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

REGION IV

Report No. 50-498/80-08; 50-499/80-08

Docket No. 50-498; 50-499 Category A2

Licensee: Houston Lighting and Power Company
Post Office Box 1700
Houston, Texas 77001

Facility Name: South Texas Project, Units 1 and 2

Investigation at: South Texas Project, Matagorda County, Texas

Investigation conducted: January 19-23 and February 20, 1981

Inspectors: W A Crossman 2/24/81
W. A. Crossman, Chief, Projects Section Date

for W A Crossman 2/26/81
W. G. Hubacek, Reactor Inspector, Projects Section Date

L D Gilbert 2/24/81
L. D. Gilbert, Reactor Inspector, Engineering Support Section Date

Approved: W A Crossman 2/26/81
W. A. Crossman, Chief, Projects Section Date

L D Gilbert for 2/26/81
R. E. Hall, Chief, Engineering Support Section Date

Investigation Summary:

Investigation on January 19-23 and February 20, 1981 (Report No. 50-498/80-08; 50-499/80-08)
Areas Investigated: Special, unannounced investigation of alleged construction deficiencies and inaccuracy of an in-service inspection device. The investigation involved sixty-six inspector-hours by three NRC inspectors.
Results: No violations or deviations were identified.

INTRODUCTION

The South Texas Project, Units No. 1 and 2 are under construction in Matagorda County, Texas, near the town of Wadsworth, Texas. Houston Lighting and Power Company (HL&P) is the Construction Permit holder. Brown & Root, Incorporated (B&R) is both Architect Engineer and Constructor for the project.

REASON FOR INVESTIGATION

Information concerning alleged irregularities in the civil construction program was described in a Houston Post article, dated February 24, 1980, and in answers of Citizens Concerned About Nuclear Power, Inc. to the second set of interrogatories and requests for production of documents from HL&P related to the forthcoming operating license hearing before the Atomic Safety and Licensing Board. In addition, information concerning alleged inaccuracy of an in-service inspection device was received from a confidential source.

SUMMARY OF FACTS

The following alleged deficiencies were expressed:

1. There was a 24 by 30 inch hole through a 30 inch thick radiation shielding wall in the Unit 1 Reactor Building.

2. The west outside wall of the Unit 1 Mechanical and Electrical Building was out of plumb, tilting almost an inch and a half to one side.

3. Trash and foreign objects were inadvertently buried in the concrete walls of the two Reactor Buildings and Fuel Handling Buildings.

4. Because of improper mixing, grout, used to plug voids, was below strength, bleeding and shrinking.

5. Sixteen Deficiency and Disposition Reports (DDRs) address voids in areas other than the Reactor Containment shell walls. None of the DDRs were reported to the NRC pursuant to 10 CFR Part 50.55(e).

6. In the walls already examined in Reactor Containment Buildings 1 and 2, there is no evidence to support a conclusion that there are no internal voids surrounded by concrete.

7. Eighteen concrete pours, other than around the equipment doors, were identified where reinforcing bars were missing from the containment structure.

8. The applicants, in Revision G of Specification 2A010CS028, have removed the requirement to completely fill tie holes. The problem of using taper ties and filling holes left by removing these ties is thus cured by removing requirements which created the problem.

9. The accuracy of an in-service inspection device was found to be substantially off (by as much as 1/2 inch to 2-1/2 inches).

CONCLUSIONS

1. The alleged 24 by 30 inch hole through a 30 inch thick radiation shielding wall in the Unit 1 Reactor Building was confirmed. The void was identified in DDR S-335, dated February 24, 1978. Repair of the void was documented on a Concrete Repair Card for Pour No. C11-W18, dated February 22, 1978.

2. The alleged out of plumb condition of the west outside wall of the Unit 1 Mechanical and Electrical Auxiliary Building was confirmed. Nonconformance Report (NCR) S-C1281, dated November 28, 1978, described out of tolerance conditions with respect to thickness, plumbness and linear building lines. Disposition of NCR S-C1281 described action to bring higher elevation of the wall back into construction tolerances.

3. The investigation confirmed that trash and foreign objects were inadvertently buried in the concrete walls of the two Reactor Buildings and Fuel Handling Buildings. DDRs S-292 and S-297 and NCRs S-C631, S-C818, S-C820, S-C836, S-C1897, S-C2276A, S-C3151 and S-C3179 documented the presence of foreign materials in various concrete placements.

4. The alleged improper mixing, which caused grout to be below strength, bleed and shrink, was confirmed. DDR S-320, dated January 6, 1978, describes the occurrence of these deficiencies during grouting of voids under crane rail channel supports in the Unit 1 Fuel Handling Building.

5. The investigation confirmed that sixteen DDRs identified voids in areas other than the Reactor Containment shell walls. The allegation that none of these voids were reported to the NRC pursuant to 10 CFR Part 50.55(e) was not substantiated. Voids in the Unit 1 Fuel Handling Building described in DDR S-315B were reported to the NRC pursuant to 10 CFR Part 50.55(e).

6. The alleged lack of support for the conclusion that there are no internal voids in the concrete in the Unit 1 and 2 Reactor Containment Buildings was not confirmed or refuted. The licensee's ongoing evaluation of concrete structures in response to the Show Cause Order will address this matter.

7. The alleged missing reinforcing bars from eighteen concrete pours could not be confirmed or refuted. Review of construction and inspection of documents failed to reveal evidence of missing reinforcing bars. Six of the eighteen listed concrete pour numbers were apparently not valid numbers and could not be identified with existing pours.

8. The alleged removal of the requirement to completely fill tie holes from Specification 2A01OCS028, Revision G was not substantiated. Section 7.2.3.1 of Specification 2A01OCS028, Revisions G and H contains the requirement that tie holes shall be filled solid with dry-pack mortar.

9. The alleged inaccuracy of the in-service inspection device was confirmed, in that, measurements and subsequent calculations indicated that inaccuracies in the range of 1/2 to 1-1/2 inches existed; however, the error band of the calculations, which involved rounding off to the nearest 1/2 degree of angles measured by transit on which the calculations were based, encompassed the alleged inaccuracies. The alleged inaccuracy did not necessarily represent the true accuracy of the in-service inspection device.

   Southwest Research Institute representatives stated that additional measurements indicate that maximum error of .8 to .95 inches may occur at full extension of the device, but repeatability and ability to accurately measure small distances which are essential to the nondestructive examination function are acceptable.

   The device has not yet been used at the South Texas Project.

DETAILS

1. Persons Contacted

Principal Licensee Employees

*R. A. Frazar, Quality Assurance Manager
*R. A. Carvel, Project QA Supervisor (Civil/Structural)
B. R. Schulte, QA Civil
*R. L. Hand, General QA Supervisor, Management Analysis Company (MAC)
*T. J. Jordan, Supervisor, Quality Systems
*L. D. Wilson, Project QA Supervisor (Mechanical)

Other Personnel

*W. J. Friedrich, Project QA Manager for Brown & Root (B&R), MAC
*G. L. Hall, Quality Engineering Coordinator, B&R
*D. J. Harris, Quality Engineering Manager for B&R, MAC
*F. G. Miller, Chief Welding Engineer, B&R
W. T. Flach, Director, Department of Engineering Services, Southwest Research Institute (SwRI)
J. T. Crane, Manager, Design Engineering and Fabrication, SwRI
G. Van Steenberg, General Counsel, SwRI

The IE inspectors also interviewed other licensee and contractor employees including members of the QA/QC and engineering staffs.

*Denotes those attending the exit interview on January 23, 1981.

2. Investigation Details

The following specific allegations were investigated during this investigation. Resultant findings of the NRC investigation team are indicated as follows:

a. Allegation 1:

There was a 24 by 30 inch hole through a 30 inch thick radiation shielding wall in the Unit 1 Reactor Building.

Investigation Findings:

The IE inspector reviewed Deficiency Disposition Report (DDR) No. S-335, dated February 24, 1978, which describes a void area in Pours No. C11-W18 and 18C in the secondary shield wall beneath a blockout in the west wall and another through the thickness of the north wall. The deficient areas were attributed to improper placement and consolidation techniques in violation of Specification 2A010CS028, Revision E. Repair of the voids was documented on a Concrete Repair Card, dated February 2, 1978. Pre-placement and placement inspections for the repairs were documented in two QC inspection books, dated February 2, 1978.

The IE inspectors inspected the repaired void areas and had no further questions on this matter.

b. Allegation 2:

The west outside wall of the Unit 1 Mechanical and Electrical Building was out of plumb, tilting almost an inch and a half to one side.

Investigation Findings:

The IE inspectors reviewed Nonconformance Report (NCR) S-C1281, dated November 28, 1978, which describes a deficiency in the west exterior wall of the Unit 1 Mechanical-Electrical Auxiliary Building (MEAB). The east face of the wall, between elevation (-)13'0" and (+)26'6", is out of tolerance with respect to thickness, plumbness and linear building lines as set forth in ACI-347. The maximum deviation from design was 1-1/2 inches, excluding allowable construction tolerances. The east face of the west MEAB wall is separated by seismic joint material from the east exterior wall of the Unit 1 Fuel Handling Building (FHB), which was placed to elevation (+)66'0". The deficiency was corrected by adjusting the concrete forms on succeeding wall placements to bring the wall back to construction tolerances above elevation (+)66'0". The affected MEAB wall area was not accessible for physical inspection.

The IE inspectors had no further questions on this matter.

c. Allegation 3:

Trash and foreign objects were inadvertently buried in the concrete walls of the two Reactor Buildings and the Fuel Handling Buildings.

Investigation Findings:

The IE inspectors reviewed DDRs S-292 and S-297 and NCRs S-C631, S-C818, S-C820, S-C836, S-C1897, S-C2276A, S-C3151 and S-C3179, which describe the presence of foreign objects in concrete including tie wire, paper cups, wood, polyethylene, vibrator air hoses, chain, tape, electrical cord, wire brush, pencils and sand pockets. Disposition of these items involved removal of the foreign objects and repair of the affected areas, except for vibrator heads, chain and one case of electrical wire which were left embedded in the concrete following evaluation that such items were not detrimental to structural integrity. The IE inspectors observed the affected areas that were repaired and were still accessible for visual inspection.

The IE inspectors had no further questions on this matter.

d. Allegation 4:

Because of improper mixing, grout, used to plug voids, was below strength, bleeding and shrinking.

Investigation Findings:

The IE inspectors reviewed DDR No. S-320 which described violations of B&R Specification 2A010CS028-E that occurred during grouting of voids under crane rail supports in FHB-1 walls W13 and W16. Violations of the specification included mixing two batches of grout with excess water, failure of grout to meet acceptance criteria for flow core tests, average compressive strength of the grout failed to meet the 6000 psi minimum requirement at 28 days, and voids remained under the crane rail supports after the grouting was completed. Disposition of the DDR included instruction of construction personnel to ensure that the manufacturer's mixing instructions and specification requirements are followed during grout mixing and placing operations; the batches with excess water and low compressive strength (5070 psi at 28 days) were accepted as is, based on grout strength meeting or exceeding the minimum strength (4000 psi) of the concrete which it replaced; the remaining voids were repaired in accordance with FREA 1-C-0579, tighter controls were imposed on future grout batching and placing; remaining grout from affected batch No. DT 167A was removed from the job site and replaced; and action, including training and revision of procedures, was taken to correct the failure of QC to react to observed deviations from specified requirements during the grout repairs.

The IE inspectors inspected the repaired areas and had no further questions regarding this matter.

e. Allegation 5:

Sixteen DDRs address voids in areas other than the Reactor Containment shell walls. None of the DDRs were reported to the NRC pursuant to 10 CFR Part 50.55(e).

Investigation Findings:

The IE inspectors reviewed sixteen DDRs related to voids in concrete in areas other than the containment shell walls. The DDRs included the following:

S-202, voids and honeycomb in Wall Pour No. FH1-W15

S-249, voids under crane rails in Wall Pours No. FH1-W13 and W16

S-255, void on north face of embedded structural steel column in Wall Pours No. FH1-W19, 19A, 21 and 21A

S-273, repair of voids in Wall Pour No. FH1-W14 without an approved procedure

S-281, honeycomb in Wall Pour No. CA2-W1

S-283, void in Wall Pour No. FH1-W8C

S-287, void in Mat Pour No. CI2-M2

S-292, voids in Slab Pour No. FH1-S2

S-296, voids in Wall Pour No. CI1-W15

S-297, voids in Wall Pours No. CI2-M2 through CI1-M5

S-305, void and honeycomb in Wall Pour No. ME1-W001-02

S-310, voids and rock pockets in emergency access shaft in Pour No. CI2-M9

S-314, voids and rock pockets in Pour No. CI2-M7

S-315B, voids in underside of Slab Pour No. FH1-S2

S-321, honeycomb area on Wall Pour No. FH1-W45

S-335, voids in Wall Pours No. CI1-W18 and W18C

The IE inspectors reviewed corrective actions related to the above DDRs and inspected the affected areas where access to the areas was possible.

The IE inspectors observed that the voids in the underside of Slab Pour No. FH1-S2 were reported as a construction deficiency to the NRC on March 9, 1978, as required by 10 CFR Part 50.55(e). The final report on this matter was submitted to the NRC on September 18, 1978.

The IE inspectors had no further questions on this matter.

f. Allegation 6:

In the walls already examined in Reactor Containment Buildings 1 and 2, there is no evidence to support a conclusion that there are internal voids surrounded by concrete.

Investigation Findings:

There was no objective evidence available for the IE inspector's review that would support or refute a conclusion that there were no internal voids in the concrete. The licensee stated that this matter will be addressed in their evaluation of concrete structures which is being performed in their response to the Show Cause Order.

g. Allegation 7:

Eighteen concrete pours, other than around the equipment doors, were identified where reinforcing bars were missing from the containment structure.

Investigation Findings:

The IE inspectors reviewed QA records related to Pours No. CI1-S8, CI2-W14, CI1-44A, CI2-W17, CI1-W44, CI1-W24F, CI1-29A, CI1-W34, CI1-W99A, CS1-W37 and CI1-W76 and found no documented evidence that reinforcing bars were missing from these pours. Pour numbers listed as CI1-555, CI1-340, CI2-58, CI1-450, CI1-344, CI1-355 and CI1-W205 did not appear to be valid numbers and could not be identified with existing pours.

The IE inspectors had no further questions on this matter.

h. Allegation 8:

The applicants, in Revision G of Specification 2A010CS028, have removed the requirement to completely fill tie holes. The problem of using taper ties and filling the holes left by removing these ties is thus cured by removing the requirements which created the problem.

Investigation Findings:

The IE inspectors reviewed Revisions G (superseded) and H (current) of Specification 2A010CS028 and observed that the requirement to solidly fill taper tie holes with dry-pack mortar is contained in paragraph 7.2.3.1 in both Revisions G and H.

The IE inspectors had no further questions on this matter.

i. Allegation 9:

The accuracy of an in-service inspection device was found to be substantially off (by as much as 1/2 inch to 2-1/2 inches).

Investigation Findings:

The IE inspectors reviewed information concerning this allegation with representatives of the Southwest Research Institute (SwRI). The allegation was apparently made by an individual who was employed under a consulting service agreement with SwRI. Part of the individual's services included the measurement and evaluation of the accuracy of devices used to position transducers used for nondestructive examination (NDE) of reactor pressure vessels.

The individual measured the vertical extension of three of the devices by means of sighting with transits at points on the device at various extension distances and determining the actual extension distances by means of calculations using trigonometric functions based on the measured angles. Comparison of the calculated data with indications taken from the readout devices of the machines indicated errors ranging from approximately 1/2 to 1-1/2 inches. The errors were smallest at minimum extension and greatest at full extension.

During discussion of the data, SwRI representatives revealed that, during the production of the raw data from which calculations were made, the angles measured by the use of the transits were rounded off to the nearest 1/2 degree. It was demonstrated that the calculated values utilizing the transit measurements fell within the limits of error produced as a result of the practice of rounding off the angles, thus, the alleged inaccuracies ranging from 1/2 to 1-1/2 inches did not necessarily represent the true accuracies of the devices.

The SwRI representatives stated that measurements made by other means indicate that maximum errors of .8 to .95 inches may occur at full extension of the devices; however, repeatability and ability to accurately measure small distances which are essential to the NDE functions are acceptable. The SwRI representatives pointed out that the positioning devices have been used successfully in numerous facilities in the United States and other countries of the world and at some facilities more than once. They stated that the apparent existing inherent positioning accuracy was not detrimental to the function of the device as other means of checking transducer positions are available.

The IE inspector determined that the positioning devices have not yet been used at the South Texas Project.

The IE inspectors had no further questions regarding this matter.

3. Exit Meeting

The IE inspectors met with licensee representatives (denoted in paragraph 1) on January 23, 1981. The IE inspectors summarized the purpose and the scope of the investigation.