UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

June 5, 1983

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of

APPLICATION OF TEXAS UTILITIES GENERATING COMPANY, ET AL. FOR AN OPERATING LICENSE FOR COMANCHE PEAK STEAM ELECTRIC STATION UNITS #1 AND #2 (CPSES)

Docket Nos. 50-445 and 50-446

AFFIDAVIT OF DR. DAVID H. BOLTZ

Q: Please state your name and address for the record.

A: My name is Dr. David H. Boltz. I reside at 2012 South Polk Street, Dallas, Texas, 75224.

Q: Is a copy of your most recent resume attached to this affadavit?

A: Yes. It is the one which I am currently using to seek employment in my field. (It is Attachment A to this Affidavit.)

Q: Are you on the Board of Directors of CASE?

A: Yes.

Q: Did you review the following ASME Code subsections in preparation for the May hearings: NF-3231.1(a), NF-1121(a), NF-3213.10, NF-3121.11 (1980 Edition with Winter 1982 Addenda)?

A: Yes, I did.

Q: Why didn't you present your affidavit on NF-1121(a) for the May hearing?

A: It never occurred to me that the subsection could be misunderstood in this way. It never occurred to me that anyone would call "but" a subordinate conjunction, thus making the clause in question subordinate. Immediately following the Board's ruling on Monday, May 16, I prepared a brief linguistic

analysis, including a paraphrase on NF-1121(a) which makes implicit information explicit.

Q: Since the close of the May hearings, have you reviewed the pertinent portions of the transcript regarding this Board ruling?

A: Yes, I have.

Q: Please describe in detail your grammatical and linguistic analysis of subsection NF-1121(a), and give your expert opinion regarding the proper understanding of the meaning of this subsection.

A: Before I begin, I wish to comment on the lack of complexity of my analysis. This analysis is not intended to bedazzle any linguist who may read it. Instead, it is intended to simply set forth the structure of the subsection in question so as to make its meaning understandable. I have deliberately avoided using technical jargon in my attempt to make my points easily understood by all. I will defer to the engineers among us regarding possible implications of the subsection as it was structured in the 1974 Edition of the Code.

I will begin with a surface structure chart of NF-1121(a):

(1) The rules of Subsection NF provide requirements for new construction

and

(2) include consideration of mechanical stresses and effects

(a) which result from the constraint of free-end displacements

(b) , designated as P_e in NF-3222.3

but

(3) not thermal or peak stresses.

First, item (2)(b) on the previous page stands in apposition to (2) and to (2)(a), since it posits an equivalent relationship between itself and the set comprised of (2) and (2)(a). (This is easily seen since (2)(b) is a cross-reference.) To properly set off the phrase "designated as P_e in NF-3222.3" (and to bring it in line with standard English punctuation rules), a second comma is needed following the phrase. (Incidently, on page 5997 of the transcript, the court reporters punctuated this subsection correctly.)

Second, clause (2)(a) cannot be modified by clause (3) since, according to rules which can be found in most standard English grammars (see Attachment B), the clause "but not thermal or peak stresses" is coordinate, not subordinate (as was alleged on page 5999 of the transcript). (Thus, it would be incorrect to infer that thermal stress is a type of free-end displacement.) In addition, according to basic linguistic principles regarding how "but" functions in the subsection and how the parts of the sentence relate to one another, "but" must be considered to be a coordinate, not a subordinate, conjunction. This is true since "but" relates two <u>equal</u> clauses which are comprised of grammatically-equivalent elements on the same linguistic level.

The problem appears to be that <u>clause (3) looks like a phrase in the surface structure</u> (and, thus, could be mistaken for one), <u>but in the deep structure it is, in reality, a clause</u>. The following chart of the subsection's deep structure makes explicit the implicit information contained in the two ellipses (which have been typed in italics for clarity):

(1) The rules of Subsection NF provide requirements for new construction

and

(2) *the rules of Subsection* NF include consideration of mechanical stresses and effects

(a) which result from the constraint of free-end displacements

(b) , designated as P_e in NF-3222.3

but

(3) *the rules of Subsection* NF *do* not *include consideration of* thermal or peak stresses.

As is clearly seen in the above chart with the ellipses made explicit, "but" functions in such a way as to show deep structure contrast. (Linguistically, this is termed a NEGATIVE ALTERNATIVE.) The writers of this subsection apparently posited that a given set of stresses exist and that of this given set of stresses, some will be considered and some will not. According to the way that this subsection was written in the 1974 Edition of the Code, they apparently determined that mechanical stresses and effects resulting from the constraint of free-end displacements <u>are</u> to be considered, while thermal stresses and peak stresses are not.

Clause (3), seen in the light of the deep structure chart, is a coordinate clause on an equal footing with clauses (1) and (2). It is not a subordinate clause dependent on (1) and (2). It cannot be viewed as modifying "constraint of free-end displacement" and, thus, restricting the <u>causes</u> of constraint of free-end displacements. It must be noted that nothing is said in this subsection which would restrict the set of causes of constraint of free-end displacements. This subsection merely states that a constraint of free-end displacement

causes mechanical stresses and effects which <u>must</u> be considered.

Further support for the correctness of this analysis is given in NF-3121.2 where it states: "In addition to the above, for piping and component supports, stresses induced in the support by restraint of free-end displacement ((NF-3111(e) and (f)) and anchor motion of piping are considered primary stresses." Similarly, no restriction on causation is given in this subsection. Thus, since no restriction is given, it must be assumed that all causes of constraint of free-end displacement are valid and that all constraint of free-end displacements, whatever the cause, must be considered.

It should also be noted that subsection NF-3231.1(a) contains an ellipis which is similar to that described in NF-1121(a). A similar analysis run on this subsection would lead to the same conclusion as for this one.

Q: Is there anything you wish to add at this time?

A: Yes, there is. It is my opinion that the text of the NF-1121(a) which appears in the 1974 Edition of the Code was not written as clearly as it might have been. Thus, the words which appear there may not say what the Committee originally intended for them to say. Nevertheless, this reading of the subsection which is based on a brief linguistic analysis is, I believe, the correct one. I also feel that the Committee's revision of this very subsection (a revision which appeared in the Winter, 1982 Addenda to the 1980 Edition of the Code) attempted to clarify the wording of the 1974 text.

I have read the foregoing 5 -page affidavit, which was prepared under my personal direction. The thoughts and words expressed therein are my own thought and words. Where questions were posed, they were posed by CASE. The statements contained therein are true and correct to the best of my knowledge and belief.

Dr. David H. Boltz

Date: 6/5/83

STATE OF TEXAS

On this, the 5th day of June, 1983, personally appeared Dr. David H. Boltz, 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 5th day of June, 1983.

Notary Public in and for the State of Texas

My Commission Expires: Dec. 31, 1983

DR. DAVID HERMAN BOLTZ

2012 South Polk Street
Dallas, Texas 75224
(214) 339-4979

EDUCATION

Ph.D. - Philosophy (Linguistics) - University of Texas at Arlington (12/81)
M. A. - Theological Studies (summa cum laude) - Wheaton Graduate School (6/76)
B. A. - Religious Education (summa cum laude) - Wheaton College (6/74)
A. A. - College Preparatory (magna cum laude) - College of DuPage (6/72)

SKILLS AND EXPERIENCE

Communication

Guest lecturer and adult seminar leader for various local community groups including the Jewish Federation of Dallas and the United Synagogue Youth Council. Developed and taught several courses in a community-wide continuing adult educational program. Employed a wide range of teaching methods in order to effectively motivate participants to use what they learned. Cross-culturally conversant. Consultant for Performax Systems, International, Inc. (personal situational perspective and behavioral pattern analysis).

Educational Planning and Development

Assessed needs, developed cirricula and related instructional materials (as well as learning experiences and evaluations) for each seminar. Major contributor to discussion guide for a recent local educational conference. A contributing editor for a personal growth and development workshop manual and leader's guide for executives of the Weyerhauser Corporation (under the aegis of Source, Inc.). Formerly on the Alumni Board of College of DuPage, planning the scope and direction of the association as well as the development of a professional-quality magazine and the establishment of scholarship funds. Currently on the Board of Citizens Association for Sound Energy developing workable strategies for utility hearings; using speed-reading and analytical skills to examine and organize technical data for findings of fact. Also narrated and assisted in the development of a recent multi-media educational presentation.

Organizational and Managerial

Varied supervisory experience. Able not only to assume but also to delegate responsibility. Both task and time oriented: meeting deadlines while having a proven track-record of meeting and exceeding departmental goals. Able to manage team members effectively as well as efficiently so that as goals are achieved, team morale remains high. Highly motivated self-starter: worked to pay own way from junior college through doctorate.

HONORS

Member - Phi Sigma Iota (national linguistic honor society)
Who's Who Among Students in American Universities and Colleges
National Phi Rho Pi champion - Reader's Theater
Semi-finalist - Informative and Persuasive Speaking

References and dates of employment available upon request.

ATTACHMENT B

The Random House Handbook

Third Edition

FREDERICK CREWS

CONJ
There may be difficulties ahead. *But* it is time to make a decision.

Since conjunctions are most likely to be confused with prepositions and adverbs, look to see if the word at issue *takes an object* or *modifies another word*. If it does either, it isn't a conjunction.

types of conjunctions All conjunctions are either *coordinating*, *subordinating*, or *correlative:*

coordinating conjunctions			
and	or		
but	so		
for	yet		
nor			
subordinating conjunctions			
after	because	so (that)	when
although	before	than	whenever
as	how	that	where
as if	if	though	wherever
as long as	in order that	till	while *(etc.)*
as soon as	provided (that)	unless	
as though	since	until	
correlative conjunctions			
both . . . and			
either . . . or			
neither . . . nor			
not only . . . but also			

The difference in function between coordinating and subordinating conjunctions is important to a writer aiming at precise statement (see pp. 141–146). Coordinating conjunctions are meant to join *logically comparable* elements, without turning one element into a modifier of the other:

The night is young, { and you're so beautiful.
but you aren't.
or perhaps it isn't.

A subordinating conjunction, by contrast, joins *logically distinct* elements, one of which supports, explains, or subtracts something from the other:

CASE

(CITIZENS ASSN. FOR SOUND ENERGY)

1426 S. Polk
Dallas, Texas 75224

214/946-9446

EXPRESS MAIL

June 1, 1983

Mr. Kevin Ennis
Nuclear Department
American Society of Mechanical Engineers
345 East 47th St.
New York, N. Y. 10017

Dear Mr. Ennis:

Subject: ASME Code Interpretation Request

As I discussed with you by phone yesterday, we request an interpretation of the ASME Code regarding the items on the attached sheets.

We realize that some of the questions may appear to be elementary; however, we need an official ASME interpretation of them. We also realize that our request appears to be quite lengthy; however, we have included several items which can be answered yes or no, and we believe you'll find that the questions are not as formidable as they may appear at first glance.

We also wanted to confirm some information we discussed during our telephone conversation. It is our understanding that there is no charge for an ASME Code interpretation, and we want to express our appreciation for this service.

It is also our understanding that ASME does not officially recognize any interpretation of any portion of the ASME Code by any individual or group other than the ASME Code Interpretation committee. (And this is the reason for our request.)

From our discussion, we understand that the procedure will be to turn our request over to a four-person committee for consideration, and that their consideration may take anywhere from about fifteen days (if everyone agrees, which is somewhat unusual) to several months (perhaps six months or so). We would also appreciate being advised of the names of the members of the committee who ultimately make the decision (following the decision). As I mentioned today, our only concern in this regard would be that no individual who is directly involved in the Comanche Peak operating license hearings before the Nuclear Regulatory Commission, in which CASE is the Intervenor, should be in the position of participating in the decision. We understand that ASME's usual position in this regard is to leave this up to the individual, but that you do have a code of ethics and would not want to have even the appearance of any undue influence regarding the decision.

One matter which we did not discuss yesterday which we would like to know is whether or not you are aware of any previous Code interpretations regarding the items attached to which we might refer.

Again, thanks very much for your assistance. If we can offer any clarification regarding what we're concerned about, please let me know.

Sincerely,

Juanita Ellis

(Mrs.) Juanita Ellis, President

Attachment: Code Interpretation Request

ASME 1974 Edition

"NF-3231.1 Elastic Analysis

"(a) Design, Normal and Upset Conditions. The stress limits for Design, Normal, and Upset Conditions are identical and are given in Appendix XVII. The allowable stress for the combined mechanical loads and effects which result from constraint of free-end displacements (NF-3213.10), but not thermal or peak stresses, shall be limited to three times the stress limits of XVII-2000."

1. Under NF-3231.1(a), is constraint of free-end displacement a primary or a secondary stress?

2. Under NF-3231.1(a), is thermal stress a primary or a secondary stress?

3. Under NF-3231.1(a), must all primary stresses be included in the design of linear-type pipe supports?

4. Under NF-3231.1(a), is constraint of free-end displacement due to expansion of a pipe support which is the result of a uniform increase in environmental temperature a primary stress or a secondary stress?

5. Under NF-3231.1(a), is any potential cause(s) of free-end displacement excluded from consideration in the design of linear-type pipe supports?
   If so, please indicate which cause(s) are excluded and which cause(s) must be considered.

6. Under NF-3231.1(a), must constraint of free-end displacement due to expansion of a pipe support which is the result of a uniform increase in environmental temperature be considered in the design of linear-type pipe supports?

7. Under NF-3231.1(a), when a pipe support wants to expand due to a uniform increase in environmental temperature, and that support is restrained on both ends:

   (a) Is the stress resulting from the pipe support's being unable to freely expand considered to be a thermal expansion stress?

   (b) Is the stress resulting from the pipe support's being unable to freely expand considered to be a thermal stress?

   (c) Is the stress resulting from the pipe support's being unable to freely expand considered to be constraint of free-end displacement?

   (d) Is the stress resulting from the pipe support's being unable to freely expand considered to be a primary stress or a secondary stress?

8. Under NF-3231.1(a), when a pipe support wants to expand due to a uniform increase in environmental temperature, and that support is restrained on both ends:

   (a) Must the effects which result from the support's being unable to freely expand be considered in the design of linear-type pipe supports?

   (b) Must the effects on the support itself (i.e., the stress within the support member itself) which result from the support's being unable to freely expand be considered in the design of the support?

   (c) Must the effects on the pipe which the support is supporting which result from the support's being unable to freely expand be considered in the design of the support?

   (d) Must the effects on the wall which result from the support's being unable to freely expand be considered in the design of the support?

   (e) Must the effects on the individual members of the support which result from the support's being unable to freely expand be considered in the design of the support (or must only the effects on the entire support which is welded together be considered in the design of the support)?

   (f) Is it correct that the effect on a pipe support from the piping system must be considered, but that the effect of the constraint on the support itself need not be considered?

   (g) Would the effects of the differential expansion between a wall and a pipe support under uniform distribution of environmental conditions be considered constraint of free-end displacement?

   (h) Is it correct that constraint of free-end displacement must be considered:

      (1) between the pipe and the support?

      (2) between the support and the wall?

      (3) between two supports?

      (4) all of the above?

      (5) none of the above? (Please explain.)

9. Have any of the preceding Code interpretations changed under the Winter 1982 Addenda to the 1980 Edition of the Code?
   If so, please explain in what way they have changed and the reason for the change(s).

ASME 1974 Edition

"NF-1121 Rules for Supports

"(a) The rules of Subsection NF provide requirements for new construction and include consideration of mechanical stresses and effects which result from the constraint of free-end displacements, designated as P_e in NF-3222.3 but not thermal or peak stresses."

1. Under NF-1121(a), is constraint of free-end displacement a primary or a secondary stress?

2. Under NF-1121(a), is thermal stress a primary or a secondary stress?

3. Is constraint of free-end displacement due to expansion of a pipe support which is the result of a uniform increase in environmental temperature a primary stress or a secondary stress?

4. Must all primary stresses be included in the design of linear-type pipe supports? (If not, please specify which must be or may not be included.)

5. Under NF-1121(a), is any potential cause(s) of free-end displacement excluded from consideration in the design of linear-type pipe supports?
   If so, please indicate which cause(s) are excluded and which cause(s) must be considered.

6. Under NF-1121(a), does constraint of free-end displacement due to expansion of a pipe support which is the result of a uniform increase in environmental temperature need to be considered in the design of linear-type pipe supports?

7. Under NF-1121(a), do you agree with either of the following paraphrases?

   (a) The rules of Subsection NF provide requirements for new construction and include consideration of mechanical stresses and effects which result from the constraint of free-end displacements, designated as P_e in NF-3222.3, but the rules of Subsection NF do not include consideration of thermal or peak stresses which result from the constraint of free-end displacement.

   (b) The rules of Subsection NF provide requirements for new construction and include consideration of mechanical stresses and effects which result from the constraint of free-end displacements, designated as P_e in NF-3222.3, but the rules of Subsection NF do not include consideration of thermal or peak stresses when a constraint of free-end displacement is also present.

   (c) If neither paraphrase is correct (either in full or in part), please rewrite the paraphrase correctly.

8. Does NF-1121(a) mean that in a structure where constraint of free-end displacement, thermal stresses, and peak stresses are present only constraint of free-end displacement need be considered?

9. Does NF-1121(a) mean that if a structure will not undergo constraint of free-end displacement, thermal and peak stresses should be considered (if present)?

10. Please define thermal stress, thermal expansion stress, and constraint of free-end displacement in regard to pipe supports.
    Please include specific examples of each in your response.

11. Have any of the preceding Code interpretations changed under the Winter 1982 Addenda to the 1980 Edition of the Code?
    If so, please explain in what way they have changed and the reason for the change(s).

ASME 1974 Edition

"NF-3213.10 Free End Displacement consists of the relative motions that would occur between an attachment and connected structure or equipment if the two members were separated. Examples of such motions are those that would occur because of relative thermal expansion of piping, equipment, and equipment supports, or because of rotations imposed upon the equipment by sources other than the piping."

1. Is it correct that an equipment support's thermal expansion must be considered but that a pipe support's thermal expansion need not be considered?

2. Could the motions which would occur because of relative thermal expansion of pipe supports also be considered to be an example of the motions referenced in the second sentence of NF-3213.10?

3. Have any of the preceding Code interpretations changed under the Winter 1982 Addenda to the 1980 Edition of the Code?

   If so, please explain in what way they have changed and the reason for the change(s).

ASME 1980 Edition with Winter 1982 Addenda

"NF-3121.11 Thermal Stress. Thermal stress is a self-equilibrating stress produced by a nonuniform distribution of temperature or by differing thermal coefficients of expansion. Thermal stress is developed in a solid body whenever a volume of material is prevented from assuming the size and shape that it normally would under a change in temperature. Evaluation of thermal stresses in the support is not required by this Subsection."

1. Under NF-3121.11, does the term "solid body" mean:

   (a) a piece of solid steel?

   (b) a piece of tube steel?

   (c) a frame?

   (d) any entire structure which is welded together?

   (e) in regard to a pipe support, the entire frame welded together regardless of the number and/or sizes of members involved?

   (f) none of the above. (Please explain.)

May 22, 1983

Mr. Kevin Ennis
American Society of Mechanical Engineers
345 East 47th St.
New York, N. Y. 10017

Dear Mr. Ennis:

Subject: Code Interpretation

As discussed by phone with you Friday, I would appreciate a Code interpretation of the following:

1. In NF 3213.10 of the 1974 Code with Winter Addenda, is thermal expansion of component supports or pipe supports to be considered as an example of free-end displacement?

2. In NF-3231.1(a) of the 1974 Code with Winter Addenda, does the phrase "constraint of free-end displacement" exclude those stresses due to thermal expansion as used in the above examples of free-end displacement in NF 3213.10?

3. Does thermal stress as defined in NF 3121.11 of the 1980 Code with Winter 1982 Addenda and as used in NF 1121(a) of the 1974 Code with Winter Addenda include those stresses that result from constraint of free-end displacements due to uniform distribution of temperature which could result from environmental conditions?

If you should need clarification of any of the above questions, please let me know.

I would appreciate anything you can do to expedite the interpretation.

Sincerely,

Mark A Walsh

Mark A. Walsh
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