

The Light company

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September 8, 1981
ST-HL-AE-722
SFN: V-0530

Mr. Karl Seyfrit
Director, Region IV
Nuclear Regulatory Commission
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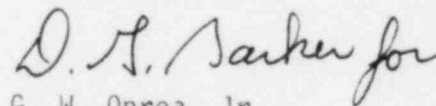
Dear Mr. Seyfrit:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Beam to Column Connection
Design in the Reactor Containment Building

On September 24, 1980, pursuant to 10CFR50.55(e) Houston Lighting & Power Company notified your office of an item concerning the Beam to Column Connection Design in the Reactor Containment Building. Our final report is attached.

If there are any questions, please contact Mr. Michael E. Powell at (713) 676-8592.

Very truly yours,



G. W. Oprea, Jr.
Executive Vice President

RRH/amj
Attachment

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Revision Date 7-28-81

FINAL REPORT CONCERNING
BEAM TO COLUMN CONNECTION
DESIGN IN THE REACTOR
CONTAINMENT BUILDING

SUMMARY

The design of the structural steel inside the Reactor Containment Building has been determined to be reportable under 10CFR50.55(e). Although a substantial safety hazard has not been identified to date, reverification of calculations and modifications will be required to assure compliance with project criteria. Concerns were first identified to your office in October, 1978 and Houston Lighting & Power Company (HL&P) committed to a reverification program. As this program progressed, problems in addition to those discussed in late 1978 were found. Thus, HL&P provided notification to your office in September, 1980 of these additional problems. As of this date, the program is in the final stages of implementation and this Final Report is being submitted. The remaining actions are:

Finalization of Specific Design Loads	November 15, 1981
Completion of Reanalysis	January 9, 1982
Completion of Redesign/Modification Effort	April 17, 1982
Completion of Redetailing	June 1, 1982
Issuance of Drawings for Construction	September 1, 1982

DESCRIPTION OF THE INCIDENT

On September 24, 1980, pursuant to 10CFR50.55(e), HL&P identified further concerns related to a previously closed item regarding the Reactor Containment Building (RCB) Structural Steel Beam to Column Connection Design.

Originally, on October 25, 1978, HL&P had notified your office of an item involving the failure of the designer to properly consider the application of certain postulated loads in the RCB Internal Structural Steel beam design for the South Texas Project (STP). Further investigation of design calculations revealed numerous examples of design errors involving the improper consideration of loads, loading combinations, allowable stresses and design inputs. Accordingly, on November 27, 1978, HL&P notified the NRC that this item was considered to be reportable.

Subsequently, in HL&P's first interim report on this item in December, 1978, a detailed description of all findings to that point was provided. For the ultimate resolution and closure of this deficiency, certain commitments were made for a plan of action, including the following:

- (1) A detailed investigation of the specific findings reported at that time,
- (2) To perform a complete reverification of all RCB structural steel calculations with correction of calculations as necessary, and to modify any members whose design was found to be inadequate.

Investigations required under Item (1) above were performed during the early part of 1979 and a final report was provided on this deficiency in June, 1979. In this activity, the affected calculations were corrected without the necessity for changes to the design itself.

Subsequently, pursuant to the commitment identified as Item (2) above, the designer has been involved in an extensive program to: (a) define and refine loads and loading conditions for the RCB Internal Structural Steel, (b) investigation of original design calculation, (c) reanalysis of substantial portions of the structures, and (d) identification of certain required design changes. During the course of this reverification, other significant design errors were identified, involving as before, the omission or misapplication of design loads. In numerous instances it has been determined that the correction of these errors would result in modification of the original design in order to ensure that design allowables will not be exceeded. Therefore, HL&P notified your office on September 24, 1980, that the reverification effort had identified design problems for the same structural steel but of a nature not previously discussed in the earlier report. Our report of October 24, 1980 provided the description of the new problems.

CORRECTIVE ACTION

The corrective action for this concern has been our commitment of a reverification program that confirms that the design of the RCB structural steel conforms to the design criteria and to correct any errors.

A special structural design team has been created and charged with the responsibility for conducting a complete review and reanalysis of the RCB Internal Structural Steel. This special review team is also charged with the responsibility of performing the modifications and the redetailing required to bring the original design into conformance with project design criteria. The reanalysis performed by this special structural design team will also be required to be design verified in accordance with project procedures.

The following paragraphs provide a discussion of the problems and actions being taken by this reverification program:

As the original calculations performed were prepared manually and did not include all design parameters, it was decided that these calculations would not be used in this reverification effort, and a complete reanalysis and design would be required. This reanalysis is being executed by using ICES (STRUDL) computer program for all steel framing inside the RCB. All vertical, axial and transverse loads are being

included in the reanalysis in order that the stability of steel framing will be ensured. The reanalysis will also ensure that adequate transfer of loads from the point of application down to the top of containment mat is being provided.

During this reverification process, it was found that previous calculations were adequate for loading in the vertical direction only. Horizontal components of forces such as Accident Thermal Loads, Seismic Loads, and Reactor Containment Fan Coolers (RCFC) Duct Design Pressure Load were not properly taken into consideration or were assumed to be negligible.

The Accident Thermal Load is a self limiting load, where the magnitude of force is reduced in direct proportion with the freedom of a member to expand. Also, this load increases in direct relation with any increase in the cross sectional area of the structural member.

The RCFC Duct Design Pressure load is applicable to a portion the floors at elevations (-) 2'-0" and 19'-0" only.

Based on the completion of a preliminary analysis, it has been determined that replacement of some existing connections by expansion joints will provide the best solution to qualify the steel framing for Accident Thermal Loads. Location of these expansion joints will be selected in such a way as to provide maximum thermal expansion without impairing the structural functionality under other design loading conditions.

Since the internal steel columns were designed initially to carry only vertical and local eccentric loads, the horizontal seismic loads will be now transferred to RCB Secondary Shield concrete walls and the concrete floors. Some connections at the interface between steel beams and concrete walls will be required to be replaced by heavier connections to allow for this load transfer and to secure the steel framing to the concrete walls. Also, some interior steel connections in the line of the load transfer will also be replaced with heavier connections.

The RCFC Duct Design Pressure Load is a result of a pressure differential between the Design Accident Pressure within the RCB and the Internal RCFC Duct Pressure. This differential pressure acts from the outside direction of the RCFC Duct towards the inside of the Duct. Thus, in order to transfer this load from its point of application to the RCB Secondary Shield concrete wall, some connections will require modification, and some beams will require additional stiffeners or cover plates. Also, additional bracing may also be required in the high pressure zones.

RECURRENCE CONTROL

As stated earlier in the report this item of concern was identified through the implementation of a revised design verification program on the South Texas Project. This design verification program was initiated as a result of a commitment made by HL&P regarding recurrence control in the first interim report issued on this item.

Details of the design verification program are contained in the Final Report on the Reportable Deficiency Concerning Beam to Column Connections for Unit 1 which was submitted in June, 1979.

SAFETY EVALUATION

Detailed calculations have not been performed to determine whether the original RCB Internal Steel framing system design, if left uncorrected would have resulted in a significant safety hazard. Rather, it is Houston Lighting & Power's intent to correct the design errors to ensure that the final design configuration is in conformance with project criteria.