November 16, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

APPLICANTS' REPLY TO CASE'S ANSWER TO APPLICANTS' RESPONSE TO BOARD'S PARTIAL INITIAL DECISION REGARDING A500 STEEL

I. INTRODUCTION

Texas Utilities Electric Company, et al. ("Applicants") hereby submit their reply to "CASE's Answer to Applicants' Response to Board's Partial Initial Decision Regarding A500 Steel," filed September 26, 1984 ("Answer"). Applicants filed their response to the Board's Partial Initial Decision on April 11, 1984 ("Response"). The Board has decided to consider this issue with the other topics being addressed through summary disposition procedures. The Board authorized Applicants to submit replies to CASE's answers in the August 22, 1984, conference call (Tr. 13,995). In accordance with that authorization Applicants file the instant reply. As demonstrated below, CASE has failed to demonstrate the existence of a genuine issue regarding this topic. Accordingly, the Board should render the decision sought by Applicants.

II. APPLICANTS' REPLY TO CASE'S ANSWER

A. General

The Board has established a different standard for disposing of the remaining issues in this phase of the proceeding than that established by 10 C.F.R. §2.749 for formal summary disposition. As the Board noted in its June 29, 1984, Memorandum and Order[1], the Board intends to ask questions, request briefs or otherwise seek to clarify matters so as to determine whether sufficient information is available to make a "reasoned decision". As demonstrated below, there clearly is sufficient information before the Board for it to reach a reasoned decision on this issue.

However, as with each of CASE's answers to which we have replied, CASE fails in the instant answer to adhere to the Board's admonition in its Memorandum and Order that CASE demonstrate why its objections are relevant to the issues.[2] More importantly, CASE also fails, contrary to the Board's further admonition, to demonstrate that its points of disagreement with Applicants constitute important issues that affect the public

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1 Memorandum and Order (Written-Filing Decisions # 1; Some AWS-ASME Issues) (June 29, 1984) at 2-3 ("Memorandum and Order").

2 Memorandum and Order at 6.

safety.[3] In short, CASE's answer makes it extremely difficult to discern whether, and if so what, additional information need be provided for the Board to reach a reasoned decision. Nonetheless, we address below each of CASE's assertions which we perceive to require clarification and/or rebuttal to assist the Board in reaching a sound decision.

B. Applicants Reply to CASE's Answer

Applicants focus here on CASE's assertions which are clearly relevant to the issues at hand. As already noted, CASE generally does not demonstrate why its arguments should be considered to raise important safety questions.[4] Thus, it is difficult to predict whether the Board might consider any particular argument to raise a safety issue. Accordingly, we have addressed each potentially relevant issue regardless of its apparent lack of safety significance.

1. Discovery Regarding A500 Steel

In its motion CASE contends that Applicants were not responsive to CASE's requests for discovery regarding Applicants' reply to the Board's partial initial decision. CASE argues both that Applicants were not timely in their responses and that certain documentation was "incomplete". (Answer at 2-3.)

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3 Id. at 7.

4 CASE's Answer is supported by the affidavit of Mark Walsh ("Affidavit").

CASE's concerns regarding the timeliness of Applicants' responses are irrelevant to the disposition of the technical issues before the Board, particularly given the absence of, or even claim of, prejudice to CASE (even assuming its charges to be true) because of the lack of any deadline for CASE to file a response. Thus, we will not dwell on CASE's charges. However, we do note that CASE's brief summary of the discovery on this topic does not mention the extensive delay of CASE's own doing. Applicants provided the documentation for all but one category of CASE's request by July 5, shortly after the Board ruled on Applicants' objections. Applicants suggested at that time that with respect to this largest category of requested documents that CASE select a representative sample for production. CASE took over a month to decide whether to accept this proposal and to identify the criteria for selecting the sample (July 29, 1984). In short, CASE's description of the discovery process on this issue is incomplete.[5]

A final point made by CASE regarding discovery on this topic is that documentation requested did "not exist". CASE notes that certain calculations were prepared recently. CASE suggests that the subject calculations should have been, but were not, retained

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5 The Board itself inquired into the reason for the "delay" in providing the documents requested by CASE following CASE's identification of the criteria for selection of a sample. As explained by Mr. Finneran, the press of other matters, including preparation of material for the Staff and Cygna and other documents for CASE, as well as his performing the routine responsibilities of his position, simply prevented Applicants from immediately providing the requested information (Finneran Affidavit at 15-16).

when originally performed. (Answer at 3.) Again, CASE completely misunderstands the purpose of the calculations requested and provided. Those "calculations" are sample comparisons (ratios) of data from the design calculations and were performed strictly for the preparation of Applicants' reply. They are not part of the design calculations for the individual supports. There was no purpose or requirement, therefore, for retaining these calculations, and they were not. In order to respond to CASE's discovery requests the information was simply regenerated and sample calculations (which are the calculations CASE references that were performed in July), were provided to CASE. (Finneran Affidavit at 2.) In sum, CASE's assertion is simply in error.[6]

2. Satisfaction of GDC 1 and 4

CASE agrees with Applicants' position that neither GDC 1 nor GDC 4 dictate a particular methodology for accounting for the revised yield values for A500 steel (Answer at 3). As Applicants stated in their response, the Board incorrectly interpreted these regulations to require specific detailed analyses of the effect of the revised "values (Response at 4-10). CASE does assert, however, that "documentation" must exist to demonstrate that

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6 Even had the "calculations" CASE questioned been design calculations, possibly subject to some retention requirement, CASE's general reference to various criteria of 10 C.F.R. Part 50, Appendix B, "to name a few" is patently insufficient to demonstrate noncompliance with NRC requirements.

Applicants, in fact, considered the revised values when issued (Answer at 3-4). CASE does not point to any requirement mandating such documentation. Applicants have produced a sworn affidavit stating that timely consideration was given to the revised yield values as well as documentation demonstrating ASME agreement with Applicants' conclusions concerning the applicability of the Code Case at issue and evidence that Applicants' original judgment as to the impact of the change on Applicants' designs was, indeed, justified. As demonstrated in this reply, CASE does not demonstrate that any of the evidence produced by Applicants is incorrect. In short, Applicants <u>have</u> produced documentation which fully demonstrates the validity of their position. The Board should find, therefore, that CASE' arguments to the contrary are unfounded.

3. NRC Staff Response

CASE argues, again incorrectly, that Applicants did not consider the effect of the revised A500 yield strengths by any of the means suggested by the NRC Staff, <u>viz</u>., engineering judgment, scoping calculations, assessment of conservative design practices (Answer at 4). Contrary to CASE's claim, Applicants appropriately utilized each of those methods in considering the effects of the revision.

First, as CASE should know, consideration of the effect of material properties on designs is inherent in the design of piping and support systems. Thus, contrary to CASE's unsupported claim, Applicants' initial engineering judgment was founded on extensive experience and knowledge concerning the effect of changes in material properties. Applicants further demonstrate through an evaluation of a large sample of supports using A500 tube steel that none would be subject to stresses which exceed the allowables calculated using the revised yield strength, and, in fact, all but a small percentage are far below that allowable. This large sample is certainly a reasonable method for assessing the impact of the revision on the supports at Comanche Peak. Finally, Applicants did assess their design practices and found them to produce conservative calculations of stresses. In short, Applicants properly employed each of the means which the Staff suggested were appropriate for considering the revised yield values. The Board should find that CASE's assertions to the contrary are unfounded.

4. CASE Affidavit

CASE raises numerous additional arguments in the affidavit attached to its answer. As demonstrated in the attached Affidavit of John C. Finneran, Jr. ("Finneran Affidavit"), those arguments are either invalid, irrelevant to the questions raised by the Board or pose no serious safety question which warrants further consideration. Mr. Finneran's response to CASE's arguments are set forth below.

a. cyclic stresses

CASE asserts that any calculations using the original yield value for A500 tube steel are in "error" by 15%, including calculations considering cyclic stresses (Affidavit at 1). As Mr. Finneran explains, the ASME did not adopt the revised yield strength value because the original value was in "error" and does not consider the revision to constitute a potential safety concern. Further, Applicants do not take advantage of the increases in allowables for cyclic stresses permitted by the ASME Code, and, thus, CASE's argument regarding cyclic stresses is irrelevant to Applicants' practice. (Finneran Affidavit at 2.) The Board should find CASE's arguments in this regard without merit.

b. PSE guidelines

CASE contends (Affidavit at 2) that Applicants should have "included consideration" of the revised yield strength in the PSE guidelines. CASE apparently believes that the date those guidelines were adopted is important for determining the applicability of the code case. CASE apparently does not recall that the applicability of the code cases is determined by Regulatory Guide 1.85, which provides that code cases are not to be retroactively applied to components contracted for prior to the effective date of the code case. In fact, the Board recognized this fact when it originally ruled that further consideration of the code case was not appropriate. (Tr. 6803, 6806-09, 6816.)

Further, CASE's claim that the PSE group had no guidelines prior to late 1981 is misleading. CASE should be aware that "PSE" was formed in late 1981 in a reorganization of site engineering groups and essentially adopted the guidelines of its predecessor, the Pipe Support Design Group (Finneran Affidavit at 3). Thus, the premise for CASE's argument regarding the applicability of the code case is, itself, incorrect. The Board should find, therefore, that CASE's argument regarding the PSE guideline is meritless.

c. bending stress

CASE claims, apparently as an indication that Applicants did not consider the revised yield strength, that Applicants use an allowable for bending stress of tube steel which is not applicable to cold formed steel. CASE also implies that it is not appropriate to use A500 Grade B tube steel in situations where it is subject to bending. (Affidavit at 2-3.)

Both of these assertions are irrelevant to the issue of whether Applicants properly considered the revised yield strength. CASE is simply seeking once again to inject new issues into the proceeding with no more justification than that they concern generally a topic involved in the proceeding, here A500 tube steel, regardless of their relevancy to the allegation at issue, viz., appropriate yield strength for A500 tube steel. In any event, Applicants respond briefly to these latest assertions in order to demonstrate their invalidity.

As Mr. Finneran demonstrates, use of Section XVII-2214 of the ASME Code to calculate bending stresses for cold formed tube steel is entirely appropriate. The Code's reference to hot-rolled steel does not preclude its application to cold formed steel and, in fact, the AISC (from which Code the ASME adopted this provision) acknowledges the appropriateness of applying this provision to cold formed steel, as does the Welded Steel Tube Institute, which is the organization of cold formed tubing producers. As for the appropriateness of using A500 tube steel in applications subject to bending, neither the ASME, AISC, nor the Welded Steel Tube Institute place any restrictions on the use of cold formed tube steel in bending and, in fact, expressly provide for such application. (Finneran Affidavit at 3-5).

In sum, CASE's arguments regarding the use of cold formed tube steel in bending are false, and the Board should so find.

d. NRC Staff comments

CASE misunderstands comments made by Mr. Terao of the NRC Staff in a meeting with Cygna, claiming that he had "some concerns regarding the use of A500 tube steel" (Motion at 3-5). Mr. Terao simply was not addressing yield strength for A500 tube steel and, thus, his comments are irrelevant to this issue. In any event, it is interesting to note that Mr. Terao also indicates, as discussed above, that the AISC accepts the use of its design equations for tube steel and those same provisions were simply adopted by the ASME. (Finneran Affidavit at 6.)

e. applicability of ASME code cases

CASE asserts that Applicants incorrectly interpreted ASME practice regarding application of code cases. CASE asserts that ASME code cases are not made mandatory. (Affidavit at 5.)

Applicants could have been more precise in describing ASME practice regarding code cases. As explained by Mr. Finneran, if the ASME revises a code case, that revision is neither mandatory nor retroactive. Most importantly, however, the ASME will use various notice mechanisms if a code case raises a potential safety concern, which was not the situation in this case. (Finneran Affidavit at 6.) Thus, although CASE's assertions concerning the mandatory nature of code cases are not incorrect, the implication that the ASME will not take specific action if a code case raises a potential safety concern is not valid.

f. conservatisms

CASE disagrees with Applicants' description of the conservatisms inherent in Applicants' design practices. CASE argues that these conservatisms do not justify Applicants' determination that no reduction in A500 yield strength need be taken. (Affidavit at 6-9.) CASE does not disagree that these conservatisms exist. Rather, CASE contends for a variety of reasons that they should not be considered. As demonstrated in Mr. Finneran's affidavit, and discussed below, CASE's assertions are either irrelevant or invalid, or both.

1. 1/16" deflection criterion

CASE does not disagree with Applicants' position that the 1/16" deflection criterion is most likely to govern the design rather than member stresses, thus keeping tube steel stresses well below allowables. Further, CASE's assertion regarding generic stiffnesses is irrelevant to this fact. (Finneran Affidavit at 7.) In any event, Applicants have demonstrated the appropriateness of the use of these generic stiffness values in their motion for summary disposition regarding this issue, filed May 21, 1984.

2. anchor bolt design

CASE again misses the point. Applicants noted, and CASE does not dispute, that because anchor bolt stress ratios are generally higher than for tube steel, the anchor bolts are another design consideration which provide assurances that tube steel stresses are well below allowables. CASE asserts Applicants can "only claim" that anchor bolts are "more likely to be overstressed" than tube steel and not that anchor bolt design is a controlling design consideration. CASE infers that Applicants do not check other stresses when the anchor bolts are found to be satisfactory. (Affidavit at 6-7.)

CASE's assertion is illogical. CASE does not dispute that anchor bolts are likely to be more highly stressed than tube steel members. By definition then, the anchor bolt design is controlling with respect to the tube steel design. However, this fact does not mean, and it is not correct as CASE suggests, that Applicants do not check all stresses in the design of a support regardless of whether one is likely to be controlling. CASE's comments are, therefore, invalid. (Finneran Affidavit at 7-8.)

3. level B allowables/level C loads

Applicants have stated that their support designers frequently use level B allowables for level C loads, which provides an added degree of conservatism to Applicants' support designs (Finneran Affidavit at 8). CASE asserts that Applicants should use this approach at all times, claiming that Applicants may use this approach only on members with low stresses. CASE goes on to claim that it has never seen calculations which support Applicants' statement and that based on "personal knowledge" it does not believe Applicants are truthful. (Answer at 7.)

In the first instance, Applicants' practice is a common approach employed regardless of the magnitude of the load. More importantly, however, CASE's claims that it has never seen documentation supporting Applicants' position and that based on "personal knowledge" it believes this is not Applicants' practice are both false. As discussed in Mr. Finneran's affidavit, several calculations in CASE exhibits utilize this approach.

(Finneran Affidavit at 8-9.) In short, CASE is incorrect in its assertions regarding this practice and has either knowingly misrepresented the facts or its "personal knowledge" is very limited. Applicants address below the implications of CASE's incorrect assertion, based on "personal knowledge".

4. stronger tube steel members

CASE poses an illogical argument in response to Applicants' statement that it is normal design practice to utilize stronger tube steel members than necessary in original designs to provide for possible load changes at later stages of the design process (Affidavit at 7-8). Contrary to the implication of CASE's assertion, providing such a contingency is simply good design practice and does not adversely impact satisfaction of other design requirements (Finneran Affidavit at 9).

5. ITT-Grinnell practice

CASE argues that it is its "understanding that ITT-Grinnell did not use tube steel in its original design" (Affidavit at 8). CASE does not demonstrate how this assertion is relevant to the issue at hand, and its relevancy is not apparent. In any event, CASE's "understanding" is again incorrect (Finneran Affidavit at 9).

Applicants note that this type of assertion, founded on nothing more than an invalid "understanding", coupled with the patently false claim discussed above regarding the use of level B allowables purportedly premised on "personal knowledge" are simply further examples of CASE's aggregious abuse of the administrative process. CASE has repeatedly raised such frivolous arguments in this proceeding without fear of sanction. CASE risks nothing more than having the Board decide against it on a particular issue. Applicants on the other hand are forced to waste time and resources rebutting such claims, or risk a similar adverse decision with billion dollar consequences. Further, had Applicants posed such patently false claims they would surely have been subjected to swift and severe castigation, if not penalty. Applicants urge the Board to hold CASE to the same standards of honesty and professional conduct as it does Applicants. (That CASE is not represented by counsel in this phase of the proceeding is irrelevant given the technical nature of the issues and CASE's use of supposed expert witnesses.) Only by doing so can the Board have any assurance that claims raised by CASE are not frivolous or false.

6. actual yield strengths

CASE asserts that Applicants may not rely on actual yield strengths of A500 material as documented on Certified Mill Test Reports ("CMTR"), or assume the same yield reduction assumed by the ASME to demonstrate the conservatism inherent in Applicants' designs using tube steel (Affidavit at 8-9). As discussed in Mr. Finneran's affidavit, CASE apparently misunderstands both the purpose of Applicants' evaluation using CMTR data, as well as the

ASME position regarding yield strength reduction and the ASTM (American Society for Testing Materials) specifications for A500. As Mr. Finneran demonstrates, Applicants properly assessed the actual yield strength for A500 tube steel in demonstrating yet another conservatism inherent in their design practice. CASE's assertions do not demonstrate that this assessment was incorrect. (Finneran Affidavit at 9-11.)

g. calculations

The next assertion made by CASE which warrants reply is its claim that Applicants should have retained the "calculations" originally performed for Applicants' Response (Affidavit at 11-12). As Mr. Finneran explains, those "calculations" were simple ratios, readily reproducible, which are not part of the design calculations. No sound reason, let alone requirement, exists which would have Applicants retain those "calculations". (Finneran Affidavit at 11-12.)

h. level B allowables with level C loads

CASE again asserts that Applicants may not take credit for their practice of using level B allowables with level C loads in demonstrating the conservative nature of their practice (Affidavit at 12). As already explained, and as demonstrated once again by Mr. Finneran, Applicants' practice is appropriate and evidences of a conservative design approach which provides further assurance that there is no safety significance to Applicants' use of the original A500 yield value (Finneran Affidavit at 13-14).

CASE also asserts that Applicants are incorrect if they "want to convince the Board that level C loads with level B allowables will always give satisfactory results," claiming that it has found an example where use of the level B allowable with a level C load would produce unsatisfactory results (Affidavit at 12). Although Applicants have never made the claim attributed to them by CASE, Mr. Finneran reviewed CASE's "example" and, as shown in his affidavit, found that CASE had incorrectly performed its calculation. Had CASE correctly performed the calculation it would have found that even if the level B allowable had been used the support would have been qualified. (Finneran Affidavit at 13-14). Thus, CASE is also incorrect in this assertion regarding the use of level B allowables with level C loads.[7]

i. ASME inquiry

CASE's final arguments concern the ASME response to the code inquiry Applicants submitted. First, CASE claims that response

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7 CASE's related assertion that these calculations are "incomplete" (Affidavit at 13), is also unfounded (Finneran Affidavit at 14).

requires Applicants to have performed tests before continuing to use the original yield strengths. Further, although CASE does not claim that response is incorrect,[8] it challenges the procedures by which Applicants received the reply to their inquiry. (Affidavit at 14-15.) As Mr. Finneran demonstrates, CASE's assertions are invalid (Finneran Affidavit at 15).

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8 Applicants are deeply disturbed by CASE's wreckless accusation regarding the integrity of the ASME and its members. CASE argues that the Board should "consider" the "credibility of [the] ASME" (Affidavit at 14). Although not identifying any aspect of the ASME's response it believes is incorrect, CASE infers that members of the ASME (CASE specifically mentions two individuals, both well-recognized experts in various fields of engineering, <u>viz</u>., Mr. Reedy (a former witness for Applicants) and Mr. Bressler (who was scheduled to but was unable to serve as an expert witness for Applicants)) would influence the outcome of ASME deliberations for the purpose of reaching an invalid technical position. These accusations not only are false, but wholly improper. The Board has previously found that such unfounded accusations concerning the integrity of Applicants' witnesses are inappropriate (<u>see</u> <u>Memorandum and Order</u> (Motion for Clarification on Thermal Stress in Pipe Supports), August 19, 1983). Applicants urge the Board to admonish CASE for such false charges and demand that CASE cease from any further slanderous claims.

III. CONCLUSION

For the foregoing reasons, the Board should find that there is sufficient evidence before it to reach a reasoned decision on CASE's allegations regarding A500 steel and that evidence demonstrates that Applicants' practice is appropriate and based on sound engineering principles.

Respectfully submitted,

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TEXAS UTILITIES ELECTRIC COMPANY, ET AL.	)	Docket Nos. 50-445 and 50-446 OL
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AFFIDAVIT OF JOHN C. FINNERAN, JR.
REGARDING CASE'S ANSWER CONCERNING A500 STEEL

I, John C. Finneran, being first duly sworn hereby depose and state as follows: I am employed by Texas Utilities Generating Company as Project Pipe Support Engineer for Comanche Peak Steam Electric Station. In this position I oversee the design work of all pipe support design organizations at Comanche Peak. A statement of my educational and professional qualifications is in evidence as Applicants' Exhibit 142B.

Q. What is the purpose of this affidavit?

A. I address below CASE's assertions set forth in its September 26, 1984, Answer to Applicants' Response to Board's Partial Initial Decision Regarding A500 Steel, filed in the form of an affidavit of Mark Walsh ("Affidavit"). Applicants filed their response on April 11, 1984, supported with my affidavit ("Finneran Affidavit").

Q. What is your response to CASE's comments regarding the discussion in your original affidavit concerning consideration of cyclic stresses?

A. CASE does not disagree with the substance of my original discussion that because Applicants do not take advantage of the increase in allowables permitted by the ASME Code for cyclic stresses, the revision to the A500 yield strength raises no concern for Applicants' consideration of cyclic stresses. CASE simply claims that calculations based on the original value, including calculations considering cyclic stresses, are "in error". (Affidavit at 1.)

My original affidavit demonstrated both that the ASME does not consider use of the original yield values for A500 tube steel to be an "error" or to present a serious safety concern and that, in fact, Applicants' use of those values poses no safety concern. Thus, CASE's general assertion that use of those values is an "error" is unfounded.

Further, CASE's specific claim that consideration of "cyclic stresses" will be "in error by 15%" is not relevant to Applicants' design practice. As I stated in my original affidavit (at 2), Applicants do not take advantage of the increases in allowables for cyclic stresses permitted by the ASME Code (NF-3231.1(a)). Thus, Applicants' support designs maintain stresses well below the stress levels of concern for cyclic stresses even if the revised yield strength would be utilized.

Q. Do you have any comments regarding CASE's assertions (Affidavit at 2) regarding the need to include evidence of Applicants' consideration of the revised A500 yield values in the PSE guidelines?

A. Yes. CASE incorrectly represents the facts surrounding the formation of PSE and establishment of its guidelines. As CASE should recognize (see Applicants' July 3, 1984, Motion for Summary Disposition Regarding Quality Assurance for Design, supporting affidavit at 44, n.22), PSE was formed in a reorganization of existing engineering groups on site, which included the Pipe Support Design Group (PSDG). When that reorganization occurred in late 1981, PSE essentially adopted the guidelines of PSDG, which were in existence for some time. Thus, CASE's claims in this regard are unfounded.

Q. What are your comments concerning CASE's discussion (Affidavit at 2-3) regarding consideration of allowable bending stresses?

A. CASE's argument regarding the establishment of bending stresses for A500 tube steel is irrelevant to the issue at hand. The method of calculation of the bending stress allowable is independent of the particular yield strength which may be employed for A500 tube steel. Further, Applicants did not and were not required to adopt the revised yield strength value for A500 and, thus, there is no reason that the stress allowable in the PSE Guidelines should reflect, as CASE seems to imply, the revised values.

In any event, CASE neither provides nor suggests any technical rationale for not using Applicants' method of determining the allowable bending stress for cold formed A500 tube steel. CASE suggests Applicants should have employed another section of the ASME Code to calculate a bending stress allowable, but not does identify any particular section. Contrary to CASE's claim, the provision of the ASME Code Applicants employ for this purpose is appropriate for use with cold formed tube steel.

The use of the term "hot rolled" in this section of the ASME Code arises only because the ASME adopted virtually the exact words from the AISC Specifications, which focus on hot rolled shapes. However, this does not mean it is inappropriate to use this section of the Code for cold formed steel. In fact, ITT made an inquiry to the AISC on this subject in April 1983. See ITT letter of April 4, 1983 and AISC reply, dated April 8, 1983 (Attachments A and B). The AISC specifically acknowledged the applicability of this provision to cold formed A500 tube steel despite the reference only to hot-rolled steel. Further, the Welded Steel Tube Institute, the organization of cold formed tubing producers, expressly recommends using these AISC allowables for cold formed steel such as A500 (see pages 95-96 of the

1974 Manual of Cold Formed Welded Structural Steel Tubing (Attachment C)). In sum, Applicants' use of Section XVII-2214 of the ASME Code for determining bending stress allowables for cold formed A500 tube steel is appropriate. CASE's argument to the contrary has no technical merit.

Further, CASE's assertion (Affidavit at 3) that in normal construction tube steel is only used as a column in a non-rigid frame and, thus, is not to be used in bending, is incorrect. Both the ASME and AISC have approved A500 as a structural steel, with absolutely no restrictions on its use as a member in bending (see AISC Specification Section 1.4-Material (Attachment D); ASME Code Case N-71-10 (CASE Exhibit 751)). In addition, page 1-103 of the AISC manual (Attachment E) clearly indicates that tube steel was intended for use in bending when it distinguishes between shapes which are compact or non-compact, a fact which is used to determine the bending stress allowable. In addition, it is quite clear that the Welded Steel Tube Institute itself intends tube steel to be utilized in bending, since they have developed allowables in their manual for tube steel used as beams (see Attachment C), which are subjected to bending. Thus, there is no validity to CASE's argument that A500 tube steel is not to be used in bending.

Q. What comments do you have regarding CASE's characterization (Affidavit at 3-5) of Mr. Terao's discussion with Cygna?

A. CASE misunderstands Mr. Terao's comments. Mr. Terao was not addressing stress allowables for tube steel. Thus, his comments are irrelevant to the issue at hand. Nonetheless, it is instructive to note that Mr. Terao observed, as I discussed above, that AISC believes that the use of its design equations were appropriate for tube steel, and the ASME simply excerpted portions of the AISC Code for design.

Q. What are your comments regarding CASE's assertion (Affidavit at 5) that Applicants did not accurately describe the ASME practice regarding application of code cases involving changes in provisions?

A. I could have been more precise in my initial description of ASME practice regarding code cases. As stated by the ASME in their response to Applicants' inquiry, the provisions of later revisions of code cases are neither mandatory nor retroactive (see Finneran Affidavit, Attachment). The important point of my original answer, however, was that the ASME will take specific action if a code case raises a potential safety concern. The ASME did not take such action in this instance. (Finneran Affidavit at 3.) Thus, although CASE's assertions concerning the mandatory nature of code cases are not incorrect, the implication that the ASME will not take specific action if a code case raises a potential safety concern is not valid.

Q. What comments do you have regarding CASE's discussion (Affidavit at 6-9) of the conservatisms inherent in Applicants' design of supports using tube steel?

A. CASE's arguments are either irrelevant to the issue at hand or are founded on a misunderstanding of the principles involved.

First, CASE's discussion of the 1/16" deflection criterion appears to be based on a misunderstanding of my original affidavit. As I indicated in that affidavit, the deflection criterion, and not member stresses, governs the design in many instances, thus keeping tube steel stresses well below allowable values. There is no relation between this fact and the generic stiffness issue CASE attempts to raise.

In addition, CASE's argument (Affidavit at 6-7) regarding anchor bolts misses the point. I stated previously that the anchor bolt stress ratios are usually higher than the tube steel stress ratios. Thus, the anchor bolts would control the design. This fact, which CASE does not dispute, provides additional evidence of the conservatism of Applicants' designs and further assurance that use of the original yield values for A500 steel presents no safety concern. Further, contrary to CASE's assertion, Applicants recognize the need to and indeed check <u>all</u> stresses regardless of whether one is likely to be controlling. CASE's comment regarding "inadequate engineering judgment and philosophy" (Affidavit at 7) is, therefore, baseless.

With regard to CASE's comments concerning the use of level B allowables with level C loads (Affidavit at 7), I previously indicated that Applicants' support designers frequently use such conservative design assumptions (Finneran Affidavit at 5). This is a common practice employed regardless of the magnitude of the load. CASE's attempt to turn this practice into an absolute rule is misplaced. Further, CASE's statement that it has "not seen calculations which would substantiate Applicants' claim" regarding this practice is false. There are several examples of this approach in the calculations furnished to CASE on discovery regarding the Cygna hearings (CASE Exhibits 928 to 939). For instance, in CASE Exhibit 928 (calculation for support SI-1-325-002-S32R), page 2 of 13 (p. 20 of exhibit), the strut level B N/u (Normal/upset) allowable (38.7 kips) is compared to the level C load (19.169 kips). On the next page, the level B (N/u) allowable (50.6 kips) for the XRB-24 rear bracket is compared to the level C load (19.169 kips). Additionally, in this calculation, the tube steel (following two pages) and the base plate (sheet 13 of 13) are designed using level B allowables and Level C loads. Additional examples of this practice just from this group of supports are in CASE

Exhibits 929, 931-34, 936, 937 and 939. Thus, CASE has, in fact, seen many such calculations which substantiate Applicants' practice, contrary to CASE's claim. I discuss this allegation further below.

CASE's arguments concerning Applicants' practice of providing in original designs for possible load changes at later stages of the design process (Affidavit at 7-8) is illogical. Such changes in loads may occur for any number of reasons. To provide a contingency for possible changes later on in the process is simply a good design practice and does not adversely impact satisfaction of other design requirements.

Further, CASE's "understanding" regarding ITT design practices (Affidavit at 8) is not relevant to the issues at hand. CASE draws no conclusions and no logical conclusions are apparent. In any event, CASE is simply wrong when it states that ITT did not use any tube steel in its original design. (see Attachments F and G)), original ITT designs which utilize tube steel.)

In addition, CASE's arguments (Affidavit at 8-9) relating to the Certified Mill Test Report ("CMTR") yield values are not only wrong but demonstrate CASE's misunderstanding of the ASME Code and the ASTM specifications. CASE apparently believes that Applicants should not have assumed a 15% reduction in yield strength due to welding and demonstrated the minimum actual yields for all cases. In the first instance, the purpose of my original affidavit was to demonstrate the appropriateness of the continued use of the 42 ksi yield strength for A500 tube steel. The CMTR data presented in my original affidavit was for the worst case (most highly stressed) supports of the sample examined. This was a reasonable approach to assess the impact of the reduction in yield strength on the tube steel used at Comanche Peak. Further, the assumption of 15% reduction in strength was reasonable. It was based on the reduction for welding conservatively assumed by the ASME. It simply was not necessary to perform actual testing of the effect of welding to make a conservative assumption. In fact, the ASME itself had not performed actual tests but made a conservative assumption, as indicated in its reply to Applicants' inquiry (Reply 2, Attached to original Affidavit):

> "The Committee recognized that the yield strength of A500 in the cold wrought condition may be slightly reduced in the heat affected zone of weldments. The revised values, given in N-71-10, for A500 were those used for A501 and A36 material which were selected as conservative values for A500 tubular shapes in the welded condition. The revised values may be changed at such time when material data for the welded condition, as required by the Code, is presented to the Committee for consideration." (emphasis added)

These facts are simply more evidence of the conservative nature of Applicants' design and provide additional assurance of the adequacy of those designs. In sum, Applicants' assumptions regarding actual yield strengths and the amount of reduction in yield strength caused by welding were both reasonable and conservative.

An important additional fact concerning the actual yield strength of A500 tube steel is that the ASTM Specification from which the ASME selected the 42 ksi value actually sets forth two minimum values of yield stress for A500 Grade B tubing. (ASTM Specification, p. 377 (Attachment H)). The value for <u>round</u> structural tubing is 42 ksi. The value for <u>shaped</u> structural tubing (which Applicants use) is 46 ksi. The ASME conservatively used only the lower value for all A500 tube steel. Thus, the ASME's reduced minimum yield strength for A500 tube steel is actually premised on a very conservative yield value in the first instance for shaped structural tubing.

Q. Has CASE correctly characterized the calculations Applicants performed to determine the interaction values using the reduced allowable stress?

A. No. CASE's allegations (Affidavit at 11-12) relating to Applicants' calculations are totally misleading. CASE incorrectly asserts that these calculations are part of the design calculations and should have been retained. However, as indicated in Applicants' letter to CASE (quoted in CASE's Affidavit at 11), these calculations were not part of the design calculations for the supports. In fact, the "calculations" generally involve the simple matter of ratioing the stress value for the highest stressed tube steel member (as calculated in the existing support design calculations) with the revised (using the revised yield strength for A500) allowable. These "calculations" were performed simply for the purpose of providing data for the A500 reply and are not part of the support calculation packages. A stress ratio summary sheet was then prepared using the resulting data. This summary was supplied to CASE, along with additional sample "calculations", to demonstrate to CASE how the original calculations were performed. There was no need or purpose to retain the original ratios, particularly because they could be readily reproduced from the existing design calculations at any time. CASE is incorrect in asserting (Affidavit at 12) that Applicants should have retained these "original calculations". In addition, Dr. Chen also did not review those original calculations, because they were not retained. Dr. Chen checked Applicants' data by performing the ratioing described above and comparing those results with the stress ratio summary sheets for the supports, which have been supplied to CASE.

In sum, CASE's claims regarding these calculations are invalid.

Q. What is your response to CASE's assertions (Affidavit at 12-13) regarding Applicants' use of level B allowables with level C loads?

A. CASE again misunderstands the facts concerning Applicants' use of these allowables and the purpose of noting this practice in our reply. Again, as I previously stated, Applicants frequently, although not always, use such conservative assumptions. For example, 16 of the 19 supports Dr. Chen reviewed, or about 84%, used level B allowables with level C loads. Thus, although Applicants do not always use this method, its frequent use is an additional conservatism in the design of a majority of the supports and provides further assurance that there is no safety significance to the use of the original A500 yield value.

With respect to CASE's comments regarding support CC-2-028-704-A33A (Affidavit at 12), CASE has again erred in their assessment. To illustrate, we have attached the sample ratio calculation for this support (Attachment I). In that calculation, the bending stress term uses a level C allowable of 28800 psi. CASE, however, incorrectly claims that the stress ratio would exceed 1 if level B allowables were substituted. CASE fails to point out, however, that the axial stress allowable used, Fa, is already the level B allowable. Substituting the level B allowable for bendir, stress (21648 psi) does yield an interaction of less than 1.0, contrary to CASE's claim.

$$\frac{17655}{21648} + \frac{2899}{18900} = 0.97$$

This is further evidence of the conservatism of Applicants' design process in that even using the lower level B allowable with the revised A500 yield strength (neither of which assumptions are required) in a design for which the assumptions were not originally made, the interaction value is still less than 1.0.

Finally, with respect to CASE's comment (Affidavit at 13) that the calculations (providing the above-described ratios) were "incomplete" because they did not note the particular level of allowable or stress, I note only that these are not design calculations and, thus, there was no need to specify such information for the limited purpose of these calculations.

Q. What is your response to CASE's comment (Affidavit at 14) that the ASME intended that testing "as required by the Code" be performed before use of the original A500 yield strengths would be permitted?

A. As I previously noted, the ASME stated in their response to Applicants' inquiry that if they had considered there to be a potential safety concern with the use of the original yield values, they would have published a notice to that effect. It appears that in the quoted portion of their interpretation the ASME simply meant that if tests are performed on A500 steel, they should be conducted in accordance with ASME test procedures.

Q. What is your response to CASE's comments regarding Applicants' inquiry to the ASME?

A. I have only a brief comment regarding CASE's remarks concerning the ASME and Applicants' inquiry (Affidavit at 14-15). Not only is CASE totally incorrect in its assertions, but the implications of its remarks are wholly improper.

Further, Applicants' inquiry was submitted just before the ASME quarterly meeting, addressed at that meeting and the determination then forwarded to Applicants. Finally, Applicants' inquiry, including the suggested reply, was in accordance with the ASME's standard procedure. Thus, CASE's claims in this regard are unfounded.

Q. Finally, the Board has inquired as to the cause of the delay in providing documents to CASE regarding A500 steel following CASE's selection of the criteria for providing calculations for a sample of supports. What is your response to that inquiry?

A. As indicated by the dates of the ratio calculations provided to CASE, and attached to their Affidavit, Applicants begin gathering the material for CASE promptly after CASE provided the criteria for its sample on July 29, 1984. Simply because of the press of other matters, including preparation of other material for the Staff and Cygna, and documents for CASE, as well as performing the routine responsibilities of my position, were we not able to provide the material sooner.

John C. Finneran, Jr.

Subscribed and sworn to before me this __ day of November, 1984.

Notary Public

A signed signature page will be forwarded under separate cover.

Attachment A

ITT

ITT Grinnell Corporation
Executive Offices
260 West Exchange Street
Providence, Rhode Island 02901
(401) 831-7000

Pipe Hanger Division

April 4, 1983

American Institute of Steel Construction, Inc.
400 North Michigan Avenue
Chicago, IL 60611

Attention Mr. W. A. Milek, Jr., Vice President, Director of Engineering

Gentlemen:

Re: Usage of cold-formed welded and seamless carbon steel structural tubing in rounds and shapes, ASTM A500

The purpose of this correspondence is to confirm, in writing, the results of our telephone conversation of 3/30/83. Those results will be summarized as: 1) even though the AISC Manual of Steel Construction in specification section 1.5.1.4.1 stipulates that members must be hot-rolled, it is the intention of AISC that ASTM A500 is applicable for usage with respect to the provisions of the AISC specification for the design, fabrication and erection of structural steel for buildings; and 2) the AISC specification requires that the material yield point used in design, F_y. is the ASTM specified yield point of the material without any credit being taken for the increase in yield point that results from cold working; i.e. 42 ksi for ASTM A500 at 100° F.

A letter of confirmation would be appreciated. Thank you for your assistance and cooperation.

Very truly yours,

Raymond E. Mandeville

Raymond E. Mandeville, P.E.
Senior Analysis Engineer

REM/msb 639
cc: P. Fang
V. Kumar
F. Vasiliadis
R. Wisniewski

Attachment B

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

The Wrigley Building / 400 North Michigan Avenue / Chicago, Illinois 60611-4185 / 312 • 670-2400

April 8, 1983

Raymond E. Mandeville, P. E.
Senior Analysis Engineer
ITT Grinnell Corporation
260 West Exhange St.,
Providence, RI 02901

Dear Mr. Manderville:

The interpretation stated in your letter of April 4 is an accurate summary of our telephone conversation of March 30, 1983, and is an accurate statement of the intent of the AISC Specification relative to ASTM A500 steel.

Very truly yours,

W. A. Milek
W. A. Milek
Consultant

WAM/jf

R. WISNIEWSKI

RECEIVED
PIPE HANGER DIVISION
APR 11 1983
RD & E
P/S ANALYSIS

Attachment C

Welded
Steel
Tube
Institute,
Inc.

Structural
Tube
Division

Manual of

Cold Formed Welded Structural Steel Tubing

FIRST EDITION

BEAMS

Cold Formed Welded Structural Steel Tubing

Allowable loads in the tables that follow, used as simple beams, give the total allowable uniformly distributed loads in kips for laterally supported steel beams. The tables are based on the allowable stresses in accordance with the American Institute of Steel Construction *Specification for the Design, Fabrication and Erection of Structural Steel for Buildings*, dated February 12, 1969. Separate tables are presented for F_y = 46 and F_y = 50 ksi. The tabulated loads include the weight of the beam, which should be deducted to arrive at the net load the beam will support.

Unless noted with an asterisk, all sections tabulated are compact sections as defined in Section 1.5.1.4.1 of the American Institute of Steel Construction *Specification for the Design, Fabrication and Erection of Structural Steel Buildings*, dated February 12, 1969, with an allowable bending stress of 0.66 F_y. The value in parentheses at the bottom of the load column indicates the allowable stress (in ksi) used to tabulate the loads for non-compact sections.

The tables are also applicable to laterally supported simple beams for concentrated loading conditions. Refer to the AISC *Manual of Steel Construction*, Seventh Edition, "Allowable Load on Beams," concentrated load conditions.

It is assumed in all cases of rectangular sections, that the loads are applied normal to the *X-X* axis, shown in the tables of properties of rectangles and that the beam, square or rectangle, deflects vertically in the plane of bending only. If the conditions of loading involve forces outside of this plane, allowable loads must be determined from the general theory of flexure in accordance with the character of the load and its mode of application.

Included in the tables are the deflections for the beams of various spans supporting the full tabulated allowable loads. These deflections are calculated with the tabulated allowable loads. It is to be noted that in some cases the deflections are in excess of 1/360 of the span length.

Where spans are short, the loads are limited by the shearing strength of the webs instead of the maximum bending stress permitted in the flanges. This limit is indicated in the tables by a solid horizontal line. Loads shown above these lines will produce the maximum allowable shear on the webs of the tubes.

The loads in the tables were computed on the basis that the compression flange was laterally supported. Tubes are torsionally very stiff, especially when compared to W beams. Since a square tube is symmetrical about the two principal axes, it is not subject to torsional lateral buckling and does not require lateral bracing for the compression flange. Deflection will be the governing condition. Rectangular tubes, though highly resistant to torsional lateral buckling, should have lateral support for the portions of the compression flange in bending. Section 1.5.1.4.4 of the American Institute of Steel Construction *Specification for the Design, Fabrication, and Erection of Structural Steel Buildings*, dated February 12, 1969, requires lateral bracing for non-compact box-type flexural members at intervals not exceeding 2500 F_y times the flange width. At time of this printing, the AISC Specification Advisory Committee is considering an appropriate provision for lateral bracing applicable to compact box-type flexural members in bending.

Cold Formed Welded Structural Steel Tubing is produced to minimum yield strengths of 46 ksi and 50 ksi under specifications ASTM A500, Grade B and ASTM A500, Grade B modified* respectively.

* At time of this printing, a proposal has been submitted to The American Society for Testing and Materials, Subcommittee A01.09, requesting a Grade C, with a 50 ksi minimum yield point.

1.3.7 Minimum Loads

In the absence of any applicable building code requirements, the loads referred to in Sect. 1.3.1, 1.3.2, 1.3.5 and 1.3.6 above shall be not less than those recommended in the *USA Standard Building Code Requirements for Minimum Design Loads in Buildings and Other Structures*, USASI A58.1, latest edition.

SECTION 1.4 MATERIAL

1.4.1 Structural Steel

1.4.1.1 Material conforming to one of the following listing (latest date of issue) is approved for use under this Specification:

Structural Steel, ASTM A36
Welded and Seamless Steel Pipe, ASTM A53, Grade B
High-Strength Low-Alloy Structural Steel, ASTM A242
High-Strength Low-Alloy Hot-Rolled Steel Sheet and Strip, ASTM A375
High-Strength Structural Steel, ASTM A440
High-Strength Low-Alloy Structural Manganese Vanadium Steel, ASTM A441
Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes, ASTM A500
Hot-Formed Welded and Seamless Carbon Steel Structural Tubing, ASTM A501
Structural Steel with 42,000 psi Minimum Yield Point, ASTM A529
Hot-Rolled Carbon Steel Sheets and Strip, Structural Quality, ASTM A570, Grades D and E
High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality, ASTM A572
High-Strength Low-Alloy Structural Steel with 50,000 psi Minimum Yield Point to 4 in. Thick, ASTM A588
High-Yield Strength Quenched and Tempered Alloy Steel Plate, Suitable for Welding, ASTM A514. (Quenched and tempered alloy steel structural shapes and seamless mechanical tubing meeting all of the mechanical and chemical requirements of A514 steel, except that the specified maximum tensile strength may be 140,000 psi for structural shapes and 145,000 psi for seamless mechanical tubing, shall be considered as A514 steel.)

Certified mill test reports or certified reports of tests made by the fabricator or a testing laboratory in accordance with ASTM A6 and the governing specification shall constitute sufficient evidence of conformity with one of the above ASTM specifications. Additionally, the fabricator shall, if requested, provide an affidavit stating that the structural steel furnished meets the requirements of the grade specified.

1.4.1.2 Unidentified steel, if free from surface imperfections, may be used for parts of minor importance, or for unimportant details, where the precise physical properties of the steel and its weldability would not affect the strength of the structure.

	S in.³	r in.
)17	.041	.261
)37	.071	.334
)87	.133	.421
95	.235	.540
10	.326	.623
66	.561	.787
3	1.06	.947
2	1.72	1.16
9	2.39	1.34
3	3.21	1.51
	5.45	1.88
	8.50	2.25
	16.8	2.94
	29.9	3.67
	43.8	4.38
0	.048	.250
5	.085	.321
6	.161	.407
2	.291	.524
1	.412	.605
8	.731	.766
	1.34	.924
	2.23	1.14
	3.14	1.31
	4.27	1.48
	7.43	1.84
	12.2	2.19
	24.5	2.88
	39.4	3.63
	56.7	4.33
	1.10	.703
	2.00	.844
	3.42	1.05
	6.79	1.37
	12.1	1.72
	20.0	2.06
	37.6	2.76

53 Grade B or A501.
manufacturers or

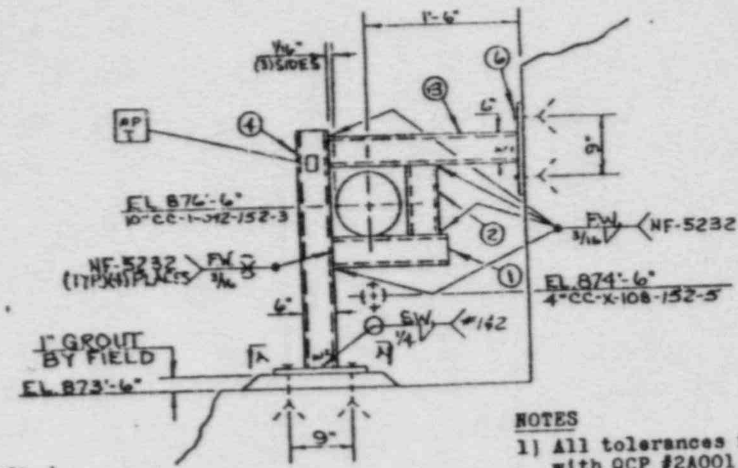
STRUCTURAL TUBING
Square
Dimensions and properties

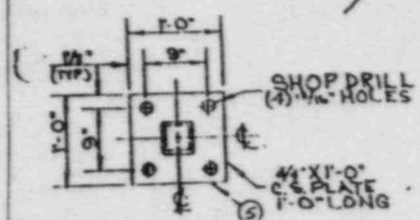
DIMENSIONS				PROPERTIES			
Nominal* Size	Wall Thickness		Weight per Foot	Area	*I*	*S*	*r*
In.	In.		Lb.	In.²	In.⁴	In.³	In.
10 × 10	.6250	5/8	73.98	21.8	304.	60.7	3.74
	.5000	1/2	60.95	17.9	260.	52.0	3.81
	.3750	3/8	47.03	13.8	208.	41.7	3.88
	.3125	5/16	‡39.74	11.7	179.	35.8	3.92
	.2500	1/4	†32.23	9.48	148.	29.6	3.95
	.1875	3/16	†24.50	7.21	114.	22.9	3.98
8 × 8	.6250	5/8	56.98	16.8	142.	35.5	2.91
	.5000	1/2	47.35	13.9	124.	31.1	2.99
	.3750	3/8	36.83	10.8	102.	25.4	3.06
	.3125	5/16	31.24	9.19	88.1	22.0	3.10
	.2500	1/4	‡25.44	7.48	73.4	18.4	3.13
	.1875	3/16	†19.41	5.71	57.2	14.3	3.17
7 × 7	.5000	1/2	40.55	11.9	79.2	22.6	2.58
	.3750	3/8	31.73	9.33	65.6	18.8	2.65
	.3125	5/16	26.99	7.94	57.4	16.4	2.69
	.2500	1/4	22.04	6.48	48.1	13.7	2.72
	.1875	3/16	†16.85	4.96	37.7	10.8	2.76
6 × 6	.5000	1/2	34.48	10.1	48.6	16.2	2.19
	.3750	3/8	27.04	7.95	40.5	13.5	2.26
	.3125	5/16	23.02	6.77	35.5	11.8	2.29
	.2500	1/4	18.82	5.54	29.9	9.95	2.32
	.1875	3/16	‡14.41	4.24	23.5	7.83	2.35
5 × 5	.5000	1/2	27.68	8.14	25.7	10.3	1.78
	.3750	3/8	21.94	6.45	22.0	8.80	1.85
	.3125	5/16	18.77	5.52	19.5	7.81	1.88
	.2500	1/4	15.42	4.54	16.6	6.64	1.91
	.1875	3/16	11.86	3.49	13.2	5.28	1.95
4 × 4	.5000	1/2	20.88	6.14	11.4	5.70	1.36
	.3750	3/8	16.84	4.95	10.2	5.10	1.44
	.3125	5/16	14.52	4.27	9.23	4.61	1.47
	.2500	1/4	12.02	3.54	8.00	4.00	1.50
	.1875	3/16	9.31	2.74	6.47	3.24	1.54
3½ × 3½	.2500	1/4	10.50	3.09	5.29	3.02	1.31
	.1875	3/16	8.14	2.39	4.29	2.45	1.34
3 × 3	.2500	1/4	8.80	2.59	3.16	2.10	1.10
	.1875	3/16	6.86	2.02	2.60	1.73	1.13
2 × 2	.2500	1/4	5.40	1.59	.766	.766	.694
	.1875	3/16	4.31	1.27	.668	.668	.726

* Outside dimensions across flat sides.
† Non-compact section for F_y = 36 ksi and F_y = 46 ksi, bending only.
‡ Non-compact section for F_y = 46 ksi, bending only.
Sections subjected to axial compression or compression due to bending should be checked for compliance with Specification Sect. 1.9.2.2.

Attachment F

FIELD STRIP INK. 1/2" EACH SIDE OF STEEL





SECTION A-A

NOTES

1) All tolerances in accordance with QCP #2A001 U.N.O.
2) Fab. Procedure is H-101-4
3) All products designed in accordance with EPL File No.1 Rev. 9

GHT ISO M1-2931-22	REV. E
IPD ISO. CC-1-AB-67 REV.1	
DATA POINT 1846/PROB.631	
PIPE MAT'L. SA-106 GR.B	
INSUL. 1/2"	AREA A

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP		PBS	L	CSS	PRIM	SEC	AISC
	SEISMIC PIPE RESTRAINT CONSISTING OF	ONE								
A	ALL MATERIAL EXISTS IN FIELD.									
1	1/4"x4"x4" T.S. (A500-GRB) 1'-3 1/2" Long TW-16#	1					x	x		
2	1/4"x4"x4" T.S. (A500-GRB) 0'-10" Long TW-11#	1					x	x		
3	3/8"x4"x6" T.S. (A500-GRB) 1'-10 11/16" Long TW-41# SHOP WELD TO ONE ITEM 5	1					x	x		
4	3/8"x4"x6" T.S. (SA500-GRB) 3'-10 1/4" Long TW-85" SHOP WELD TO ONE ITEM 5	1				x		x		
5	Carbon Steel (SA515 GR65 or SA36) Plate / Section A-A TW-61#	2					x			
6	3/4"x10" Hilti Kwik Bolt, Concrete Anchor TW-11#	8								
	SEISMIC ASSEMBLY SKETCH AND ENGINEERING BUNDLE AND TAG	1								
	MARK # CC-1-092-001-A73R	1								
	Apply one coat of Carbo Zinc #11 to above mat'l except th'ds which shall be coated w/a rust preventative.									

INFORMATION ONLY COPY — THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION

Approved By: C.F.C.
Date: 5-30-78

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ____ SHEET ___ OF ___

ITT GRINNELL
PIPE HANGER DIVISION

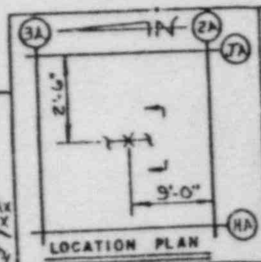
REF. DRAWING NUMBERS

PIPE: M1-0700 REV.6 ELECT: E1-0704 REV.3
STEEL: S-0735-REV.2 H.V.A.C.: M1-0753 REV.2

CONDITIONS	Fx	Fy	Fz	Mx	My
DESIGN					
NORMAL & UPSET	—	1809 2025	1834 1650		
EMERGENCY		[illegible]	[illegible]		
FAULTED	A				

REV.	DATE	ENG. BY	ENG. CHK.	DWN. BY	CHK. BY	DESCRIPTION
0	[illegible]	[illegible]	JHC	X.M.	SR	ISSUED FOR CONSTRUCTION
1	[illegible]	[illegible]	[illegible]	AT	[illegible]	LOAD CHANGE
2						
3						
4						

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0016
JOB NAME Comanche Peak 1 & 2
MARK NO. CC-1-092-001-A73R
SKETCH NO.
SHEET 1 OF 1 REV. 1

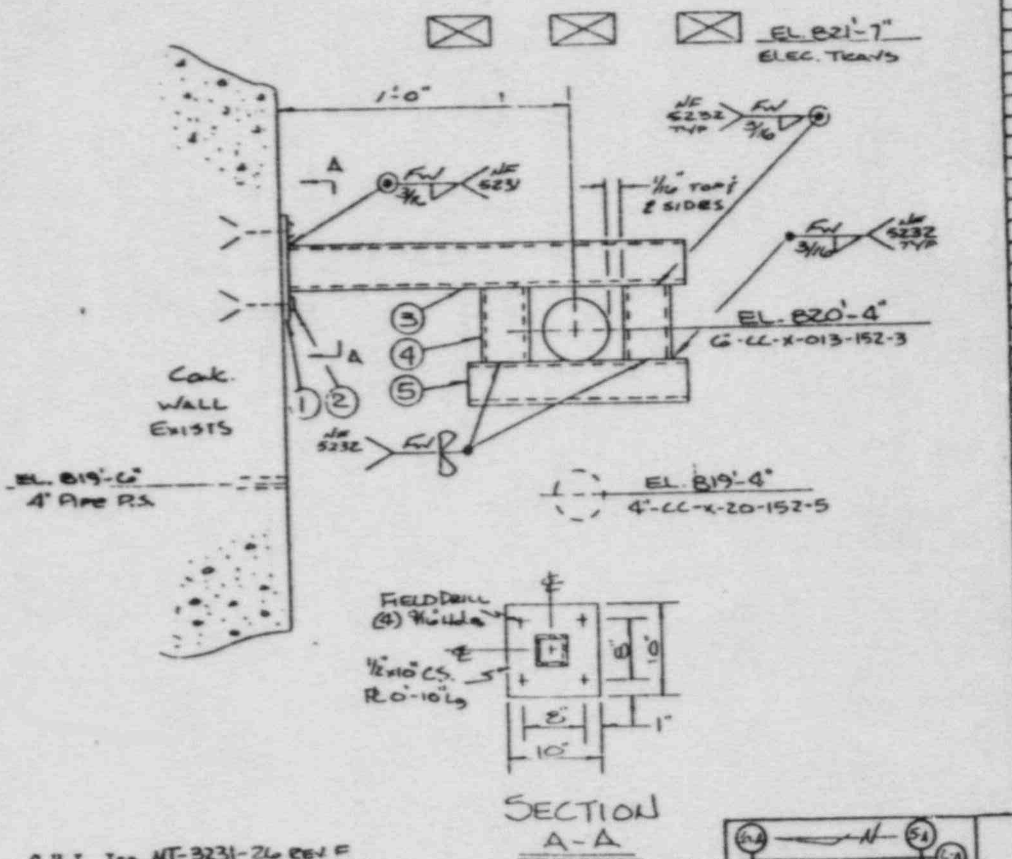


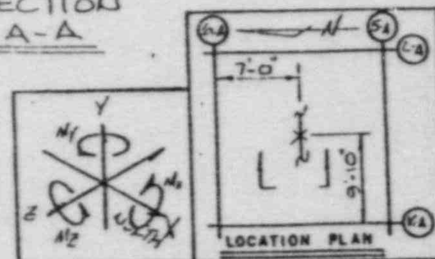
THIRD PARTY INSPECTION YES ☒ NO ☐
CODE CLASS: ASME III-3

Shop Weld No.	Weld Procedure	Exam. Procedure
#182	1-01-1-13	I-SF-1502 NF-2

cb

Attachment G





ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP		PBS	L	CSS	PRIM	SEC	AISC
	SEISMIC PIPE RESTRAINT CONSISTING OF:	ONE								
1	1/2"x10" Carbon STeel (SA-36 or SA-515 GR 65) Plate 0'-10" Long, TW-14#	1			x				x	
2	1/2"x5 1/2" Hilti Kwik Concrete Anchors (11141)	4						x		
3	1/4"x4"x4" Structural Tubing (A-500 GR B) 1'-6 1/2" Long, TW-19#	1					x		x	
4	1/4"x3"x3" Structural Tubing (A-500 GR B) 0'-6 11/16" Long, TW-10#	2					x		x	
5	1/4"x3"x3" Structural Tubing (A-500-GRB) 1'-1 3/4" Long, TW-10#	1					x		x	
	SEISMIC ASSEMBLY SKETCH AND ENGINEERING BUNDLE AND TAG	1 1								
	MARK # CC-X-013-013-A43R									
	No MAT'L BY GRINNELL									
	Apply one coat of Carbo Zinc #11 to above mat'l except th'ds which shall be coated w/a rust preventative.									

INFORMATION COPY
THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION

Approved By: CFG
Date: 5-8-79

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ___ SHEET ___ OF ___

ITT GRINNELL
PIPE HANGER DIVISION

REF. DRAWING NUMBERS
PIPE: M1-0703-02 REV 5 ELECT: E1-0701-05 R4
STEEL: S-0711 REV 6 H.V.A.C.: M1-0753 R4

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—	—	—	—	—	
NORMAL & UPSET	±491	±569	—	—	—	
EMERGENCY	±792	±745	—	—	—	
FAULTED	—	—	—	—	—	

REV.	DATE	ENG. BY	ENG. CHK.	DWN.	CHK BY	DESCRIPTION
0	4/21/79	SAR	H.K.	JFC	KCH	ISSUED FOR CONSTRUCTION
1						
2						
3						
4						

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. CC-X-013-013-A43R
SKETCH NO. —
SHEET 1 OF 1 REV. 0

THIRD PARTY INSPECTION YES ☐ NO ☒
CODE CLASS: ASME-III-3

G.H.I. Iso. MI-3231-26 REV F
I.P.D. Iso. CC-1-AB-64 REV 6
Data Point 30 / PI-65
Pipe Mat'l. SA-106 GR B
Insul. 1/2 Bldg. A

NOTE
1) All tolerances in accordance with [illegible]
2) [illegible] Procedure is [illegible]-4
3) [illegible] in accordance with [illegible] File No. 1 [illegible]

cb

place of manufacture to assure conform- ı the requirements of this specification.

All tubing shall be free from defects all have a workmanlike finish.

.1 Surface imperfections shall be classed cts when their depth reduces the remain- ıll thickness to less than 90 % of the ed nominal wall.

2 Surface imperfections such as han- ıarks, light die or roll marks, or shallow e not considered defects providing the ections are removable within the mini- /all permitted. The removal of such sur- ıperfections is not required. Welded tub- ıll be free of protruding metal on the : surface of the weld seam.

The ends of structural tubing, unless ·ise specified, shall be finished square cut e burr held to a minimum. The burr can noved on the outside diameter, inside ter, or both, as a supplementary require- When burrs are to be removed, it shall cified on the purchase order.

Upon request of the purchaser in the ct or order, a manufacturer's certification ıe material was manufactured and tested ordance with this specification together report of the chemical and tensile tests ɩe furnished.

ejection

Each length of tubing received from the facturer may be inspected by the pur- r and, if it does not meet the requirements ıis specification based on the inspection est method as outlined in the specification, ength may be rejected and the manufac- shall be notified. Disposit[illegible] of rejected ıg shall be a matter of agreement between ıanufacturer and the purchaser.

2 Tubing found in fabrication or in in- ion to be unsuitable for the intended [illegible] the scope and requirements of this [illegible] on, may be set aside and the [illegible] notified. Such tubing shall be subject al investigation as to the nature and of the deficiency and the forming lation, or both, conditions involved. D[illegible] on shall be a matter for agreement.

TABLE 1 Chemical Requirements

Element	Composition, %			
	Grades A and B		Grade C	
	Heat Analysis	Product Analysis	Heat Analysis	Product Analysis
Carbon, max	0.26	0.30	0.23	0.27
Manganese, max	...	...	1.35	1.40
Phosphorus, max	0.04	0.05	0.04	0.05
Sulfur, max	0.05	0.063	0.05	0.063
Copper, when copper steel is specified, min	0.20	0.18	0.20	0.18

TABLE 2 Tensile Requirements

Round Structural Tubing			
	Grade A	Grade B	Grade C
Tensile strength, min, psi (MPa)	45 000 (310)	58 000 (400)	62 000 (427)
Yield strength, min, psi (MPa)	33 000 (228)	42 000 (290)	46 000 (317)
Elongation in 2 in. (50.8 mm), min, %	25[A]	23[B]	21[C]
Shaped Structural Tubing			
	Grade A	Grade B	Grade C
Tensile strength, min, psi (MPa)	45 000 (310)	58 000 (400)	62 000 (427)
Yield strength, min, psi (MPa)	39 000 (269)	46 000 (317)	50 000 (345)
Elongation in 2 in. (50.8 mm), min, %	25[A]	23[B]	21[C]

[A] Applies to specified wall thicknesses 0.120 in. (3.05 mm) and over. For wall thicknesses under 0.120 in., the minimum elongation shall be calculated by the formula: percent elongation in 2 in. = $56t + 17.5$.

[B] Applies to specified wall thicknesses 0.180 in. (4.57 mm) and over. For wall thicknesses under 0.180 in., the minimum elongation shall be calculated by the formula: percent elongation in 2 in. = $61t + 12$.

[C] Applies to specified wall thicknesses 0.120 in. (3.05 mm) and over. For lighter wall thicknesses, elongation shall be by agreement with the manufacturer.

NOTE—The following table gives calculated minimum values for longitudinal strip tests:

Wall thickness, in. (mm)	Elongation in 2 in. (50.8 mm), min, %	
	Grade A	Grade B
0.180 (4.57)	...	23
0.165 (4.19)	...	22
0.148 (3.76)	...	21
0.134 (3.40)	...	20
0.120 (3.05)	25	19.5
0.109 (2.77)	23.5	19
0.095 (2.41)	23	18
0.083 (2.11)	22	17
0.065 (1.65)	21	16
0.049 (1.24)	20	15
0.035 (0.89)	19.5	14

TABLE 3 Specified Mill Length Tolerances for Structural Tubing

	22 ft (6.7 m) and Under		Over 22 to 44 ft (6.7 to 13.4 m), incl	
	Over	Under	Over	Under
Length tolerance for specified mill length, in. (mm)	½ (12.7)	¼ (6.4)	¾ (19.0)	¼ (6.4)

TEXAS UTILITIES SERVICES INC.
COMANCHE PEAK S.E.S.
Agent For
DALLAS POWER & LIGHT COMPANY
TEXAS ELECTRIC SERVICE COMPANY
TEXAS POWER & LIGHT COMPANY

Date 7-30-84
Calc By GMC
Chk'd/Apprd. By
Filing Code
Sheet No. 1 of 1
G & H Job. No.
Subject CC-2-028-704-A33A
Ref. Dwg./Spec. No.

A500 REVIEW

$$\frac{17655}{28800} + \frac{2899}{18900} = 0.766$$

1.) 2899 = 19075#/6.58 IN² = 2899 #/IN²

WHERE: 19075 = AXIAL LOAD

6.58 IN² = AREA OF T.S. 6x4

2.) 28800 = (32.8 KSI)(.66)(1.33)

WHERE: — 32.8 KSI IS S_y @ 200°

— 0.66 MULTIPLIER BY S_y

— (1.33) MULTIPLIER TO FIND EMER ALLOW

3.) 18900 PSI = F_a = 22,000 (.856)

WHERE: (.856) IS 32.8/38.3

THIS IS A RATIO OF THE OLD ALLOWABLE TO THE NEW

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

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

CERTIFICATE OF SERVICE

I hereby certify that copies of "Applicants' Reply to CASE's Answer to Applicants' Response to Board's Partial Initial Decision Regarding A500 Steel", in the above-captioned matter was served upon the following persons by express delivery (*), or deposit in the United States mail, first class, postage prepaid, this 16th day of November, 1984, or by hand delivery (**) on the 19th day of November, 1984.

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