Attachment 1

June 22, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. 50-445 and
TEXAS UTILITIES ELECTRIC COMPANY, et al.	)	50-446
	)	
	)	(Application for
(Comanche Peak Steam Electric Station, Units 1 and 2)	)	Operating Licenses)
	)	

AFFIDAVIT OF R.C. IOTTI AND J.C. FINNERAN, JR.
REGARDING DIFFERENTIAL DISPLACEMENT
OF LARGE FRAME PIPE SUPPORTS

We, John C. Finneran, Jr., and Robert C. Iotti, being first duly sworn hereby depose and state, as follows[1]:

(Finneran) I am the Pipe Support Engineer for the Pipe Support Engineering Group at Comanche Peak Steam Electric Station. In this position, I oversee the design work of all pipe support design organizations for Comanche Peak. I have previously provided testimony in this proceeding. A statement of my professional and educational qualifications was received into evidence as Applicants' Exhibit 142B.

(Iotti) I am the Chief Engineer, Applied Physics for Ebasco Services, Inc. I have been retained by Texas Utilities

[1] Except as otherwise indicated, each Affiant attests to all parts of this affidavit.

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Electric Company to oversee the assessment of allegations regarding the design of piping and supports at Comanche Peak Steam Electric Station. A statement of my educational and professional qualifications is attached to Applicants' letter of May 16, 1984, to the Licensing Board.

Q. What is the purpose of this affidavit?

A. This affidavit addresses the Licensing Board's questions regarding "Differential Seismic Displacement" set forth in the Board's February 8, 1984, Memorandum and Order at p. 30, i.e., "how it came about that PSE violated its own design guidelines [regarding design of wall-to-wall or floor-to-ceiling pipe supports], how this event came to be reflected in its design quality assurance system, and whether this problem was resolved promptly . . . ." In addition, this affidavit addresses CASE's recommendation regarding this issue (set forth in its Proposed Findings at p. VI-14) that Applicants should be required to reanalyze all wall-to-slab (floor or ceiling) pipe supports as it had done for wall-to-wall and floor-to-ceiling pipe supports. Finally, this Affidavit provides a report to the Board on all floor-to-ceiling and wall-to-wall pipe supports. Applicants' Plan to Respond to Memorandum and Order (Quality Assurance for Design) at p. 7 (February 3, 1984).

Q. Are you familiar with CASE's allegations regarding the adequacy of floor-to-ceiling and wall-to-wall pipe supports?

A. Yes. As set forth in the Board's Memorandum and Order of December 28, 1983 at pp. 57-58, CASE has alleged that there should be slip-joints in all large frame supports which span from wall-to-wall or floor-to-ceiling. PSE guidelines provided general guidance to this effect. Memorandum and Order of December 28, 1983 at pp. 57-8 In CASE Exhibit 669B at pp. 7c and d, CASE had identified two supports on the service water system that were designed inconsistent with these guidelines. Id.

Q. Discuss the background and disposition of these large frame supports on the service water system identified by CASE.

A. As indicated in Applicants' Exhibit 142 at p. 25, prior to this issue being raised by the NRC or CASE, in late 1981 Applicants identified large-frame, floor-to-ceiling supports designed by PSE as being inconsistent with PSE guidelines. (The PSE guidelines state that such large-frame supports should have slip-joints; the purpose was to negate the need to consider differential seismic displacement for such supports between floor and ceiling or between walls.) Actually, there were four identical PSE supports in the service water yard tunnel which extended from floor-to-ceiling without slip-joints, thus falling outside these guidelines. It should be noted that there were not necessarily any design deficiencies with these supports, they just didn't follow PSE guidelines. The supports were very

conservatively designed, and it was believed that they were adequate.

In the process of awaiting completion of construction of structures associated with the four supports, and obtaining as-built loads by which to fully assess the adequacy of the designs, the NRC Special Investigation Team ("SIT") inquired about the adequacy of these supports. While Applicants believed that a detailed analysis of the supports would demonstrate their adequacy, calculations reflected that the floor-to-ceiling columns could simply be cut off and the supports would still be adequate. This was by far the easier course of action. Accordingly, Applicants cut the columns in half to eliminate any suspected problems of a support extending from floor-to-ceiling.

Q. Did Applicants perform any analyses of the original designs to demonstrate adequacy?

A. Yes. After this issue was raised in this case, to demonstrate the adequacy of the initial designs, Applicants determined the seismic differential displacement between the floor and ceiling in the location of the supports and analyzed the columns for the combined design load and differential seismic displacement load. The differential seismic displacement between the floor and the ceiling in this area is .006 inches (less than the thickness of two sheets of paper). Using the computer code STRUDL, one of the four identical supports was analyzed for the combined effect of

pipe loads and the full seismic differential support motion of the floor and ceiling. This is, of course, conservative since the .006 inches is the displacement that would occur with no column. The presence of the column assures that the actual displacement would be less. Moreover, the computer code itself models the configurations in an extremely conservative manner. For example, the computer code ideally assumes that (1) all members are hard and fast at all support points with no connection flexibility, and (2) all joints modeled as rigid connections remain rigid without any rotation at all. In the real world, neither of these two assumptions are true, and accordingly, a differential displacement of .006 inches (that is limited and would never exceed .006 inches) would never be a matter of concern for any support. In any event, the resulting stresses in the support based on the computer run were within the code allowable values.

In conclusion, the analysis demonstrates that the supports were capable of supporting the original piping loads as well as differential seismic displacement loads between the floor and ceiling.

Q. Have you conducted a review to determine if there are other floor-to-ceiling or wall-to-wall supports in the plant?

A. Yes. Applicants have reviewed all Unit 1 and common safety related piping supports and determined that there are 26 supports spanning from wall-to-wall or floor-to-ceiling. Of

these 26 supports, 7 have slip-joints, 4 have small spans and negligible movements and are not considered large-framed supports, and the remaining 15 have been evaluated and are acceptable considering the potential for differential seismic displacement. (A listing of these supports is contained in Attachment 1). Significantly, none of these remaining 15 supports were designed by PSE, and they were designed prior to transmittal of the PSE guideline regarding this issue to the other design organizations. Accordingly, the PSE guideline was not applicable to these initial design efforts.

Q. Please answer the Board's first question, "how it came about that PSE violated its own design guidelines." (Memorandum and Order of February 8, 1984, at p. 30.)

A. It must be remembered that the PSE guideline regarding floor-to-ceiling and wall-to-wall supports was not a code or procedural requirement, but rather guidance for the designer. Indeed, this guideline was not initially applicable to the other two design groups (ITT and NPSI). However, as indicated above, their supports were adequately designed for all loads including differential seismic displacements. While we cannot be certain why the designer and reviewer did not follow the guideline for these four PSE supports (these individuals are no longer employed at CPSES), as previously demonstrated the designs were appropriately conservative and, even if unchanged would have been acceptable.

Q. Please answer the Board's second question, "how did this event [come] to be reflected in the design quality assurance system?" Id.

A. The failure to follow the PSE guideline for these four supports did not require the generation of any QC non-conformance documentation. If the supports had not been adequately designed in the first instance, appropriate corrective action would have been required in accordance with site procedures. Of course, because there was a design change of the supports, appropriate design change documentation was generated.

Q. Please answer the Board's third question, "whether this problem received prompt attention." Id.

A. Yes, the problem received prompt attention. In 1981 the four non-complying supports were identified. As previously stated, it was believed that the designs, although not in strict compliance with the PSE guideline, were adequate. Accordingly, Applicants chose to wait until construction associated with all four of the supports and all piping had been completed to determine the precise as-built loads to assure the adequacy of the designs. In the interim, the SIT raised the issue and the decision was made to modify the supports as opposed to going through a detailed and, because of timing, a premature design analysis. That prompt attention to this problem was taken is evidenced by the fact that only these four supports were in violation of the guideline.

In sum, Applicants did promptly respond to the problem when it was identified.

Subsequently, the SIT recommended that the guideline regarding this issue be made applicable to ITT and NPSI. While Applicants did not believe it was necessary, Applicants promptly complied with the request. As previously noted, analysis of similar supports designed by ITT and NPSI reflect that such supports were adequate including consideration of differential seismic displacement.

Q. CASE has recommended that Applicants analyze all wall-to-slab (floor or ceiling) supports in the plant which do not contain slip joints. Are stresses on these supports resulting from seismic differential displacement significant?

A. No. The seismic deflection that could occur on wall-to-slab supports consists of vertical deflection of the slab and horizontal deflection of the wall. In that such supports are near the juncture of the slab and wall, the actual deflection realized at the support would be minimal and less than the maximum deflection realized toward the middle of the wall or slab. To determine if differential seismic deflection appeared to be a problem with such supports, we analyzed three representative supports using the STRUDL code (discussed above) (i.e., support numbers CC-1-070-002-A33R, CS-X-004-004-A33R and SW-1-132-703-Y33R). The differential seismic displacement for the three supports ranged from .00035 to .0045 inches, less than the seismic deflection

analyzed above regarding floor-to-ceiling supports. As with those other supports, displacements of this range would never be a matter of concern for any support. In any event, the results of the analysis (even with its substantial conservatisms noted above) reflected that stresses for all members from pipe loads and differential seismic motion are below allowables.

Robert C. Iotti

John C. Finneran, Jr.

Subscribed and sworn to before me this 22 day of June, 1984.

Notary Public

My Commission Expires May 31, 1987

ATTACHMENT 1

SUMMARY OF WALL TO WALL OR FLOOR TO CEILING SUPPORTS

		Support Number	Remarks
PSE	1.	AF1-099-712-S33R	Support designed with slip joints
	2.	CC1-028-720-S33R	Support designed with slip joints
	3.	CC1-028-721-S33R	Support designed with slip joints
	4.	FW1-017-714-C52R	Support designed with slip joints
	5.	BRX-057-705-A53R	Small span (4') and negligible seismic motions
	6.	BRX-057-706-A53R	Same remark as #5.
	7.	H-BRX-AB-064-006-3	Small span (3') and negligible seismic motion
	8.	SW1-129-736-A43R	Small span (4'-3") and negligible seismic motion
ITT	9.	CC1-009-016-A43A	Analysis including differential seismic motion show all stresses below allowable
	10.	CC1-057-011-A33R	Support designed with slip joint
	11.	CC2-019-003-A33R	Analysis including differential seismic motion show all stresses below allowable
	12.	CS1-018-001-S52R	Analysis including differential seismic motion show all stresses below allowable
	13.	CS1-018-002-S52R	Support designed with slip joints
	14.	CS1-018-004-S52R	Analysis including differential seismic motion show all stresses below allowable
	15.	CS1-018-009-S52R	Analysis including differential seismic motion show all stresses below allowable
	16.	CT1-025-004-S22K	Support designed with slip joint
	17.	SW1-011-016-F33R	Support has already been assessed for differential seismic motion and is acceptable
	18.	SW1-011-017-F33R	Same as #17
	19.	SW1-011-018-F33R	Same as #17
	20.	SW1-011-019-F33R	Same as #17
	21.	SW1-011-020-F33R	Same as #17
	22.	SW1-011-021-F33R	Same as #17
	23.	SW1-011-022-F33R	Same as #17
	24.	SW1-011-029-F33R	Same as #17
	25.	SW1-173-063-S42K	Attached with flexible angle clips and negligible differential seismic motions
NPSI	26.	FW1-097-018-C62R	Analysis including differential seismic motion show all stresses below allowable