1.3 Implementation

1.3.1 This Project Quality Assurance Plan is to be implemented, as applicable, by all individuals assigned responsibility for performance of technical, managerial, and administrative functions related to the quality assured activities identified previously.

1.3.2 Revisions are effective and shall be implemented within ten (10) working days of the date of issue of the revision. All activities are to be in compliance accordingly.

2. ORGANIZATION

2.1 Project Organization

Figure 1 provides the organizational chart for the project. Technical and administrative personnel (not shown) will receive assignments directly from the Project Manager (PM). The Project Manager will serve as the principal point of contact with Consumers Power Company. The Project Quality Assurance Engineers will report directly to the Vice President. They will identify internal quality assurance deficiencies, work with the Project Manager in providing clarification relative to identified deficiencies and any recommendations made by them for resolution. | 5

between each other to assure that IDV and ICV interfaces are adequately addressed. These individuals report directly to the Project Manager. The Manager of Design Verification may perform the responsibilities of the Managers of the AFW, SEP and CR-HVAC reviews. The Manager of Construction Verification may perform the responsibilities of the Manager, Site Activities and Construction Verification LTRs. 5

2.2.9 The Managers of the AFW, SEP and CR-HVAC Reviews are responsible for management and implementation of design review activities necessary to complete an integrated review of their respective systems, coordination of activities between LTRs under their supervision and coordination with the ICV program LTRs. These individuals report to the Manager, Design Verification. The Managers of the AFW, SEP and CR-HVAC reviews may perform the responsibilities of their respective LTRs. 5

2.2.10 The Manager, Site Activities is responsible for planning, management and supervision of all Midland site related activities and the Construction/Installation Documentation, Verification Activities and Verification of Physical Configuration categories of review. He reports directly to the Manager, Construction Verification.

3. PERSONNEL QUALIFICATIONS AND CONTROL

3.1 Management Personnel

3.1.1 Principal-in-Charge - Donald K. Davis

Mr. Davis has broad experience in plant and reactor systems, safety analysis, design, and licensing areas of the nuclear power industry and has been selected by the TERA President to provide corporate overview of the project. He is Senior Vice President of TERA's nuclear services organization. A copy of his resume is presented in Appendix C and provides documentary evidence of his qualifications. 5

3.1.2 Project Manager - Howard A. Levin

Mr. Levin has broad experience in the areas of nuclear plant engineering and licensing as well as managing engineering projects. He has been selected by the TERA President as Project Manager to manage and direct the implementation of the project. A copy of his resume is presented in Appendix C and provides documentary evidence of his qualifications.

3.1.3 Project Quality Assurance Engineer - Mark Polit

Mr. Polit is highly qualified in the area of nuclear power plant quality assurance and has been selected by the TERA President as Project Quality Assurance Engineer for the project. A copy of his resume is presented in Appendix C and provides documentary evidence of his qualifications.

3.1.4 Management Personnel

The following personnel have been selected by the Project Manager based upon their unique technical and management

qualifications for the project. The following lists management personnel along with a short description of their areas of expertise. Copies of their resumes are presented in Appendix C providing documentary evidence of their qualifications.

Manager	Areas of Expertise
Frank Dougherty Manager, Design Verification, and Manager, Auxiliary Feedwater System Review	Nuclear power plant mechanical design, safety and reliability analysis, system design/criteria development
Donald Tulodieski Manager, Construction Verification	Project management/control, start-up testing, engineering analysis and design, licensing, plant reliability analysis
Martin Jones Manager, Site Activities	Nuclear power plant construction management, quality control, training, start-up, electrical engineering
Doug Witt Manager, Control Room HVAC System Review	Nuclear power plant systems and mechanical design, safety analysis, equipment design, licensing, HELBA, thermal-hydraulics
Gerald Setka Manager, Standby Electric Power System Review	Electrical engineering, nuclear power plant operations, design implementation, equipment qualification

5

3.1.5 Senior Review Team

The Senior Review Team (SRT) has been selected by the Principal-in-Charge based upon their many years of experience in the nuclear industry, broad areas of personal knowledge, and specific nuclear design review expertise. The following lists the SRT members along with a short description of their areas of expertise. Copies of their resumes are presented in Appendix C providing documentary evidence of their qualifications.

SRT Member	Functional Areas of Expertise	
Joseph M. Hendrie	Nuclear plant design, safety and licensing, plant and reactor systems, operations, physics, accident analysis	5
William J. Hall	Engineering analysis and design, structural engineering, structural mechanics and dynamics, soil mechanics, fracture mechanics, engineering criteria development for major projects	
Robert Wilson 1/	Nuclear power plant operations, engineering and design, licensing project management	5

1/ Mr. Wilson is on an extended medical leave. His responsibilities have been assumed by Dr. Hendrie and Dr. Hall at the request of the Principal-in-Charge. 5

3.1.6 Senior Review Team Chairman - William J. Hall

Dr. Hall has extensive experience in nuclear plant engineering and has been selected by the Principal-in-Charge for the project. He will coordinate and direct Senior Review Team activities. 5

3.1.7 The Managers, Design and Construction Verification are controlled and their performance evaluated under direct supervision of the Project Manager who provides input to the Principal-in-Charge for his review and concurrence. LTRs, the Managers of the AFW, SEP and CR-HVAC Reviews, and the Manager, Site Activities are controlled and their performance evaluated under the direct supervison of the Managers, Design or Construction Verification, respectively, who provide input to the Project Manager for his review and concurrence.

3.1.8 Management control is provided by TERA President, Robert W. Felton and Vice President, Larry H. Wight, through review of project reports, audit findings, and evaluations conducted in the normal course of business. Mr. Felton and Mr. Wight have extensive experience in the management of large-scale projects involving engineering, licensing and quality assurance. Their resumes are provided in Appendix C. 5

Technical Reviewer	Functional Areas of Expertise
Farzin Ramezanbeigi	Structural and mechanical engineering, usage and interpretation of structural/mechanical computer codes
Christian Nelson	Nuclear power plant operations, design, safety analysis, seismic design evaluation, inspection program development
Jim McIlvaine	Nuclear power plant design, licensing, mechanical engineering, waste management
John Richardson	Nuclear power plant operations, licensing, safety and engineering analysis, project management

5

3.2.3 Staff personnel are controlled and their performance evaluated under direct supervision of the LTRs and Manager, Site Activities who provide input to the Managers of the AFW, SEP or CR-HVAC System Reviews or the Manager, Construction Verification for their review and concurrence.

3.2.4 Lead Technical Reviewers

The Lead Technical Reviewers (LTR) have been selected based upon their unique technical qualifications for the project. The following lists the LTRs along with a short description of their areas of expertise. Copies of their resumes are presented in Appendix C, providing documentary evidence of their qualifications.

Lead Technical Reviewer	Functional Areas of Expertise	
Joseph Martore AFW and CR-HVAC Structural Review	Nuclear power plant structural, mechanical design and construction, equipment qualification, operating reactor safety, licensing, project management	
Frank Dougherty AFW Mechanical and Systems Review	Nuclear power plant mechanical design, safety and reliability analysis, system design/criteria development	5
Lionel Bates Electrical Review	Nuclear power plant electrical, instrumentation and control systems design, equipment qualification, plant operations and maintenance	
Doug Witt CR-HVAC Mechanical and Systems Review	Nuclear power plant systems and mechanical design, safety analysis, equipment design, licensing, HELBA, thermal-hydraulics	
Gerald Setka SEP Mechanical and Systems Review	Electrical engineering, nuclear power plant operations, design implementation, equipment qualification	5
Christian Mortgat SEP Structural Review	Nuclear power plant structural/ mechanical design, engineering mechanics, earthquake engineering	
Randy Cleland ICV Verification Activities	Power plant mechanical design, piping/hanger design and construction, review and inspection of mechanical systems, construction supervision and management, results engineering	
(Vacant) ICV Construction/ Installation Documentation	(Position to be filled prior to commencement of ICVP activities)	5

Associate	Functional Areas
James Owens	Nuclear and fossil power plant design and construction, nuclear steam supply systems design and construction, project management, control systems, safeguards, licensing
Stanley Kaut	Design review, construction, testing, operation and licensing of electrical power, instrumentation and control systems and equipment; project management, plant procedures development, quality assurance
Edward Beck	Nondestructive testing, Level III in radiography, ultrasonics, magnetic particle, liquid penetrant, materials testing
Robert Reneau	Nondestructive testing, Level II in radiography, ultrasonics, magnetic particle, liquid penetrant, materials testing
Orin Kilgore	Corporate quality assurance, construction, startup and operations
William Pryor	Mechanical, piping, electrical and instrumentation quality inspections, startup, testing and operations

Associate	Functional Areas
Joseph Penzien	Structural engineering, earthquake engineering, reinforced concrete response
Daniele Veneziano	Engineering statistical analysis, probabilistic analysis, civil engineering
Lenny Laakso	Structural/mechanical analysis and design of nuclear power plant buildings and equipment, specifications, planning and scheduling
David Pocacha	Mechanical engineering, welding, nondestructive testing, ultrasonics
Paul J. Brunner, Jr.	Quality control, acceptance testing, construction inspection, nondestructive testing
John Smith	Ultrasonics testing, structural failure analyses, quality control
Richard Norris	Engineering materials evaluations, fracture face analyses, metallurgist
Robert D. Phillips	Nondestructive testing, Level III in radiography, ultrasonics, magnetic particle, liquid penetrant, weld inspection
William M. Capps	Nondestructive testing, shop fabrication, metallurgical engineering
David A. Rumrill	Nondestructive testing, Level III in radiography, ultrasonic, magnetic particle and penetrant inspections, materials testing

5

Myle J. Holley, Jr.	Structural engineering, nuclear power plant analysis and design, structural mechanics and dynamics, fracture mechanics
David Segal	Structural and civil engineering, nuclear power plant regulation, design and analysis, soils mechanics
Paul L. Streeter	Dynamic analysis, seismic analysis, structural mechanics
Howard E. Lambert	System safety and reliability analysis, probabilistic risk assessments, nuclear safety, accident analysis
Jean-Lou A. Chameau	Seismic hazard analysis, soil mechanics, design and construction of nuclear power plants
Greg A. Reimers	Electrical engineering, nuclear power plant operations and system design, licensing, instrumentation and control
Jonathan Stanley	Licensing, design and operations of nuclear power plants, piping analysis, and support design
John M. Biggs	Structural engineering, structural mechanics and dynamics, fracture mechanics, nuclear power plant analysis and design

5

4. ADMINISTRATIVE CONTROL

4.1 Subject File

The following numbers shall be used as subject file identifiers to identify controlled documents in that file. Documents in a file shall have an I.D. number that includes the project identifier and the subject file identifier followed by a unique sequence number (001-999).

File Register	Correspondence Type Designator
CPC to NRC	A
NRC to CPC	B
CPC to TERA	C
NRC to TERA	D
TERA To CPC and NRC	E
CPC to Bechtel	F
Bechtel to CPC	G
NRC to Bechtel	H
Bechtel to TERA	J
CPC to/from B&W	K
Project Miscellaneous	L
Bechtel to/from B&W	M
Bechtel Internal and Miscellaneous	N
Miscellaneous NRC	P
TERA to Bechtel and B&W	Q
To and from Stone & Webster	R

5

5

4.8.2 A register (sample shown in Attachment D) will be maintained for each file. The file control stamp or equivalent (example shown on Attachment E) shall be used to record the identification number assigned to each document.

4.9 Potential Open, Open, Confirmed and Resolved Item Reports, Finding Reports, Finding Resolution Reports and Observations

Potential Open, Open, Confirmed and Resolved Item Reports, Finding Reports and Finding Resolution Reports are controlled in compliance with the requirements of Project Instruction PI-3201-008; Preparation of Open, Confirmed and Resolved Item Reports, Finding Reports and Finding Resolution Reports."

and register will be maintained for various categories of source documents at the discretion of the Project Manager or his designated representative.

4.13 Scope Change Requests

Scope Change Requests are controlled in compliance with the requirements of Project Instruction PI-3201-012, "Scope Change Requests, Midland IDCV Program." The Project Manager shall maintain a register (Attachment H) for Project File 3201-012.

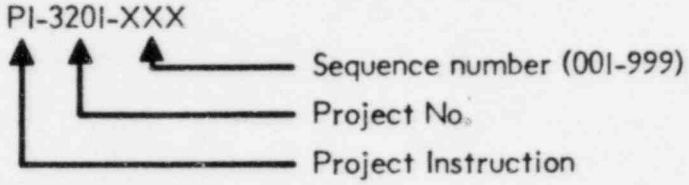
5. PROCEDURES AND INSTRUCTIONS

5.1 Engineering Control Procedures

5.1.1 Engineering Control Procedures (ECP) and revisions are implemented at project level by issue of the PQAP or by revision thereof. ECPs are corporate level documents prepared under the supervision of the Quality Assurance Manager and approved by the Executive Vice President.

5.1.2 The following ECP's are hereby implemented for the subject project:

(1) ECP-5.2, "Calculation Preparation and Control", Rev. 4



5.2.6 Project Instructions

The following Project Instructions are hereby implemented for this project.

(1) PI-3201-001, "Engineering Evaluation Preparation and Control", Rev. 4 | 5

(2) PI-3201-001QA, "Audit Checklist for Engineering Evaluation Preparation and Control", Rev. 1

(3) PI-3201-002, "Document Control Cover Sheet", Rev. 2

(4) PI-3201-002QA, "Audit Checklist for Document Control Cover Sheet", Rev. 1

(5) PI-3201-004, "Midland Project Engineering Program Verification", Rev. 0 | 5

(6) PI-3201-005, "Documentation of Observations", Rev. 1

(7) PI-3201-006, "Use of Design Verification Checklists", Rev. 0

(8) PI-3201-007, "Use of Construction Verification Checklists", Rev. 0

(9) PI-3201-008, "Preparation of Open, Confirmed and Resolved Item Reports, Finding Reports, and Finding Resolution Reports", Rev. 3 | 5

(10) PI-3201-009, "Engineering Program Plan", Rev. 3

(11) PI-3201-010, "External Communications: Preparation of Contact Log Sheets", Rev. 2 | 5

(12) PI-3201-011, "Control of Subcontractors", Rev. 0 | 5

(13) PI-3201-012, "Scope Change Request, Midland IDCV", Rev. 1

Copies of the implemented revisions of these project instructions are attached in Appendix B with the exception of Project Instructions PI-3201-006 and PI-3201-007 which will be provided at a later date.

6. QUALITY ASSURANCE

6.1 Records

All quality assurance checklists, audit reports and records documenting activities related to the Quality Assured Activities of Section 1.2

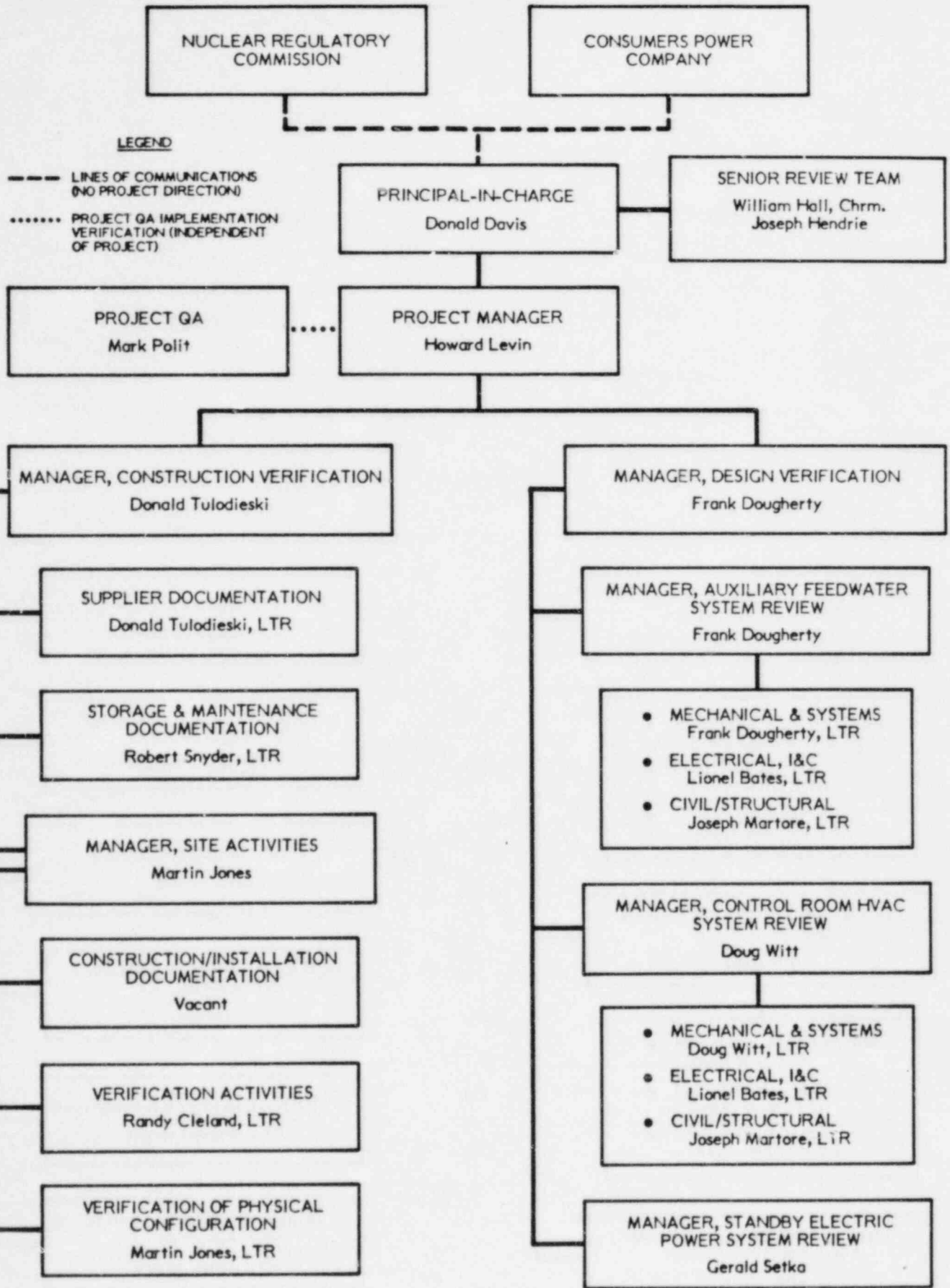


FIGURE 1

PROJECT ORGANIZATION

MIDLAND INDEPENDENT DESIGN AND CONSTRUCTION VERIFICATION PROGRAM

ENGINEERING CONTROL PROCEDURE

ECP- 5.2	SUBJECT:
REV: 4 DATE: 8/1/83	CALCULATION PREPARATION AND CONTROL
PAGE 1 OF 7	PREPARED BY: APPROVED BY:

1. PURPOSE

This procedure shall be followed in the preparation and control of calculations, when required by the PQAP. Calculations are to be prepared to establish or verify designs, design parameters, design criteria, reduce data, establish performance and economic parameters, and otherwise provide quantitative information in accordance with accepted analytical and mathematical methods.

2. PREPARATION

2.1 Each calculation shall be prepared following accepted engineering practice and shall include sufficient sketches, notes and explanatory information to allow any person not familiar with the work, but technically qualified, to understand it without extensive additional inquiry and research.

2.2 Calculations shall be complete and orderly and shall include problem statement and input requirements such as assumptions, basic criteria, methodology, data referenced to the source, and applicable codes and standards. Major equation sources shall be given and the source or derivation of any uncommon equations introduced in the calculation.

2.3 References shall be listed and identified sufficiently to allow easy recovery. Title, revision number or date, author, copyright date, edition, etc., shall be included as necessary identification information.

2.4 All final calculations shall be made on standard Control Sheets (Attachment A) or on sheets stamped with the Control Stamp (Attachment B) with all required information completed by the originator. A Calculation Cover Sheet (Attachment C) shall also be prepared and attached as sheet 0 of each final calculation prior to verification and approval.

2.5 Computer calculations shall be identified by a Calculation Cover Sheet with attachments as necessary to define the calculation being performed, the assumptions and input data used, basic mathematical models applied and references as appropriate. Additional requirements for the control of computer calculations are found in ECP-5.4, Computer Program Certification.

3. VERIFICATION AND APPROVAL

3.1 Status

Calculations shall be designated as preliminary until verified by checking and approved by the Project Manager or his designated representative, or until he determines that such review and approval are not required. Preliminary calculations not upgraded to final calculation status shall be maintained in a separate file.

3.2 Verification

3.2.1 Each final calculation shall be checked by an individual who has qualifications at least sufficient to originate the calculation. The checker shall not (1) be the originator or

the originator's immediate superior, (2) have specified a singular calculational approach, (3) have ruled out certain considerations, or (4) have established the input for a certain aspect being verified.

3.2.2 The extent of verification required is a function of the importance of the calculation, its complexity, degree of standardization and relation to the state-of-the-art. Based on these considerations, the input, assumptions, and method of calculation may be reviewed as well as the reasonableness of the results. The depth of verification can range from a detailed check of the whole calculation to a limited check of the calculation approach and an alternative or simplified calculation technique.

3.3 Documentation of Verification

3.3.1 To provide a basis for project manager approval and future traceability, the extent and method of verification shall be clearly indicated by such methods as check marks on the original calculation and a description of the verification on the Calculation Cover Sheet or a separate sheet. The checker shall flag all errors. However, only the originator may alter the original calculation. In all cases when the propagation of the error is not corrected in the calculation or later in the design process, the originator shall clearly discuss its significance either on the cover sheet or on the original calculation.

3.3.2 In cases where only certain aspects of a calculation were verified either due to the perceived need (Section 3.2) or any limitations in the qualifications of the checker, this shall be stated explicitly on the Calculation Cover Sheet or attachments as necessary.

3.3.3 After checking, the checker shall sign and date the Calculation Cover Sheet and each calculation sheet. When more than one person contributes to checking a calculation (for example when one checks the methodology and the other checks the math) one of them shall take responsibility for the full check by signing the Cover Sheet. The roles of other checkers may be described in the verification space of the Cover Sheet or by their signatures on the pages which they verified. Any comments shall be resolved with the originator prior to signoff.

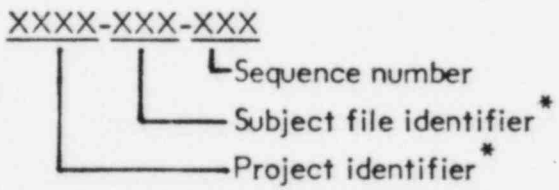
3.4 Approval

The calculation shall then be passed to the Project Manager or his designated representative for approval. The extent and method of verification must be reviewed and determined to be satisfactory prior to signoff. The Project Manager or his designated representative will sign only the cover sheet.

4. DOCUMENT CONTROL

4.1 Identification

Calculations shall be assigned a control identification number by the Project Manager or his designated representative in the following format:



*Project and subject file identifers are established in the PQAP.

The Project Manager or his designee shall insert the control identification number on the cover sheet and each page of the final calculation.

4.2 Retention

The final calculation shall be indexed, Attachment D, and filed in the appropriate subject file. Calculations shall not be stored loosely but shall be filed in binders or contained in folders.

Further controls resulting from contractual agreement or project specific needs may be stated in the PQAP.

4.3 Distribution

4.3.1 Distribution of final calculations, calculation input, and other design documents shall be controlled by the Project Manager or his designated representative.

4.3.2 When the size of the project and complexity of interface warrants, distribution shall be controlled by distribution registers (such as Attachment E) maintained in the project QA files. These registers shall be kept current to assure that the proper personnel are sent all the documents required to perform the work and that the current revision is being used. When a design document revision is issued, all individuals on the distribution register shall be forwarded a copy of the revised information.

4.3.3 Special project circumstances that may warrant use of distribution registers include the distribution of documents to other offices of TERA, to associates, or outside of TERA. When TERA is issued controlled design documents, such as drawings and other source material, for which TERA is on a revision distribution list, these materials shall be controlled pursuant to Section 4.3.2. Independent verification of the determined need for distribution list will be provided by the internal audit process.

5. REVISIONS

5.1 Revisions to final calculations shall be made, verified, and approved in the same manner as the original calculation.

5.2 Superceded final calculations shall be so identified and transferred to a superceded calculation file. This action shall be noted by completing the "Superceded By" blanks on the Calculation Index for the superceded calculation. Superceded final calculations shall either be identified as such on each page or shall be securely bound with at least the cover page so identified.

5.3 Calculation packages may be revised by inserting replacement pages or additional pages with the revision number added to the Control I.D. number on these pages. Appropriate page numbers shall be supplied with subpage numbers used if necessary (e.g., 41A, 41B or 41.01, 41.02, etc.). The Page Revision Record, Attachment F, must be used to record all removed, replaced or revised pages and shall be attached to the Calculation Cover Sheet. Superceded pages shall be identified as such and transferred to a separate file.

6. QA AUDIT CHECKLIST

6.1 Audits of the implementation of this procedure shall be conducted by the PQAE using Audit Checklist ECP-5.2QA.

SUBJECT _____

_____

PROJECT NO. _____

CONTROL I.D. NO. _____

SHEET _____ OF _____ SHEETS

PREPARED BY _____ DATE _____

CHECKED BY _____ DATE _____

TERA

CONTROL STAMP

CONTROL ID NO
PREPARED BY/DATE
VERIFIED BY/DATE
PAGE ____ OF ____

CALCULATION COVER SHEET

SUBJECT _____

CONT. ID. NO. _____

PROJECT _____

NO. OF SHTS. _____

SUPERCEDES CALC. NO.

REV. NO.	REVISION	ORIGINATOR	DATE	VERIFIED BY	DATE	APPROVED BY	DATE

VERIFICATION

PURPOSE/INPUT REQUIREMENTS

SOURCES OF DATA, FORMULAE AND REFERENCES

(References may be listed on a separate sheet)

TERA CORPORATION

CALCULATION INDEX

CONT ID. NO.	SUPERCEDED BY	TITLE	REVISION DATE						
			0	1	2	3	4	5	6

DOCUMENT CONTROL REGISTER FOR DRAWINGS AND SPECIFICATIONS

PROJ. NO. ______________ TYPE: PROJECT:
PAGE ___ LOCATION: SUBJECT FILE NO. ______________

DOCUMENT TITLE	ID NUMBER	DATE OF ISSUE	REV.	DISTR.	DATE OF ISSUE	REV.	DISTR.	DATE OF ISSUE	REV.	DISTR.

PAGE REVISION RECORD

CONT. I.D. NO. _____ PREPARED BY _____ DATE _____

REV. _____ DATE _____ CHECKED BY _____ DATE _____

SUBJECT _____

PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV

TERA CORPORATION

PROJECT INSTRUCTION

PI-3201 - 001	SUBJECT: Engineering Evaluation Preparation and Control
REV.: 4 DATE: 6/15/84	
PAGE 1 of 8	PREPARED BY: [signature] APPROVED BY: [signature]

1.0 GENERAL

1.1 Purpose

The purpose of this instruction is to establish the requirements for preparation and control of engineering evaluations required for the Midland Independent Design and Construction Verification (IDCV) Program.

1.2 Scope

Engineering evaluations are the principal means of documenting the IDCV review process and the bases for conclusions. As a minimum, an engineering evaluation shall address each topic within the scope of the program. A single engineering evaluation may cover multiple related topics. Alternatively, it may be necessary to have several supporting engineering evaluations serving as input to a primary engineering evaluation which documents the final resolution of a particular topic. The scope of individual engineering evaluations and the combinations of engineering evaluations which form the basis of the final report depend upon the technical scope which is appropriate for the particular topic and review area and the area of expertise of the assigned individuals. As a minimum, each engineering evaluation shall clearly indicate the topics and review areas within its scope. The Project Manager and the Design and Construction Verification Managers shall be jointly responsible for assuring that all reviews are appropriately documented in engineering evaluations. 4

3.2 Each final engineering evaluation shall be verified by the review of an individual who has qualifications at least sufficient to originate the evaluation. The reviewer shall not be the originator but may be the Project Manager, Managers, Design and Construction Verification, Managers, AFW, SEP or CR-HVAC reviews, Manager, Site Activities or an LTR. After reviewing, the reviewer shall sign and date the engineering evaluation cover sheet. To provide a basis for future traceability and approval, the extent and method of review shall be clearly described on the Engineering Evaluation Cover Sheet. Any comments shall be resolved with the originator prior to signoff.

3.3 The objective of engineering evaluation verification is to provide assurance that:

- the engineering evaluation meets the intent of the format guidelines of PI-3201-001,
- the engineering evaluation scope statement is met by the content of the engineering evaluation,
- the scope and content of the engineering evaluation are appropriate and adequate considering the applicable portions of the Engineering Program Plan (PI-3201-009), and
- the engineering evaluation is internally consistent and correctly represents NRC regulations.

3.4 Each AFW, SEP or CR-HVAC review manager and Manager, Site Activities should discuss with their respective Manager of Design or Construction Verification the most appropriate choice for assignment of originator and recommend people to perform the verification for each engineering evaluation.

Upon completion of the preliminary engineering evaluation, the AFW, SEP or CR-HVAC review manager and Manager, Site Activities should determine whether to proceed with verification or wait until OCRs and other open items are resolved. They should advise their respective Manager of Design or Construction Verification of their plan for performance of the verification step. 4

3.5 The verifier/checker should complete the following minimum steps:

3.5.1 Compare the format and content of the engineering evaluation against that specified in PI-3201-001. The reviewer should note any significant differences; however, he should be aware that flexibility exists in meeting the intent of the format guidelines for engineering evaluations. The critical factor is whether the engineering evaluation meets the scope specified within itself and is sufficiently documented considering the recommended contents for evaluations. The reviewer should also consider the QA checklist attached to PI-3201-001.

3.5.2 Compare the scope contained within the engineering evaluation (considering the results of the previous step) with the descriptions in the engineering program plan for both the depth of review (columns in the review matrix) and review topics (rows in the matrix) covered by the engineering evaluation. For example, if an engineering evaluation scope includes criteria, implementing document, and calculation reviews for two review topics, the person doing the verification step should verify that the activities described in the engineering program plan for criteria, implementing document, and calculation reviews have been performed and that any specific requirements outlined in the engineering program plan for the two review topics have, in fact, been accomplished. 4

3.5.3 Review the engineering evaluation for appropriateness of acceptance criteria and reasonableness of results. The review should be in detail sufficient to determine whether the acceptance criteria stated in the engineering evaluation have been met. The review should further determine whether there is sufficient detail and justification in the engineering evaluation to conclude that the scope has been adequately reviewed.

3.5.4 Discuss with the originator (and the LTR, AFW, SEP or CR-HVAC system manager, Manager, Site Activities and other IDVP management personnel as necessary) any areas

which he feels should be changed. The originator and the verifier should mutually agree upon the engineering evaluation and the originator should revise the evaluation as mutually agreed. If they cannot agree, the matter should be referred successively to the LTR, the AFW, SEP or CR-HVAC system manager, Manager, Site Activities, the Manager, Design Verification, Manager, Construction Verification, and the Project Manager until agreement is reached.

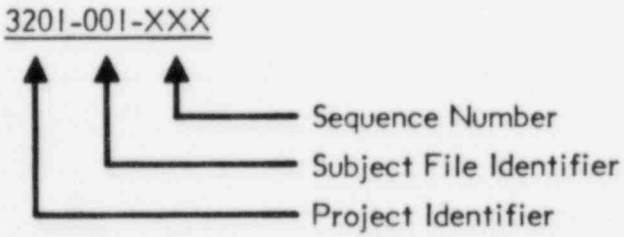
3.5.5 Upon resolution of comments, the verifier should sign the engineering evaluation cover sheet and describe the extent of the review as required by PI-3201-001. The engineering evaluation should then receive further processing as defined in that project instruction. 4

3.6 The Managers, Design and Construction Verification, the Project Manager, or his designated representative shall indicate approval by signing only the cover sheet when the evaluation and its review have been completed.

4.0 DOCUMENT CONTROL

4.1 Identification

After all approvals have been obtained, the final engineering evaluation shall be assigned a control identification number by the Project Manager or his designated representative in the following format:



PROJECT INSTRUCTION		
PI- 3201 - 004	SUBJECT: Midland Project Engineering Activity Verification	
REV.: 0 DATE: 5/7/84		
PAGE 1 of 8	PREPARED BY:	APPROVED BY:

1.0 GENERAL

1.1 Purpose

The purpose of this instruction is to establish the requirements for the preparation of evaluations of Midland Project engineering activities. Such evaluations supplement end product reviews addressed under Project Instruction 3201-001, Engineering Evaluation Preparation and Control. In particular, this instruction addresses those situations where ongoing engineering activities by the Midland Project prevent performance of the end product reviews contemplated by PI-3201-001. It provides guidance for identifying such circumstances and required implementation necessary to meet the objectives of the Midland Independent Design Verification Program.

1.2 Scope

This Project Instruction applies to the Design Verification Program. It is used as a supplement to the requirements of PI-3201-001, which covers the normal preparation of engineering evaluations, and supplements PI-3201-009, the Engineering Program Plan. This instruction provides guidance for defining the scope of documentation to complete evaluations of selected review topics where Midland Project design-related activities are ongoing. This instruction shall be used in conjunction with PI-3201-001 and PI-3201-009 such that the sample selection criteria and the objectives of the Engineering Program Plan are met.

1.3 Applicability

This project instruction applies without further approval to the following specific design areas (topics) and scopes of review which are defined in the Engineering Program Plan.

Design Area	Topic Number
Technical Specifications	I.4-1 I.4-2 I.4-3
Seismic Design/Equipment Qualification	II.4-1 II.4-2 II.4-3
High Energy Line Break Accidents/Pipe Whip	II.6-1
Environmental Protection/Equipment Qualification	II.10-1 II.10-2 II.10-3
Fire Protection	II.12-1 II.12-2 II.12-3
Systems Interaction	II.14-1 II.14-2 II.14-3

The procedure outlined below may be used for the above topics without further approval of the Project Manager. Application of this procedure to other aspects of the Midland Independent Design Verification Program may be authorized only in accordance with Section 3.0 of this Project Instruction.

1.4 Project Instruction Overview

Figure 1 presents a graphical overview of this Project Instruction.

2.0 RESPONSIBILITIES AND APPROVAL

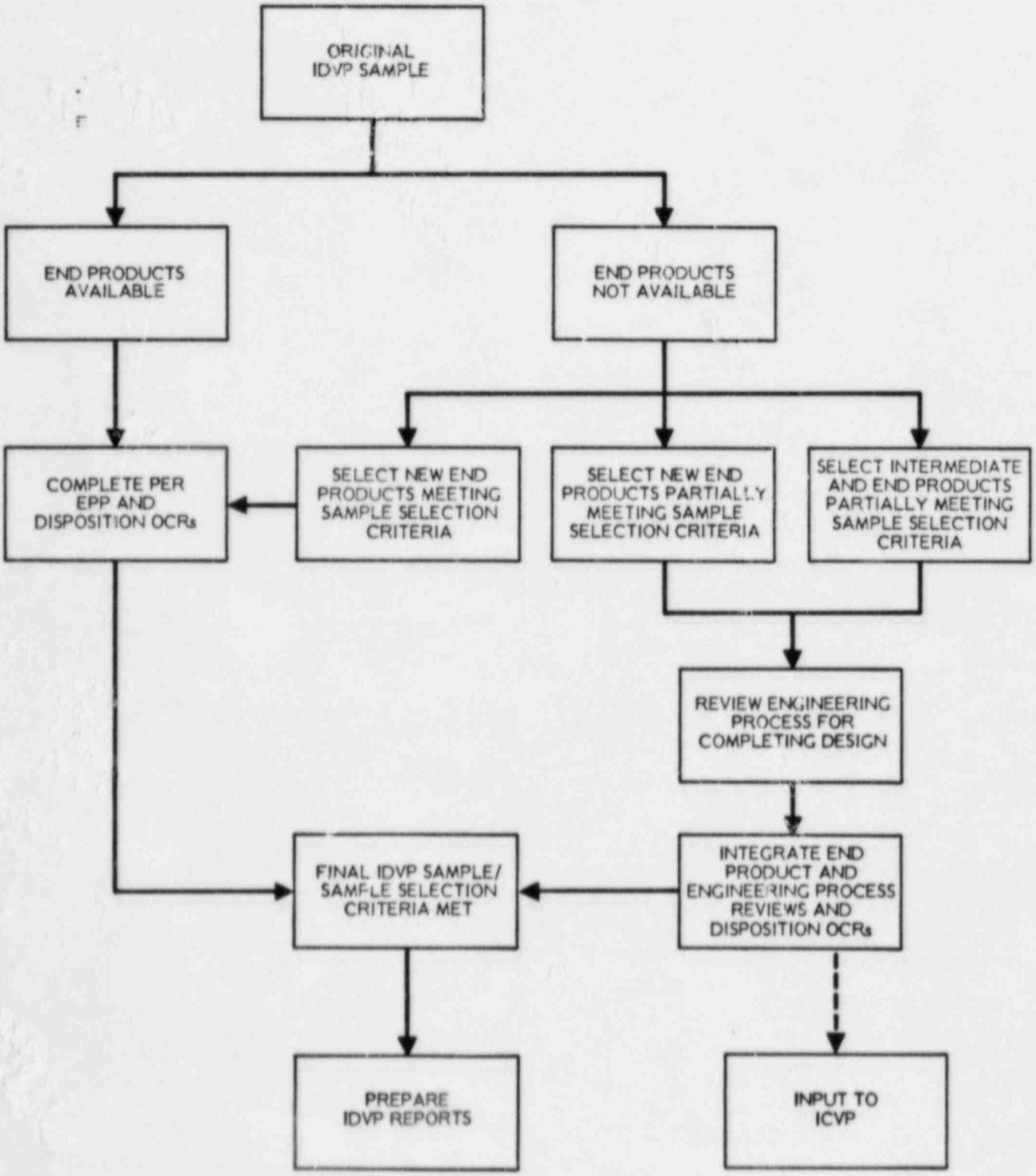
2.1 Lead Technical Reviewers

The Lead Technical Reviewers (LTR) shall be aware of the status of completion of Midland Project engineering activities within their scope of review. If an LTR finds that engineering products which were selected in accordance with the sample selection criteria of the Engineering Program Plan are not complete, he shall determine the extent to which his sample is affected and the schedule for completion of the design activities required in those areas. In performing this review, he shall determine whether the remaining work represents a revision to previously completed work, or the initial completion of the material. Where the incomplete work is due to revision of the engineering products, he shall determine the reasons for the revision. Based upon his review of the end products, the remaining work and the schedule for that remaining work, the LTR shall evaluate the following four courses of action:

- Hold completion of the affected engineering evaluation until the revised documents are completed.
- Apply the sample selection criteria to other associated completed work products such that a revised sample is selected which meets the criteria for the original sample.

FIGURE I

IDVP REVIEW APPROACH TO SAMPLE SELECTION
FOR SPECIFIC DESIGN TOPICS



- Select alternate end products which partially meet the sample selection criteria and supplement the review by implementing Section 3.0 of this Project Instruction.

- Select a sample of end products and intermediate products to perform the engineering evaluation and supplement the review by implementing Section 3.0 of this instruction.

The LTR shall notify the responsible System Review Manager of the incomplete end products. He shall provide his recommendations for the course of action together with a status summary for the incomplete engineering activities.

2.2 System Review Manager

Upon receipt of notification from an LTR that incomplete engineering products may affect the sample selection, the System Review Manager shall review the LTR's definition of the situation and recommend a course of action. The System Review Manager shall review the Engineering Program Plan with respect to the affected design areas and shall determine whether corresponding design areas in other systems within the scope of the IDVP are also affected. He shall consult, as appropriate, with the other Review Managers and LTRs to make this determination. The System Review Manager may authorize placing the review activity on hold or substitution of equivalent engineering products based upon his review of the LTR's recommendation. He shall notify the Manager, Design Verification, if he anticipates cost or schedule impact due to his decision. If the System Review Manager determines that the appropriate course of action is to select a new sample and supplement it with a review of Midland Project engineering activities (process review as defined in Section 3.0

below), he shall document his recommendation and request a review by the Project Manager; Manger, Design Verification; and Manager, Construction Verification.

2.3 Manager, Design Verification

The Manager, Design Verification shall effect a project team meeting or telephone conference (i.e., himself; the Project Manager; Manager, Construction Verification; and other appropriate personnel) to review the recommendations of the System Review Manager with respect to implementing the review procedure of this instruction. These personnel shall weigh all appropriate considerations and alternatives available, including impact upon the design verification program sample, the ability to extrapolate results, and the overall ability to meet IDCVP objectives. They shall consider the interface between the design and construction verification programs and the cumulative effect of sample modification in accordance with this instruction. They may direct the system review manager to implement Alternatives 1 or 2 (described in Section 2.1).

2.4 Project Manager

Upon review by the project team and their determination that an engineering process review is the most appropriate course of action, the Project Manager shall authorize the System Review Manager to implement the process review of Midland Project engineering programs defined below in addition to performance of engineering evaluations using end or intermediate end products. The Project Manager shall determine whether or not implementation of the identified actions constitute substantive matters previously unaddressed and, if required by the IDCVP Protocol, take the

appropriate course of action with respect to notification of the NRC, CPC, and the public regarding implementation of this alternative. Where appropriate, the Project Manager may request guidance from the Principal-in-Charge or the Senior Review Team.

3.0 PREPARATION

3.1 Process Review

A process review is defined as an evaluation of the Midland Project engineering programs, procedures, and other activities required to complete engineering work in progress at the time of sample selection. The process review shall be performed only when authorized by the Project Manager in accordance with Section 2.0 of this instruction.

3.2 Process Review Program Definition

Upon authorization to perform a process review, the Manager, Design Verification shall assign a reviewer to perform the process review. The reviewer may be the LTR who initially identified the issue; however, the Manager, Design Verification may select another person if he determines that it is in the best interest of the program. The Manager, Design Verification, the LTR, the assigned reviewer, and other appropriate project personnel shall discuss the nature of the remaining work and the nature of the sample of end or intermediate and end products which are being evaluated. With this information, the reviewer assigned to the process review shall prepare a review scope document.

3.3 Review Scope Document

The review scope document shall define the procedure by which the process review of Midland Project engineering programs will be conducted. It shall consist of the following elements:

- Objectives

  This section shall define the objectives for the process review. It shall relate the process review to the sample selection criteria and indicate how completion of the process review will affect completion of that topical area of the design verification program.

- Scope

  The review scope document shall define the scope of the process review in terms of the design topical areas and scope of review (see Engineering Program Plan) which are covered by the process review. If the process review affects more than one topic or more than one scope of review item, they shall all be appropriately listed. Furthermore, to the extent that a review scope item as defined on the sample review matrix for the system or systems is partly satisfied by an engineering evaluation and partially satisfied by a process review, the division of responsibility between these review methods shall be documented in the review scope document. The scope section shall also identify the process items which are within its scope. For example, if the process review involves calculations and specification preparation, these activities should be noted in the scope section. Where different engineering groups (e.g., mechanical and electrical) are involved in the engineering activity, this fact should be noted. The scope section may include flow charts or similar graphic information to help identify the scope of the process review.

- Acceptance Criteria

  The review scope document shall identify the criteria against which the process being reviewed is to be evaluated. The criteria shall be listed such that satisfaction of those criteria will demonstrate that the process meets its objectives and that the process review performed as part of the design verification program meets the objectives set forth for it in Section I of the review scope document.

4.0 ADMINISTRATIVE CONTROL, REVISIONS, AND QA AUDITS

For the purposes of document control, evaluations performed as process reviews shall be numbered, controlled, filed, revised, and audited with other engineering evaluations performed as part of the IDVP. In this respect, Sections 4.0, 5.0, and 6.0 of PI-3201-001 shall apply to process review evaluation documents, respectively.

2.2 The Lead Technical Reviewers are responsible for the review of and concurrence in all Potential Open Items and OCRs forwarded by their technical reviewers, the classification of OCRs, the preparation of Finding Reports and Finding Resolution Reports, and the forwarding of all of these reports to the Project Manager (PM). The LTRs shall consider input provided to them by the technical reviewers. An LTR may perform the duties of the technical reviewer.

2.2.1 The Managers, AFW, SEP or CR-HVAC reviews and the Manager, Site Activities may perform the responsibilities of their respective LTRs.

2.2.2 The Managers of Design Verification and Construction Verification may perform the responsibilities of the Managers, AFW, SEP or CR-HVAC reviews and Manager, Site Activities respectively, and the responsibilities of their respective LTRs. 3

2.3 The Project Manager is responsible for periodically organizing meetings or telecons of the project team for the purpose of conducting an integrated review of the classification and significance of OCRs and Findings, and the resolution of Findings.

2.4 The Project Manager is responsible for forwarding OCR Item Reports, Finding Reports, and Finding Resolution Reports to the Principal-in-Charge and Senior Review Team (SRT); and forwarding Confirmed Item Reports, Finding Reports and Finding Resolution Reports to outside parties. The Project Manager may perform the duties of anyone within the project organization reporting up through him. 3

2.5 The project team shall review all Potential Open Items forwarded by the LTRs, review the classification of and attempt to resolve Open or Confirmed Items, conduct further technical review or call for further technical review to clarify, expand or reassess Open or Confirmed Items. The project team is responsible for verification of a Confirmed Item leading to the declaration of a Finding, resolution of a Finding or the re-classification of a Finding as "resolved" by issuance of a Finding Resolution Report.

2.6 The Principal-in-Charge (PIC) is responsible for concurring with the classification of OCRs, Findings, Findings Resolution Reports, making a determination if a review of OCRs is required by the Senior Review Team, and directing the Project Manager to forward Con-

4.0 VERIFICATION AND APPROVAL

4.1 OCR Reports, Finding Reports and Finding Resolution Reports shall be designated as preliminary until verified by the review of the project team and signing by the Project Manager. These reports are controlled in accordance with section 5.0 of this instruction upon signature by the Project Manager.

4.2 The technical reviewers shall sign OCR Reports thereby verifying the accuracy of the information presented and signifying that the report has been prepared under his review.

4.3 The LTRs shall sign OCR Item Reports signifying his concurrence. The LTRs shall sign Finding Reports and Finding Resolution Reports thereby verifying the accuracy of information presented and signifying that the report has been prepared under his review. The Managers AFW, SEP or CR-HVAC reviews and Manager, Site Activities may sign for a reporting LTR provided that a verbal concurrence has been obtained. 3

4.4 The Project Manager shall approve OCR Reports and Finding Reports and Finding Resolution Reports signifying completion of review and concurrence by the project team. The Principal-in-Charge may sign for the Project Manager provided a verbal concurrence has been obtained. 3

4.5 Potential Open Items that are not approved by the project team and therefore never to become Open Items are controlled in accordance with section 5.0 of this Project Instruction.

4.6 The Principal-in-Charge shall sign OCR Reports, Finding Reports and Finding Resolution Reports signifying his review, concurrence and determination whether OCRs reports require SRT review. The Project Manager may sign for the Principal-in-Charge provided a verbal concurrence has been obtained. 3

1.4 Definitions

1.4.1 Substantive Matters

As discussed in Attachment A, substantive matters are those matters where notice of public meetings are required prior to discussion with external parties. In general, issues of a technical nature will not be substantive unless a Confirmed Item has been made. Prior to Confirmed Items, technical information exchange with external parties will be necessary to obtain information; however, at this stage the project team will not have reached its technical conclusion as to the matters under review. Therefore, discussions prior to confirmed items should not concern project team judgments on engineering assumptions, calculations, design bases, or interpretations of licensing or code requirements. Should any project team reviewer believe that his contacts with external parties will include any of the areas described above, he should consult the Project Manager to solicit a decision on whether this discussion involves a substantive matter prior to engaging in discussions with external parties.

2

2

Should discussions with external parties, which were not anticipated to involve substantive matters, evolve into areas where substantive matters could be discussed, the project team reviewers are to avoid any such discussion until resolution with the Project Manager is obtained. This may require

PROJECT INSTRUCTION

PI-3201 - 011	SUBJECT: Control of Subcontractors
REV.: 0 DATE: 6/15/84	
PAGE 1 of 9	PREPARED BY: APPROVED BY:

1.0 GENERAL

1.1 Purpose

The intent of this instruction is to define and establish the steps utilized to ensure that the TERA Corporation Quality Assurance Program (QAP) instruction for the Control of Purchased Services is applied to the Midland Project IDCVP in a manner consistent with the mandated "protocol" of the IDCVP and with other quality requirements unique to the conduct of the IDCVP.

1.2 Scope and Applicability

1.2.1

During the conduct of the IDCVP, TERA management may find it necessary to supplement TERA's staff capabilities with technical expertise as provided by a contractor or vendor. When such needs for outside assistance are identified, the steps delineated in Section 3.0 shall be rigorously followed and applied during the process of evaluating, contracting, and managing the contractor/vendor until contract requirements are met.

1.2.2

For the purpose of applying this instruction it is important to differentiate between the contributions which are made to the IDCVP by contracted personnel or organizations. Specifically, certain personnel are retained by TERA IDCVP management to provide a professional service and a deliverable while acting as an integral member of the IDCVP team. Other contributions to the IDCVP, however, are contracted, developed, and prepared independently from the IDCVP and delivered to the IDCVP staff for their evaluation and subsequent use in supporting IDCVP conclusions. The difference between the contributions relates specifically to the manner with which the contracted deliverable is developed, prepared, and documented.

APPLICABILITY CASE I:

In the case where an individual or organization is retained by TERA to participate in the IDCVP as an integral member of the IDCVP project team, the total scope of the contracted personnel's or organization's activities will be governed by the instructions contained within the Midland IDCVP Project Quality Assurance Plan (PQAP). Additionally, the contracted personnel or organization will be directed and supervised by TERA program management

who also must function in accordance with the requirements of the PQAP. Thus when an individual or organization is retained to participate as a member of the IDCVP staff, his contribution/deliverable will be developed and documented in accordance with and under the control of the Midland IDCVP project quality assurance program.

APPLICABILITY CASE II:

In the case where an organization or individual is retained to provide a service and produce a deliverable independent of the Midland IDCVP PQAP, specific criteria must be applied to ensure that the deliverables developed are done so in accordance with acceptable quality controls and standards. In this case the TERA staff views the contracted personnel/organization as a "black box" wherein the contract establishes the deliverable and criteria to be met. The contractor, using his own resources and processes, and relying upon his own quality control and quality assurance programs, produces the deliverable in accordance with the promulgated criteria. The deliverable, once received by TERA, would then be processed, evaluated, and utilized by IDCVP personnel subject to the requirements of the Midland PQAP.

The steps delineated in Section 3.0 of this instruction have been annotated with a Roman numeral one or two (I, II) to indicate the applicability of a step to the service being contracted as defined above in Applicability Cases I & II.

2.0 RESPONSIBILITIES

2.1

IDCVP Management (Principal-In-Charge, Project Manager, Managers of Design & Construction Activities) shall when applicable ensure that the steps delineated in Section 3.0 of this instruction are executed in all instances when the capabilities of the TERA staff must necessarily be supplemented with procured services/deliverables. The Midland IDCVP Project Manager retains the ultimate responsibility for the contractor's performance although day-to-day management and supervision of the contractor may be delegated to a TERA IDCVP staff member who, for reason of review area, would be most knowledgable to evaluate the adequacy of the procured service/deliverable.

2.2

The Midland IDCVP Project Quality Assurance Engineer (PQAE) shall verify the consistent application of the steps delineated in Section 3.0 to ensure conformance to the TERA Corporation

Quality Assurance Plan and the unique quality requirements mandated by the Midland IDCVP and as defined by the body of instructions which comprise this Midland PQAP.

2.3

The Manager of Construction Verification Activities shall, in addition to activities delegated by the Project Manager as defined in Section 2.1, maintain this instruction current and in compliance with comments received from the Midland IDCVP Project Quality Assurance Engineer.

3.0 STEPS FOR THE CONTROL OF SUBCONTRACTORS

The steps below have been annotated with either a Roman numeral one or two (I, II) to indicate their applicability as defined in Section 2.0 of this instruction.

3.1

The Project Manager, with assistance from the PQAE, and congnizant discipline managers, will establish at the earliest possible date, consistent with the Midland IDCVP project schedule, the services required from outside organizations (I & II).

3.2

The Project Manager, or designated TERA individual, shall establish a listing of potentially acceptable contractors. This listing need not be formal and may be developed through discussions among cognizant IDCVP personnel (I & II).

3.3

The Project Manager, or designated individual, shall review and evaluate potentially acceptable contractors. The focus of the review, for the purpose of this instruction, will be upon determining appropriate capabilities based upon documented performance history and past affiliations with CPC and/or the Midland Project. Past affiliations with CPC or the Midland Project or lack of sufficient experience may be cause for rejection (I & II).

3.4

Prior to contract award, the PQAE or his designee shall evalute the prospective supplier from a quality assurance perspective relative to the proposed scope of work. In support of this effort, the supplier's history of providing the service or similar services may be reviewed, as well as personnel qualification records. In addition, a review of the supplier's quality assurance program or procedures may be warranted in order to verify that pertinent

controls exist. A source audit may be performed to verify implementation of these controls (II).

3.5

A scope of work will be prepared which will delineate the services/deliverables required and the terms and conditions attendant with their provision. The scope of work will be agreed to and signed by the successful contractor (I & II).

3.6

The successful contractor will sign an affidavit and have the affidavit notarized asserting the successful contractor's Statement of Independence (I & II).

3.6.1

In the case of an agreement entered into with an outside organization, a responsible officer of the organization shall, in addition to the Statements of Independence required by 3.6 above for each individual anticipated to be involved in executing the agreement, sign a Corporate Statement of Independence. Such a Statement shall be notarized (II).

3.7

A project Quality Assurance Plan shall be prepared by the successful contractor and be approved by the TERA Midland IDCVP PQAE and the Project Manager or Manager IDV or ICV prior to the start of work. As a minimum the project Quality Assurance Plan shall identify: (II)

- Applicable criteria of 10 CFR 50, Appendix B (II).
- Quality Assurance procedures and instructions (II).
- Applicable codes and standards to be applied in the conduct of the work and execution of the Quality Assurance Plan (II).
- Internal Audit Schedules (II).

3.8 The Terms and Conditions attendant with the provision of contracted services/deliverables shall, as a minimum address the following: (II)

- Specify that the scope of work as nuclear, safety-related with the applicable criteria of 10 CFR 50, Appendix B applying (II).
- Specify that the requirements of 10CFR 21 apply (II).
- Reporting requirements in accordance with the provisions of 10CFR 50.55(e) (II).
- Reporting and record keeping requirements in accordance with the provisions of 10CFR 20 and

capability to demonstrate appropriate education and experience (II).

- Documentation requirements including the retention or submittal of records necessary to assure the quality of services provided including QA and/or QC programs and special process procedures/evaluations, as applicable (II).

- Assessment of the control of quality at intervals consistent with the importance and complexity of the service/deliverable provided. This assessment shall be accomplished either through periodic source audit or receipt inspection of deliverables, as appropriate. Should source audit be deemed appropriate, considering the particular scope of services, the terms and conditions shall provide for the right of access to the supplier's facility, the site of service performance, and records, as appropriate (II).

- The incorporation of the pertinent quality assurance requirements in subtier procurement documents (II).

- Regulatory requirements, industry standards and regulations, as applicable (II).

4.0 REVIEW AND APPROVAL OF PROCUREMENT DOCUMENTS

The PQAE shall review and verify the contract documents and assures that pertinent technical, regulatory, QA or other aspects necessary to assure the quality of the services are included. The procurement documents are then reviewed and approved by Mr. L. H. Wight, Vice President, TERA Corporation prior to issue.

ENGINEERING PROGRAM PLAN
PROJECT INSTRUCTION PI-3201-009
MIDLAND INDEPENDENT
DESIGN AND CONSTRUCTION
VERIFICATION PROGRAM
PROJECT 3201

JUNE 15, 1984
REVISION: 4

COPY NO. _____

TERA CORPORATION
QUALITY ASSURANCE PROGRAM

Midland Independent Design and Construction Verification Program

Engineering Program Plan
3201-009

DOCUMENT REVISION RECORD

REV	DATE	DESCRIPTION OF CHANGES
1	2/9/83	Pg. 1 - Update status of NRC approval of TERA Corporation: deleted "and approved by the NRC", replaced with, "subject to NRC approval"
		Pg. 24 -Update reference to P&ID M439: added, "revision 9" after 3A and changed rev. 9 to rev. 10 after 3B
		Pg. 25 -Add System Selection Boundary for HVAC: add, "AFW pump room fan coolers and associated ductwork and supports"
2	5/18/83	Modified to reflect the addition of the Standby Electric Power (SEP) system and the Control Room Heating, Ventilating and Air Conditioning (HVAC) system to the scope of the Midland IDCV program.
3	7/15/83	Changes reflect changes in the Project Organization and clarification of the scope of selected review topics.
4	6/15/84	Changes reflect supplementation of scope of the design verification program to include an evaluation of selected engineering programs and supplementation of the construction verification program to include a review of CPC's quality verification program; update of Project Organization and miscellaneous clarifications.

Midland Independent Design and Construction Verification Program

EPP

DATE: 6/15/84
REV: 4

PAGE REVISION RECORD

PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV	PAGE	REV
Cover	4	Fig1.2-6b	3	41	2	70	2	97	4	124	2
i	4	Fig1.2-7	3	42	2	71	3	97a	4	125	2
ii	2	15	3	43	3	72	2	98	2	126	2
iii	2	16	2	44	2	73	2	99	2	127	2
iv	2	17	3	45	2	74	4	100	2	128	2
v	2	Fig2.1-1	4	46	2	75	3	101	2	129	2
vi	2	19	3	47	2	76	3	102	2	130	2
vii	2	20	4	48	2	77	3	103	2	131	2
viii	2	20a	4	49	2	78	2	104	2	132	2
ix	4	21	2	50	2	79	2	105	2	133	2
x	2	22	2	51	2	80	2	106	2	134	2
xi	2	23	2	52	3	81	3	107	3	135	2
xii	2	24	2	53	2	82	3	108	2	136	2
xiii	2	25	2	54	3	83	2	109	2	137	2
1	2	26	3	55	2	84	3	110	4	138	2
2	4	27	2	56	2	85	3	110a	4	Fig5.2-1	2
2a	4	28	2	57	2	86	3	111	2	140	3
3	3	29	2	58	2	87	2	112	2	141	2
4	3	30	2	59	2	88	2	113	2	142	2
4a	4	31	2	60	3	89	2	114	2	143	2
4b	4	32	2	61	3	90	2	115	2	144	4
Fig1.2-1	3	33	2	62	3	91	2	116	2	145	2
Fig1.2-2a	3	34	2	63	2	92	2	117	2		
Fig1.2-2b	3	35	2	64	2	93	4	118	2		
Fig1.2-3	3	36	2	65	3	93a	4	119	2		
Fig1.2-4a	3	37	2	66	2	93b	4	120	2		
Fig1.2-4b	3	38	3	67	3	94	2	121	2		
Fig1.2-5	3	39	2	68	2	95	2	122	2		
Fig1.2-6a	3	40	2	69	2	96	2	123	2		

TABLE OF CONTENTS

TABLE OF CONTENTS

(continued)

PROJECT INSTRUCTION			
PI- 3201 - 009		SUBJECT: Engineering Program Plan Midland Independent Design and Construction Verification Program	
REV.: 4	DATE: 6/15/84		
PAGE 2	of 145	PREPARED BY:	APPROVED BY:

TERA Corporation has been selected by CPC to scope, manage, and implement the Midland Independent Design and Construction Verification (IDCV) Program. By a letter dated May 3, 1983, the NRC approved the selection of TERA. The selection is based upon the firm's technical qualifications, experience, and independence from the Midland project. Such independence includes all individuals who may contribute to the IDCV Program.

This project instruction, or Engineering Program Plan (the Plan), has been established to outline the scope, philosophy of review, methodology, independence requirements, organization, control, documentation, reporting, and quality assurance requirements for the Midland IDCV Program. On July 22, 1983, the NRC issued a letter approving the Plan for all three systems and the Project Quality Assurance Plan (PQAP) for which the Plan is appended. 4

The IDCV approach selected is a review and evaluation of a detailed "vertical slice" of the Midland project with a focus on providing an overall assessment of the quality of the design and the constructed plant. Therefore, the primary emphasis of the IDCV evaluation is on the end results of the design and construction process and not on an evaluation of the process itself which is typical of the more common quality assurance audit. The "vertical slice" constitutes a carefully selected sample of three safety systems from which the results of the IDCV may be extrapolated to other similarly designed and constructed systems. Thus, the IDCV is intended to provide the necessary assurance to CPC, NRC, and the public that the Midland Plant is designed and constructed such that it is capable of functioning in accordance with its safety design bases and that applicable licensing commitments have been properly implemented.

PROJECT INSTRUCTION			
PI- 3201 - 009		SUBJECT:	Engineering Program Plan Midland Independent Design and Construction Verification Program
REV.: 4	DATE: 6/15/84		
PAGE 2a	of 145	PREPARED BY:	APPROVED BY:

In a letter dated February 10, 1984, TERA identified a need to supplement selected topical reviews within the design verification program with an evaluation of engineering procedures, action plans, and their implementation where Midland project design-related activities are ongoing. Additionally, it was indicated that selected Midland project Quality Verification Program documentation processes would be reviewed as part of the construction verification program. Details of TERA's plans were discussed at a March 13, 1984, public meeting. The NRC issued a letter on June 6, 1984, concurring with TERA's plans.

The topic numbers used in the matrices have the following format:

X Y Z i

Construction Topic Identifier
C = Construction Topic
blank = Design Topic

System Number
1 = AFW System
2 = Standby Electric Power System
3 = Control Room HVAC

Topic Numbers

Where identical design areas apply to each system, the number is the same. For example, topic 1 for each system is "System Operating Limits" and 23 is "Failure Modes and Effects". Unique topics (e.g. fuel oil system) are given numbers (e.g. 27) which apply to only one system.

Design Review Areas
I = System Performance Requirements
II = System Protection Features
III = Structures Housing the System

OR

Construction Review Areas
I = Mechanical
II = Electrical
III = Instrumentation & Control
IV = HVAC
V = Structural
VI = NDE/Materials Testing

4

1.3 SYSTEMS SELECTION CRITERIA

The selection of the auxiliary feedwater system was based upon the following six criteria:

- Importance to Safety - The system should have a relatively high level of importance to the overall safety of the Midland Plant.

- Inclusion of Design and Construction Interfaces - The system should be one which involves multiple interfaces among engineering and construction disciplines as well as design and construction organizations, such as the NSSS vendor, architect engineer, constructor, and subtier contractors. The system should also be one where design or construction changes have occurred and thus provide the ability to test the effectiveness of the design and construction process exercised by principal internal and external organizations or disciplines in areas of design or construction change.

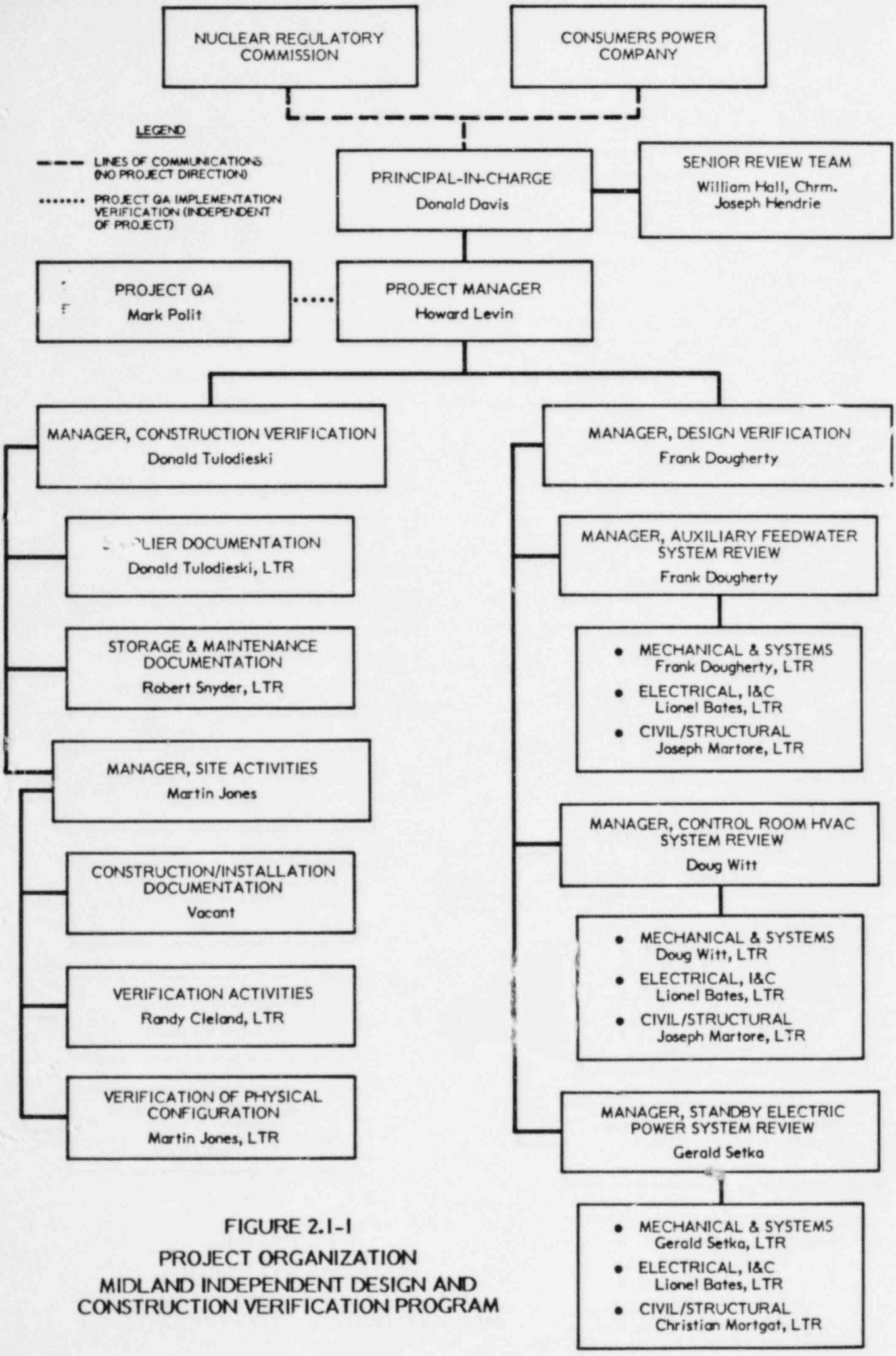


FIGURE 2.1-1

PROJECT ORGANIZATION

MIDLAND INDEPENDENT DESIGN AND CONSTRUCTION VERIFICATION PROGRAM

with CPC. The Project Quality Assurance Engineers report directly to the Vice President, TERA. They will identify internal quality assurance deficiencies, work with the PM in providing clarification relative to identified deficiencies and any recommendations made by them for resolution. 4

2.2 AUTHORITY AND RESPONSIBILITY

The project authority and responsibility is addressed in Section 2.2 of the PQAP, Project 3201, as augmented by various project instructions and engineering control procedures which are referenced in the PQAP.

The Principal-in-Charge (PIC) is responsible for helping establish the general philosophy of review, setting forth guidance to the Project Manager and the Managers, Design and Construction Verification, assisting as an interface with the Senior Review Team (SRT), NRC and CPC and reviewing/concurring in reports issued to CPC, NRC and other outside parties.

The Project Manager is responsible for overall planning and direct supervision of all in-house activities undertaken to fulfill the contract requirements. All documentation, correspondence, reports, calculations, etc., issued to CPC, NRC and other outside parties are to be issued under his signature or otherwise receive his approval as required by the applicable Engineering Control Procedure or Project Instruction.

The Project Manager is responsible for overall planning and management of all outside activities performed by subcontractors or Associates, but may delegate responsibility for supervision to other individuals within the project.

Documentation may be issued to the subcontractor or Associate under the signature of the designated individual.

The Managers of Design Verification and Construction Verification are responsible for overall planning, management and supervision of all activities within the IDV and ICV portions of the Midland IDCV respectively, and coordination between each other to assure that IDV and ICV interfaces are adequately addressed. These individuals report directly to the Project Manager.

The Managers of the AFW, SEP and CR-HVAC Reviews are responsible for management and implementation of design review activities necessary to complete an integrated review of their respective systems, coordination of activities between LTRs under their supervision and coordination with the ICV program LTRs. These individuals report to the Manager, Design Verification.

The Manager, Site Activities is responsible for planning, management and supervision of all Midland site related activities and the Construction/Installation Documentation, Verification Activities and Verification of Physical Configuration categories of review. He reports directly to the Manager, Construction Verification.

The Managers of Design Verification and Construction Verification may perform the functions of Managers reporting to them as appropriate. 4

The Senior Review Team (SRT) is responsible for the review of Open, Confirmed or Resolved (OCR) Item Reports, as requested by the PIC, Finding Reports, Finding Resolution Reports, as well as Interim Technical Reports and Final Reports. The SRT may at any time recommend to the PIC that the PM expand the scope of review, provide clarification or reassess elements of the review to

assess the technical validity and significance of project team conclusions and the proper classification of OCRs and Findings. (These reports are defined in Section 5.0 of this Plan). The SRT is also responsible for the review of Monthly Status Reports, OCRs as directed by the SRT Chairman, and any Draft Interim Technical Reports to maintain current awareness and assure a high level of technical quality. They will also provide recommendations to resolve differing technical views which may arise among project team membes. The SRT Chairman is responsible for coordination and direction of SRT activities.

The Lead Technical Reviewers (LTR) are responsible for implementation of all review activities within their discipline of review, including technical supervision of individuals on the project and outside activities performed by Associates. The IDV LTRs report to the Managers of the AFW, SEP and CR-HVAC System Reviews. The ICV LTRs report to either the Manager, Construction Verification or the Manager, Site Activities as shown on Figure 2.1-1. The LTRs are responsible for the classification of OCRs and Findings, the preparation of Finding Reports and Finding Resolution Reports. The functions of the LTR may be performed by the Managers of the AFW, SEP, and CR-HVAC reviews as appropriate. 4

The Project Quality Assurance Engineer is responsible for verification of the implementation of the PQAP and will perform audits evaluating the implementation of applicable procedures and instructions in accordance with Section 6.3 and ECP-5.6.

Specific interface points are as follows:

CONTROL ROOM HVAC SYSTEM SAMPLE SELECTION BOUNDARIES

Interfacing System	Interfacing Point
ac/dc Power System	All portions of Class IE electric system serving the CR HVAC are included in the Standby Electric Power (SEP) System review (see Section 3.1.4 for SEP sample selection boundaries).
Plant HVAC	Portion of the Control Room Area Ventilation System (CRAVS) (FSAR Figures 9.4-1 and 9.4-2) up to and including: Valves ØMO 6545A, ØMO 6545B, ØMO 6543A, ØMO 6543B, ØXV 6554, ØXV 6557, ØMO 6549, ØMO 6547A, ØMO 6547B
Equip. & Piping Supports	Includes all supports incorporated in the seismic qualification of the Control Room portion of the CRAVS as defined above.
ESFAS	Includes Control Room Isolation System (CRIS) subsystem, FSAR Figure 7.3-5.
Accident Monitoring Inst.	Portions essential for isolation of Control Room and operation of CRAVS, e.g. - intake duct radioactivity - charcoal filter temperature - hazardous gas concentration See FSAR Tables 7.5-1 and 7.5-3.
Plant I&C	Portions essential for isolation of Control Room and CRAVS operation.
Control Room Structure	Portions required for pressure boundary including penetrations and doors.

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3.1.7 PLAN FOR ADDITIONAL SAMPLING AND VERIFICATION

Additional sampling or verification within the scope of the IDV or outside the scope into other systems will be conducted if discrepancies are found. The level of additional sampling or verification will be based upon the nature of the discrepancy. In all cases when discrepancies are found, an introspective evaluation will follow to identify the extent and root cause. The root cause may either be random or systematic (generic). The additional review will attempt to verify whether the discrepancy is restricted to the specific system, component, or structure under review; restricted to work by a specific design organization; or if the discrepancy cuts across many interfaces and applies to similarly designed systems, components, and structures. As a rule, mathematical errors will not precipitate additional sampling and verification unless these are found in significant numbers, leading to significant deficiencies or a compounding of errors. Judgement in making this assessment will be required on case-by-case basis.

As necessary, additional sampling or verification within the scope of the system sample selection boundaries identified in sections 3.1.3, 3.1.4 and 3.1.5 of this Plan will be undertaken by TERA and approved internally. All such actions will be documented in the Monthly Status Report. Additional sampling outside this scope is considered a substantive issue and will be discussed between TERA, CPC and NRC prior to initiation.

3.1.8 MIDLAND PROJECT ENGINEERING PROGRAM VERIFICATION

3.1.8.1 Background

The IDCV Program methodology assumes that items subject to verification within the scope of the program are complete or substantially complete, placing emphasis on an evaluation of the quality of end products. A portion of the Midland design-related activities are ongoing or are in revision as part of the normal design/construction reconciliation process (i.e., field change requests and design review). With the exception of the field change/design review activities, these design-related activities generally fall into a category of efforts associated with licensing/confirmatory evaluations of the compliance of the design with design criteria and commitments and not the primary design completion cycle. Examples include ongoing fire hazards analysis and equipment qualification. These topical areas as well as others are within the IDV scope and therefore require independent verification. The ongoing field change/design review activities have a lesser impact on the IDV execution because most field changes do not fundamentally impact the design. TERA has determined that the IDV objectives can best be met by supplementing the existing end product reviews with a review of engineering programs and action plans for the implementation of selected ongoing design-related activities. A summary of the approach was provided in a letter from TERA to CPC and NRC dated February 10, 1984. Details were discussed at a public meeting held on March 13, 1984. The NRC issued a letter on June 6, 1984, concurring with the approach. The following section outlines this element of the IDV reviews. 4

3.1.8.2 Scope and Implementation

IDV topical reviews can be divided into two major subcomponents: those areas where sufficient end products exist to permit application of the IDV methodology

documented in Section 3.1 of this Plan and those areas where design-related work is ongoing and end products are in intermediate stages of completion. Project Instruction, PI-3201-004, Midland Project Engineering Program Verification, documents the procedure for implementing the IDV review of typical areas affected by ongoing design-related activities.

In summary, the vertical slice approach to design verification by reviewing end products is maintained for the majority of the samples where sufficient end products exist. For design areas affected by ongoing design-related work, the review will use available end products (or intermediate products) combined with a limited review of the engineering programs, action plans and implementing processes by which the design effort will be completed. This will be accomplished by confirming the status of all design areas and dividing them into those which are substantially complete and those which are subject to the modified program. For each incomplete design area the revised program will require identification of the processes to be used to complete the design area. The processes thus identified will then be appropriately grouped and reviewed using available end or intermediate products as a means of verification of implementation. It is estimated that approximately 10 to 20 percent of the IDV sample will be verified in this manner and that 80 to 90 percent of the sample will be verified with emphasis on quality of the end product. 4

3.2 INDEPENDENT CONSTRUCTION VERIFICATION METHODOLOGY

The Independent Construction Verification (ICV) Program will consist of a review and evaluation of the quality of construction of selected components and

and associated activities (e.g. system layup associated with Construction Completion Program) observed to provide additional verification that components have been properly stored and maintained during the construction process.

3.2.1.3 Review of Construction/Installation Documentation

A major factor in the evaluation of the quality of construction is the review of those items constructed or installed on site. The review of documentation associated with the construction/installation process will be conducted to verify that the applicable requirements have been met (e.g. conformance to construction specifications will be verified). Included in this review will be verification of the utilization of proper documents in the process such as design output requirements, construction specifications, erection specifications, installation requirements, construction procedures and other specified construction codes and standards, as applicable. Design changes, field modifications, and other input related to final as-built drawings will be reviewed. Included will be the review of documentation associated with such items as concrete materials, concrete, the welding process, bolting activities, NDE, etc. Inspection requirements, including personnel qualification and training, reports, and associated documentation will also be included in the review. Where possible, selected on-going construction/installation activities will be observed to provide additional information for the evaluation of this process. An ongoing activity which exercises significant influence upon the conduct of this review is the Quality Verification Program (QVP). The QVP is that activity undertaken by CPC to verify the quality of safety-related components and commodities which have been installed and inspected and considered complete as of December 2, 1982. The products of the QVP will be

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quality documentation packages for this portion of the Midland project installation. The construction/installation documentation review will sample packages assembled by the QVP as part of the end product ICV confirmation.

A supplemental ICV review will be conducted of the QVP documentation process to aid the end product quality documentation verification by ensuring that QVP outputs are complete, valid and retained in a secure and consistent manner effectively integrated with the Midland project Construction Completion Program (CCP) activities. The QVP attributes to be reviewed range in scope from evaluating the information sources used to generate and assemble the quality verification documentation packages to observing the manner with which these quality verification packages are utilized in demonstrating the quality of previously installed and inspected items. The combination of reviewing the QVP documentation process and evaluating specific end products of this process is intended to enhance extrapolation of the ICV conclusions. 4

3.2.1.4 Review of Selected Verification Activities

Verification activities conducted subsequent to the construction/installation/inspection activity will be reviewed and evaluated. Included will be over-inspection activities associated with cable separation verification, bolt hardness testing verification, the pipe support reinspection program, the Construction

performance of NDE and material testing on selected material, components, and structures of the AFW system. The program will be conducted as an integral part of the ICV and will include over-inspection and testing of selected shop-fabricated/vendor-supplied components in addition to the over-inspection and testing of on-site welding, weld repair, NDE and other site-material related testing and inspection programs. Results of the testing performed as part of the NDE/Materials Testing Program will be documented, reviewed, and compared against vendor supplied and site-generated material testing and NDE test data and against applicable codes and standards.

The direction and degree of testing performed as a part of the NDE/Materials Testing Program will be initiated and influenced by the results of the construction/installation documentation review as described in sections 3.2.3.1 through 3.2.3.5. The results of the documentation review will be integrated with the consideration of a statistical sampling approach and sound engineering judgment to arrive at the quantity and types of components and structures to be tested and the type of testing to be employed.

An intermediate output of the NDE/Materials Testing Program will be a listing defining the components/structures to be tested and the corresponding test to be performed. Rationale for component/structure selection will also be provided to enable reviewers to easily discern the derivation of the sample and the sample size. The NDE/Materials Testing Program will be documented in a Project Instruction to be issued prior to intiation of the program.

Law Engineering Testing Company (LAW) has been selected by TERA to assist in the execution of the NDE/Materials Testing Program. This selection is based

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upon LAW's technical capabilities and independence from Midland project activities. The NRC issued a letter dated March 7, 1984, accepting TERA's selection of LAW. 4

6.0 QUALITY ASSURANCE

6.1 APPLICABLE REQUIREMENTS

The Midland IDCV shall be performed in accordance with applicable quality assurance requirements of the NRC's regulation 10 CFR 50, Appendix B. Furthermore, the IDCV will comply with:

- NRC Regulatory Guide 1.28 (6/7/72) including Sections 1, 2, 3, 5, 7, 17, and 18 of ANSI N45.2-1971
- NRC Regulatory Guide 1.64 (Revision 1, 2/75) including Sections 1, 2, and 6 of ANSI N45.2.11-1974

These requirements are implemented by the TERA Corporate Quality Assurance Plan (QAP), Revision 3 (January 1, 1980) and the Midland IDCV Project Quality Assurance Plan (PQAP), Revision 5 (June 15, 1984). 4

6.2 VERIFICATION OF COMPUTER CODES

All computer codes utilized by IDCV analysts shall be verified as follows:

- Program Verification - The quality of the code should be determined from a comparison of the code generated solutions with known solutions of selected problems.
- Facility Verification - Given that the generic quality of the code has been determined, the capability to reproduce known results utilizing hardware and software available to TERA must be determined.