

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT

Division of Quality Assurance, Vendor, and
Technical Training Center Programs
Quality Assurance Branch

Report No.: 50-498/85-26, 50-499/85-23
Docket Nos.: 50-498/499
Licensee: Houston Lighting & Power Company
Facility Name: South Texas Project Unit 1
Inspection At: Bechtel Energy Corporation, Houston, Texas
Inspection Conducted: December 2-6, 1985
Inspection Team Members:
Team Leader: E. V. Imbro, Section Chief, IE
Electrical/I&C: S. V. Athavale, Inspection Specialist, IE
Mechanical Systems: T. J. DelGaizo, Consultant, WESTEC Services
Mechanical Components: R. Parkhill, Inspection Specialist, IE
J. Blackman, Consultant, WESTEC Services
Civil/Structural: A. Unsal, Consultant, HARSTEAD Engineering

Prepared by:

E. V. Imbro
for R. W. Parkhill
Inspection Specialist, IE

3/25/86
Date

Approved by:

E. V. Imbro
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Section Chief
Quality Assurance Branch, IE

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SOUTH TEXAS PROJECT - UNIT 1
INSPECTION OF AUDIT RESULTS: TASKS 83-1, 83-3, 84-1, 84-2 AND 84-3
DECEMBER 2, 1985 THROUGH DECEMBER 6, 1985

1. Background

On March 1, 1984, representatives of Houston Lighting and Power Company (HL&P) presented to the NRC the details of the Engineering Assurance Program (EAP) being conducted on the South Texas Project (STP). As a result of this meeting and additional information provided by HL&P, the NRC determined that this program, if properly implemented, could provide the additional assurances of design adequacy normally provided by an Independent Design Verification Program (IDVP). Formal acceptance of the EAP as a substitute for an IDVP was provided via letter to HL&P dated August 20, 1984.

The NRC decided to monitor the STP Engineering Assurance Program in three phases for Task 85-1, Control Room HVAC, Task 85-2, Component Cooling Water System and Task 85-3, Offsite AC Power and Medium Voltage AC Power Supply Systems: (1) implementation of program plan and procedures, (2) review and evaluation of audit results and (3) followup of corrective actions. The first phase of inspection was accomplished at the headquarters of the Stone and Webster Engineering Co. (SWEC) in Boston during the week of April 23, 1985. The report of this inspection (No. 50-498/85-09) was forwarded to HL&P on July 12, 1985. The second phase of inspection for Tasks 85-1 and 85-2 was accomplished at SWEC's headquarters in Boston from July 22, 1985 through July 26, 1985 and a report of this inspection (No. 50-498-85-14) was forwarded to HL&P on August 28, 1985. The second phase of inspection for Task 85-3 was accomplished at SWEC's headquarters in Boston from October 15, 1985 through October 17, 1985. The report of that inspection (No. 50-498/85-22) was forwarded to HL&P on November 18, 1985.

2. Purpose

The purpose of this inspection was to verify the adequacy of the corrective actions associated with EAP Tasks 83-1, 83-3, 84-1, 84-2 and 84-3. These tasks were completed prior to NRC involvement in the EAP and consequently an in-process review was not performed by the staff. Therefore the objectives of the inspection were limited to: (1) verifying that the concerns developed by SWEC had been correctly implemented by HL&P as action items; (2) verifying that the action items had been satisfactorily resolved, and (3) confirming that the implementation of required corrective actions had been satisfactorily completed.

3. Personnel Contacted

The following is a brief list of key personnel contacted during this inspection:

<u>Name</u>	<u>Position</u>
R. A. Frazar	HL&P EA Program Manager
S. R. Basu	HL&P EA Program Staff
M. Chakravorty	HL&P EA Program Staff
J. Woods	HL&P EA Program Staff
C. Allen	HL&P Project Engineering
N. Jonnejo	Bechtel
M. Scott	Bechtel
J. Shellabarger	Bechtel
P. Trudel	Bechtel
B. Woodley	Bechtel
L. Shipley	Bechtel
O. Gurbuz	Bechtel
R. Singh	Bechtel
D. Quattrociocchi	Bechtel

4. General Conclusions

A substantial amount of review work was performed during the SWEC audits based upon the scope of findings presented. Pertinent design documents reviewed were design specifications, design procedures, calculations, logic diagrams and equipment qualification documentation. This effort resulted in a large number of findings which were, in turn, satisfactorily implemented as action items by HL&P. The required corrective actions were reviewed in detail and found to be adequately implemented, subject to the comments contained in this report.

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The following are summary descriptions, presented in accordance with each of the disciplines involved with Tasks 83-1, 83-3, 84-1, 84-2 and 84-3.

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In the Mechanical Systems Area, the following design assessments were reviewed: (1) Task 84-1, Containment Analysis, and (2) the systems portions of Task 84-2, Equipment Qualification. In both instances, it was concluded that the reviews had been effectively completed as follows:

- a. Independent Reviewer concerns had been correctly translated into action items.
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A key Action Item related to the systems aspects of Task 84-2 was 84-2-3, which questioned the applicability of the Westinghouse model for analysis of main steam line break (MSLB) accidents. A new calculation was prepared (NC7007) which confirmed the conservatism of the the FSAR with regard to MSLB parameters. During its review of this calculation, the Staff questioned the validity of feedwater isolation as assumed in the calculation. The Staff determined, through review of control logic diagrams, that feedwater control valves, bypass valves, and isolation valves are all shut on high containment pressure signals and other safety-injection signals. The Staff

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Mechanical Components

The scope of review in the Mechanical Components Area consisted of design assessment for: (1) Task 83-3, ASME III Pipe Stress Analysis of RHR/SI System; (2) the mechanical components portion of Task 84-2, Equipment Qualification; and (3) Task 84-3, ASME III Pipe Support Design of the RHR/SI system.

Task 83-3, ASME III Pipe Stress Analysis of RHR/SI System was reviewed by examining the overall technical depth associated with original SWEC findings, Bechtel's response, and any required corrective actions. In so doing a number of calculations, criteria documents and design procedures were examined in detail. Related action items were reviewed as a group to examine the interrelationships between them. Based upon this review, it was concluded that the required corrective actions, performed by Bechtel, satisfied their intended purpose. The Action Items reviewed during this inspection included 83-3-1,3,4,6,7,8,9,11,18,21,23, 27,28,and 30, and their associated reference documents.

The mechanical components aspects of Task 84-2, Equipment Qualification, were reviewed in a manner identical to Task 83-3. All of the Action Items were related to seismic qualification issues and were basically individual technical issues associated with specific hardware. Based upon this review, it was concluded that the required corrective actions, performed by Bechtel or the equipment vendor, satisfied their intended purpose. The action items reviewed during this inspection included 84-2-20.1-20.4, 20.6, 21, 23, 24, 25 and 26, and their associated reference documents.

Task 84-3, ASME III Pipe Support Design, was inspected by first examining the corrective actions associated with a selected sample of Action Items and secondly, by independently reviewing a selected sample of pipe supports to ensure that reviewers' comments were generically addressed by Project Engineering. In general, the verification plan for 84-3 was responsive to the concerns raised by Engineering Assurance, in that, Project Engineering had implemented an appropriate corrective action and Engineering Assurance had performed an acceptable verification program. The Action Items reviewed as part of this inspection included 2a, 2i, 18, 19, 20, 22, 27, 28a, 28b, 29, 30, 32, 37a, 37b, 49a, 55b and 62. The pipe supports and associated calculations independently reviewed included SI-9201-SH0007 Rev. 2, CL-9504-GU0012 Rev. 3, and AC-9221-HL5002. Two observations resulted due to this inspection and are as follows:

- (1) Engineering Assurance needs to review a larger sample of pipe supports for Action Items numbered 18 and 19 to ensure that the generic impact is adequately verified. Also it was noted that Engineering Assurance plans to review the verification sample size for all affected pipe support active items.
- (2) Based upon discussions with HL&P Engineering Assurance, it is understood that all additional action items resulting from the EAP verification of previous findings of potential significance, will now be formally submitted to BEC for response. In addition, action items which were closed based upon the existence of programmatic solutions will be incorporated into the project document turnover review process to ensure proper followup.

Civil/Structural Discipline

The HL&P corrective action plan for Task 83-1, Soil Structure Interaction Analysis and Seismic Design, was reviewed. The technical and programmatic content of the plan was compared to the original action items to verify proper closure. The substantiating documentation for Action Items 83-1-1 through 83-1-13 was reviewed in detail and based upon this review, it was concluded that they had been addressed properly.

BEC did a complete review of the civil/structural design when they replaced Brown & Root as the architect. Therefore, this area has only been addressed by the EAP in Task 83-1. In order to be able to reach a conclusion on design adequacy in all technical disciplines, HL&P proposed that the BEC

review of Brown and Root's baseline design could be used to supplement the EAP in the area of civil/structural design. In response to this proposal, the Staff reviewed the following work packages:

EC-122	Containment Internal Structural Steel
EC-130	MEAB Concrete
EC-165	Auxiliary Feedwater Storage Tank
EC-186	HVAC Ducts and Duct Supports

Based upon the content of the work packages reviewed, it was evident that Bechtel has done a thorough review of the work performed by Brown and Root. They identified a number of items that had to be corrected due to technical or procedural errors. Although it was evident that a credible review had been performed, an auditable path was not maintained during the review, therefore overall conclusions and verification of required remedial measures cannot be determined. In most cases, Bechtel reanalyzed the structures using different methodology and criteria than were used by Brown & Root. Furthermore, in some cases, such as Isolation Valve Cubicle, a complete redesign was performed by Bechtel. Therefore, additional reviews appear to be necessary to establish the acceptability of this effort. In response to this, HL&P proposed evaluation of the following additional areas:

1. Isolation Valve Cubicle (IVC)
2. MEAB - Reinforced Concrete
3. RCB - Internal Structural Steel

This approach is acceptable to the Staff and will be reviewed during a subsequent inspection when the HL&P reviews are completed. (Open item 85-26-01.)

Mr. J. H. Goldberg
Houston Lighting and Power Company

South Texas Project

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Houston Lighting & Power Company - 2 - South Texas Project

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Bethesda, Maryland 20814

Mr. J. H. Goldberg

- 2 -

The NRC found that the work package reviews performed by BEC were thoroughly and comprehensively performed. However, since Bechtel did not adopt all of Brown and Root's design methodology but instead used some alternate approaches, it was agreed that additional supplements to the EAP in the civil/structural area are appropriate. This work will be reviewed by the NRC, when completed.

Sincerely,

Brian K. Grimes, Director
Division of Quality Assurance, Vendor,
and Technical Training Center Programs
Office of Inspection and Enforcement

Enclosure: Inspection Report

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

MAR 25 1986

Docket Nos. 50-498
50-499

Mr. J. H. Goldberg
Group Vice President - Nuclear
Houston Lighting and Power Company
P. O. Box 1700
Houston, Texas 77001

SUBJECT: SOUTH TEXAS PROJECT ENGINEERING ASSURANCE PROGRAM (EAP)
INSPECTION REPORT 50-498/85-26, 50-499/85-23

Dear Mr. Goldberg:

This letter conveys the results and conclusions of NRC's evaluation of the following Stone and Webster Engineering Corporation (SWEC) EAP Independent Technical Assessment Tasks: 83-1, Soil-Structure Interaction and Seismic Design Verification; 83-3, ASME III Pipe Stress Analysis of RHR/SI System; 84-1, Containment Analysis; 84-2, Environmental Qualification of Equipment; and 84-3, ASME III Pipe Support Design. The inspection was conducted by a team of personnel from the NRC's Office of Inspection and Enforcement and consultants at the offices of Bechtel Energy Corporation (BEC), Houston, Texas from December 2, 1985, through December 6, 1985. The objective of this inspection was threefold: (1) verify that the concerns developed by the SWEC audit team had been correctly implemented as action items; (2) determine if the action items had been satisfactorily resolved; and (3) verify that the appropriate corrective actions had been implemented or, if the corrective actions were part of an ongoing resolution program, verify that proper implementation was in progress. In addition, at the request of Houston Lighting and Power (HL&P), four work packages in the civil/structural area were reviewed to determine if the results of these reviews, performed by BEC to validate the original engineering design work performed by Brown and Root, could be used to supplement the scope of review in the civil/structural area of the EAP.

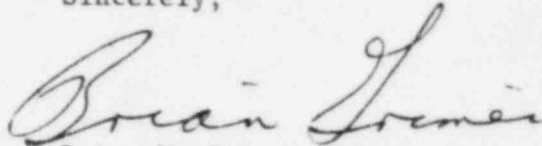
Based upon our inspection, it was concluded that Tasks 83-1, 83-3, 84-1, 84-2 and 84-3 had been acceptably completed subject to the resolution of the NRC's comments, as described in the enclosed report. The HL&P review was comprehensive, checklists were thoroughly completed, files were in good order, backup documentation was in good order and corrective actions were implemented in an auditable manner.

Mr. J. H. Goldberg

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The NRC found that the work package reviews performed by BEC were thoroughly and comprehensively performed. However, since Bechtel did not adopt all of Brown and Root's design methodology but instead used some alternate approaches, it was agreed that additional supplements to the EAP in the civil/structural area are appropriate. This work will be reviewed by the NRC, when completed.

Sincerely,

A handwritten signature in cursive script, appearing to read "Brian K. Grimes".

Brian K. Grimes, Director
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Enclosure: Inspection Report

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Mechanical Components

The scope of review in the Mechanical Components Area consisted of design assessment for: (1) Task 83-3, ASME III Pipe Stress Analysis of RHR/SI System; (2) the mechanical components portion of Task 84-2, Equipment Qualification; and (3) Task 84-3, ASME III Pipe Support Design of the RHR/SI system.

Task 83-3, ASME III Pipe Stress Analysis of RHR/SI System was reviewed by examining the overall technical depth associated with original SWEC findings, Bechtel's response, and any required corrective actions. In so doing a number of calculations, criteria documents and design procedures were examined in detail. Related action items were reviewed as a group to examine the interrelationships between them. Based upon this review, it was concluded that the required corrective actions, performed by Bechtel, satisfied their intended purpose. The Action Items reviewed during this inspection included 83-3-1,3,4,6,7,8,9,11,18,21,23, 27,28,and 30, and their associated reference documents.

The mechanical components aspects of Task 84-2, Equipment Qualification, were reviewed in a manner identical to Task 83-3. All of the Action Items were related to seismic qualification issues and were basically individual technical issues associated with specific hardware. Based upon this review, it was concluded that the required corrective actions, performed by Bechtel or the equipment vendor, satisfied their intended purpose. The action items reviewed during this inspection included 84-2-20.1-20.4, 20.6, 21, 23, 24, 25 and 26, and their associated reference documents.

Task 84-3, ASME III Pipe Support Design, was inspected by first examining the corrective actions associated with a selected sample of Action Items and secondly, by independently reviewing a selected sample of pipe supports to ensure that reviewers' comments were generically addressed by Project Engineering. In general, the verification plan for 84-3 was responsive to the concerns raised by Engineering Assurance, in that, Project Engineering had implemented an appropriate corrective action and Engineering Assurance had performed an acceptable verification program. The Action Items reviewed as part of this inspection included 2a, 2i, 18, 19, 20, 22, 27, 28a, 28b, 29, 30, 32, 37a, 37b, 49a, 55b and 62. The pipe supports and associated calculations independently reviewed included SI-9201-SH0007 Rev. 2, CL-9504-GU0012 Rev. 3, and AC-9221-HL5002. Two observations resulted due to this inspection and are as follows:

- (1) Engineering Assurance needs to review a larger sample of pipe supports for Action Items numbered 18 and 19 to ensure that the generic impact is adequately verified. Also it was noted that Engineering Assurance plans to review the verification sample size for all affected pipe support active items.
- (2) Based upon discussions with HL&P Engineering Assurance, it is understood that all additional action items resulting from the EAP verification of previous findings of potential significance, will now be formally submitted to BEC for response. In addition, action items which were closed based upon the existence of programmatic solutions will be incorporated into the project document turnover review process to ensure proper followup.

Civil/Structural Discipline

The HL&P corrective action plan for Task 83-1, Soil Structure Interaction Analysis and Seismic Design, was reviewed. The technical and programmatic content of the plan was compared to the original action items to verify proper closure. The substantiating documentation for Action Items 83-1-1 through 83-1-13 was reviewed in detail and based upon this review, it was concluded that they had been addressed properly.

BEC did a complete review of the civil/structural design when they replaced Brown & Root as the architect. Therefore, this area has only been addressed by the EAP in Task 83-1. In order to be able to reach a conclusion on design adequacy in all technical disciplines, HL&P proposed that the BEC

review of Brown and Root's baseline design could be used to supplement the EAP in the area of civil/structural design. In response to this proposal, the Staff reviewed the following work packages:

EC-122	Containment Internal Structural Steel
EC-130	MEAB Concrete
EC-165	Auxiliary Feedwater Storage Tank
EC-186	HVAC Ducts and Duct Supports

Based upon the content of the work packages reviewed, it was evident that Bechtel has done a thorough review of the work performed by Brown and Root. They identified a number of items that had to be corrected due to technical or procedural errors. Although it was evident that a credible review had been performed, an auditable path was not maintained during the review, therefore overall conclusions and verification of required remedial measures cannot be determined. In most cases, Bechtel reanalyzed the structures using different methodology and criteria than were used by Brown & Root. Furthermore, in some cases, such as Isolation Valve Cubicle, a complete redesign was performed by Bechtel. Therefore, additional reviews appear to be necessary to establish the acceptability of this effort. In response to this, HL&P proposed evaluation of the following additional areas:

1. Isolation Valve Cubicle (IVC)
2. MEAB - Reinforced Concrete
3. RCB - Internal Structural Steel

This approach is acceptable to the Staff and will be reviewed during a subsequent inspection when the HL&P reviews are completed. (Open item 85-26-01.)

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The NRC found that the work package reviews performed by BEC were thoroughly and comprehensively performed. However, since Bechtel did not adopt all of Brown and Root's design methodology but instead used some alternate approaches, it was agreed that additional supplements to the EAP in the civil/structural area are appropriate. This work will be reviewed by the NRC, when completed.

Sincerely,

Brian K. Grimes, Director
Division of Quality Assurance, Vendor,
and Technical Training Center Programs
Office of Inspection and Enforcement

Enclosure: Inspection Report

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