

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

Report No. 99900502/79-02

Program No. 51200

Company: Brown and Root, Incorporated
Power Engineering
4100 Clinton Drive
Post Office Box 3
Houston, Texas 77001

Inspection Conducted: May 7-11, 1979

Inspector: C. J. Hale for 5-23-79
D. G. Anderson, Principal Inspector, Vendor
Inspection Branch Date

Approved by: C. J. Hale 5-23-79
C. J. Hale, Chief, Program Evaluation Section
Vendor Inspection Branch Date

Summary

Inspection on May 7-11, 1979 (99900502/79-02)

Areas Inspected: Implementation of Title 10 CFR 50, Appendix B, and Topical Report, B&R-002A, including design change control and action on previous inspection findings. The inspection involved thirty-seven (37) inspector hours on site by one (1) USNRC inspector.

Results: In the two (2) areas inspected, no deviations from commitment or unresolved items were identified.

7907230736

Details Section

A. Persons Contacted

- *T. H. Gamon, Quality Assurance Manager
- I. K. Ghosh, Senior Engineer
- H. C. Huang, Senior Structural Engineer
- M. J. Meyer, Senior Project Engineer
- *B. F. Mitchell, Project Quality Engineer
- *J. E. Paden, Project Quality Engineer
- L. B. Patel, Containment Internals Supervisor
- *R. W. Peverley, Assistant Engineering Project Manager
- S. P. N. Singh, Discipline Project Engineer
- M. K. Wanchoo, Containment Supervisor

*Indicates those present at the exit meeting.

3. Action on Previous Inspection Findings

1. (Closed) Deviation (Report No. 79-01): Two (2) calculations performed for a safety related structure either did not include the date of approval or references for two (2) sets of design input. The inspector verified that corrective action as referenced in the B&W letter of response dated March 6, 1979, had been completed. In particular, each of the calculations were corrected and a training program was conducted for those disciplines involved.
2. (Open) Unresolved Item (Report No. 79-01): Response spectra for the reactor containment structure, as identified in a B&R report, appears to differ from that reported in the FSAR for the South Texas Project. The inspector reviewed the B&R evaluation of this item with respect to possible inclusion of the non-conservative response spectra in B&R design documents. It appears that the only safety related items impacted by this error were the specifications for the reactor containment fan coolers and the design of the shield structure for the containment building equipment hatch. This item will remain open pending NRR/DSS verification of the redesign of the shield structure. (See paragraph D. below for additional information).

C. Design Change Control1. Objectives

The objectives of this area of the inspection were to verify that:

- a. Procedures have been established and implemented for controlling changes to approved design documents.

- b. Design changes are reviewed for the impact of the change, documented as to the action taken, and transmitted to all affected persons and organizations.
- c. The design changes are justified and subjected to review and approval by the same groups or organizations as for the original design.
- d. When responsibility has been changed, the designated organization shall have access to the pertinent information, competence in the specific area of design, and an understanding of the requirements and intent of the original design.

2. Method of Accomplishment

The preceding objectives were accomplished by:

- a. A review of the Brown and Root Topical Report, B&R-002A, Section 17.3, Design Control, which summarizes the methods used by Brown and Root, Power Engineering Group, to describe their activities related to design change control. The design change control process is defined, implemented, and enforced according to the following procedures:
 - (1) The Brown and Root Quality Assurance Manual, Section 3.8, Design Change.
 - (2) Engineering Procedures;
 - STP-DC-002-I, Engineering Procedure for Drawing Control, May 15, 1978.
 - STP-DC-005-H, Preparation and Control of Specifications, February, 7, 1978.
 - STP-PM-005-F, Interface Control, November 4, 1977.
 - STP-DC-007-G, Preparation and Control of System Design Design Descriptions (SDD), August 22, 1978.
 - STP-DC-008-G, Calculations, February 3, 1978.
 - STP-DC-009-G, File and File Storage, February 14, 1978.
 - STP-DC-012-G, Final Safety Analysis Report (FSAR) Change Control, June 14, 1978.
 - STP-DC-013-C, Document Change Notice Control, January 24, 1978.
 - STP-DC-014-E, Document Comment Porocess, January 10, 1978.

STP-DC-015-G, Design Verification, January 29, 1979.

STP-DC-017-C, Computer Program Documentation, July 27, 1978.

- b. Review of STP Form 200.29, Document Change Notices, which documents the review of the design change, the impact of the change, and the action taken and accompanies each of the following documents:

(1) Document Change Notices for Calculations:

DCN No. 2N129RC005-DCN, February 19, 1979, Safety Injection System Low Head Pump Discharge, Reanalysis Revision D to Revision E; DCN No. 2N129RC006-DCN, February 16, 1979, ECCS Low Head Pump Discharge Piping-Train B, Reanalysis Revision C to Revision D; DCN No. 2N129RC007-DCN, February 16, 1979, ECCS Low Head SI Pump Discharge-Train C; DCN No. 2N129RC008-DCN, February 19, 1979, ECCS High Head SI Pump Discharge, Train A; DCN No. 2N129RC009-DCN, February 16, 1979, ECCS High Head SI Pump Discharge, Train B; DCN No. 2N129RC010-DCN, February 16, 1979, ECCS High Head SI Pump Discharge, Train C; DCN No. 2N129RC011-DCN, February 19, 1979, Containment Spray System, Train A; DCN No. 2N129RC012-DCN, February 19, 1979, Containment Spray Additive System, Pump A; DCN No. 2N129RC013-DCN, February 16, 1979, Containment Spray Pump Discharge, Trains B and C; DCN No. 2N129RC014-DCN, February 19, 1979, ECCS Containment Spray Additive, Train B; DCN No. 2C011SC040-B-DCN, May 7, 1979, Addition of Response Spectrum Curves; DCN No. 2C101SC019B-DCN, April 25, 1979, Crane Girder Analysis and Design; DCN No. 2C091SC014B-DCN, May 3, 1979, Equipment Hatch Analysis and Design.

(2) Document Change Notices for Specifications:

DCN No. 3Z149ZS001E-DCN, October 25, 1978, Area Radiation Monitoring System; DCN No. 2V211VS001E-DCN, April 10, 1979, Design Verification of RCB HVAC System Cooling Load Calculation, update of earthquake response spectrum curves; DCN No. 3V279VS007E-DCN, May 2, 1979, clarification to seismic response spectra; DCN No. 2R099RC124A-DCN, May 2, 1979, correction to specification; Reactor Incore Instrumentation Guide Tubes; DCN No. 2C269SS006G-DCN, February 12, 1979, incorporate correct floor design spectra for EAST-WEST SSE elevations 37', 68', and 108'.

(3) Document Change Notices for Reports:

DCN No. 3N160SR043B-DCN, March 7, 1979, fourteen (14) response spectra are revised to make them compatible with calculation package 2C011SC040B.

(4) Document Change Notices for the following drawings:

2N171R0301H, Stress Isometric ECCS Pump Discharge Train A, February 16, 1979.

2N171R0302E, Stress Isometric ECCS Pump Discharge Train B, February 16, 1979.

2N171R0303E, Stress Isometric ECCS Pump Discharge Train C, February 16, 1979.

- c. The documentation referenced in C.2.b above was also accompanied by STP Form 200.52, Document Transmittal Order, which transmits design changes to cognizant groups or to the same organizations who performed the original design. This assures that design changes are subjected to review and approval by the group who performed the original design or if responsibility has changed, it assures that the newly designated organization has competence in the particular area of design.

3. Findings

In this area of the inspection, no deviations from commitment or unresolved items were identified.

D. Follow-up on Unresolved Item-Seismic Response Spectra

During Inspection No. 79-01, an unresolved item was identified which related to a discrepancy between seismic response spectra for the containment building as reported in the South Texas Project FSAR and an engineering report generated by Brown and Root. During Inspection No. 79-02, the inspector followed up on Brown and Root's evaluation of this discrepancy.

The Quality Engineering group of Brown and Root performed a systematic investigation of all documents, i.e., specifications, calculations, engineering reports, and external transmittals, to assure that design input containing the non-conservative seismic response spectra has not been incorporated into components being supplied or structures being supplied or structures being fabricated at the South Texas Project. The inspector reviewed the following documentation related to this investigation:

1. Specifications:

Structural-2C269SS006-G, Steel Liner Work for Reactor Containment Structure; 3F269SS034-D, Stainless Steel Pool Gate System;

Stress-2R099RC124-A, Reactor Incore Instrumentation Guide Tubes; 3R209RS004-D, Flex Hose For Reactor Coolant Pump Auxiliary Piping; 3V279RQ009-B, HVAC Ductwork Structural Design Data; 3V279RC019-A, HVAC Duct Support Deflection Analysis; 1N1790RQ001-C, Piping Stress Analysis Criteria;

HVAC-3V279VS007-E, Safety Class Ductwork; 3V289VS008-F, Safety Class Dampers; 2V211VS001-E, Reactor Containment Fan Coolers;

Mechanical-2C099NS054-D, Mechanical Penetrations (Containment); 7C109NS052-D, Containment Polar Crane;

Piping and Valves-1L529TS100-D, ASME Section III, Gate, Globe and Check Valves 2½" and Larger; 1L529TS101-D, ASME Section III Gate, Globe and Check Valves 2" and Smaller; 1L529TS102-D, ASME Section III Ball and Plug Valves; 2L529TS103-D, ASME Section III Butterfly Valves; 1L529TS104-D, ASME Section I/II Bellows Seal or Packless Metal Diaphragm Valves 2" and Smaller; 2L359PS505-D, ASME Section III Metallic Expansion Joints; 1L360PS102-E, ASME Section III Pipe Hangers and Supports;

Instrumentation and Controls-2Z439ZS210-D, ASME Section III Control Valves; 2Z449ZS006-D, ASME Section III Solenoid Valves; 3Z149ZS001-E, Radiation Monitoring System; 3Z169Z-S070-D, Containment Hydrogen Monitoring; 2Z459ZS230-D, Class 2 and 3 Pressure Safety and Relief Valves; and

Electrical-3E209ES031-E, Electrical Penetration Assemblies; 3E509ES039-C, Class IE AC/DC Distribution Panels.

2. Calculations:

Structural-2C011SC040-C, Seismic Analysis of the Reactor Containment Building; 3D011SC104-A, Seismic Analysis of the Diesel Generator Building; 3M011SC089-B, Seismic Analysis of the Mechanical Electrical Auxiliary Building; 3F011SC126-A, Final Seismic Analysis of the Fuel Handling Building; 2C011SC037-E, Final Calculations Concrete Floors; 2C011SC044-E, Final Calculations Miscellaneous; 2C101SC019-B, Crane Girder and Bracket Analysis and Design; and

Seismic-2C011SC040-A&B, Seismic Analysis of the Reactor Containment Building.

3. Reports:

2N160SR043-C, Seismic Analysis of the Reactor Containment Building; 3N160SR044-C, Seismic Analysis of the Category 1 Structures.

4. Procedures:

1N019RQ004-C, Qualification Procedure for Seismic Category 1 Equipment.

5. Transmittals:

ST-BR-ED-0132, Relative Displacement Criteria, February 4, 1976.

6. Consultants Reports:

Y310XR069, Soil Structure Interaction Analysis Woodward-Clyde Consultants, Transmitted to Brown and Root, January 5, 1976, ST-WC-BR-0428.

In addition to these investigations, Brown and Root performed a survey through their resident engineer at EDS Nuclear, a consulting firm that is responsible for piping analyses under contract to Brown and Root. The following SUPERPIPE computer runs were checked for response spectra input:

CS-01, Revision 1, October 21, 1976.

FC-01, Revision 0, January 26, 1977.

CC-05, Revision 0, July 26, 1976.

CV-02-03, Revision 3, October 25, 1978.

MS-03, Revision 3, May 12, 1977.

FW-02, Revision 1, April 19, 1977.

The results of this intensive investigation were that the majority of the purchase and engineering specifications were generated using the conservative spectra. One (1) specification and one (1) calculation using nonconservative spectra have been re-evaluated with the following results:

Specification: 2V211VS001-E, Reactor Containment Fan Coolers. The incorrect response spectra had been incorporated into the specification, however, in tests performed at Joy Manufacturing, the supplier, a seismic load of 10g was used. Since the specified loads for the South Texas Project are 1g horizontal, and 0.67 vertical, the tested loadings on the Reactor Containment Fan Cooler System appear to be quite conservative.

Calculation: 2C091SC014-B, Equipment Hatch Shelf Analysis and Design. The inspector was notified that a less conservative seismic response spectra was used in the original design of the structure which supports shielding to prevent radiation streaming through the equipment hatch. This support structure is attached to the containment building shell by means of imbedments. The results of the analysis were that stiffening of the structure would be required, however, the inspector was concerned that if the imbedments originally met the non conservative response spectra, then should not the imbedment design be reviewed to assure that

the shield structure would remain intact under increased loads. These calculations are being forwarded to NRR/DSS for independent design verification and this item will remain open pending completion of this verification.

Based upon the material reviewed by the inspector and discussions with Brown and Root personnel involved in this investigation, it appears that evaluation was organized, conducted, and reported in sufficient detail to assure that the non-conservative response spectra have not been used in the acquisition, design, or fabrication of safety related structures or components at the South Texas Project. Of the large volume of documents reviewed, only the two noted above appear to have required further consideration.

E. Exit Meeting

An exit meeting was conducted with Brown and Root management personnel at the conclusion of the inspection on May 11, 1979. Those individuals indicated by an asterisk in paragraph A above were in attendance. In addition, the following were present:

E. H. Bomke, Senior Vice President, Power Engineering
K. M. Broom, Vice President, Engineering
L. E. Hayden, Jr., Engineering Project Manager
R. G. Helms, Project Quality Engineer
H. Paperno, Assistant Quality Assurance Manager,
W. N. Phillips, Projects Quality Assurance Manager, Hoston Lighting and
Power Company
J. Shuckrow, Lead Auditor
K. A. Swarts, Engineering Manager

This inspector discussed the scope of the inspection and indicated that no findings had been identified during the inspection. The inspector noted, however, that the unresolved item related to incorrect response spectra will remain open until design verification of the calculation for equipment hatch shield support design has been completed by NRR/DSS. Management representatives of Brown and Root acknowledged the statements by the inspector.