May 16, 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 OL
	)	
	)	(Application for
(Comanche Peak Steam Electric Station, Units 1 and 2)	)	Operating Licenses)
	)	

APPLICANT'S MOTION FOR SUMMARY DISPOSITON REGARDING CONSIDERATION OF FRICTION FORCES IN THE DESIGN OF PIPE SUPPORTS WITH SMALL THERMAL MOVEMENTS

Pursuant to 10 C.F.R. § 2.749, Texas Utilities Electric Company ("Applicants") hereby move the Atomic Safety and Licensing Board for summary disposition of the Citizens Association for Sound Energy's ("CASE") allegations regarding the consideration of friction forces in the design of pipe supports with small thermal movements. As demonstrated in the accompanying affidavit and statement of material facts, there is no genuine issue of fact to be heard regarding these issues. Applicants urge the Board to so find, and to conclude that Applicants are entitled to a favorable decision as a matter of law, and to dismiss the issue from the proceeding.

I. BACKGROUND

In a deposition (later admitted as testimony) taken in August, 1982, CASE witness Jack Doyle alleged that Applicants' pipe support designers had not properly considered the effects of friction on a particular support (CASE Exhibit 669, pages 219-221; Tr. 3850-52). In response to this allegation, Applicants testified that the support had been identified in the normal course of the design review process as requiring modification due to out-of-plane friction. However, when revised piping analyses were generated, it was determined that the support was no longer subject to out of plane movement which would warrant consideration of friction. (Applicants' Exhibit 142F, at 9.)

In reviewing Mr. Doyle's allegation, the NRC SIT noted that two of Applicants' pipe support design organizations (PSE and ITT-Grinnell) only required consideration of friction forces if piping thermal movements were greater than 1/16". The SIT concluded that the friction design parameters employed by Applicants' pipe support design organizations, including the 1/16" criterion, were acceptable. (NRC Exhibit 207 at 43-44.)

CASE argued in its Proposed Findings that failure to consider friction loads, even when the piping thermal growth was less than 1/16" was improper. (CASE Proposed Findings, Section XVI). Applicants addressed these allegations in their Proposed Findings (August 5, 1983), at 61-63, and in their Reply to CASE's Proposed Findings (September 6, 1983), at 40-41. The Board did not address this matter in its December 28, 1983, Memorandum and

Order (Quality Assurance for Design). Nevertheless, to assure the record is adequate on this subject, Applicants have reevaluated numerous supports, including those specifically alleged by CASE to require consideration of friction loads. Accordingly, Applicants provided with this motion the results of their reanalysis and seek summary disposition of this matter.

II. APPLICANTS' MOTION FOR SUMMARY DISPOSITON

A. General

Applicants have previously discussed the legal requirements applicable to motions for summary disposition in their "Motion for Summary Disposition of Certain CASE Allegations Regarding AWS and ASME Code Provisions Related to Welding," filed April 25, 1984, at 5-8. Accordingly, we incorporate that discussion herein by reference.

B. CASE's Allegations Regarding Applicants' Consideration of Friction Forces in the Design of Pipe Supports With Small Thermal Movements Should Be Summarily Dismissed

Two of the three support design organizations (PSE and ITT-Grinnell) do not require consideration of friction loads in pipe supports for which piping thermal movements are less than 1/16". All three organizations consider friction loads where piping movements are greater than 1/16". CASE alleges in Chapter XVI of its Proposed Findings that friction forces must be calculated for all piping movements. CASE argues that the point at which friction forces may be most significant is at the point movement of the pipe begins (CASE Proposed Findings at XVI-4).

At the request of the Board, Mr. Doyle performed a simple analysis during the May, 1983, hearings to illustrate his position (CASE Exhibit 843; following Tr. 6824). In that exhibit, Mr. Doyle addresses the support configuration he believed would have the most dramatic effects, i.e., a relatively short, stiff cantilever beam (Tr. 6759). Mr. Doyle concluded that to apply the procedure he thought should be applied would result in a "gross conservatism" and the condition his calculation indicated would result "could not exist" (CASE Exhibit 843 at 1).

As Mr. Doyle apparently recognized (Tr. 6757, 6759; CASE Exhibit 843 at 1), the true friction load for movements less than 1/16" would be the lesser of:

1. The normal load on the support times the coefficient of friction, or
2. The amount of force needed to deflect the support a distance equal to the thermal movement.

The procedure Mr. Doyle applied in CASE Exhibit 843 was the latter. He also noted that if one were to employ the first method to achieve loads equivalent to those first calculated, a 10,000 pound normal load would have to be placed on the beam from the pipe with a resulting stress of 60,000 psi. Because a 10,000 pound normal load could not be placed on the beam from the pipe (the actual normal load would be on the order of 1,000 pounds), Mr. Doyle recognized that his simple calculation resulted in "outlandish" numbers. In fact, Mr. Doyle eventually concluded

that his concern "really doesn't exist, except on a theoretical level" (Tr. 6825) and "dwindles into insignificance" (Tr. 6829.) (Finneran Affidavit at 2-3.)

In his calculations Mr. Doyle first assumed that the cantilever beam would deflect the full 1/16". He then calculated the friction force needed to cause this deflection in the beam. Obviously, this would give the maximum stress in the beam if the friction between the pipe and the beam were maintained through the entire 1/16" movement. However, this calculation has no relation to the physical phenomena present when friction is used to transmit a force. As Mr. Doyle recognized, for the friction to be maintained between the support beam and the pipe in order to transmit the load calculated for the full 1/16" movement, an extraordinary normal force would have to be placed on the beam by the pipe. In reality, a significantly smaller normal force would exist such that the maximum friction force which could be transmitted into the beam by the movement of the pipe before the friction was broken (and the friction force instantly reduced) would be much less than he had calculated. (Finneran Affidavit at 3-4.)

After recognizing this calculational technique was not an accurate representation of actual conditions, Mr. Doyle concluded that a more rational approach would be to establish some guideline based on stress ratios for (actual/allowable loads) normal and upset conditions such that if the ratio were, for example .900, then friction should be included in the calculation

(CASE Exhibit 843 at 2). It is not necessary, however, to adopt Mr. Doyle's recommendation. What Mr. Doyle apparently did not recognize is that the allowables Applicants use for normal and upset conditions are the stress limits established by the ASME Code for primary, mechanical loads. If friction conditions resulting from the thermal growth of the pipe, i.e., effects which result from the restraint of free-end displacements, were to be combined with those mechanical loads, the ASME Code permits the allowables to be increased by a factor of three (ASME Code Section NF-3231.1). Thus, given that the friction loads are a small contribution to the total support loads, as Mr. Doyle acknowledges there would not be any condition where inclusion of those loads would exceed the allowable actually permitted, even if the stress ratios using Applicants' allowables were 1.0 before consideration of the friction loads. In addition, because Applicants use a factor of safety of 5:1 (rather than the 4:1 value authorized by I&E Bulletin 79-02) when establishing its Hilti bolt allowables, the effects of friction for these small movements would not cause the actual allowables of the Hilti's to be exceeded even if they were loaded up to the conservative allowables employed by Applicants. (Finneran Affidavit at 4-5.)

In order to provide added assurance of the adequacy of Applicants' design process in this regard, Applicants assessed a sample of actual supports in the field which are within the category of supports with which Mr. Doyle had his principal concern, namely short, stiff cantilever beams with relatively

large pipes. Applicants first examined support SW-1-012-009-A33R, which is referenced on page XVI-1 of CASE's Proposed Findings, and was discussed in Section 16 of CASE Exhibit 669B. The analysis of this support demonstrates that even including the friction load for this support in the normal and upset loading condition, in the manner used by Mr. Doyle (Section 16 of CASE Exhibit 669B), results in maximum member stresses, weld stresses, plate stresses, and Hilti interactions that are all within applicable allowables. (Finneran Affidavit of 5-6.)

In addition, Applicants randomly selected 5 other supports which fall into the area of Mr. Doyle's concern, and which all have a thermal movement less than 1/16". These supports were analyzed by including the appropriate friction forces in the level A and B loading conditions. (See Table 1 (attached to Finneran Affidavit).) All stresses were determined to be well within the allowables. It should be noted that Applicants used the established normal and upset allowables and they did not increase the allowable as permitted by the Code. In addition, all Hilti bolt interactions are less than 1. (Finneran Affidavit at 6.)

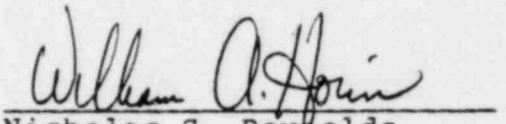
In sum, these analyses demonstrate that the friction effects of concern to Mr. Doyle are indeed insignificant and Applicants' support designs provide more than adequate capacities to accommodate these effects even if grossly conservative

assumptions are employed. As Mr. Doyle stated, this concern truly "dwindles into insignificance." (Finneran Affidavit at 6-7.)

III. CONCLUSION

For the reasons set forth above, Applicants request that the Board grant Applicants' Motion for Summary Disposition.

Respectfully submitted,



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