UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

TEXAS UTILITIES GENERATING COMPANY, et al.

(Comanche Peak Steam Electric Station Station, Units 1 and 2)

Docket Nos. 50-445-1 and 50-446-1

CASE'S ANSWER TO APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING CONSIDERATION OF FRICTION LOADS

in the form of

AFFIDAVIT OF CASE WITNESS MARK WALSH

Q: Mr. Walsh, is there information contained in Applicants' 9/19/84 Reply to CASE's Answer to Applicants' Motion for Summary Disposition Regarding Consideration of Friction Forces to which you believe you must respond in order to make the record complete?

A: Yes, there is, including Applicants' use of new calculations not provided previously.

First, referring to Applicants' Affidavit attached to their Reply, at page 3 in their discussion regarding their sixth statement of material facts, the Applicants are again misinterpretting the code for their own purposes. On the bottom of page 3 of the Affidavit, they discuss ". . . mechanical loading combinations (not including friction) . . ." What the Applicants are presently doing is taking loads that are from outside the structure itself (i.e., the loads from the pipe) and comparing the

allowables to loads induced within the structure itself (i.e., constraint of free-end displacement). The thermal load from the pipe normal to the support is considered a mechanical load. If this pipe moves due to thermal growth, and creates a friction force, this would still be a mechanical load and not subject to the allowable increase due to self-constraint of a structure. Therefore, Applicants' statement that "If friction effects are included, those loading combinations may utilize the increased allowable" is incorrect, and the allowables which the Applicants have utilized throughout their Affidavit are in error.

On page 13 of CASE's Answer to Applicants' Statement of Material Facts As To Which There Is No Genuine Issue Regarding Consideration of Friction Forces in the Design of Pipe Supports With Small thermal Movements (Affidavit attached to CASE's 8/6/84 Answer to Applicants' Motion for Summary Disposition), we discuss the allowable increase permitted by Regulatory Guide 1.124. The purpose of this discussion was to show the Board that the Applicants neglect utilizing the Regulatory Guide. Although we may not have made it clear in our previous answer, it was not meant to be construed as, and should not have been considered to be, the required method in determining the allowables due to friction, since, in fact, no increase should be allowed for friction. It was just to indicate that, had any increase been allowed, the Applicants should have used (but did not) the requirements of this Regulatory Guide and erroneously (in this instance) rely only on the stress increases permitted in NF.

It should also be noted that Applicants state, at the bottom of page 3:

> "If friction effects are included, those loading combinations may utilize the increased allowable. /1/ . . .

"/1/ As I previously noted, Applicants' standard practice is not to take advantage of this increase in allowables, even when friction is included." (Emphases added.)

As we have previously found in other Motions for Summary Disposition, the Applicants' "standard practice" does not always apply to highly stressed supports where it would be most critical (for example, as discussed in CASE's Answer on A500 Steel, where the Applicants claimed that they utilize as a standard practice level B allowables with level C loads, yet the calculation package indicated that they used level C allowables with level C loads in the instance at which I looked).

On page 4 of their Affidavit, in their discussion regarding their sixth statement of material facts, Applicants claim they are using a conservative calculation technique in evaluating a weld; that is, treating the compression force as a tension load. This is not a conservative calculation technique, but a required technique, and will be discussed further later in this pleading. Consequently, their conclusion at the top of page 5 of the Affidavit is in error.

On pages 6 and 7, the Applicants claim that the hypothetical model used in our Affidavit would not put tension in bolt A. The Applicants are correct to the extent that this was a poor model. However, if the pipe were located 12" from the base plate or the bolts were more closely spaced, the net effect in bolt A would be tension by summing the moments. Therefore, CASE's assertions would be correct with this modification to the model. In addition, the bolts in the original hypothetical model would be receiving a shear load due to this friction, and this aspect was not included in our previous discussions, and the Applicants have neglected to consider it also.

On page 7, the Applicants agree that there was an error in their calculation and that this would increase the moment by 37%. They also state that not "all" values would be increased by 37%. They are correct to the extent that all values will not be increased, but all stresses due to the moment My will be increased by 37%. The Applicants attempt to justify this error by recalculating the force on the weld, as shown on top of page 8 of their Affidavit. The fourth item of the equation is preceded by a negative sign and appears to be cubed (however, it actually was not cubed, based on the answer arrived at). The original calculation did not contain a negative sign, as shown on the 5/10/84 calculation (the first page 2 of 6 -- there are two) page 3 of 6 of Attachment A to Applicants' Affidavit, line 12, equation for Fn. The original calculation was correct in regards to the sign designation of +. The equation which Applicants are now using to justify their error is incorrect. It should be:

13/835/5.17 x 1.37 + 1.010/16/88 + 4.768/12.63 = 4.1 kips/inch

Thus, the new force in the weld, due to bending and the axial load in the attaching member, is actually 4.1 kips/inch. This value by itself exceeds the allowable of 3.431 kips/inch.

The capacity of the weld actually must be based on a shear stress between the weld and the base metal. This is a requirement of the AISC code, 7th Edition, Supplement No. 3, as indicated in Table 1.5.3. (to which Applicants are committed), as indicated under "Fillet Welds." (See Attachment A hereto.) The load is transferred through shear from the base metal to the weld, and therefore, all the normal forces, designated as Fn on line 12 of the calculation, must be additive. This additive effect need not be in the code (although it is), but based on engineering judgement, it

would have to be additive. As shown in Figure 1 below, there is a gap between the base metal and the attaching member. This gap is normally found in the field and is acceptable up to 1/16"; i.e., there will be no nonconforming conditions if a 1/16" fit-up gap is inspected prior to welding. Since the force from the attaching member must pass the load by shear through the weld (designated by F in the diagram below), it is easily seen that whether the load is axial compression or tension is of no importance in this regard.

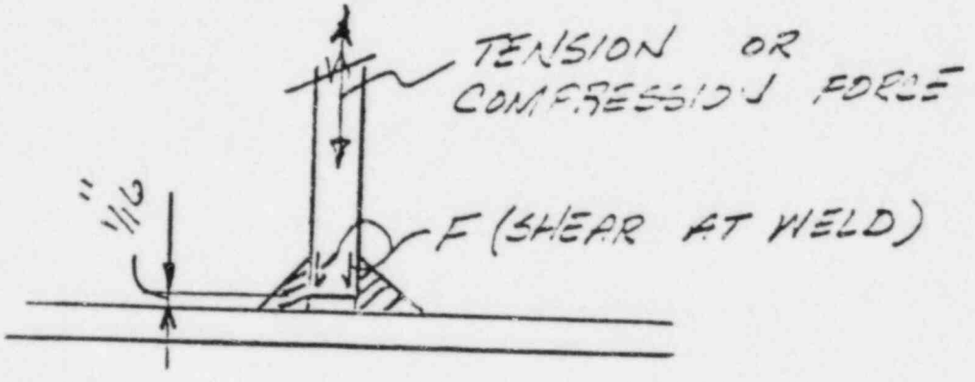

FIGURE 1

This appears to be a generic (to Comanche Peak) error used by the Applicants to qualify a deficient design. In previous Motions for Summary Disposition, the Applicants have stated many times that their reevaluations, when they include items not considered before (for example, actual stiffnesses), indicate that there are very few overstressed supports. CASE has requested to see the calculations but in many instances they are not supplied because, we are told, the original calculations do not exist, and

we do not receive all of the present calculations. In almost all instances, the calculations received were prepared expressly for Applicants' Motions for Summary Disposition or in response to our discovery requests. Therefore, I do not know to what extent this deficiency exists at Comanche Peak.

It should be noted that it was Applicants, not CASE, who chose this particular issue as one to be included in Applicants' Plan. The issues chosen by Applicants are not necessarily those Mr. Doyle or I would have chosen as being the most important. I believe that Applicants chose this one, at least in part, because they thought it would be ar easy one for them to prevail on. To the contrary, in addition to Applicants' having been shown to be in error for the design of friction loads, they have (by their own statements and calculations) have now identified a new design deficiency.

This particular calculation which was discussed in our Affidavit did not consider all loading combinations and was not a review of all calculations. For example, a review of the calculaton on the second sheet 2 of 6 (dated 5/15/84) of Attachment A to Applicants' original Affidavit will reveal additional problems in this weld. On line 12, the normal force is calculated to be 4.315 kips/inch. This definitely exceeds the allowable of 3.431, but the Applicants, in this calculation, do not consider that comparison. On line 26, the Applicants consider only bending without any Fx = 12.018 kips, and arrive at Fn = 3.363 kips/inch. Using the Applicants' method shown on page 8 of their Affidavit (which is not a correct method) of justifying a weld, we shall use these values on line 26 and show that the weld still exceeds the allowables, even using Applicants' erroneous method:

$Fn = 15.438/5.17 \times 1.37 + 6.377/16.88 - 12.018/12.63 = 3.517$ kips/inch

The resultant force is then:

$$Fr = [3.517^2 + .137^2 + .1635^2]^{1/2} = 3.523 \text{ kips/inch}$$

This exceeds the allowable of 3.431 used in the original calculation. Thus, CASE's assertion that e stress ratio exceeds i is still valid, even using Applicants' erroneous method. This is another instance where the Applicants have made an error, by not looking at the worst loading condition for the weld.

On the bottom of page 8, continuing on top of page 9 of Applicants' Affidavit, the Applicants clarify the dimensional problem with the support (SW-1-012-009-A33R), and they state: "The tube steel is installed with a 1/16" clearance as indicated on the drawing." (Emphasis in the original.) But during the 6/6/84 conference call between Applicants/Staff/CASE, I requested the latest drawing and calculations, but the Applicants stated that the support no longer exists (see Tr. pages 46-51 of 6/6/84 conference call transcript). If the support actually no longer exists, Applicants' current Affidavit is incorrect. If the support does exist, Applicants' representations to CASE in the 6/6/84 conference call were incorrect, and we should have been provided with the latest drawing and calculations as I requested.

Page 9 of Affidavit, Applicants state that "It should be noted in any event that CASE's position is premised on Regulatory Guide 1.124, which applies to class 1 supports. The subject support is a class 3 support." Applicants fail to mention what criteria they must apply regarding class 3 supports.

Applicants state in footnote 4, bottom of page 9, that:

> "Contrary to CASE's claim (Affidavit at 13) Applicants are not 'committed' to any edition of the AISC Code for weld design. Applicants' requirements for weld design are set forth in subsection NF of ASME Code Section III. Applicants do not reference the AISC Manual for the purpose of establishing weld design criteria for ASME supports."

However, in Applicants' specification for "Nuclear Safety Class Pipe Hangers and Supports," Specification 2323-MS-46A, it states under "SECTION 3 - TECHNICAL SPECIFICATION NUCLEAR SAFETY CLASS PIPE HANGERS AND SUPPORTS," under "3.3 CODES AND STANDARDS," pages 3-15 and 3-20:

> "Design, fabrication, materials, certification, code stamping, and testing requirements included in this specification shall be in accordance with the edition and addenda of the following codes, legislation, regulations, and standards, in effect on July 28, 1975, unless otherwise specified below or authorized by the owner. . .
>
> "h. American Institute of Steel Construction (AISC)
>
> "Conflict among the above referenced codes, standards, and regulations, and conflicts among this specification and the above referenced codes, standards, and regulations shall be immediately brought to the attention of the Engineer for resolution."

Further, 10 CFR Part 50, Appendix A, Criterion 1, states, in part:

> "Structures, systems, and components important to safety shall be designed, erected, and tested to quality standards commensurate wit the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function." (Emphases added.)

It should be noted that I have not even attempted to address Applicants' characterizations of statements made in CASE's Answer (although I do not agree with many of those characterizations), since they are arguable. If the Board does not understand what we are disagreeing with in Applicants' Motion or feels that it needs additional information to clarify

any of the statements in our previous Answer (or in this Answer), we ask that they so advise and allow us the opportunity to provide such additional information. As the Board is aware, our Answers were prepared under severe time constraints which did not afford time for adequately rechecking our work. In addition, it is difficult to put these details regarding design into words.

Attachment:

Attachment A AISC code, 7th Edition, Supplement No. 3, as indicated in Table 1.5.3. (to which Applicants are committed), as indicated under "Fillet Welds." -- see page 4 of this pleading

The preceding CASE's Answer to Applicants' Statement of Material Facts As To Which There Is No Genuine Issue was prepared under the personal direction of the undersigned, CASE Witness Mark Walsh. I can be contacted through CASE President, Mrs. Juanita Ellis, 1426 S. Polk, Dallas, Texas 75224, 214/946-9446.

My qualifications and background are already a part of the record in these proceedings. (See CASE Exhibit 841, Revision to Resume of Mark Walsh, accepted into evidence at Tr. 7278; see also Board's 12/28/83 Memorandum and Order (Quality Assurance for Design), pages 14-16.)

I have read the statements therein, and they are true and correct to the best of my knowledge and belief. I do not consider that Applicants have, in their Motion for Summary Disposition, adequately responded to the issues raised by CASE Witness Jack Doyle and me; however, I have attempted to comply with the Licensing Board's directive to answer only the specific statements made by Applicants.

Mark Walsh

(Signed) Mark Walsh

STATE OF TEXAS

On this, the 1 day of Oct, 1984, personally appeared Mark Walsh, known to me to be the person whose name is subscribed to the foregoing instrument, and acknowledged to me that he executed the same for the purposes therein expressed.

Subscribed and sworn before me on the ct __, 1984.

S
M

My Commission Expires:___

Attachment A

SUPPLEMENT NO. 3

TO THE SPECIFICATION FOR THE DESIGN, FABRICATION & ERECTION OF STRUCTURAL STEEL FOR BUILDINGS

(ADOPTED FEBRUARY 12, 1969)

Effective June 12, 1974
Revised Effective October 30, 1975

(INCLUDING ADDENDA TO THE **COMMENTARY** ON THE SPECIFICATION)

AMERICAN INSTITUTE
OF STEEL CONSTRUCTION
1221 AVENUE OF THE AMERICAS, NEW YORK, N.Y. 10020

Price: $1.00

PREFACE

Since its adoption on February 12, 1969, the AISC Specification has been under constant review. Modifications, when adopted, are issued in the form of Supplements.

To date, three Supplements to the Specification have been issued, of which this document is the latest. Encircled numbers (①, ②) along the page margin indicate that the noted section was also modified in Supplement No. 1 (November 1, 1970) or Supplement No. 2 (December 8, 1971) and that reference should be made to the earlier Supplement.

Addenda to the Commentary on the AISC Specification, which follow Supplement No. 3 in this printing, are the first additions to the Commentary since its publication in July, 1969.

June, 1974

REVISION

Effective October 30, 1975, the following changes were made to Supplement No. 3:

The definition of h was modified in the Nomenclature and in Sect. 1.10.5.2.

The definition of A_w was modified in Sect. 1.10.6.

1.5.2 Rivets, Bolts, and Threaded Parts

1.5.2.1 In Table 1.5.2.1, under the column headed "Description of Fastener", immediately after "A325" in the fifth and sixth items, delete "and A449".

Delete Table 1.5.3 in its entirety and substitute new Table 1.5.3.

TABLE 1.5.3 ALLOWABLE STRESS

Type of Weld and Stress[1]	Allowable Stress	Required Weld Strength Level[2,3]
Complete Penetration Groove Welds		
Tension normal to the effective area	Same as base metal	"Matching" weld metal must be used; see Table 1.17.2.
Compression normal to the effective area	Same as base metal	Weld metal with a strength level equal to or less than "matching" weld metal may be used.
Tension or compression parallel to the axis of the weld	Same as base metal	
Shear on the effective area	0.30 × nominal tensile strength of weld metal (ksi), except stress on base metal shall not exceed 0.40 × yield stress of base metal	
Partial Penetration Groove Welds[4]		
Compression normal to effective area	Same as base metal	Weld metal with a strength level equal to or less than "matching" weld metal may be used.
Tension or compression parallel to axis of the weld[5]	Same as base metal	
Shear parallel to axis of weld	0.30 × nominal tensile strength of weld metal (ksi), except stress on base metal shall not exceed 0.40 × yield stress of base metal	
Tension normal to effective area	0.30 × nominal tensile strength of weld metal (ksi), except stress on base metal shall not exceed 0.60 × yield stress of base metal	
Fillet Welds		
Stress on effective area	0.30 × nominal tensile strength of weld metal (ksi), except stress on base metal shall not exceed 0.40 × yield stress of base metal	Weld metal with a strength level equal to or less than "matching" metal may be used.
Tension or compression parallel to axis of weld[5]	Same as base metal	
Plug and Slot Welds		
Shear parallel to faying surfaces (on effective area)	0.30 × nominal tensile strength of weld metal (ksi), except stress on base metal shall not exceed 0.40 × yield stress of base metal	Weld metal with a strength level equal to or less than "matching" weld metal may be used.

[1] For definition of effective area see Sect. 1.14.7.

[2] For "matching" weld metal, see Table 1.17.2.

[3] Weld metal one strength level stronger than "matching" weld metal will be permitted.

[4] See Sect. 1.10.8 for a limitation on use of partial penetration groove welded joints.

[5] Fillet welds and partial penetration groove welds joining the component elements of built-up members, such as flange-to-web connections, may be designed without regard to the tensile or compressive stress in these elements parallel to the axis of the welds.

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UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

OFFICE OF SECRETARY
DOCKETING & SERVICE
BRANCH

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

CERTIFICATE OF SERVICE

By my signature below, I hereby certify that true and correct copies of CASE'S ANSWER TO APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' MOTION FOR SUMMARY DISPOSITION REGARDING CONSIDERATION OF FRICTION FORCES

have been sent to the names listed below this ~~1st~~ 2nd day of October, 1984, by: ~~Express Mail where indicated by X~~ and First Class Mail.

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