Houston
Lighting
& Power
Company

Electric Tower
P.O. Box 1700
Houston, Texas 77001

June 15, 1979
ST-HL-AE-351
SFN: V-0100

Director, Region IV
Office of Inspection and Enforcement
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76102

Dear Sir:

South Texas Project
Units 1 & 2
Docket Nos. STN 50-498, STN 50-499
Interim Report on the Essential
Cooling Water Intake Structure
Gantry Crane

On May 16, 1979, pursuant to 10 CFR 50.55(e) Houston Lighting and Power reported to your office the failure to properly include the effects of tornado wind loadings on the essential cooling water gantry crane. This report provides an interim report as required by 10 CFR 50.55(e)(3) on the status of the deficiency.

A final report will be issued to your office on or about October 15, 1979.

Very truly yours,

D R Baker for

E. A. Turner
Vice President
Power Plant Construction
& Technical Services

LRJ:bf
Attachment
cc: Director, NRC Office of Inspection & Enforcement
C. Thrash (Baker & Botts)
R. Gordon Gooch (Baker & Botts)
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INTERIM REPORT

ECW GANTRY CRANE DESIGN DEFICIENCY

I. SUMMARY

The STP FSAR identifies the Essential Cooling Water Gantry Crane as a Seismic Category I structure. The STPEGS FSAR also requires that Category I structures be designed to withstand the effects of a design basis tornado. Contrary to these commitments, the ECW Gantry Crane which was purchased for the STPEGS was not fully designed to withstand the effects of a design basis tornado. This crane has been manufactured and delivered to the Site.

The cause of this deficiency was a breakdown of the design change control program. This crane was designated as being non-safety related and , as a result, neither the design nor changes thereto were subjected to the design verification process.

Houston Lighting & Power is evaluating several options for correcting this deficiency. Concerning recurrence control, Engineering procedures have been revised to place the design of all non-safety related Category I structures under the formal design verification program. This change has been identified as being retroactive.

The safety significance of this deficiency is that the crane could fail under the design basis tornado loading falling upon ECW Intake Structure, which houses the Essential Cooling Pumps.

II. DESCRIPTION OF THE INCIDENT

A. Component Description

The ECW Gantry Crane is designed to service the ECW intake structure. Its main function is to assist in the performance of maintenance on the equipment in each cubicle within the structure such as lifting pumps, motors, strainers, piping, and if necessary the entire traveling water screen, as well as the trash containers at the ends of the structure. The crane is designed with the following characteristics:

a.	Capacity of crane/hoist	20 tons
b.	Crane span	65 ft.
c.	Total span = span + cantilever span	98'-3"
d.	Maximum lift of hoist	76'
e.	Length of runway	136'
f.	Maximum full load speed of hoist	20'/min
g.	Speed of trolley	75'/min
h.	Speed of bridge	100'/min

i. Maximum pass through width of Gantry legs on the cantilever end of crane 13'

j. Maximum pass through height of Gantry legs on the cantilever end of crane 49'

Bridge, sills and gantry legs are constructed from A36 welded box girders. Full depth diaphragms are used when possible. The crane is designed in accordance with CMAA specification 70.

The crane is a non-safety class component. Its location (on top of the ECW intake structure) requires it to meet the seismic category I requirement. The fact that the ECW crane will operate above safety equipment (ECW valves & pumps, etc.) also places the crane under certain operating limitations.

The crane will not carry a component over any other ECW cubicle at any time. This means that each lift operation will have to be conducted within each ECW cubicle or between the cubicle and the outside laydown area. Also, the crane is not operated during high wind (30 mph or above) conditions. An alarm will sound when 30 mph wind is detected by the anemometer which is located top side of the gantry crane.

B. Source and Extent of the Deficiency

FSAR Table 3.2.A-1 identifies the ECW Gantry Crane as a category I structure and Section 3.3.2.1 of the FSAR requires Category I structures to be designed to withstand the effects of a design basis tornado. Sections 9.2.1.2.2.3 and 3.5.1.1.3 state that the crane will not fail so as to create gravitational missiles. The design basis tornado loadings on the crane are 360 mph.

Contrary to the above requirements, the specification for this crane failed to properly specify the correct loadings. The following sequence of events led up to this situation.

- The original design of the plant did not include the ECW Gantry Crane. The crane was added at a later date at the request of Houston Lighting & Power Co.

- The original bid specification did not contain any requirements for tornado loadings. The following wind loadings were included:

  - Section 3.4.1. Under clamping and storage locks, a maximum wind load of 120 mph was specified.

  - Section 3.4.2.1 stated a wind pressure of 400 psf shall be used. This is comparable to a wind velocity of 347 mph. The inquiry specification was then ammended to require a wind pressure of 40 psf, which is equivalent to a wind velocity of 110 mph.

- During the design review process, it was discovered that the tornado loads were missing from the specification.

- Each potential supplier was contacted via telephone and informed that the requirement for tornado loadings was to be added. Kranco Inc. of Houston, Texas stated verbally that the additional requirement would pose no problem.

- Following the award to Kranco, the specification was revised to include the tornado loading. Inadvertently, the tornado loadings were not stated in the main body of the specification but were only listed in the attachment concerning seismic loadings. The wind loadings for the locks and clamps were revised to 400 psf.

- Approximately two months after the purchase order for the specification was issued, Kranco, Inc. sent a letter to B&R stating that the crane could not be designed to the 360 mph wind loading requirement even though the locks and clamps could accomodate the 347 mph (400 psf) loadings. B&R failed to respond to the letter. Kranco repeated this exception during a meeting between Kranco and B&R a short time later. Again, Kranco's exception received no response. The lock and clamp wind loading in the specification was later revised to 40 psf.

- The ECW Intake structure (upon which the crane rests) is designed to include the moments and reactions for tornado loadings on the crane when the crane is parked over the cross walls.

- The crane has been designed, fabricated, and shipped to the STPEGS Site.

- During the verification review of the structural design calculation (which was prepared by Kranco), the Structural Discipline of B&R Engineering discovered that the tornado loadings were not included.

- The deficiency was reported to the NRC Region IV office on May 16, 1979 by HL&P Quality Assurance.

In summary, the cause of the deficiency was the ambiguity of the specification combined with the failure of the B&R Responsible Engineer to follow-up on the Kranco exception. The Engineering procedures were deficient because they did not provide proper means for detecting and correcting this deficiency, as explained below.

III. CORRECTIVE ACTION

A. Immediate Actions

B&R Engineering has a system for reporting and resolving design deficiencies and procedural violations. These are titled

Engineering Design Deficiencies (EDDs) and are processed on a specific form for that purpose. For this incident, two such reports were issued. EDD 79-24 was issued to the Mechanical Discipline of B&R Engineering (who is responsible for the design and who reported the deficiency). This EDD was issued against the design and is still open pending the decision on how the deficiency will be corrected. EDD 79-25 was issued against Project Quality Engineering because the Engineering procedures failed to contain proper controls to preclude such an incident. This EDD is closed, as will be described below.

B. Design Correction

The four following options are being considered:

- Delete the permanent crane. Maintenance could then be performed with a mobile crane that can be moved away from safety-related structures, systems, or components when not in use or during adverse weather conditions.

- Extend the parking rails so that the crane could be moved sufficiently far from the ECW Intake Structure that its postulated failure could not compromise safety.

- Provide guy wires so that the postulated tornado wind induced loads could be transferred to the ground.

- Make such structural modifications that the postulated failure of the crane under design basis tornado loading conditions would be sufficiently controlled so as to preclude any safety hazard.

A schedule for the completion of the design change cannot be projected until a satisfactory solution is chosen. The target date for selection of the design option is July 15, 1979.

C. Actions to Preclude Recurrance

Under the B&R Engineering design control system, formal design verification is required for those structures, systems, and components whose function is safety related, i.e., as described in Regulatory Guide 1.26 and 1.29. The design verification program meets or exceeds the requirements of ANSI N45.2.11. This program did have one weakness, however, which allowed this deficiency to occur. Formal design verification failed to include those structures, systems, or components that did not perform any safety function but whose failure under design basis seismic or tornado loading conditions could cause the failure of safety related systems. The Engineering Procedure on design verification (STP-DC-015) was revised to correct this deficiency. The provisions of this revision have been made retroactive.

IV. SAFETY ANALYSIS

A limited analysis was conducted since there will be a design correction made. The following is a summary of this analysis.

The following assumptions were made during this analysis:

- Maximum tornado wind loading will occur normal to the longitudinal axis of the crane.
- Sufficient warning of adverse meteorological conditions will be provided to move the crane to its parked position.
- The tornado can occur concurrently with a postulated single failure.
- The tornado loadings will not occur at the same time as a seismic event.

Under the postulated tornado loading, the bending moment in the legs of the crane will exceed the design resisting moment and bending will occur. Neither the locks and clamps nor the ECW Intake Structure supports will fail since their design margin is adequate. When bending occurs, it was assumed that the ultimate strength of the A-36 material will be exceeded and the crane girder will become a gravitational missile. Since the roof of the ECW Intake Structure was not designed to withstand such an impact, the roof must be assumed to fail.