PROGRAM FOR COMPLETION OF THE ENGINEERING ASSURANCE IN-DEPTH TECHNICAL AUDITS BEAVER VALLEY 2 PROJECT

DUQUESNE LIGHT
COMPANY

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OVERVIEW

This plan describes a two phase program for completion of the Engineering Assurance In-depth Technical Audits. The Program provides for performance of four in-depth technical audits of the Beaver Valley 2 Project engineering and design activities. Three audits have been completed to date. Completion of the audit activities involves the performance of the fourth audit (Phase I) and the evaluation and assessment of the results of the four audits in order to form a conclusion as to the adequacy of the design process as implemented for Beaver Valley 2 (Phase II).

A detailed plan for completion of both phases of the program is described below. The completion schedule provides for initiating phase II for the three technical audits that have been completed such that the preliminary results of the evaluation may be used to adjust or expand the scope of the fourth technical audit as necessary.

PHASE I - AUDIT PLAN FOR PERFORMANCE OF THE FOURTH IN-DEPTH TECHNICAL AUDIT OF BEAVER VALLEY 2

PURPOSE

The purpose of the audit is to assess the adequacy of the design process by evaluating the design of the Safety Injection System (SIS) and the adjoining portion of the Recirculation Spray System (RSS) and associated interfaces. Adequacy of design changes generated by the Site Engineering Group (SEG) and other specific activities will also be evaluated.

OVERALL SCOPE AND APPROACH

The SIS will form the basis of the audit. The design will be reviewed to determine if the following attributes are met:

- The design is consistent with and supports the FSAR commitments; including system function, compliance to documents committed to in the FSAR and compliance with correct design practices.
- The design is in compliance with NSSS requirements and criteria.
- Technically adequate calculations are available to support the design.
- Diagrams, specifications, and drawings are technically complete and consistent with each other.
- Inter- and intra- discipline interfaces are adequate.

The adequacy of design changes generated by the SEG will also be evaluated. Emphasis will be placed on changes that relate to the SIS. However, changes to other systems will be evaluated as necessary to obtain a reasonable sample size.

In order to evaluate certain activities, it is anticipated that review of material other than that related to the SIS will be necessary. These activities include:

- o Structural Load Tracking
- o As-Built/Stress Reconciliation
- o Cable Tray and Conduit Supports
- o Electrical Separation

The audit team will perform site walkdowns for the purpose of facilitating and expediting the system review and for the detailed review of specific programs.

SCOPE AND APPROACH BY DISCIPLINE

Controls:

The basic scope of the review of the SIS will encompass four major areas.

- o System design including instrument and control redundancy, and licensing document compliance.
- o Environmental qualification adequacy.
- o Field review of as-built design and configuration relative to licensing requirements.
- o Compatibility with NSSS interface requirements.

Automatic control logic, operator controls and hardware will be evaluated for the ability of the system to meet the commitments of the FSAR. The review will encompass local mounted sensors and controlling devices, panel mounted instruments and control and auxiliary devices such as relays.

Logic diagrams, loop diagrams, instrument schematics, elementary diagrams and specifications will be reviewed for compliance with licensing requirements as detailed in the FSAR and other applicable criteria, and for consistency with interfacing documents such as flow diagrams and wiring diagrams.

Equipment for review will be selected from key equipment lists. Selections will be based on environment, input from other disciplines and generic functionality. Equipment located in harsh environment will be reviewed for proper qualification to the postulated conditions. Equipment characteristics will be verified for consistency with supporting calculations and the adequacy of the calculations evaluated.

Field and panel mounted equipment will be evaluated for capability of controlling and monitoring the process function. Safety related instrumentation will be checked for compatibility of set points with the anticipated process operating conditions. Electrical control and instrument power input will be compared to the electrical voltage profiles to assure operability under adverse voltage conditions.

Availability and independence of power available to redundant subsystems, including proper separation, will be checked from initiating device to source of power.

Safety related equipment will be reviewed for appropriate environmental and seismic qualification.

Grounding of enclosures, shields and signal wires will be examined for compliance with applicable standards, vendor requirements, and project procedures. Separation, isolation and routing of low level signal and control wires for control and instrumentation cabinets and panels will be reviewed during the audit and evaluated during the field walkdown (such as, adequate separation of wire bundles inside control boards and minimum clearance between modules).

A sample of E&DCRs and N&Ds will be reviewed to evaluate the technical adequacy of the problem solutions and dispositions, respectively.

A site walkdown will be performed to evaluate various attributes, examples of which, are identified in Attachment 4.

Electrical:

The basic scope in reviewing the electrical design aspects of the SIS involve three areas: (1) system equipment that are electrically driven, (2) power sources supplying electrical power to that equipment, and (3) cable and raceway systems carrying the electrical power from the power sources to the electrically driven system equipment.

Equipment for review will be selected from each of these three areas. The selection of specific items of electrically driven system equipment will be predetermined from the tabulation of key equipment. Electric power source equipment supplying power to these electrically driven systems equipment will be selected. In addition, the safety-related electrical distribution system and equipment supporting these power sources up through and including the safety-related medium voltage switchgear will be reviewed to verify electrical power distribution system adequacy and independence. The selection of cables and raceways will be those carrying the electrical power from the electrical power sources to the selected electrically driven system equipment. The following equipment types will be included: Switchgears, Load Centers, MCCs, AC Panels, Motor Operated Valves, Solenoid Operated Valves, and Pump Motors.

The objective will be to determine if the design documents that apply to selected equipment meet the design basis, are technically adequate and are consistent with associated documents.

In each of these three areas, design documents will be compared against FSAR design basis requirements and commitments. These design documents include design criteria, diagrams, drawings, specifications, calculations and design change documents (E&DCRs and N&Ds). Drawings and diagrams will be reviewed considering design criteria such as electrical independence, cables/raceways, grounding and environmental conditions. The electrical power distribution system documents will be reviewed for consistency with the main one line diagrams. Overall design configuration, equipment, and impact on or from nearby equipment will be considered. Specifications will be reviewed for adequate electrical and environmental condition requirements. Calculations supporting the system equipment and the adequacy of the electrical distribution system's capability of providing the required quality of power will be reviewed for adequacy and consistency with the design. These calculations will include equipment sizing, voltage profile, short circuit capacity and cables. Vendor drawings will be reviewed for consistency with specifications, drawings and diagrams.

For equipment qualification, it will be determined if the Class 1E equipment meet specification requirements (including environmental and seismic), are traceable to its qualification documentation and are installed in a manner consistent with the engineering and equipment qualification documentation. The equipment sampled will generally be the same as that used in the above review except that equipment sampled will include types of equipment not specifically covered in prior technical audits and may include equipment that has been turned over to DLC.

For separation, the class 1E equipment including cables and raceways will be reviewed for conformance to the separation criteria of RG 1.75, as committed in the FSAR.

Electrical interfaces for the SWEC and NSSS systems will be reviewed with Control Systems, Power, Engineering Mechanics, and Structural team members for compatibility and consistency of engineering and design requirements where applicable.

Vendor documents will be reviewed for consistency with the associated specifications and design drawings.

Recent change documents (E&DCRs and N&Ds) will be selected and reviewed for adequacy. These change documents will be selected mainly from those associated with the SIS.

A site walkdown will be performed to evaluate certain attributes such as compliance with the requirements of:

- Electrical and physical separation.
- Equipment qualification requirements including equipment location, position, proximity to non-safety related equipment and pipes carrying high energy fluids, mounting methods and the consistency of the installed equipment with specifications.

Engineering Mechanics:

The Engineering Mechanics (EMD) portion of the audit will consist of a review of specific activities such as pipe stress analysis and pipe support design. Interface activities between EMD and other disciplines as well as outside organizations will also be reviewed.

The approach to be used for the EMD portion of the audit will be consistent with the overall project audit in that the following attributes will be examined:

a. That consistency exists between the FSAR commitments and the design.

b. That the calculations supporting the design are adequate.

c. That the design meets the NSSS requirements and criteria.

d. That consistency exists between the drawings, diagrams and specifications and that the documents are current and complete.

In addition, interface activities between EMD and other disciplines will be reviewed.

1. The FSAR will be examined for pertinent EMD commitments relative to technical procedures and analytical methods. Licensing inquiries and responses will be included.

2. The Design Criteria will be reviewed for compliance with the FSAR commitment list. In addition, applicable USNRC Standard Review Plans, Regulatory Guides, NUREG's, I.E. Bulletins, EMD Technical Procedures and approved Deviation Requests, and ASME Code Sections will be reviewed to ensure compliance.

3. Inter-division pipe stress analysis interface information pertinent to the SIS will be reviewed to ensure that the incoming source data is complete and reasonable. Typical documents to be reviewed are:

   As-built piping drawings, structural drawings, machine location plans, piping and pipe support specifications, vendor drawings, E&DCRs, N&Ds, power input control lists, line designation tables, flow diagrams, seismic and hydrodynamic ARS, dynamic building movements and geotechnical ground movements.

4. Selected pipe stress analyses applicable to the SIS will be reviewed with particular attention shown to the following attributes:

   a. Reconciliation of the analytical model to the "as-built" configuration.

   b. Compliance with the PSAS Design Criteria, NSSS specification, vendor requirements, etc.

   c. The mathematical procedures and methods used are correct and applicable.

d. The mathematical modeling techniques are correct.

e. Clarity and completeness of the calculations.

f. Justification of assumptions and/or special methods used in the calculation.

g. Summaries and conclusions that are reasonable, complete and consistent with the calculation objectives and design requirements.

5. Transmittals of pipe stress results will be reviewed to verify that they are complete and current. Written acceptance for those components that may exceed allowable limits, such as nozzle loads or valve accelerations, and components such as pipe supports and penetrations, will be reviewed to ensure that the approval circuits are properly fulfilled and that the approval are included or referenced in the respective calculations.

6. A sample of SIS pipe supports will be selected for review. The selection will consist of various types of restraint designs so that a broad spectrum of pipe supports may be evaluated. Typical designs will include, if possible, anchors (6-way), dynamic snubbers, frame type rigid restraints, struts, and spring hangers. Supports selected shall include integral welded attachments to the run pipe, base plates with concrete anchor bolts, attachments to embedded plates and attachments to structural steel members. The pipe supports will be reviewed with emphasis on the following:

a. That the pipe support design meets the stress analysis functional intent.

b. That the pipe support is in compliance with the pipe support design specification.

c. That the mathematical procedures and methods are correct and applicable.

d. That justification of assumptions and/or special methods used in the calculation are clearly stated and applicable.

e. That the calculation is clear and complete.

f. That the construction drawings show all pertinent details of the design calculations (proper members and orientation, weld types and sizes, etc.) and construction and inspection requirements are complete.

7. Transmittals of pipe support results will be reviewed to verify that they are complete and in proper users format. The loads at the structural/concrete interface locations and the weld technique sheets specified on the construction drawings are particularly subject to this requirement.

8. Safety Injection System components subject to dynamic qualification for seismic events will be reviewed by comparing the predicted accelerations with the qualification documentation. The designs shall be reviewed to ensure that the qualification requirements are not violated.

9. Mechanical components associated with the SIS system shall be reviewed for technical adequacy. Attention shall be focused on the following attributes:

   a. That the analysis is reconciled to the "as-built" configuration.

   b. That the mathematical procedures and methods are correct and applicable.

   c. That the computer modeling techniques are correct and sufficiently detailed to produce accurate results.

   d. That the justification of assumptions and/or special methods used in the calculation are clearly stated and are acceptable.

   e. That the calculation is clear and complete.

   f. That the construction drawings show all pertinent design details in the calculation. (Proper members and orientation, weld details and sizes, and construction and inspection requirements).

10. Transmittals of mechanical analysis results going to other disciplines, divisions and vendors, including the NSSS will be reviewed for adequacy. Typical of the documents to be reviewed are the transmittal of structural interface loads and vendor correspondence.

11. Hazard Analysis Program implementation reviews will be performed in conjunction with other audit disciplines for the following activities:

   - Internally Generated Missile

   - Seismically Induced Safety/Non-Safety Interactions

   - Safe-Shutdown Analysis

12. A site walkdown will be performed to evaluate certain attributes such as pipe support spacing function and orientation.

Power:

Systems Engineering:

The scope of this technical audit will involve a design review of structures, systems, and components that are required to satisfy the safety and operational functions of the SIS, including the portion of the Recirculation Spray System (RSS) which functions during the recirculation mode of the high head safety injection. This audit will be primarily based on review of design documents, discussions with project personnel in the power discipline, and discussions with other team members. Design changes will also be evaluated.

The overall design review approach will involve multiple phases. Each phase will utilize a separate Review Plan outlining the detailed approach for that phase. The first phase will be to review those sections of the Final Safety Analysis Report (FSAR) and Licensing Commitment List which provide the design and regulatory commitments for the SIS. This portion of the review will also provide a basis for familiarization with the systems safety and operational functional requirements. The second phase will be to review the Westinghouse Nuclear Steam Supply System (NSSS) design documents to ensure that interfaces have been considered and are consistent with the FSAR commitments. The third phase will be to review the SWEC flow diagrams to ensure: the NSSS design basis criteria interfaces are properly incorporated; the flow diagrams support the FSAR commitments; and the flow diagrams incorporate and are consistent with the SWEC power division technical procedures and standards. The fourth phase will be to review the Power discipline calculations to determine if the system design bases are supported by the calculations or other suitable documentation. The fifth phase will be to provide a review and comparison of selected design, purchase, installation, and equipment specifications to ensure proper interpretation and consistent use of specified system and component design conditions. The sixth phase will be to review piping arrangement and machine location drawings for suitability of design to consider maintainability, operability, inspectability, and personnel safety. The seventh phase will be to review vendor documents for consistency with the associated specification design conditions. The eighth phase will be to review system interfaces with the Controls, Engineering Mechanics, Structural, and Electrical team members for compatibility of design requirements. Recent E&DCRs and N&Ds will be selected and evaluated for adequacy. E&DCRs and N&Ds will be mainly selected from those that affect the SIS.

A site walkdown will be performed to facilitate evaluation of certain attributes such as system interaction, implementation of piping and component layout, to verify adequacy of separation where applicable.

Structural:

The scope of the Structural portion of the audit will include the technical evaluation of structures that interface with the SIS and shall consist of the evaluation of various support systems and their effect on building structural design. This review is to evaluate the technical adequacy of engineering and design documents including design changes such as E&DCRs and N&Ds for the degree of compliance with governing documents such as design criteria, FSAR, applicable codes, and other licensing commitments.

The categories or general attributes listed under Overall Scope and Approach will be used as the basis for the structural review. Prior to initiating an examination of the designs, a review of design basis documents used by the civil/structural groups will be carried out. The FSAR, Structural Design Criteria and selected key specifications and procedures will be reviewed for:

- o Consistency between the FSAR and key design basis documents.
- o Consistency between design basis documents.
- o Familiarizing the reviewer with project commitments and requirements (both Regulatory and Project Unique) to facilitate the overall evaluation.

Upon completion of the basic review of the design basis documents, a comprehensive design evaluation of the structures or structural elements including materials and installation will be initiated. It is anticipated that the review will consist but not be restricted to the following items. The sampling of these items will be based on different types of documents and degree of importance for supporting the SIS system.

1. Determine consistency between the FSAR and design documents such as design criteria, procedures and drawings.
2. Evaluation of calculations for the structural analysis and design of structural elements within the buildings including items, such as, equipment supports, anchor bolts and base plates.
3. Structural interface and compliance with NSSS requirements and criteria for equipment such as pumps.
4. Consistency and adequacy checks between specifications associated drawings and other design documents.
5. Implementation of structural load tracking and confirmation for structural members.
6. Analysis and design of raceway supports.
7. The seismic analysis of a structure will be reviewed to verify that the stiffness properties of the seismic model reflects the geometry, material and configuration of the supporting structural elements. The model mass properties will be reviewed to verify that the building geometry, self weight and equipment loads have been adequately considered.

8. Technical adequacy of design changes (E&DCRs and NSDs).

A site walkdown will be performed to evaluate certain attributes such as compliance with raceways support spacing requirements and adequacy of seismic shakespace between buildings.

AUDIT TEAM

The team will function under the direction of SWEC Engineering Assurance Division (EA) Boston. The team will be composed of Duquesne Light Company and SWEC personnel. The SWEC team members will be off-project experienced technical personnel.

PREPARATION

General:

- Review applicable FSAR sections, Westinghouse (NSSS) documents, and related project procedures and technical criteria to become familiar with system function, design basis requirements, and project specific considerations. Identify and assemble key documents necessary for the audit (e.g., Flow Diagrams, Design Criteria).

- Determine status of design documents (Example: Determine what pipe stress analysis problems have been stress reconciled).

- Discuss and establish means to evaluate interface between disciplines.

- Refine scope and approach to indicate specific interfacing systems, structures and components to be evaluated.

- Refine scope to account for preliminary results of the evaluation of the first three technical audits.

- Modify task sheets (see below) as necessary to address general preparation requirements, refined scope, and any additional requests by team members.

- Develop a set of marked-up documents (drawings, diagrams), a listing of key components and equipment, and any other requested material in order to provide appropriate information among team members. (Specific material required will be identified on task assignment sheets. Task sheets will be attachments to Review Plans. The audit team leader will coordinate with the audit team in establishing needs).

- Using the "base" Review Plans provided by Engineering Assurance as guidance, each team member is to develop Review Plans specific to the discipline and areas to be audited. The Review Plans are to reflect the scope of the audit and the means for evaluating discipline interface and identify the detailed attributes that are to be pursued during the audit. "Base" Review Plans to be provided by Engineering Assurance are as follows:

Special Technical 1900-2	Master List of References
Special Technical 1901-2	Consistency Between Design and FSAR
Special Technical 1902-2	Compliance with NSSS Criteria
Special Technical 1903-2	Calculations

Special Technical 1904-2	Drawings
Special Technical 1905-2	Diagrams
Special Technical 1906-2	Specifications
Special Technical 1907-3	Equipment Qualification
Special Technical 1908-2	Vendor Documents
Special Technical 1909-2	Discipline/Group Interface
Special Technical 1910-2	E&DCRs
Special Technical 1911-2	N&Ds

SPECIFIC:

Specific tasks are identified on the discipline task sheets, Attachment 6 to this audit plan. The start and completion times of these tasks are keyed to the audit summary network, Attachment 6.

PERFORMANCE

The team members must annotate the review plans to specifically and completely identify the documents reviewed (including issue and revision identification) and to document, in detail, the results of the review for each attribute. Any support documentation and auditor notes must be included as an attachment to the Review Plan.

During the performance of the audit, the Audit Team is to inform the Project of potential concerns or requests to provide needed information using an "ACTION ITEM" form. The Project engineering staff will be expected to promptly respond to each Action Item providing the information requested or a response to the potential concern. A status log is to be maintained to track and account for all Action Items. (See Attachment 2 for guidance in generating Action Items).

Attempts will be made to "bound" all valid concerns/deficiencies during the audit by the use of Action Items. In order to be bounded, the full extent of the concerns or deficiencies must be determined, corrective action taken and prevent e action, where appropriate, implemented. The team member must concur that the extent has been determined and verify that appropriate corrective action has been taken and preventive action implemented.

To facilitate the review of the system and evaluate activities, a site walkdown will be included. (See Attachment 4 for site walkdown description)

Periodic status meetings are to be held by the Team Leader and the SWEC Project Engineer. The purpose of these meetings is to discuss the progress of the audit and the status of any open Action Items.

REPORTING

At the conclusion of the audit, and prior to issuance of the report, a meeting will be held by the Team Leader with the SWEC Project Engineer and appropriate SWEC and Duquesne Light Company management personnel to discuss the results of the audit.

The audit report will generally follow the outline below:

1. INTRODUCTION

2. PURPOSE

3. SCOPE

4. SUMMARY OF RESULTS AND OVERALL CONCLUSIONS

5. AUDIT OBSERVATIONS

6. SUMMARY BY DISCIPLINE

6.1 Control Systems
6.2 Electrical
6.3 Engineering Mechanics
6.4 Power
6.5 Structural
6.6 Equipment Qualification

Each team member is specifically responsible for preparing any needed Audit Observations and preparing the summary section for the discipline audited (Sections 6.1 thru 6.6). See Attachment 3 for guidance in generating Audit Observations.

The report will be reviewed by the Audit Team Leader and approved by the Chief Engineer, Engineering Assurance Division.

PHASE II - PLAN FOR THE EVALUATION OF IN-DEPTH TECHNICAL AUDIT RESULTS FOR BEAVER VALLEY 2 PROJECT

PURPOSE

The purpose of this plan is to describe the method to be used to evaluate the combined results of the Beaver Valley 2 In-depth Technical Audits in order to form a conclusion as to the adequacy of the design process as implemented on Beaver Valley 2.

BACKGROUND

In order to put in perspective the evaluation plan for analyzing the Engineering Assurance Technical Audit results on the Beaver Valley 2 Project, it is important to review some background information on how each Engineering Assurance Technical Audit is pursued and culminated.

The purpose of the in-depth technical audit is to evaluate the technical adequacy of engineering and design documents and to evaluate their degree of compliance with the FSAR, applicable codes, standards, and other licensing commitments.

Findings from the individual technical audits are evaluated for the determination of root cause, extent of conditions and corrective and preventive actions as part of the audit follow-up. SWEC Engineering Assurance verifies that these actions are appropriate and have been completed during the individual audit follow-up.

EVALUATION PLAN

The findings from each of the technical audits will be summarized and grouped to determine the overall significance and impact, when viewed as a composite, that these findings have on the adequacy and implementation of the design process.

The findings will first be categorized by type. These categories will be selected as representing specific activities or functions of the design process and will provide a framework for judging the adequacy of the design process and its implementation. Listed below are examples of finding types which will form the basis for the categorization. These finding types were established based on the results of SWEC in-depth technical audits and NRC IDI Inspections.

1. Design Process Implementation Deficiencies
2. Design Process or Method Inadequate
3. Inadequate Interface Control
4. SAR Related Deficiencies
5. Design Corrective/Preventive Action Inadequate
6. Design Change Deficiencies
7. Document Control Deficiencies
8. Personnel Qualification/Training Deficiencies

9. Test Requirement or Implementation Deficiencies

10. Records Retention Deficiencies

11. Construction/Site QC Deficiency

12. Vendor or Site Contractor Deficiency

13. NSSS Deficiency

To facilitate the evaluation, the data base for these findings will also include, as applicable, the following:

- Responsible Discipline
- Document Type
- Cause
- Extent of Conditions
- Corrective Actions
- Preventive Actions

After the findings have been categorized and grouped by discipline they will be reviewed and screened to determine if any findings can be eliminated from further considerations because they are minor, editorial, or administrative in nature and that they do not provide evidence of inadequacies in the design process or represent generic implementation concerns and therefore do not warrant additional analysis. The rationale for eliminating findings from further consideration will be documented.

The remaining findings will be reviewed to evaluate the adequacy and implementation of the overall design process. Particular emphasis will be placed on the adequacy of the design to permit safe operation and shutdown of the facility.

This review will be accomplished by evaluating the findings within finding types (activity or function of the design process) and by evaluating the similarity of findings and the extent of corrective or preventive action as the means of determining either that further action (e.g., audit, design review, etc.) is necessary or that sufficient basis exists for establishing confidence in the adequacy of the design process and its implementation.

A summary report will be issued, which will present the conclusion reached during the analysis of the combined audit results. The report will address whether sufficient evidence exists from the technical audits to give additional confidence that the Beaver Valley 2 facility as designed is in compliance with the FSAR commitments and NRC requirements and regulations. This report will also present recommendations for areas that require additional actions to confirm the adequacy of the design, if the results so dictate.

The evaluation will be performed and a draft report prepared by SWEC, Engineering Assurance Division. Duquesne Light Company will review and approve the evaluation report and submit the final report to the NRC.

SCHEDULE OF PHASE I AND PHASE II ACTIVITIES

Attachment 7 is the schedule for both the upcoming Engineering Assurance Technical Audit and the Evaluation of Technical Audit Results.

ATTACHMENT 1
AUDIT TEAM

DISCIPLINE	NAME AND ORGANIZATION	LOCATION	TITLE
EMD			
Pipe Stress	GArena (SWEC)	245/9	Mechanical Engineer
Pipe Supports	RWSexton (SWEC)	245/9	Senior Mechanical Engineer
Mechanical	RATerry (SWEC)	245/9	Senior Mechanical Engineer
Electrical	APStakutis (SWEC)	245/4	Consulting Engineer
	JGKraemer (DLC)	Pitts.	Engineer
Power	RMSimonetti (SWEC)	245/9	Senior Power Engineer
	REFortier (SWEC) *	245/9	Supervisor, Systems Engineering
Control Systems	JJWusteney (SWEC)	245/6	Control Engineer
	NSKerman (DLC)	Pitts.	Senior Engineer
Structural	BEEbbeson	CHOC	Senior Structural Engineer
Environmental Qualification	HRedgate (SWEC)	245/4	Consultant
Engineering Assurance	EEKnapek (DLC)	BV2 Site	Senior Quality Assurance Specialist
Audit Coordinator	GRHeine (SWEC)	245/2	Senior Controls Engineer
Audit Team Leader	RWTwigg (SWEC)	245/2	Lead Engineer

* Part Time

ATTACHMENT 2
GENERATION OF ACTION ITEMS

An Action Item can be generated to identify deficiencies or to request information. It is difficult to define precise criteria to apply in determining if an Action Item should be generated. Three considerations are: significance of individual discrepancies, number of discrepancies, and the urgency of needed information by the evaluation team member.

An Action item is to be written when one or more of the following needs exist:

1. Need to identify a technical concern.

2. Need to identify a potential technical concern and there is no information readily available to substantiate or alleviate the concern.

3. Need to identify a significant program aspect or practice that is, or appears to be, incorrect or inadequate.

4. When it is deemed necessary for the project to investigate to determine cause and extent of discrepancies.

5. When it is deemed appropriate to evaluate the Project's proposed actions to correct discrepancies and prevent recurrence.

It is generally not necessary to generate an Action Item if a minor discrepancy is observed and the discrepancy appears to be isolated or random. Several minor discrepancies, however, would generate an Action Item.

NOTES

1. Review Plans must indicate all discrepancies observed regardless of significance or number and even if an Action Item was not generated. The Audit Team Leader will make the final decision for when an Action Item is written. His decision will be based on the above written guidance, as well as, objectivity and fairness to the issue in question at that time.

2. Generation of, and obtaining a response to, an Action Item does not necessarily negate the need for an Audit Observation.

ATTACHMENT 3
AN APPROACH TO DRAFTING AN AUDIT OBSERVATION

INTRODUCTION

The main purpose of the audit program is to resolve "systematic" or "generic" problems (i.e., obtain adequate preventive action). This requires audit reports, audit observations, etc. to be written in a manner such that overall assessments are presented; problems and their root causes can be addressed by appropriate management.

In order to maintain credibility and impact, AOs must be valid and demonstrate good judgement. It is difficult to define precise criteria to apply in determining if an AO is necessary or warranted. However, two main considerations are significance of individual deficiencies and number of deficiencies.

General Examples:

1. If a minor deficiency is observed in a document and was not observed in other documents of that type - An AO is probably not warranted. (Deficiency could be corrected during audit or marked for future correction at next revision).

2. If a large number of minor deficiencies are observed in several documents - an AO is probably warranted.

3. A single deficiency of relative significance if observed in only one document may warrant an AO, even if apparently isolated, in order to assure the deficiency is corrected. (Action to prevent recurrence may not be necessary, however, if deficiency is of isolated nature).

Specific Examples:

1. Logic Diagrams and Logic Descriptions are audited. They are found to be clear, complete, consistent with FSKs, ESKs, and technically adequate. Some of the Logic Descriptions contain a few minor "typos". Should on AO written? Probably not.

2. Several Power calculations are audited. Calculations are clear and complete, appropriate methods are used, are technically adequate. In one calculation, an input value was incorrect, apparently due to a transposition error. Results would not be affected. Another calculation was not marked with the QA Category (but was Independently reviewed). Should an AO be written? Probably not.

3. Structural Calculations are audited. Calculations are found to be adequate except that in one calculation an input value is incorrect. The results are not affected. The reasons for the incorrect value appears to result from failure of another discipline to provide revised information. Time did not permit further investigation. Should an AO be written? Probably.

NOTE: Review Plans must indicate all deficiencies observed regardless of significance or number. For any deficiency not included in an AO, it must be evident why an AO was not written (e.g., minor, isolated, or corrected during the audit).

If we decide that an AO is probably warranted, we now prepare it.

AUDIT OBSERVATION PREPARATION

An Audit Observation is usually presented in two basic parts: the "Description of Condition(s)" and the "Details". In nearly all cases, it is the "Description of Condition(s)" we want addressed by audited organizations in their response to the audit observation. Therefore, audit results must be evaluated, logically grouped, re-evaluated, and a conclusion or summary presented. The details or supporting evidence then follows.

Preparation of an audit observation is more of a thought process than a mechanical exercise. The following is an attempt to describe that process.

1. LIST ALL THE DEFICIENCIES

2. Determine if there is a commonality among some or all of the items listed. Can the items be logically grouped or categorized?

   Possible Groupings and Categories:

   - o By element (Procedures, control, review or approval, documentation, design consistency, technical adequacy).
   - o "Probable Cause". For example: Lack of thorough review, misunderstanding of requirements, etc.
   - o Consequence. For example: Various distribution problems could result in personnel working with out-of-date information.
   - o Other

3. Prepare a Rough Draft AO (handwritten) using the attached outline.

4. Read the draft as objectively as possible. Is it logical? Can an overall conclusion be reached? Should this conclusion be stated in the Description of Condition(s)? Is the english, spelling, etc., correct?

AUDIT OBSERVATION OUTLINE

I. Description of Condition(s) Categories need not necessarily be presented in order shown below. In fact, it would be unusual for an AO to contain all categories.

   A. Describe the basic failure of the system or activity if applicable or describe the overall conclusion (e.g., "the E&DCR system does not provide complete control of design changes").

B. Summarize the deficient elements (or sub-elements). Since most people won't be familiar with element definitions, include a brief definition or examples, e.g., "... calculations are incompletely documented (methods and sources of input not identified, ... etc.)".

C. When there is strong supporting evidence, state what the observed deficiencies indicate. That is, what is the "probable cause". Sometimes the cause is implied and need not be stated.

Example: "... the improper application of the analysis method indicates a lack of guidance to the preparer ...".

D. Indicate the consequences of the deficiencies. (As stated above, this may be implied or obvious and need not necessarily be stated. Improper application of method could, obviously, affect technical adequacy).

Example: "Failure to distribute results of revised calculations could lead to ...".

E. The auditor may (in some cases) provide guidance on the boundaries for determination of the extent of conditions.

F. If any audit findings are recurrences of earlier findings on the activity being audited, this fact should be emphasized in the AO.

II. Details (Supporting Evidence)

A. Details should be grouped and sequenced to be consistent with the Summary where practicable.

B. Some type of quantitative comparison should be provided where appropriate (e.g., fifteen of the twenty selected from the list were not included in ...").

C. Provide detail, explanation, background, etc. Don't force people to "read between the lines". Take care to provide information - not just more words.

Avoid Terms Such As:

- o in accordance with procedures ...
- o as required by ...
- o inadequate
- o generally
- o satisfactory

Avoid including nits.

Avoid long, complicated sentences.

ATTACHMENT 4
GUIDANCE FOR SITE WALKDOWNS

There are two basic site walkdowns involved in audits:

1. Detail walkdowns and investigations dealing with audits of programs such as environmental qualification and seismic qualification. Such walkdowns are performed to Review Plans that contain attributes that specifically require field checks of installed equipment and hardware. (Attributes such as determination of identification, location, and orientation of specific, pre-selected, items of equipment).

2. Walkdowns associated with vertical design reviews for the purpose of facilitating and expediting the review. The walkdown associated with a design review provides for:

   - Familiarity review of overall arrangement, location, and configuration of design.

   - Evaluating specific items that arose as a result of reviewing engineering documents.

   - Evaluating specific design attributes that are easier to evaluate by seeing the installed hardware or equipment than by document review only.

   - Evaluating the adequacy and clarity of engineering documents as evidenced by the implementation of the basic design criteria and technical requirements in the as-constructed condition.

   A general familiarity tour can be conducted early in the audit. However, a walkdown to evaluate specific items and attributes should be conducted only after design documents have been reviewed in sufficient detail to prepare for the walkdown.

   Prior to performing the walkdown, an outline will be developed. Each discipline is to provide input to the outline by preparing a scoping document (approximately 1 to 2 pages) to identify the key items and attributes from Review Plans that are to be evaluated. (The intent of the outline is to ensure team members are adequately prepared for the walkdown, but does not restrict the walkdown to only the areas identified on the outline. In addition to the walkdown, in-plant visits may be necessary to follow up on potential concerns or questions).

   The types of items or attributes that could be included in the outline are:

   - Electrical Separation

   - Separation of Redundant Equipment

   - Sloping of Lines

   - Pipe Support Spacing, function

- Pipe Restraint Locations

The results of the walkdown are to be documented in the Review Plans utilized for the design review.

The Audit Team Leader will coordinate walkdowns with the Project to establish dates and times and ensure appropriate personnel availability.

ATTACHMENT 5
TASK SHEETS

Engineering Assurance

Node Numbers *	Task
0-1	Working with Systems Engineering Group, select suitable system for audit.
0-1	Develop initial version of Audit Plan.
1-2	Issue notification schedule to project.
1-2	Request Project documents needed for preparation that are not available in EA.
1-2	Provide work area for preparation.
1-2	Finalize team member selection and obtain resumes.
1-2	Provide following in work area for preparation: - FSAR - Project Manual - Drawing Index - Diagram Index - Specification Index - E&DCR/N&D Change Record (sort by document) - Sample Report (copy each member) - Audit Plan (copy each member) - Action Item Form (copy each member) - Project Organization Chart (copy each member) - FSAR Change Request Log - Base Review Plans - Pipe Stress and Pipe Support Calculation Indexes for system to be Audited - Pipe Stress/Pipe Support Design Criteria/Specification and System Stress Data Packages - Project Manual Index
2-4	Provide input from prior technical audits.
3-4	Orientation of team members
5-6	Update Audit Plan to include: - Results of prior audits - Scope and approach by discipline - Revised task sheets - Other input

* See Attachment 6

TASK SHEET

Engineering Assurance

Node Numbers *	Task
6-7	Review and approve Review Plans
6-7	Make any needed travel arrangements
7-9	Advise client of items of turned-over requirements that should be made accessible for environmental qualification review.
7-9	Provide for work area on Project/Site.
7-9	Provide following in work area on Project/Site: - FSAR - Project Manual - Drawing Index - Diagram Index - Specification Index - Change Record (sort by document) - FSAR Change Request Log
7-9	Provide for documents requested by team members (to be available on day one).
7-9	Arrange for typing services.
7-9	Arrange for reproduction services.
9-10	Prepare for kick-off meeting.
10-11	Compile outline for site walkdown, schedule walkdown and arrange for appropriate personnel.
13-14	Prepare for Summary Meeting
15-16	Prepare for Post Audit

* See Attachment 6

TASK SHEET

Controls

Node Numbers *	Task
2-3	Obtain Logic Diagrams, Elementary Diagrams and Loop Diagrams applicable to system (copies for Controls, Power and Electrical).
3-4	Review key documents such as Audit Plan, SAR, applicable project procedures, for familiarization.
4-5	Based on review and other input, develop discipline specific scope and approach for inclusion in Audit Plan.
4-5	Revise Master Task Sheet, if necessary, for this audit.
4-5	Provide any comments on Audit Plan.
4-6	Using basic Reivew Plans provided by EA, prepare discipline specific Review Plans to suit audit scope and approach and submit to Team Leader.
4-7	Prepare a design document list that identifies those documents that will be needed in the work area during the audit. Specifically identify documents where possible (title, number, revision). Request documents such as: - Environmental Test Plans - Vendor Equipment Drawings - Vendor Equipment Manuals - Installation Drawings - Calculation (setpoints, orifice plate, etc.) Provide list to Team Leader
7-9	Start detail document review where practical.
10-11	Prepare site walkdown outline and provide to Audit Team Leader.

* See Attachment 6

TASK SHEET

Electrical

Node Numbers *	Task
2-3	Obtain one-line diagrams (SWGR, MCC, Power Distribution) and provide copy to Controls.
2-3	Obtain raceway support drawings, raceway support location drawings, design standards for cable tray and conduit supports and provide to Structural.
2-3	Obtain voltage profile calculations and provide copy to Controls and Power.
2-3	Identify environmental qualification packages needed and request packages from project.
3-4	Review Key Documents for concept including: o FSAR o Standard Review Plan o Project Manual, including organization chart for project personnel titles, assignments and responsibilities. o System Description o Marked up Flow Diagram o Equipment List (selected) o Machine Location Drawings o Main One Line Diagrams o Design Criteria o Regulatory Guides
4-5	Based on Review, and input from Team Leader, and other team members. o Develop/refine detail electrical scope and approach. Provide to Team Leader for incorporation into audit plan. o Refine task sheets. Provide to Team Leader for incorporation into audit plan
4-6	Using base Review Plans provided by EA, develop and provide to Team Leader: o Electrical Review Plans o Special review plans where base review plans are not available.
4-7	Using document indexes provided by EA, develop and provide to the Team Leader:

* See Attachment 6

TASK SHEET

Electrical

Node Numbers *	Task
	o List of electrical documents where a work copy is required at audit start, including: - Project Design Criteria - Diagrams (1-Lines, CBDs) - Specifications - Drawings (physical and wiring) - Vendors drawings - Calculations - Change Documents (E&DCRs, N&Ds) - Electrical Cable Schedule Information System Reports - Motor & Electrical Load List. - Environmental Qualification of Class 1E Equipment Packages. These packages should include: SCEW sheets, checklists, vendor documents - justifying qualification such as test reports, analysis, C of Cs, etc., communications with specification responsible engineer. o Identify specific items of equipment that will be reviewed for environmental qualification.
7-9	Start detail document review where practical.
10-11	Prepare outline for site walkdown and provide to Audit Team Leader.

* See Attachment 6

TASK SHEET

Engineering Mechanics

Node Numbers *	Task
2-3	Obtain latest seismic g-values for building and elevation and provide to Electrical, Controls, and Structural.
3-4	Review key documents (Audit Plan, SAR, design criteria, design specification, applicable project procedures, etc) for familiarization.
3-4	Determine status of analyses and select analyses for review.
4-5	Based on review of key documents and other input, develop/refine detail discipline scope and approach and provide to team leader for incorporation into audit plan.
4-5	Refine task sheets, if necessary, and provide to team leader for incorporation into audit plan.
4-6	Using base Review Plans provided by EA, develop discipline specific Review Plans and submit for team leader approval.
4-7	Complete list of documents required at audit start and provide to team leader. Request documents such as ...
7-9	Start detail document review where practical.
10-11	Prepare outline for site walkdown and provide to Audit Team Leader.

* See Attachment 6

TASK SHEET

Power (Systems Engineering)

Node Numbers *	Task
0-1	o In conjunction with the Audit Team Leader determine a suitable system for review.
1-2	o Once a system is chosen obtain (n + 2) copies of the system flow diagrams (P&ID's instead of flow diagrams if appropriate) piping drawings and machine location drawings which identifies where all of the equipment is located.
	NOTE: n - represents number of discipline groups involved in the technical evaluation.
1-2	o Each flow diagram and machine location drawing (if equipment is identified) will have all key equipment color coded with yellow.
1-2	o Prepare a tabulation that will list the key equipment types (e.g., pumps, vessels, heat exchangers, manual and automatic valves, instruments, etc.), title descriptions, mark numbers and specification numbers. Obtain (n + 2) copies of this tabulation.
1-2	o Provide overview of system to be evaluated.
3-4	o Review Project Manual specifically for piping system procedures and design criteria and obtain copies of appropriate pages.
4-5	o Based on review and other inputs, develop discipline specific scope and approach for inclusion in Audit Plan.
4-5	o Revise Master Task Sheet, if necessary, for this audit.
4-5	o Comment on initial version of Audit Plan.
4-6	o Revise Basic Review Plans to suit specific requirements of this technical evaluation.

* See Atachment 6

TASK SHEET

Power

Node Numbers *	Task
4-7	o Prepare a design document list which identifies those documents in which a copy will be required in the work area during the technical evaluation. The type of design document on this list should include as a minimum all applicable power discipline calculations, SWEC/NSSS procurement specifications that include the key equipment listed in Node 1-2 above, appropriate NSSS documents (System Design Specifications, P&ID's, Process Diagrams, etc.), SWEC piping design and erection specifications, and any other documents needed for review.
7-9	o Start detail document review where practical.
10-11	o Prepare site walkdown outline and provide to Audit Team Leader.

* See Attachment 6

TASK SHEET

Structural

Node Numbers *	Task
3-4	o Familiarization review of key documents such as FSAR, Project Technical Manuals or Procedures, and Design Criteria.
	o Determine status of project specifications and analyses.
4-5	o Based on review and input, develop/define structural scope and approach for inclusion in Audit Plan.
	o Revise structural task sheet as needed for this audit.
5-6	o Using base Review Plans, develop structural Review Plans for approval.
4-7	o Prepare a list of documents needed at audit start and provide list to team leader.
7-9	o Start detail document review where practical.
10-11	o Prepare outline for site walkdown and provide to Audit Team Leader.

* See Attachment 6

ATTACHMENT 7

SCHEDULE FOR PHASE I AND PHASE II

SCHEDULE OF ACTIVITIES

Preliminary Activities	2/18/86
NRC Meeting to Define DLC Plan/NRC Interface	2/28/86
EA Review of DLC Program Documentation	3/12 - 13/86
DLC/SWEC - Agreement of System and Scope	3/20/86
Submit Management Plan	3/20/86
Select Audit Team Members	3/24/86
Data Summarization for the First Three Technical Audits	3/24 - 4/14/86
Discussion with NRC (Informal)	4/8/86
Issue Audit Schedule	4/9/86
Initial Orientation of Audit Team	4/10/86
Submit Draft Audit Plan to NRC	4/10/86
Audit Team Status Meeting - Adjustments to Audit Plan based on Technical Audit Input	4/18/86
Audit Team Status Meeting (Submit Review Plans to Audit Team Leader for Final Approval)	4/25/86
NRC Inspection of Audit Scope/Review Plans	4/28 - 30/86
Audit Entrance Meeting (auditors and auditees)	5/5/86
Audit Start	5/5/86
Site Walkdown/Review	5/19 - 23/86
Audit Completion	5/30/86
Summary Meeting with Project	5/30/86
NRC Inspection of Audit Implementation	6/2 - 6/86
Post Audit Conference	6/24/86
Audit Report Issue	7/17/86
Audit Follow-up	6/24 - 10/17/86
Submittal of Final Evaluation Report (Phase II)	11/3/86