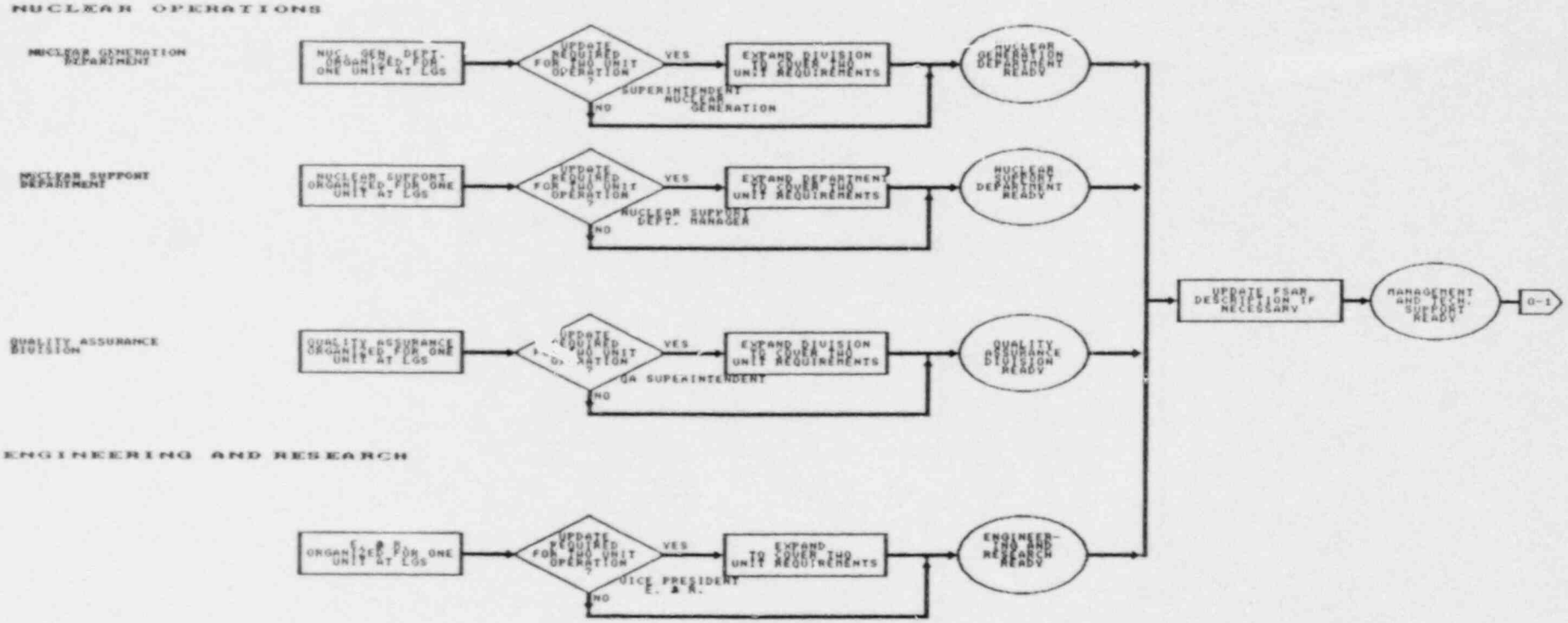
LEGEND:

PORC - PLANT OPERATIONS REVIEW COMMITTEE

O-4
MANAGEMENT AND TECHNICAL SUPPORT ORGANIZATION READY



NOTE:
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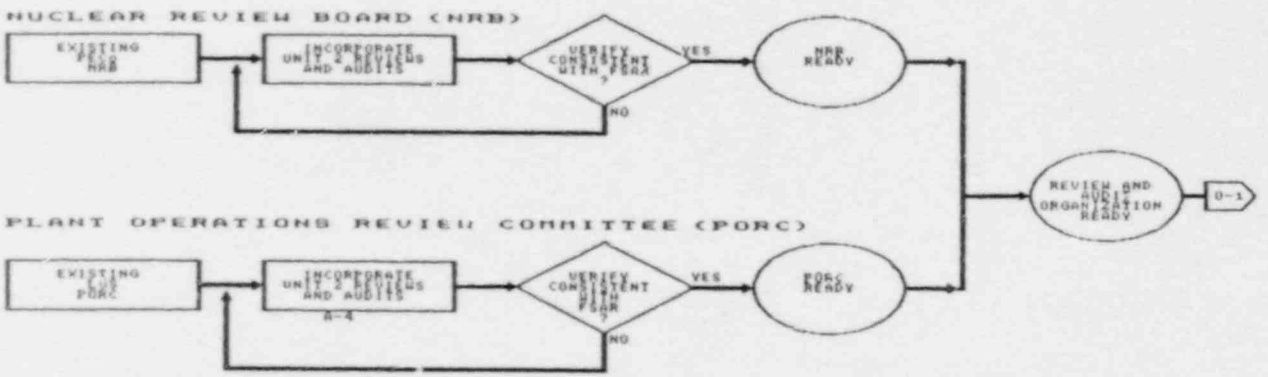
0-5
REVIEW AND AUDIT ORGANIZATION READY



NOTES:

AUDITS SHOWN ARE ONE OF THREE ACTIVITIES ONE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAM. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.

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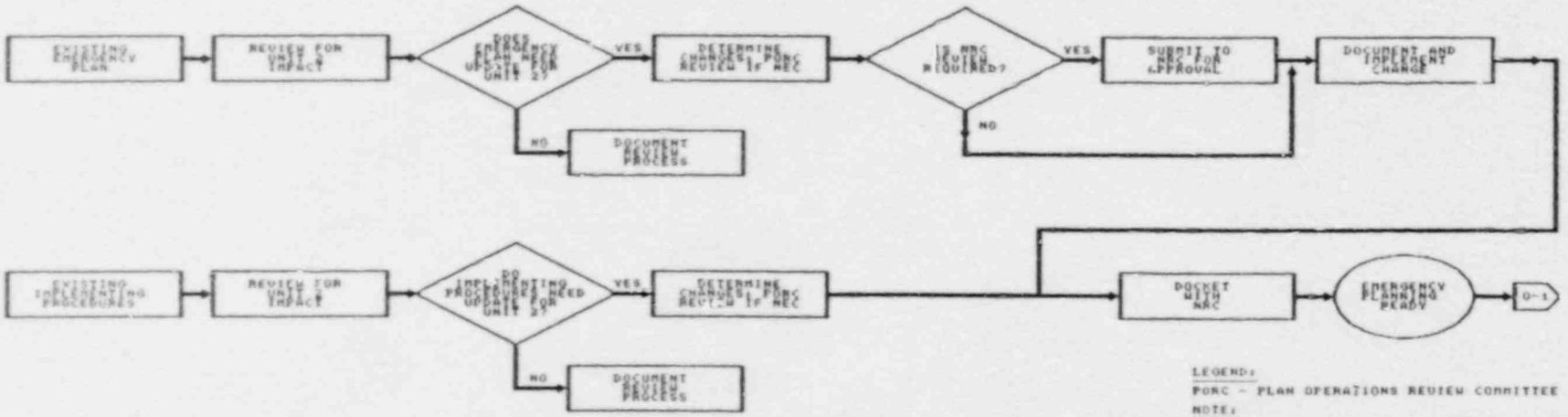
4.3.1-43

O-6
EMERGENCY PLANNING READY



LEGEND:

PORC - PLAN OPERATIONS REVIEW COMMITTEE

NOTE:

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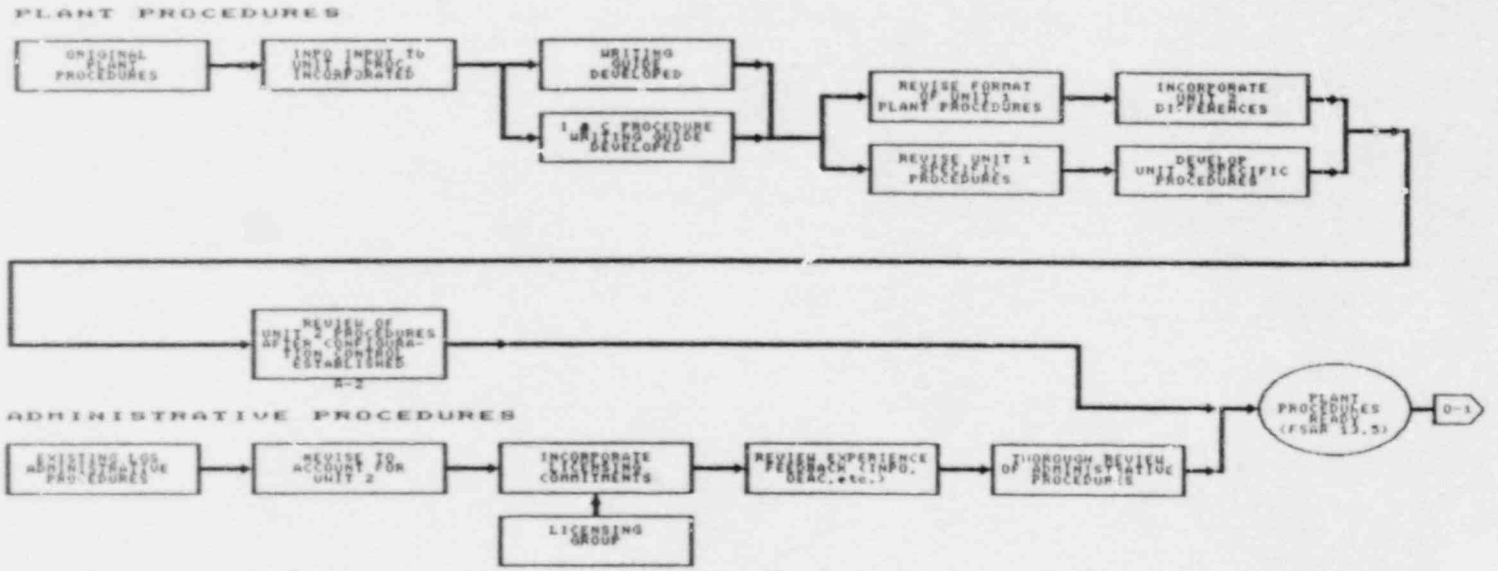
O-7
LGS PROCEDURES READY



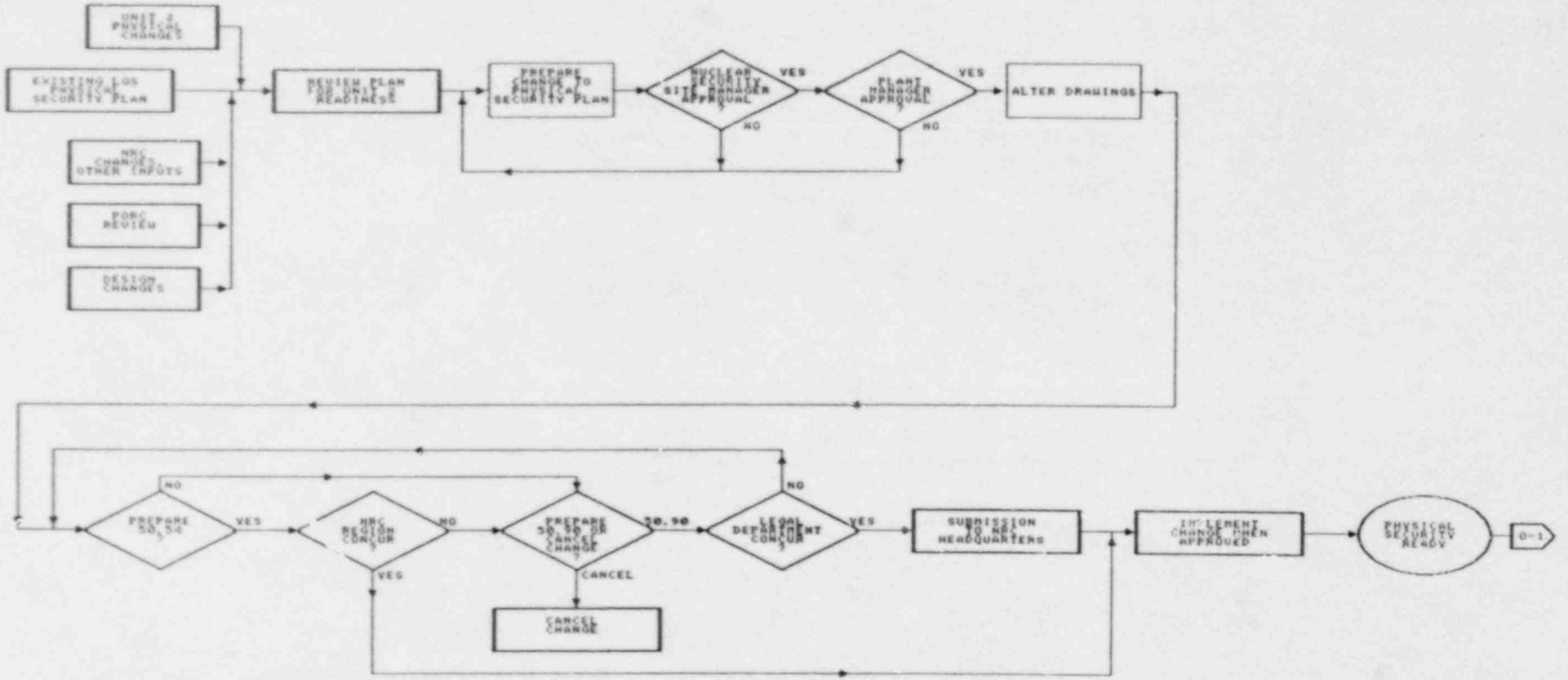
NOTES:

1. AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AS REQUIRED BY THE APPROPRIATE QUALITY ASSURANCE PROGRAM. SEE CHART Q-1 FOR DETAILS OF THE PROCESS USED.
2. THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.

LEGEND:

OEAC - OPERATING EXPERIENCE ASSESSMENT COMMITTEE

O-8
PHYSICAL SECURITY READY
(FSAR 13.6)



NOTES:

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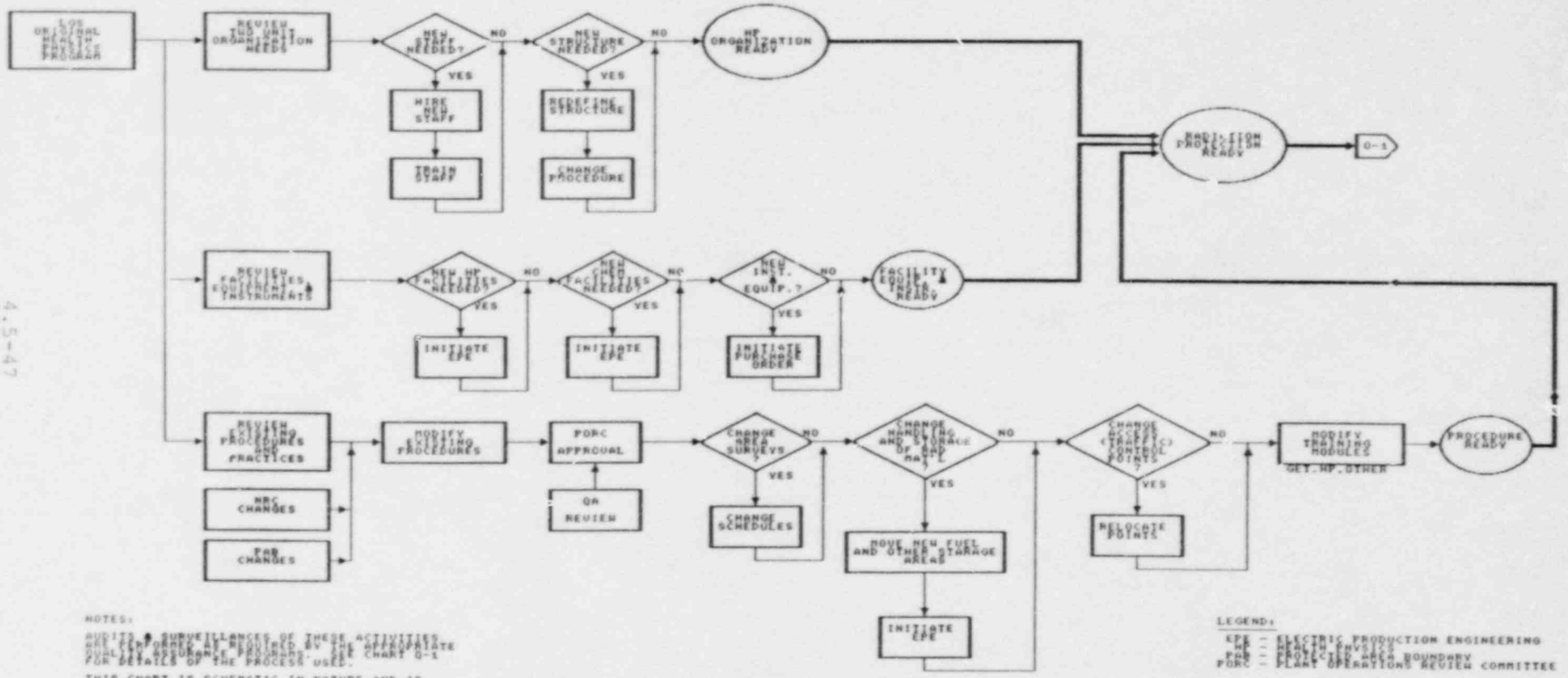
O-9
RADIATION PROTECTION READY



NOTES:

AUDITS & SURVEILLANCES OF THESE ACTIVITIES ARE PERFORMED AT POINTS BY THE APPROPRIATE QUALITY ASSURANCE PROGRAM. SEE CHART O-1 FOR DETAILS OF THE PROCESS USED.

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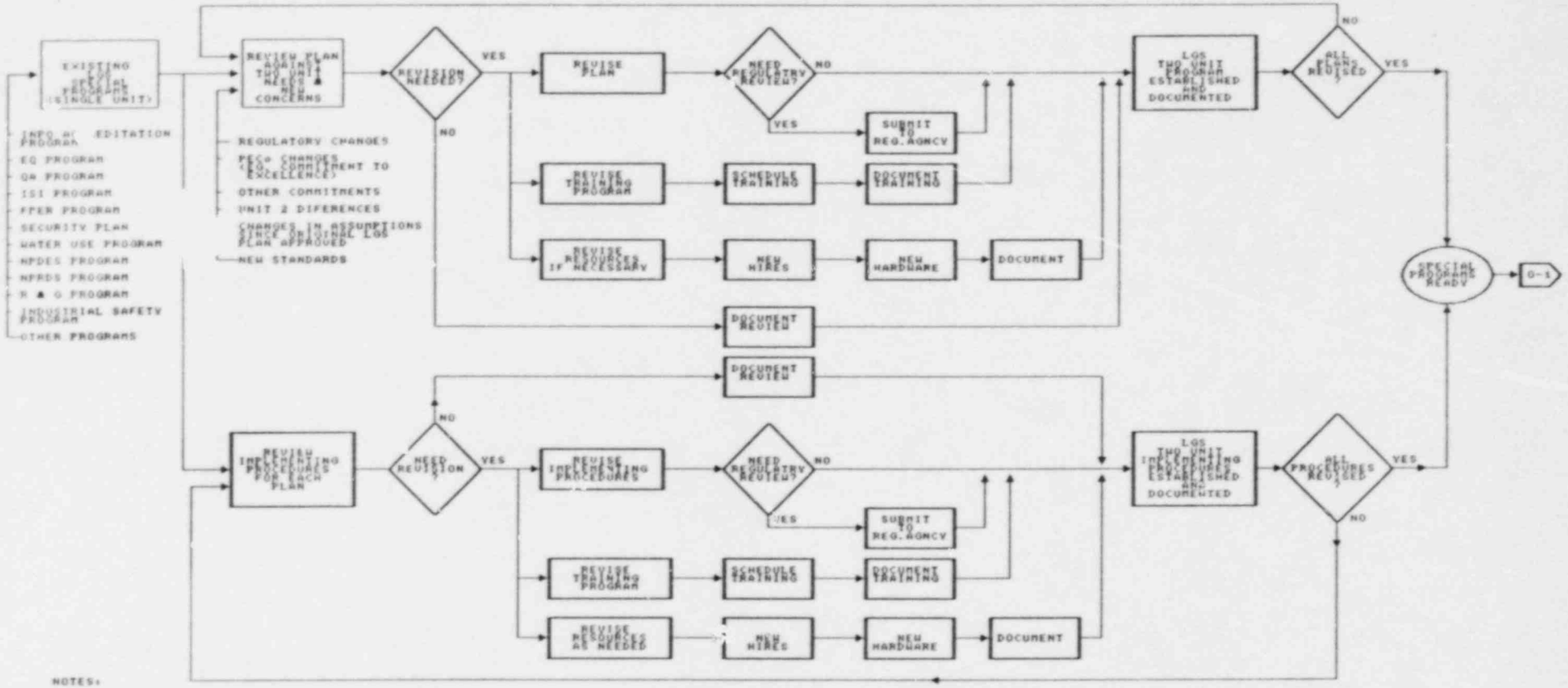
LEGEND:

EPE = ELECTRIC PRODUCTION ENGINEERING
HP = HEALTH PHYSICS
FSAR = FINAL SAFETY ANALYSIS REPORT
PORC = PLANT OPERATIONS REVIEW COMMITTEE

O-10
SPECIAL PROGRAMS READY



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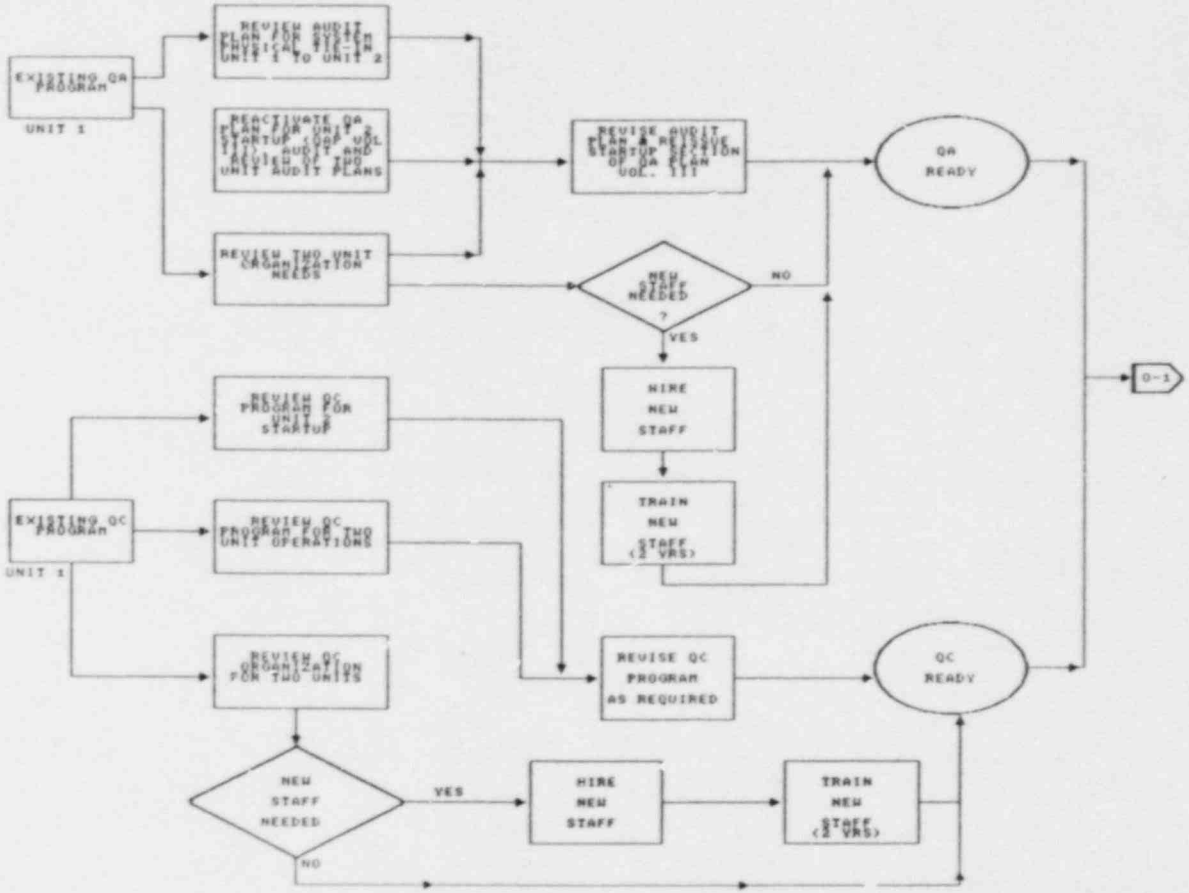
O-11
NUCLEAR OPERATIONS
QA/QC ORGANIZATION READY



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APPENDICES

Appendix A: Readiness Program Assessment Plan

Appendix B: Readiness Program Assessment Milestones

Appendix C: Method Used to Assess Readiness on Unit 1

APPENDIX A

READINESS PROGRAM ASSESSMENT PLAN

Revision 2

Submitted July 31, 1987

Revision 2
July 31, 1987

READINESS PROGRAM ASSESSMENT PLAN

FOR LIMERICK 2

PPHILADELPHIA ELECTRIC COMPANY

JULY, 1987

Revision 2
July 31, 1987

READINESS PROGRAM ASSESSMENT PLAN

CONTENTS

Revision 2
July 31, 1987

I. BACKGROUND

In October, 1984, PECo obtained the operating license for Limerick 1. Although the Nuclear Regulatory Commission's (NRC) regulatory requirements have been relatively stable since that time, there have continued to be significant changes in the way those regulatory requirements are being interpreted and implemented in the licensing of new nuclear plants. Utility companies, in hopes of bringing their new units into operation or returning their operating units to service, have had to deal with this changing regulatory environment.

Today, the NRC typically requires utilities to demonstrate higher levels of safety to greater degrees of assurance than ever before. One area that receives special NRC attention is the ability of the utility to demonstrate that construction of the plant is complete and that the plant is ready for operation. Some utilities have had difficulty making this demonstration and have experienced licensing delays. Other utilities have developed initiatives designed to facilitate demonstrations of plant completion and readiness for operation. These utilities have experienced smoother transitions from construction to operations. One management initiative which has shown particular success in addressing NRC concerns is known as a Readiness Review.

A Readiness Review is a systematic evaluation of design, construction, testing and preparation for operation that can determine an acceptable endpoint for the construction phase and commencement of the operations phase. There is a variety of types and scopes for Readiness Reviews. The most complete Readiness Review was conducted at Vogtle and included a significant effort to evaluate design adequacy and confirm that the construction conforms to the design. The Readiness Review performed by Georgia Power Company

at Vogtle is a direct result of the recommendations published in NUREG-1055, "Improving Quality and the Assurance of Quality in the Design and Construction of Nuclear Power Plants" (Ford Amendment study). South Texas Project is using a less-extensive operational Readiness Review prior to its licensing request. Grand Gulf conducted an operational readiness review prior to full power licensing. TVA and Hanford (DOE) have adopted operational readiness review procedures for restart of several reactors.

The NRC enthusiastically welcomes and encourages the Readiness Review concept. The NRC likes the ease of verification that the Readiness Review can provide in the final stages of the licensing process. For example, the NRC Commissioners have praised Georgia Power Company for its Readiness Review efforts at Vogtle 1.

A Readiness Review is also helpful in dealing with the opponents of nuclear power. Intervenors have become skilled at identifying alleged or real quality problems at nuclear construction sites. They have learned to use timely allegations to undermine the credibility of quality programs and utility management. Investigation and resolution of such highly visible issues is costly and usually does not enhance the image of the utility. A Readiness Review can strengthen the ability of a utility to withstand such intervenor challenges.

Since the quality of Limerick 1 design and construction has been demonstrated by its fine operating record since licensing, PECo has good reason to believe that existing design, construction and quality programs at Limerick Generating Station (LGS) are sufficient to bring Limerick 2 on-line with minimum problems. PECo believes that existing programs at LGS are already

accomplishing what the Readiness Review accomplishes for other utilities. Therefore, an independent readiness program similar to the program conducted at Vogtle may not be necessary to license Limerick 2. However, an initiative to conduct a limited scope assessment of existing Limerick 2 programs that relate to readiness will provide PECo with the benefit of knowing how its programs measure-up to what NRC expects in today's regulatory environment.

II. INTRODUCTION

A Readiness Program Assessment is one method for PECo to examine existing LGS programs to assess their capability to demonstrate construction completion and operational readiness for Limerick 2. The Readiness Program Assessment will determine the manner in which PECo plans to affirm the construction completion and operational readiness of Limerick 2. Based on the results of the Readiness Program Assessment, PECo can determine whether or not additional Readiness Review measures are needed for Limerick 2 and, if so, to what extent. The Readiness Program Assessment will be conducted by individuals experienced in licensing, design, construction, start-up, operations, quality assurance and Readiness Reviews. A Report presenting the results of this assessment will be developed jointly by IEAL and key PECo individuals and presented to Senior PECo Management. This Report will provide additional input for a PECo decision on its ability to assure, demonstrate and affirm construction completion and the operational readiness of Limerick 2. The Readiness Program Assessment will allow this decision to be made

in September or October, 1987, approximately two years in advance of the OL, which allows time for corrective actions, if they are required.

III. OBJECTIVE

The objective of the Readiness Program Assessment is to measure the ability of existing PECo programs to assure and demonstrate completion of Limerick 2 and its readiness for operation in accordance with the licensing commitments.

Also, activities such as the Readiness Program Assessment serve to demonstrate a proactive involvement by PECo senior Management in the completion, readiness and licensing of Limerick 2.

IV. SCOPE

The Readiness Program Assessment will be conducted as a joint effort by IEAL and PECo personnel. IEAL will function as an extension of PECo management staff and will not act as a third party or independent consultant. The Readiness Program Assessment will span a two to three-month period and will document its results in a Report based on what is learned in that time. PECo will have full ownership in the results and recommendations of the Readiness Program Assessment.

The basic approach of the Readiness Program Assessment is to:

- Identify and characterize existing PECo programs and associated documentation;
- Determine how these programs fit together in the context of completion and readiness; and,
- Determine the accountability structure that communicates the completion and readiness message to the Senior Vice President.

Performance of the Readiness Program Assessment will facilitate a PECo self-evaluation of its readiness capabilities. This assessment includes identification of existing licensing, design, construction, operations and start-up and quality assurance programs and associated documentation. This will be conducted by interviewing key PECo individuals.

As Limerick 2 nears completion, individual design, construction and start-up programs will close-down. PECo Program Managers and Supervisors will have the responsibility for program completion and sign-off. The Senior Vice President will base his NRC readiness statement upon the recommendations of his management staff and lower-tiers of responsibility. The Readiness Program Assessment will review PECo methods for completion and readiness accountability that lead to corporate affirmation by the Senior Vice President. Completion and readiness accountability should encompass the lowest to the highest tiers in the PECo and lead contractor organizations. It will be important to define and how each level within this accountability structure functions. The Assessment Outlines described later in Phases II and IV specify the details of this approach (See Attachments A and B, respectively). Each Assessment Outline describes the approach for determining the accountability structure in the given area and how it relates to the overall structure.

The result of the Readiness Program Assessment will establish the extent to which ongoing activities at Limerick 2 today can support the Senior Vice President's oath and affirmation statement that must be made to the NRC in August, 1989.

V. READINESS PROGRAM ASSESSMENT ORGANIZATION

The Readiness Program Assessment will be a joint PECo and IEAL effort with a Readiness Program Assessment Team (RPAT) organized as shown in Figure 1. This Figure shows the integration of PECo and IEAL personnel at the management and worker levels to support program objectives. A description of each functional block follows:

RPA Management Board - This board consists of senior PECo and IEAL managers. The board has overall responsibility for conducting the Readiness Program Assessment. The purpose of the RPA Management Board is:

- To meet and advise at key junctions during the assessment;
- To coordinate PECo ownership of the work and results; and,
- To make recommendations to Senior PECo management.

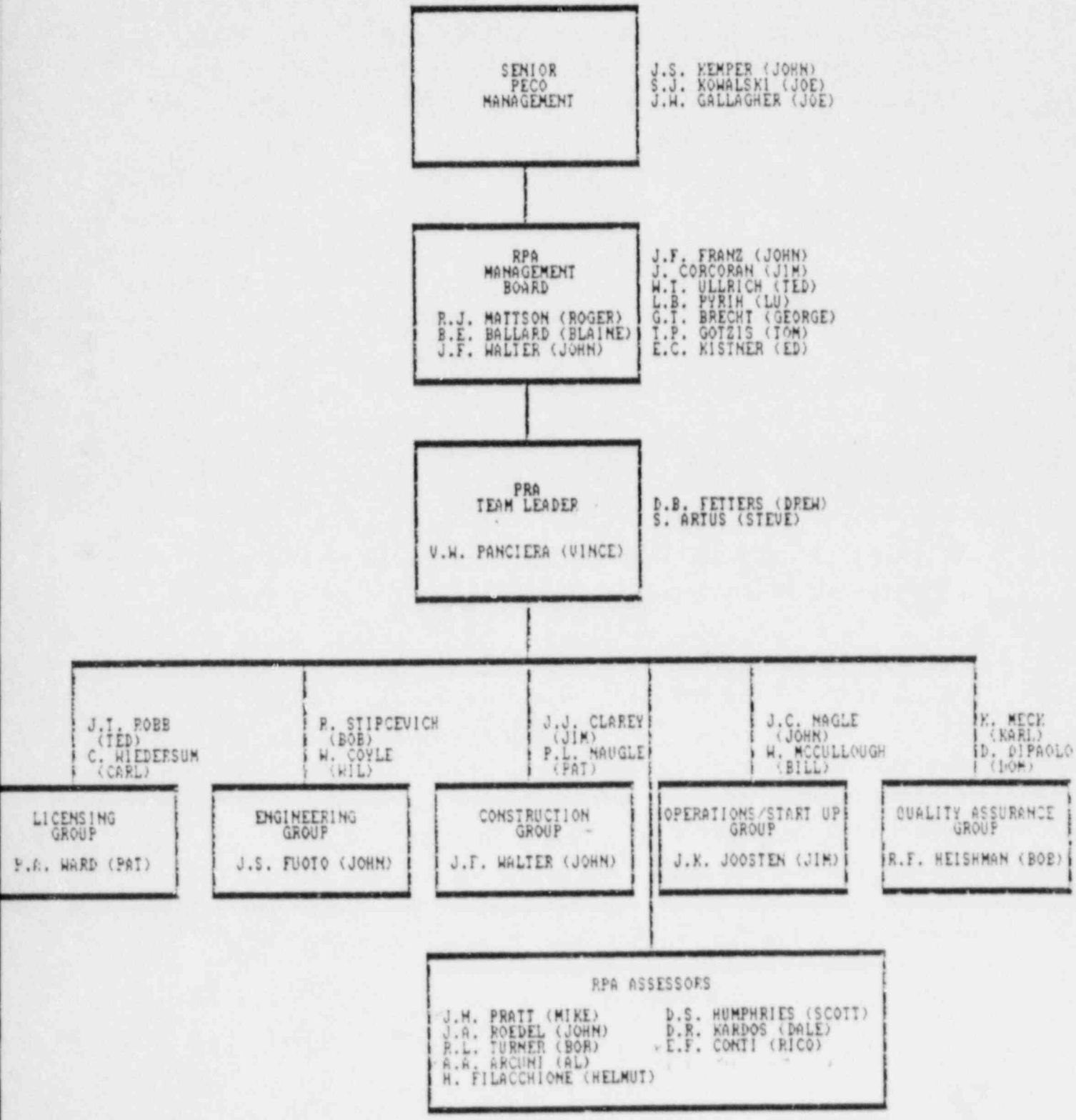
It also provides direction to the RPAT Leader with respect to the scope and depth of assessment activities. In addition, it is the responsible authority for issuance of the Readiness Program Assessment Report. It reviews the draft input from the RPAT, compares it to other nuclear project information and, after any necessary revision, issues the final Report. It is responsible for assuring that adequate resources are applied to the assessment effort and that overall Plan objectives are met.

Revision 2
July 31, 1987

LIMERICK 2 READINESS PROGRAM ASSESSMENT TEAM

(RPAT)

ORGANIZATION



RPAT Leader - The RPAT Leader receives direction from the RPA Management Board and interfaces with the PECo Project Manager on a day-to-day basis to ensure that RPAT efforts are properly coordinated between IEAL and PECo staff personnel. He provides guidance to and coordination of RPAT efforts in implementing the Plan. He reviews RPAT work on a daily basis and provides direction to assure that all areas are adequately covered and that duplication is minimized. He also assures that applicable information developed by each Group is made available to the other Groups. He coordinates RPAT input for the Report and submits the draft Report to the RPA Management Board.

PECo Project Manager - The PECo Project Manager provides overall direction to the RPAT. This direction includes guidance concerning existing PECo readiness programs, coordination of interfaces between the RPAT and key PECo managers and supervisors, day to day liaison with the RPAT Leader to assure that RPAT efforts are meeting the objectives of the Plan. He arranges for PECo administrative resources needed to support the RPAT effort.

RPAT Groups - The RPAT is composed of five distinct but inter-related Groups. The Groups assess existing PECo readiness programs within the present licensing environment and provide conclusions and recommendations for these programs to facilitate a readiness demonstration. The Groups will provide relevant input based on experience gained at other plants.

The areas covered by these groups are as follows:

- Licensing
- Engineering

- Construction
- Operations & Startup
- Quality Assurance

Note that each RPAT Group includes at least one equivalent full-time PECo member.

VI. PLAN AND SCHEDULE

The Limerick 2 Readiness Program Assessment consists of a review of existing programs and documents and interviews with key PECo personnel. The assessment will produce a Report that informs PECo of its ability to assure and demonstrate completion of construction of Limerick 2 and readiness for operation in accordance with licensing commitments. This directly supports the PECo Senior Vice President's affirmation, under oath, that Limerick 2 has been designed and constructed in accordance with the Final Safety Analysis Report.

In preparation for the Readiness Program Assessment, IEAL formulated a draft of the Readiness Program Assessment Plan based on the Limerick 2 Licensing Plan and item 3. of Roger Mattson's letter to H. W. Winitsky, dated May 27, 1987. On June 12, 1987, IEAL met with E&R management and Quality Assurance personnel to discuss quality assurance matters, including a briefing by IEAL on the salient points of NUREG-1055 and other quality assurance developments in the industry. In addition, IEAL briefed PECo on the Readiness Program Assessment Plan, including its objectives, milestones, schedule, team organization and management. On June 26, 1987, IEAL briefed PECo Senior Management on the Limerick 2 Licensing Plan which includes an option to consider the Readiness Program Assessment.

Senior Vice President approval, in concept, to proceed with development of the Readiness Program Assessment Plan was received in that meeting. The Licensing Plan has been revised to incorporate PECo comments and direction obtained at the June 26 meeting. On June 30, 1987, IEAL and key PECo counterparts met to develop the Readiness Program Assessment Plan in greater detail.

The Readiness Program Assessment will consist of five Phases. They are:

Phase I - Planning,

Phase II - First Site Visit,

Phase III - Coordination,

Phase IV - Second Site Visit, and

Phase V - Write Report.

On July 10, 1987, IEAL submitted the Readiness Program Assessment Plan to PECo for comment. Draft assessment outlines were developed and were reviewed with PECo counterparts on July 24, 1987. These draft assessment outlines were presented to the RPA Management Board on July 30, 1987. After review and approval by the RPA Management Board, conforming changes will be made for use of the assessment outlines during the first site visit scheduled for the week of August 3rd.

PECo will make program descriptions and documentation available during the planning phase, Phase I. The documentation indicated

by asterisk in Table 1 will be needed by IEAL for planning. This documentation need not include detailed implementation procedures. Interview schedules will also be developed during Phase I to facilitate the RPAT interviews of key personnel during Phase II.

During Phase II, the RPAT will conduct a 1-week site visit. It will identify existing licensing, design, construction, start-up, operational, and QA programs and associated documentation and will interview PECo and subcontractor personnel involved in these programs. Examples of programs and documentation to be reviewed by the RPAT are shown in Table 1. Activities are broken down into review areas in Figure 1. The RPA Team Leader will keep the PECo Project Manager updated on the conduct of the assessment on a daily basis.

In Phase III, IEAL team members will assemble in Fairfax, Va. to consolidate and coordinate the results of Phase II and to plan the in-depth reviews that are to be done during Phase IV. Detailed Assessment Outlines will be prepared to guide assessment activities in Phase IV. During this phase, descriptions of existing PECo programs will be developed to facilitate the RPAT development of assessment outlines for Phase IV.

The RPAT will return for a 2-week site visit during Phase IV to complete the assessment and focus on specific programs and the functional relationship between these programs. This will include the interviewing of personnel responsible for program implementation and the review of the inputs and outputs of various programs that may be used to demonstrate construction completion and operational readiness.

During Phase V, the IEAL team will assemble assessment results and draft a report. This draft Report will reflect the results of the work conducted by PECo and IEAL RPAT members. RPAT will develop a consensus Readiness Program Assessment Report.

The RPA Management Board will present the Readiness Program Assessment Report to the Senior Vice President accompanied by all assigned PECo management counterparts.

A summary of each of these milestones and the associated schedule is provided in Table 2.

Revision 2
July 31, 1987

Table 1

EXAMPLES OF DOCUMENTATION TO BE REVIEWED
DURING THE RPA PROGRAM

LICENSING GROUP

Licensing Commitment Tracking System (and System Description*)
Final Safety Analysis Report (FSAR)
FSAR Change Control System
Safety Evaluation Report (SER) and its Supplements (SSERs)
NRC Docket Correspondence
ASLB Initial Decisions on LGS

DESIGN GROUP

Project Change Request System
Environmental Qualification Program
SQRT Program
Resident Engineering
NCR, FCR, DCP and DCN Programs
Valve List
Instrument Index
Master Equipment List
Q-List
Q*5 List
As-Built Program

Table 1 (Cont.)

CONSTRUCTION GROUP

Unit 1 Interface Procedure (G-39 Procedure)*
Organization Charts*
Material Controls Procedures
Work Procedures
Construction Procedures
Construction Procedure Description and Change Process*
Construction Quality Control Procedures (Seismic II/I, Fire Protection, etc.)
Installation Specifications
Trend Procedure
System and Area Turnover Process
Quality Engineering Group

OPERATIONS AND START-UP

Pre-operational Test Program
Start-up Test Program
Maintenance Systems
Emergency Operating Procedures
Surveillance Procedures
NRB Process Description*
Field Engineering Tagging System
PORC Program Description*
Drug Awareness Program
Fitness for Duty Program
Radwaste

Table 1 (Cont.)

QUALITY ASSURANCE GROUP

Quality Assurance Plan*
Quality Assurance Procedures
Audit and Follow-up Systems
Reporting Systems
Quality Control Procedures
Employee Concerns Program

Revision 2
July 31, 1987

Table 2

SUMMARY OF READINESS PROGRAM ASSESSMENT
MILESTONES AND SCHEDULE

PHASE I: PLANNING

1. Formally submit the Readiness Program Assessment Plan to PECo.	7/10
2. The RPA Management Board reviews and approves the Plan.	7/17
3. The five Group Leaders meet one-on-one with PECo counterparts. PECo provides preliminary documentation to IEAL.	7/24
4. IEAL submits draft Assessment Outlines for the first site visit and identifies assignments and schedules.	7/29
5. RPA Management Board Review Plan and Assessment outlines.	7/30

PHASE II: FIRST SITE VISIT (1 week)

1. RPAT commences the review utilizing Assessment Outlines (See Attachment A).	8/3

(NOTE: A morning meeting will be held at 8:00 a.m. each day among RPAT Group Leaders and the PECo counterparts.)

Table 2
(Continued)

PHASE III: COORDINATION (1 week)

1. IEAL develops draft summaries in accordance with the Assessment Outlines.	8/10
2. The RPAT leader and the PECo Project Managers brief the RPA Management Board on the progress of the work and the prospects of proceeding with the remaining phases. This is a decision point.	8/12
3. IEAL develops detailed Assessment Outlines for the second site visit and identifies assignments and schedules.	8/12

PHASE IV: SECOND SITE VISIT (2 weeks)

1. RPAT commences assessments utilizing detailed Assessment Outlines (See Attachment B).	8/17
(NOTE: A morning meeting will be held at 8:00 a.m. each day among RPAT Group Leaders and the PECo counterparts.)	
2. RPAT wraps-up assessment activities. IEAL drafts an outline of the Readiness Program Assessment Report and develops preliminary findings and recommendations.	8/27

Table 2
(Continued)

3. Group Leaders and PECo counterparts meet to discuss preliminary findings and recommendations.	8/28 (a.m.)
4. The Management Board meets at the site and reviews the Report outline, preliminary findings and recommendations.	8/28 (p.m.)
PHASE V: WRITE REPORT	
1. IEAL drafts the Readiness Program Assessment Report and distributes to PECo counterparts for review and concurrence.	9/4
2. PECo counterparts review draft Report	9/8 - 9/11
3. RPAT meets to finalize draft of the Report.	9/11
4. The draft Report is presented to the RPA Management Board.	9/18 or 9/21
5. The RPA Management Board briefs Senior PECo Management.	9/28, 9/29 or 9/30
6. IEAL finalizes the Readiness Program Assessment Report and submits to PECo.	10/9

VII. SUPPORT REQUIRED

The Readiness Program Assessment is a self-assessment conducted jointly by PECo and IEAL. As the facilitator of the assessment, the IEAL team needs the following to be supplied by PECo:

- Office space at LGS site and headquarters;
- Participation of PECo personnel, i.e., RPA Management Board members, the PECo Project Manager, RPAT counterparts and interviewees; and
- Documentation related to completion and readiness, including program descriptions and associated documentation (See Table 1 for examples).

VIII. DELIVERABLES

There are five basic deliverables that will be provided by the Readiness Program Assessment. They are as follows:

1. The Readiness Program Assessment Plan - Phase I;

2. Phase II Assessment Outlines - Phase I;

3. A list of existing PECo programs that pertain to completion and readiness; brief characterizations of these programs; and, identification and characterization of the interfaces among the various organizations, particularly in these programs - Phase III;

4. Phase IV Assessment Outlines - Phase III; and,

5. Final Report - Phase V.

The Readiness Program Assessment Report will identify and characterize existing PECo programs. In addition, the Report will identify and describe:

- The inputs and outputs from these programs;
- Program interfaces and coordination points;
- The functional relationships between existing programs;
- How all of the above comprise the accountability structure for completion and readiness.

The Report will include an RPAT findings, conclusions and recommendations.

Revision 2
July 31, 1987

ATTACHMENT A

READINESS PROGRAM ASSESSMENT FOR LIMERICK 2

Assessment Outlines

Phase II

DRAFT

LIMERICK 2 READINESS PROGRAM ASSESSMENT
ASSESSMENT OUTLINE - LICENSING
PHASE II

Purpose:

In general, the purpose of the Readiness Program Assessment in this area is to:

- Identify and describe existing programs;
- Describe program interfaces and coordination points;
- Identify and describe inputs to and outputs from those programs;
- Describe the functional relationships between the existing programs within this area; and,
- Characterize how existing programs, inputs, outputs, interfaces, coordination points and functional relationships comprise the accountability structure for completion and readiness.

The first two elements of the purpose will be accomplished in Phase II.

The specific purpose of the Readiness Program Assessment in this area is to identify the ability of existing PECo programs to assure and demonstrate completion of Limerick 2 and its readiness for operation in accordance with the licensing commitments. Since the acceptance standard of this objective is related to compliance with PECo licensing commitments, the following will be determined:

- How PECo identifies and establishes its licensing commitments;

- How PECo manages and maintains its licensing commitments, including changes it needs to make; and

- How PECo assures that its licensing commitments are being met.

Elements:

The Readiness Program Assessment in the licensing area will be conducted by the Licensing Group Leader and PECo counterparts. They will identify and describe existing licensing programs and associated documentation. They will interview key PECo licensing personnel and others charged with the responsibility of meeting licensing commitments. Responses to the following general questions will help in this process:

a. How are PECo licensing responsibilities organized and assigned?

b. What existing licensing programs are associated with construction completion and readiness for operation?

c. What documents are associated with existing licensing programs?

d. Where are the interfaces with other programs and how are those interfaces addressed?

e. What are the differences between Units 1 and 2?

f. At what point is licensing complete?

g. At what point is licensing ready for operations?

Activities:

The above line of questioning will be pursued with PECo personnel in relevant organizations, as well as in the licensing group. This includes various levels of management, supervision and worker. Licensing areas to be investigated include:

a. Organization;

b. PECo licensing commitment;

c. Licensing plans for assurance and demonstration of completion and readiness;

d. Incorporation of evolving regulatory information into ongoing activities;

e. PECo/NRC interfaces;

f. Licensing interface with other PECo organization;

g. FSAR preparation and control;

h. 10 CFR 50.50 program;

i. licensing differences between Units 1 & 2;

j. SER item close out;

k. Status of Hearing Board items;

l. As-built feedback into licensing;

m. Technical Specification

n. Backfit rule program

Products:

The following products will be developed in Phase II:

1. Develop a list of existing programs with respect to the licensing areas;

2. Briefly characterize each of these programs;

3. Briefly identify and characterize the interfaces among the various organizations.

LIMERICK 2 READINESS PROGRAM ASSESSMENT
OUTLINE - ENGINEERING, DESIGN, AND ANALYSIS

Purpose:

In general, the purpose of the Readiness Program Assessment in this area is to:

- Identify and describe existing programs;
- Describe program interfaces and coordination points;
- Identify and describe inputs to and outputs from those programs;
- Describe the functional relationships between the existing programs within this area; and,
- Characterize how existing programs, inputs, outputs, interfaces, coordination points and functional relationships comprise the accountability structure for completion and readiness.

The first two elements of the purpose will be accomplished in Phase II.

A specific purpose of the Readiness Program Assessment in this area is to identify:

- The processes and programs by which the engineering, design and analysis of systems, components, and structures comply with licensing requirements as stated in the Limerick Station FSAR.

- The programs to assess the differences in engineering, design and analysis that have been introduced since receiving the OL on Limerick 1.

- The programs by which reconciliation of design and "as-built" configuration occurs and how this information is provided to Licensing for inclusion in the updated FSAR.

Elements:

1. What will be different in the configuration licensed for Limerick 2 at its OL application from the stated goal that the LGS Units 1 & 2 remain identical?

2. What are the roles and responsibility of each of the organizations involved in the engineering, design and analysis of Limerick 2?

3. Where is the information supporting the FSAR kept and if it is kept remotely, does this affect the ability of PECo to assure that the engineering, design, and analysis information is in compliance with the FSAR? NOTE: This is to be coordinated with the Licensing RPA leader.

4. What processes/procedures/programs are in place to account for the differences from the configuration licensed for Limerick 1?

5. What processes/procedures/programs are in place to account for reconciling design and "as-built" configurations, particularly for items which are different between Unit 1 and Unit 2? NOTE: This is to be coordinated with the Startup and Operations RPA leader.

Activity Areas:

1. Specific PCR's.

2. Review processes/procedures/programs, particularly those which differ from Unit 1 experience.

3. Review processes/procedures/programs in place to reconcile design and "as-built" conditions including:

   - o NCR
   - o FCR
   - o DCP
   - o DCN
   - o MDCP (Mod. DCP)
   - o FCN
   - o SFR (Startup Field Request)
   - o CFOM (Const. Field Ofc. Memo)
   - o SLE (Startup Letters to Eng'g)
   - o PCR/PCN

4. Review processes/procedures/programs in engineering, design, and analysis area to communicate "as-built" configuration to Licensing for including in Updated FSAR (LDCN's - Licensing Design Change Notices). NOTE: This is to be coordinated with the Licensing RPA leader.

5. Review tie-in of Unit 1 with Unit 2.

6. Review engineering programs shown in Appendix A.

7. Review follow-up programs to assure that changes made after programs shown in Appendix A are completed are incorporated.

Appendix A shows the specific contact for each activity.

Products:

The following products will be developed in Phase II:

1. Develop a list of existing programs with respect to the engineering areas.

2. Briefly characterize each of these programs.

3. Briefly identify and characterize the interfaces among the various organizations.

The following products will be developed in Phase III:

1. Recommendations on need for further review of programs in Phase IV that will require further visits to Bechtel San Francisco or to GE San Jose.

2. Observations on existing programs.

APPENDIX A

ACTIVITY	CONTACT	LOCATION	REFEREN DOCUMEN
1. Voltage Regulation Study	J. Langhirt/ W. Coyle	S.F.	FSAR 8.1.6.3
2. Undervoltage Study	J. Langhirt/ W. Coyle	S.F.	FSAR 8.1.6.3
3. Fire Protection	S. Artus/ G. Morley/ D. Spamer	S.F.	Spec G- (FPER)
4. Hazard Analysis	S. Artus/ T. Robb	S.F.	G-23
5. Equipment Qualification	S. Lynch/ B. Vollmer/ D. Thompson/ F. Gloechler	S.F.	Spec G-
6. Software Comp	K. Swartz/ R. Stipcevich	S.F.	Spec G-
7. As-built Design Documentation	K. Swartz R. Stipcevich	S.F.	-
8. ALARA/Shielding	S. Artus/ T. Robb	S.F.	FSAR 12
9. Seismic II/I	S. Artus/ R. Weiss	S.F.	M-400
10. Heavy Loads	S. Desai/ B. Vollmer	S.F.	-
11. HELB/MELB	S. Artus/ D. Helwig	S.F.	FSAR 3. & 3.6.2
12. Site Flooding	S. Desai/ J. Lynch	S.F.	G-39
13. PRA/SARA	A.R. Diederich	PECo	-
14. CRDR/Human Factors	J. Langhirt/ W. Coyle/ T. Cabrey	S.F.	NUREG-07

APPENDIX A (cont.)

15. I.E. Bulletins/Notices	S. Artus/ D. Fetters	S.F.	-
16. Technical Specifications	A.R. Diederich/ W. Ullrich	PECo	-
17. PSI	Bechtel QC/ D. Helwig	Bechtel QC/ PECo	
18. N5 Program	Construction/ M. Crawl/ D. Helwig	Jobsite	-
19. G39	S. Artus/ T. Robb	S.F.	-
20. Walkdowns (BLP 40544)	S. Artus/ T. Robb	S.F.	-

DRAFT

LIMERICK 2 READINESS PROGRAM ASSESSMENT
OUTLINE - CONSTRUCTION
PHASE II

Purpose:

In general, the purpose of the Readiness Program Assessment in this area is to:

- Identify and describe existing programs;
- Describe program interfaces and coordination points;
- Identify and describe inputs to and outputs from those programs;
- Describe the functional relationships between the existing programs within this area; and,
- Characterize how existing programs, inputs, outputs, interfaces, coordination points and functional relationships comprise the accountability structure for completion and readiness.

The first two elements of the purpose will be accomplished in Phase II.

A specific purpose of the Readiness Review Program in this area is to identify whether the program elements and management control systems are sufficiently comprehensive and have been systematically developed so as to provide PECo with the confidence that structures, components and systems, have been constructed, installed and maintained in accordance with design requirements and PECo commitments.

QC involvement - Hold points, inspection, nonconforming items.

Re-work - How initiated by QC, controlled, and design interfaces.

Nonconformances and Deficiencies - Identification, correction, work control and interface with design/construction.

Design Changes - Systems to process and control design changes initiated by design and field.

Work Interruptions - Systems to identify, manage and control.

Systems to Resolve Employee Feedback - Employee concerns.

Construction Supervision - Systems to verify that construction processes are properly completed and documented.

3. Control of Contractors (Bechtel, GE NSSS, Schneider):

4. Control of Field Work Activities.

Construction Procedures Control Systems - Procedure issuance and change systems.

QC and Craft Labor Training Systems - Training and qualification records maintenance.

Elements:

1. Identify the PECo, Bechtel Construction, Bechtel Start-up, Schneider and G-E (NSSS) organizations responsible for construction activities and define their functional responsibilities, interactions and interfaces with other organizations.

2. Identify the management control systems used for accountability and assurance of completion of the construction activities for each of the organizations identified above.

3. Review the process by which structures and components are identified as having completed construction for turnover to start-up.

Activities:

1. Identify the management systems used to control the procurement, receipt, and storage of all components.

2. Identify systems to control erection, construction and fabrication and cookbook design.

   Work Packages - Generation, interface with design, interface with QC and QE.

   Control of Construction Drawings - Issuance, replacement.

   Control and issue of consumable materials.

   Control of measuring and test equipment.

QC Inspection - In-process inspection program, QC records management, and equipment records.

5. Control of Installed Equipment - Systems to assure preservation, maintenance, cleanliness and protection.

6. Interfaces: Design changes, design output, disposition of nonconformances.

QA - Audit response.

QE - Employee concerns, nonconformance control, procedure review and approval.

QC - Inspection, equipment records.

Start-Up - Construction completion and turn-over.

9. Construction Completion and Turnover - Systems to identify, record and maintain completed work package documents. Systems to maintain, repair structures, components and plant systems until turnover to operations. Sign-off procedures and construction records management procedures.

Specific:

Specific activities, such as concrete placement, installation of mechanical equipment, HVAC, piping, cable pulling, terminations, etc., in each construction discipline will be reviewed and the application of management control systems determined. Key construction activities will be addressed.

Products:

The following products will be developed in Phase II:

1. Develop a list of existing programs with respect to the construction area;

2. Briefly characterize each of these programs;

3. Briefly identify and characterize the interfaces among the various organizations.

DRAFT

LIMERICK 2 READINESS PROGRAM ASSESSMENT OUTLINE - START-UP AND OPERATIONS AREA PHASE II

Purpose:

In general, the purpose of the Readiness Program Assessment in this area is to:

- Identify and describe existing programs;
- Describe program interfaces and coordination points;
- Identify and describe inputs to and outputs from those programs;
- Describe the functional relationships between the existing programs within this area; and,
- Characterize how existing programs, inputs, outputs, interfaces, coordination points and functional relationships comprise the accountability structure for completion and readiness.

The first two elements of the purpose will be accomplished in Phase II.

A specific purpose of the Readiness Program Assessment in this area is to provide PECo with the confidence that the actual start-up program elements are sufficiently comprehensive and systematically developed so as to meet the intent of the test program, as described in the LGS FSAR, and ensure overall plant readiness.

Elements:

1. How is the organization defined?

2. What elements are used in each activity area to monitor readiness?

3. What are the interfacing arrangements between the startup organization, the operations organization and other organizations?

4. How are the elements and interfaces documented?

5. What is the functional relationship between the elements, and is it complete? (i.e., how does each activity area fit into the systematic accountability structure leading to the oath and affirmation statement of compliance with the FSAR?)

Activities:

1. Organization and Administration Areas:

   a. Start-up program plan.

   b. Defined responsibilities and qualifications for implementing and reporting components of the start-up plan.

   c. Construction turnover and the operations acceptance process.

   d. Methods for tracking and resolving incomplete construction items.

e. Methods for identifying, tracking and resolving deficiencies discovered in the testing program.

f. Methods for tracking and resolving deficiencies identified in normal operations.

g. Methods for identifying differences between Unit 2 and Unit 1.

2. Training Areas:

a. Readiness for operational staffing.
b. Initial training program.
c. Replacement training program.
d. Required records.

3. Organizational Interfaces:

a. Interface arrangements between the operating organization and:

-The construction organization
-The corporate engineering organization
-The regulatory body
-The Unit 1 operating organization
-The licensing organization
-The design organization
-The site manager
-PORC
-NRB

4. Testing Program Areas:

a. Organization and staffing.
b. Test procedures.
c. Conduct of test program.
d. Review, evaluation and approval of test results.
e. Test records.
f. Conformance of test programs with regulatory guides.
g. Utilization of reactor operating and testing. experience in the development of the test program.
h. Trial use of plant operating and emergency procedures.
i. Initial fuel loading and criticality program.
j. Test program schedule.
k. Individual test descriptions
l. Methods for identifying differences between Unit 2 and Unit 1.

5. Procedure Areas:

a. Procedure development process for the operating organization:

(1) Administrative procedures
(2) Maintenance program and scheduling
(3) General operating procedure control
(4) Emergency procedures program
(5) Surveillance procedures
(6) Water chemistry controls and chemical analysis
(7) Emergency plan

b. Radiological Controls:

(1) Environmental protection
(2) Radiation protection

(3) Exposure control program
(4) Control of radioactive materials
(5) Radwaste program
(6) Contamination surveys and monitoring
(7) Plant effluent control

c. Fire Prevention/Protection.

d. Methods for identifying differences between Unit 2 and Unit 1.

6. Documentation Areas:

a. Document control process for the operating organization.

b. Documentation facilities, access, and planning.

c. Documentation integration with configuration control system.

d. Methods for identifying differences between Unit 2 and Unit 1.

Products:

The following products will be developed in Phase II:

1. Develop a list of existing programs with respect to the startup and operations.

2. Briefly characterize each of these programs.

3. Briefly identify and characterize the interfaces among the various organizations.

DRAFT

LIMERICK 2 READINESS PROGRAM ASSESSMENT
ASSESSMENT OUTLINE - QUALITY ASSURANCE AND QUALITY CONTROL
PHASE II

Purpose:

In general, the purpose of the Readiness Program Assessment in this area is to:

- Identify and describe existing programs;
- Describe program interfaces and coordination points;
- Identify and describe inputs to and outputs from those programs;
- Describe the functional relationships between the existing programs within this area; and,
- Characterize how existing programs, inputs, outputs, interfaces, coordination points and functional relationships comprise the accountability structure for completion and readiness.

The first two elements of the purpose will be accomplished in Phase II.

A specific purpose of the Readiness Program Assessment in this area is to identify whether the implementation of the quality assurance and quality control programs and functions are adequate to meet regulatory requirements and to assure that the plant has been completed and will be operated in accordance with licensing commitments.

Elements:

The Readiness Program Assessment in the QA/QC area will be conducted by the Quality Assurance Group Leader, one RPA Assessor (Part-time) and the PECo counterparts. The method to be utilized is to identify and examine existing programs and associated documentation, interview personnel having direct responsibility for activities used to accomplish the programs described above, and to evaluate the results and provide input to the final report. Some typical questions which will be used are:

a. Where are the interfaces with other programs/organizations defined? How are they controlled? Identify priority ranking of documents. Particular attention is to be paid to the interface of quality functions between Construction and Operations.

b. How are the planning and tracking functions controlled? Where are the documents located?

c. What input to Senior Management decisions are provided by QA? How are they identified? Provided?

d. What is the role of QA/QC in determining completion of systems? How is this recorded?

e. How does PECo QA/QC interface with the major contractors? Vendors?

f. What are the differences in responsibilities of QA/QC between construction (Unit 2) and Operations (Unit 1)? How does the start-up and testing QA/QC get accomplished? By whom?

Activities:

Detailed questions will be asked of various levels of QA/QC and other organizations to develop an understanding of the way activities are accomplished at the Limerick site. The areas to be reviewed include, but are not limited to, the following:

a. The audit programs for design, construction, start-up and testing and operations. What surveillance programs are used? By whom?

b. The inspection programs for vendor activities.

c. The qualification and certification of auditors and inspectors.

d. The calibration programs.

e. The systems for nonconformance corrective action including response to 10 CFR 50.55(e) and 10 CFR 21. Determine if there are other programs that require engineering evaluation of corrective action that are not identified as nonconformance systems. Pay particular attention to whether root causes are really identified and corrected to prevent recurrence of nonconformances.

f. The system for the collection and review of records for design, procurement, construction, testing and operations. Evaluate how the project handles and uses vendor records and maintenance manuals. Evaluate the collection and review of construction inspection records and N-5 data packages.

g. The construction completion system records used for system transfer including as-built drawings.

h. The procurement activities associated with the design, construction, start-up and testing and operations phases.

Products:

The following products will be developed in Phase II:

1. Develop a list of existing programs with respect to the Quality Assurance and Quality Control.

2. Briefly characterize each of these programs.

3. Briefly identify and characterize the interfaces among the various organizations.

INTERNATIONAL

Energy and Environment Group

August 13, 1987

Mr. D. B. Fetters
Philadelphia Electric Company
2301 Market Street
Philadelphia, Pennsylvania 19101

Dear Drew:

Enclosed are the draft Readiness Program Assessment Outlines for Phase IV. As we discussed these outlines can be finalized after receipt of your comments upon our arrival at Limerick Generating Station on Monday morning, August 17, 1987. I have also included the schedules we would like to follow during Phase IV for your review and use in lining up your people to support the Readiness Program Assessment effort.

If there are any questions please let me or Pat Ward Know.

Sincerely,

Vincent W. Panciera
Readiness Program Assessment Team Leader

VWP/emk

Enclosures

cc: R. Dietrich
T. Robb

DRAFT

LIMERICK 2 READINESS PROGRAM ASSESSMENT
OUTLINE - START-UP AND OPERATIONS AREA
PHASE IV

Purpose:

In general, the purpose of the Readiness Program Assessment in this area is to:

- Identify and describe existing programs;
- Describe program interfaces and coordination points;
- Identify and describe inputs to and outputs from those programs;
- Describe the functional relationships between the existing programs within this area; and,
- Characterize how existing programs, inputs, outputs, interfaces, coordination points and functional relationships comprise the accountability structure for completion and readiness.

One specific purpose of the Readiness Program Assessment in this area is to provide PECo with the confidence that the actual start-up program elements are sufficiently comprehensive and systematically developed so as to meet the intent of the test program, as described in the LGS FSAR, and ensure overall plant readiness.

Elements:

1. How is the organization defined?

2. What elements are used in each activity area to monitor readiness?

3. What are the interfacing arrangements between the startup organization, the operations organization, and other organizations?

4. How are the elements and interfaces documented?

5. What is the functional relationship between the elements, and is it complete? (i.e., i.e., how does each activity area fit into the systematic accountability structure leading to the oath and affirmation statement of compliance with the FSAR?)

Activities:

1. Gather information using interviews to complete the initial scoping of PECo's readiness program, particularly with respect to: fuel load preparations, emergency planning, radiation protection, facility turnover, and the identification of 2/1 differences.

2. Resolve questions on PECo readiness program flow charts.

3. Integrate the startup and operations areas with other plant activities (eg. design, licensing, QA, etc). Analyze interfaces.

4. Develop correlation between PECo readiness program and licensing readiness (eg. FSAR).

5. Develop recommendation on areas in the readiness program that could benefit from further strengthening or documenting.

Products:

1. A series of flow charts depicting the PECo readiness program as it applies to startup and operations including interface with other organization, coordination points, and supporting documentation.

2. An analysis of how the PECo program will demonstrate licensing and overall plant readiness including the identification of those areas where further strengthening of the program elements or increased documentation may be warranted.

SCHEDULE FOR PHASE IV

Week One

Monday

8:30-9:45	Meeting with counterparts to discuss Phase IV and review charts.
10:00-12:00	Review Fuel Load Preparation
Afternoon:	IEAL Team working session and review Emergency Planning Documents

Tuesday

8:30-10:30	Review of emergency planning readiness program
10:45-12:00	Review facility turnover plans in greater detail
Afternoon:	IEAL Team working sessions and develop emergency plan program.

Wednesday

8:30-10:00	Review 2/1 differences identification and reporting in greater detail
10:30-12:00	Review radiation protection readiness program
Afternoon:	IEAL Team working session and review FSAR section applicability

Thursday

8:30-12:00 Reserved for questions and answers

Afternoon: Correlate PECo program to licensing and overall readiness

Friday

8:30-12:00 Reserved for questions and answers

Afternoon: Further develop readiness correlations to PECo programs

Week Two

Monday

- Interviews to be scheduled as necessary
- Analyze Readiness Program

Tuesday

- Interviews to be scheduled as necessary
- Analyze Readiness Program

Wednesday

- Prepare Final Draft
- Review Final Draft with counter parts
- Revise final draft if necessary

Thursday

Finalize Results

Friday

8:30-12:00 IEAL working session to review results

Afternoon: Management Meeting

LIMERICK 2 READINESS PROGRAM ASSESSMENT
PHASE IV OUTLINE - ENGINEERING, DESIGN, AND ANALYSIS

Purpose:

In general, the purpose of the Readiness Program Assessment in this area is to:

- Identify and describe existing programs;
- Describe program interfaces and coordination points;
- Identify and describe inputs to and outputs from those programs;
- Describe the functional relationships between the existing programs within this area; and,
- Characterize how existing programs, inputs, outputs, interfaces, coordination points and functional relationships comprise the accountability structure for completion and readiness.

The first two elements of the purpose were accomplished in Phases II and III. The last three elements will be accomplished in Phases IV and V.

A specific purpose of the Readiness Program Assessment in this area is to identify:

- The processes and programs by which the engineering, design and analysis of systems, components, and structures comply with licensing requirements as stated in the Limerick Station FSAR, FPER and EQR.

- The programs to assess the differences in engineering, design and analysis that have been introduced since receiving the OL on Limerick 1.

- The programs by which reconciliation of design and "as-built" configuration occurs and how this information is provided to Licensing for inclusion in the updated FSAR.

Elements:

1. What will be different in the configuration licensed for Limerick 2 at its OL application from the stated goal that the LGS Units 1 & 2 remain identical?

2. What are the roles and responsibility of each of the organizations involved in the engineering, design and analysis of Limerick 2?

3. Where is the information supporting the FSAR kept and if it is kept remotely, does this affect the ability of PECo to assure that the engineering, design, and analysis information is in compliance with the FSAR? NOTE: This is to be coordinated with the Licensing RPA leader.

4. What processes/procedures/programs are in place to account for the differences from the configuration licensed for Limerick 1?

5. What processes/procedures/programs are in place to account for reconciling design and "as-built" configurations, particularly for items which are different between Unit 1 and Unit 2? NOTE: This is to be coordinated with the Startup and Operations RPA leader.

Activity Areas:

1. Describe engineering programs shown in Appendix A including listing of controlling program documents.

2. Review specific PCR's, FDDR's and FDI's for evidence of direct coomunication of changes affecting FSAR.

3. Describe processes/procedures/programs in place to reconcile design and "as-built" conditions including:

   - o NCR
   - o FCR
   - o DCP
   - o DCN
   - o MDCP (Mod. DCP)
   - o FDI
   - o FCN
   - o SFR (Startup Field Request)
   - o CFOM (Const. Field Ofc. Memo)
   - o SLE (Startup Letters to Eng'g)
   - o PCR/PCN
   - o FDDR

4. Describe processes/procedures/programs in engineering, design, and analysis area to communicate "as-built" configuration to Licensing for including in Updated FSAR (LDCN's - Licensing Design Change Notices). NOTE: This is to be coordinated with the Licensing RPA leader.

5. Describe follow-up programs to assure that changes made after programs shown in Appendix A are completed are incorporated.

Products:

The following products will be developed in Phase IV:

1. Identify and characterize the interfaces among the various functions and organizations, including finalized flow charts.

2. Finalize descriptions of programs shown in Appendix A.

Phase IV activities will not require further visits to Bechtel San Francisco or to GE San Jose.

APPENDIX A

ACTIVITY	CONTACT	LOCATION	REFERENCE DOCUMENT
1. Voltage Regulation Study	J. Langhirt/ W. Coyle	S.F.	FSAR 8.1.6.3.6
2. Undervoltage Study	J. Langhirt/ W. Coyle	S.F.	FSAR 8.1.6.3.6
3. Fire Protection	S. Artus/ G. Morley/ D. Spamer	S.F.	Spec G-35 (FPER)
4. Hazard Analysis	S. Artus/ T. Robb	S.F.	G-23
5. Equipment Qualification	S. Lynch/ B. Vollmer/ D. Thompson/ F. Gloechler	S.F.	Spec G-22
6. Software Completion	K. Swartz/ R. Stipcevich	S.F.	Spec G-5
7. As-built Design Documentation	K. Swartz R. Stipcevich	S.F	-
8. ALARA/Shielding	S. Artus/ T. Robb	S.F.	FSAR 12.3
9. Seismic II/I	S. Artus/ R. Weiss	S.F.	M-400
10. Heavy Loads	S. Desai/ B. Vollmer	S.F.	-
11. HELB/MELB	S. Artus/ D. Helwig	S.F.	FSAR 3.6.1 & 3.6.2
12. Site Flooding	S. Desai/ J. Lynch	S.F.	G-39
13. PRA/SARA	A.R. Diederich	PECo	-
14. CRDR/Human Factors	J. Langhirt/ W. Coyle/ T. Caprey	S.F.	NUEG-0700

APPENDIX A (cont.)

15. I.E. Bulletins/Notices	S. Artus/ D. Fetters	S.F.	-
16. Technical Specifications	A.R. Diederich/ W. Ullrich	PECo	-
17. PSI	Bechtel QC/ D. Helwig	Bechtel QC/ PECo	
18. N5 Program	Construction/ M. Crawl/ D. Helwig	Jobsite	-
19. G39	S. Artus/ T. Robb	S.F.	-
20. Walkdowns (BLP 40544)	S. Artus/ T. Robb	S.F.	-

LIMERICK 2 READINESS PROGRAM ASSESSMENT
ASSESSMENT OUTLINE - CONSTRUCTION
PHASE IV

Purpose

The purpose of the Readiness Review Program in this area is to identify whether the program elements and management control systems are sufficiently comprehensive and have been systematically developed so as to provide PECo with the confidence that structures, components and systems, have been constructed, installed and maintained in accordance with design requirements and PECo commitments.

Elements

The Readiness Program Assessment in the construction area will be conducted by the Construction Group Leader, three RPA Assessors and the PECo counterparts. The method to be utilized is to review the functional charts developed by Construction. These efforts will require close coordination with the respective groups and resolution of different perceptions held by various team members. Refinement of the Construction Functional Charts will be accomplished.

Further interviews with some key PECo/Bechtel personnel are necessary but are minimized to the extent possible (see Work Schedule, Construction Group).

Products

The product of this portion of the Readiness Program Assessment is to provide updated flow charts and an outline of the Construction section of the final report.

CONSTRUCTION GROUP
WORK SCHEDULE PHASE IV
SECOND SITE VISIT

Monday August 17, 1987

8:30	Blue Tag Testing CP-T-3	Russ McKnight Helmut Filacchione
8:30	Valve Installation J. Roedell	J.F. Walter
10:00	Hydro Testing CP-M-2	Russ McKnight Helmut Filacchione
10:00	Systems to assure all items covered by work package	J.F. Walter J. Roedell

Afternoon - interface with other IEAL teams

Tuesday

8:00	Civil	Russ McKnight	FLUEHR
	HVAC	JFW/Roedell	TATE
	MECH	Helmut	Fedrick
9:30	Electrical	JFW/Roedell	Shutt/Anderson
	Instrumentation	Helmut	Rezek
	Piping	Russ	Tokarski
11:00	System T/O	Helmut/Russ	
	Facility T/O	J.F. Walter J. Roedell	

Wednesday

8:00	Change Control	Russ/Helmut
9:00	Special Bolting CD-M-5	JFW
9:30	Long Term Storage CP-G-3	Roedell
11:00	Insulation CP-G-7	Russ

Thursday To be determined.

Friday Systems Review of system to be selected.

Week of August 24, 1987. Schedule to be established.

LIMERICK 2 READINESS PROGRAM ASSESSMENT
ASSESSMENT OUTLINE - QUALITY ASSURANCE AND QUALITY CONTROL
PHASE IV

Purpose:

The objective of the Readiness Program Assessment is to assess whether the implementation of the quality assurance and quality control programs and functions are adequate to meet regulatory requirements and to assure that the plant has been completed and will be operated in accordance with licensing commitments.

Elements:

The Readiness Program Assessment in the QA/QC area will be conducted by the Quality Assurance Group Leader, one RPA Assessor (Part-time) and the PECo counterparts. The method to be utilized is to review the functional charts developed by Design, Construction, Startup and Operations and input the QA/QC activities into the charts with appropriate references to the requirements or state the lack of policy directives in particular areas. These efforts will require close coordination with the respective groups and resolution of different perceptions held by various team members. Refinement of the QA/QC Functional and Quality Concerns Charts will also be accomplished.

Further interviews with some key PECo/Bechtel personnel may be necessary but will be minimized to the extent possible.

Products:

The product of this portion of the Readiness Program Assessment is to provide updated flow charts and an outline of the QA/QC section of the final report.

DRAFT

LIMERICK 2 READINESS PROGRAM ASSESSMENT
ASSESSMENT OUTLINE - LICENSING
PHASE IV

Purpose:

In general, the purpose of the Readiness Program Assessment in this area is to:

- Identify and describe existing programs;
- Describe program interfaces and coordination points;
- Identify and describe inputs to and outputs fron those programs;
- Describe the functional relationships between the existing programs within this area; and,
- Characterize how existing programs, inputs, outputs, interfaces, coordination points and functional relationships comprise the accountability structure for completion and readiness.

The specific purpose of the Readiness Program Assessment in this area is to identify the ability of existing PECo programs to assure and demonstrate completion of Limerick 2 and its readiness for operation in accordance with the licensing commitments. Since the acceptance standard of this objective is related to compliance with PECo licensing commitments, the following will be determined:

- How PECo identifies and establishes its licensing commitments;

- How PECo manages and maintains its licensing commitments, including changes it needs to make; and

- How PECo assures that its licensing commitments are being met.

Elements:

The Readiness Program Assessment in the licensing area will be conducted by the Licensing Group Leader and PECo counterparts. They will identify and describe existing licensing programs and associated documentation. They will interview key PECo licensing personnel and others charged with the responsibility of meeting licensing commitments. Responses to the following general questions will help in this process:

a. How are PECo licensing responsibilities organized and assigned?

b. What existing licensing programs are associated with construction completion and readiness for operation?

c. What documents are associated with existing licensing programs?

d. Where are the interfaces with other programs and how are those interfaces addressed?

e. What are the differences between Units 1 and 2?

f. At what point is licensing complete?

g. At what point is licensing ready for operations?

Activities:

During Phase IV, licensing activities will focus on two areas:

- Develop detailed flow charts for existing licensing programs based on the information accumulated in Phases II and III, and

- Coordinate licensing information with the detailed flow charts in other groups to identify licensing interfaces and pathways and assure consistent inputs and outputs.

Products:

The following products will be developed in Phase IV.

1. Finalize the detailed flow charts for licensing programs (3rd tier charts).

2. Develop the 2nd tier licensing flow charts and generate licensing input for the 2nd tier flow charts in other groups.

3. Draft the licensing section of the Readiness Program Assessment Report.

SCHEDULE FOR PHASE IV

First Week

Monday

8:30-12:00	Meeting with counterparts to discuss Phase IV and review charts.
1:00-5:00	Coordinate with other groups to identify licensing interfaces and coordination points on other flow charts.

Tuesday

8:30-12:00	Meeting with counterparts to discuss Phase IV and review charts.
1:00-5:00	Coordinate with other groups to identify licensing interfaces and coordination points on other flow charts.

Wednesday

8:30-12:00	Meeting with counterparts to discuss Phase IV and review charts.
1:00-5:00	Coordinate with other groups to identify licensing interfaces and coordination points on other flow charts.

Thursday

8:30-12:00	Meeting with counterparts to discuss Phase IV and review charts.
1:00-5:00	Coordinate with other groups to identify licensing interfaces and coordination points on other flow charts.

Friday

8:30-12:00	Meeting with counterparts to discuss Phase IV and review charts.
1:00-5:00	Coordinate with other groups to identify licensing interfaces and coordination points on other flow charts.

Second Week

Monday

Interviews to be scheduled as necessary.

Tuesday

Interviews to be scheduled as necessary.

Wednesday

- Prepare Final Draft.
- Review Final Draft with counterparts
- Revise Final Draft as necessary.

Thursday

Finalize results.

Friday

8:30-12:00	IEAL working session to review results.
Afternoon	Management meeting.

APPENDIX B

READINESS PROGRAM ASSESSMENT MILESTONES

PHASE I: PLANNING

1. IEAL formally submits the Readiness Program Assessment (RPA) Plan to PECo.	7/10/87
2. The RPA Management Board reviews and approves the Plan.	7/17
3. The five Group Leaders meet one-on-one with PECo counterparts. PECo provides preliminary documentation to IEAL.	7/24
4. IEAL submits draft Assessment Outlines for the first site visit and identifies assignments and schedules.	7/29
5. RPA Management Board Reviews and Approves Plan and Assessment Outlines.	7/30

PHASE II: FIRST SITE VISIT (1 Week)

1. RPA Team commences the review utilizing Assessment Outlines.	8/3

PHASE III: COORDINATION (1 week)

1. IEAL develops detailed Assessment Outlines for the second site visit and identifies assignments and schedules.	8/12
2. IEAL refines Methodology for Charts that depict completion and readiness processes.	8/14

PHASE IV: SECOND SITE VISIT (2 weeks)

1. RPA Team commences assessments utilizing detailed Assessment Outlines.	8/17
2. RPA Team wraps-up assessment activities. IEAL drafts an outline of the Readiness Program Assessment Report and develops preliminary findings and recommendations.	8/27

3. Group Leaders and PECo counterparts meet to discuss preliminary findings and recommendations.	8/28
4. The Management Board meets at PECo Headquarters to review the Report Outline, preliminary findings and recommendations.	8/28

PHASE V: WRITE REPORT

1. IEAL drafts the Readiness Program Assessment (RPA) Report (Rev 0) dated 9/3/87, and distributes to PECo counterparts for review and concurrence.	9/4
2. PECo counterparts review Revision 0 to the draft report.	9/8 - 9/11
3. RPA Team meets to develop 1st round comments to Revision 0 of the draft Report.	9/15
4. RPA Team issues Revision 1 to draft RPA Report dated 9/18/87.	9/18
5. The draft Report (Rev 1) is presented to the RPA Management Board. RPA Management Board reviews Open Items and directs the RPA Team to review Organizational Readiness concerns and propose alternative solutions.	9/21
6. RPA Operations Group Personnel meet to develop an approach to resolve concerns related to Operational Readiness. The RPA Operations Group agreed that these concerns and proposed solutions will be acknowledged in the RPA Report but will be addressed separately.	9/28
7. RPA Team receives RPA Management Board comment on Rev 1 of Draft Report.	9/30
8. RPA Team issues Revision 2 of RPA Draft Report dated 10/15/87.	10/15
9. RPA Management Board Meets to review and comment on Revision 2 to RPA Draft Report.	11/06

10. RPA Team submits Executive Draft Report, to the RPA Management Board.	12/4/87
11. RPA Management Board Presents Final Report to Senior PECo Management.	2/18/88
12. PECo issues RPA Report.	3/8/88

APPENDIX C

METHOD USED TO ASSESS LIMERICK 1 READINESS

The purpose of this Appendix is to summarize the method used to assess the readiness of Limerick 1 to load fuel and operate safely.

In September 1983, Philadelphia Electric Company (PECo) established the Nuclear Review Board (NRB) for LGS. The purpose of the NRB is to provide management-level oversite of nuclear power operations at LGS. The NRB is composed of senior individuals experienced in the management of power operations, both nuclear and non-nuclear. Its members were drawn originally from Peach Bottom's Operations and Safety Review (O&SR) Committee, the NRBs from Salem and Hope Creek and other senior individuals. Nuclear Review Board attention was immediately directed to Limerick 1, which was about to be licensed and placed into operation.

The NRB coordinated the Operational Readiness Assessment for Limerick 1. This assessment consisted of an audit of the various line organizations and their efforts to prepare Limerick 1 for operation. The Operational Readiness Assessment was initiated by a March 1984 letter request from the NRB to each of the organizational managers at LGS. This was about six months prior to fuel load. The letter was addressed to the following individuals:

- Chief Electrical Engineer
- Chief Mechanical Engineer
- Superintendent Nuclear Services
- Superintendent Maintenance Division
- Director - Research and Test Division
- Superintendent Quality Assurance Division
- General Superintendent Stores Division
- General Superintendent Construction Division
- Superintendent - LGS
- Director - Security

The letter requested each manager to answer specific questions about his organization. The questions were related to plant completion, readiness for operation and compliance with Nuclear Regulatory Commission regulations. The questions were tailored to each organization based on what the NRB felt was important to completion, readiness and NRC compliance. Responses to the NRB request were received during the Summer of 1984. Some responses answered the questions in narrative format; some responses were in a Question-and-Answer format; some responses provided attachments that listed open items. In total, the information provided to the NRB by LGS managers presented a comprehensive completion and readiness picture of Limerick 1.

The NRB synthesized the Limerick 1 information and formulated conclusions in the following areas:

- Design,
- Construction,
- Testing,
- Personnel,
- Procedures, and
- Contingency Plans.

In general, the NRB's findings supported the fact that Limerick 1 was complete and ready to operate. The NRB provided these conclusions to the Vice-President for Electric Production in September 1984.

In parallel to the NRB efforts, the Engineering and Research Department developed and implemented a 10CFR Conformance Evaluation Program. The purpose of this program was to determine the degree to which LGS complied with applicable NRC regulations. Applicable regulations were identified and listed. A corresponding summary statement addressing LGS compliance was developed. Based on the results of this program PECo concluded that Limerick 1 had been designed, constructed, tested and prepared for operation in accordance with applicable NRC regulations. In an October 1984 letter to the NRC, PECo certified this under oath and affirmation.

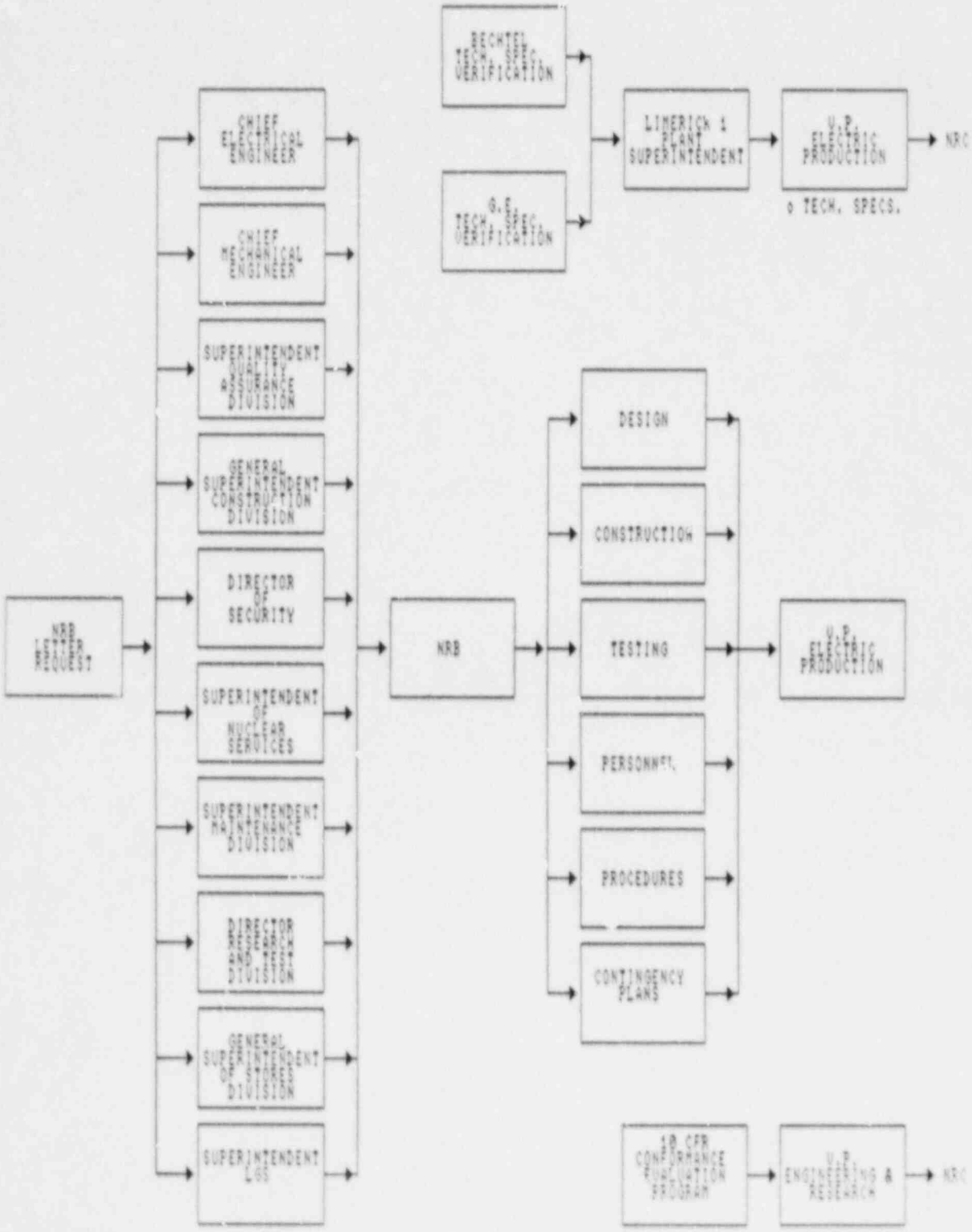
Appendix C, Chart 1, depicts the Operational Readiness Assessment that was used for Limerick 1. Chart 1 also identifies the steps that were taken to submit the Plant and Technical Specification Certification letters to the NRC.

In addition to the NRB operational readiness activities, there were many individual groups maintaining open items lists during the Limerick 1 project. The majority of these open items were associated with incomplete physical and hardware items. Licensing had a list; Quality Assurance had two lists; Start-up had the Start-up Worklist, Construction had the Construction punch list, etc. In some instances, a single item could have

appeared on the list for each group, thus making management of remaining items very complex. As Limerick 1 neared completion, it was decided to minimize redundancy and multiple tracking. A Consolidation Board was established. It was their assignment to consolidate important items from individual lists and incorporate them on one list. This list was called the Consolidated Open Item List (COIL). During the final stages of Limerick 1 licensing, the COIL had high visibility with PECo management. It was also used by the NRC Regional Inspectors to determine the plant's state of completion and readiness. All COIL items were processed through the Plant Operations Review Committee (PORC). The COIL assigned a need status to each item, (e.g., an item that was needed for fuel load, 5% power, power ascension testing, Mode 1, or first refueling outage, etc.). Open items could be prioritized based on need status. The COIL was a useful readiness tool for Limerick 1.

In conclusion, the readiness effort on Limerick 1 measured the ability of PECo programs and processes to produce a plant that was ready to operate. PECo's efforts were sufficient for the regulatory environment of 1984.

APPENDIX C
CHART 1
OPERATIONAL READINESS LIMERICK 1



LEGEND:

NRB = NUCLEAR REVIEW BOARD

THIS CHART IS SCHEMATIC IN NATURE AND IS FOR INFORMATIONAL USE ONLY.