



ENERGY
SERVICES

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March 2, 1984
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50-445/446

Mrs. Juanita Ellis, President
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Subject: Comanche Peak Steam Electric Station Independent Assessment Program -
Response to CASE Questions

Reference: (1) Brief Summary of Generic Problems from CASE Witness
Jack Doyle, 2/22/84.

(2) Brief Summary of Cross-examination Questions from CASE Witness
Mark Walsh, 2/22/84.

ATTACHED

Dear Mrs. Ellis:

Enclosed please find our responses to reference (1) items 1 and 3, and reference (2) item 10.
We are continuing to complete the remaining responses and anticipate sending another partial
set next week.

Very truly yours,

N. H. Williams

Nancy H. Williams
Project Manager

NHW:earn

Enclosures: Attachment A, Partial Responses to
CASE Questions

cc: See attachment

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Mrs. J. Ellis
Response to CASE Questions

March 2, 1984
Attachment

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1.0 CASE Question

Effects of out-of-plane seismic excitation of support hardware not included in calculation. Did Cygna address this point?

- Additional loads on support?
- Additional loads on pipe?

2.0 Cygna Interpretation

Did Cygna evaluate the effects of support self-weight excitation in the off-direction, as related to:

- a. support design?
- b. pipe design?

3.0 Response

- a. In the IAP Draft Report, Cygna noted that self-weight excitation was not included in the support design. Note 1 to checklist PS-01 states:

"Support Self-Weight Excitation"

In general, pipe support vendors have not included support loads due to self-weight excitation in their loading. Texas Utilities has done a generic study in response to Walsh/Doyle allegations which shows the effects are negligible. The NRC Site Inspection Team (SIT) has reviewed and accepted this evaluation in item 3.h of inspection reports 50-445/82-26 and 50-446/82-14."

Since the IAP was performed for the NRC Staff, further evaluation of an issue already identified and reviewed by the Staff would have been redundant. Accordingly, Cygna noted the potential deficiency on the appropriate checklist and deferred to the Staff evaluation.

- b. The response to item b. will be provided later.

Comanche Peak ASLB Hearings
Response to CASE Questions
Question No. Doyle # 3
exhibit No. 891, 897

1.0 CASE Question

Dead weight of structure not included in calculation.

2.0 Cygna Interpretation

Did Cygna consider the effect of gravity loads on the design of pipe supports?

3.0 Response

Cygna considers self-weight excitation to include all acceleration load effects within the support, including gravity. Therefore, this matter is addressed by note 1 on checklist PS-01.

For further discussion of the evaluation process regarding self-weight excitation, see the response to Doyle Question #1.



1.0 CASE Question

WD-07-02 What document did Cygna see that showed the temperature indicator would be installed at a later date?

2.0 Cygna Interpretation

What was the basis for closing Cygna Observation WD-07-02? What documentation was reviewed?

3.0 Response

Based on a conversation with Texas Utilities personnel, Cygna learned that temperature elements are normally installed after all other work in an area is completed. This is done in order to avoid damage to the instrument during construction. When Cygna performed the Spent Fuel Pool Cooling System walkdown, painting activities were still underway.

Further review also showed that local indicators, such as this one, are not safety related devices.

The key documents reviewed by Cygna relevant to closing Observation WD-07-02 are discussed below:

1. Instrument Installation Checklist (Form No. 2-81)
Form 2-81 is required to be completed by CP procedure 35-1195-ICP4. In this case, it indicated that the device was not installed and that the "discrepancy" was "turned over to Brown & Root completion and TUGCO".
2. The Q-list was checked to ensure that the device was non-safety.



BRIEF SUMMARY OF GENERIC PROBLEMS

Omitted from Calculations and Omitted from Checklists

1. Cinched up U-bolts:
 - o Not in compliance with Cygna criteria
 - o Not in compliance with NRC criteria
 - o Stresses of unknown quantity due to pre-stress, thermal and design loads
 - o Effects on pipe not shown on calculations
 - o Not in compliance with Board Notification.
2. Local effects on tube walls:
 - o Punching shear
 - o Effect on welds
 - o Resultant effect due to wall flexibility on moment at tube weld.
3. Dead weight of structure not included in calculations.
4. Weight of support masses as they affect pipe stress.
5. Inaccurate conclusions as relate to KL/R for pinned columns:
 - o If a column fixed at its base and free at the top has an effective K of 2.0 cutting at some point up from the base and adding a pin does not address the problem.
6. 16-inch pipe with about 20 kip load along 3 1/2-inch length induces high bearing stresses which require pads. This is not addressed,
 - o ASME Code against flattening.
7. Clip angle 4x4x1/2 which supports U-bolt not addressed (critical to maintaining stability):
 - o Section modulus .04 in cube
 - o Moment arm at least 2 inches
 - o 1100# load exceeds Code allowables.
 - o Pre-tensioning to obtain a clamping force required could exceed

- this (not including thermal constraint and design loads)
- o Clamping force with no margin of safety for single degree system
(not point contact or line contact) is force/coefficient of friction
or about 4 times what is required for clamping force.
8. There is no documentation in calculations to support the conclusion that flair weld is stronger than fillet weld--no calculations, therefore why did Cygna accept this statement?
- o Flair weld strength depends on radius of flair (depth).
9. The reduction of weld capacity in the calculation is based on 135° . Actual tangential angle is 150.3° . Therefore, an error exists. Did Cygna take note of this?
- o More stress in weld than stated.
 - o Wide/thin ratio induces cracking as well as the 1:4:1 ratio width to depth.
10. Changing from flair weld to fillet weld induces flange bending. Has this been addressed by Cygna?
11. Effects of out-of-plane seismic excitation of support hardware not included in calculation. Did Cygna address this point?
- o Additional loads on support
 - o Additional loads on pipe
12. Restraint of rotation by the pipe because of coupling effect of hardware on both sides of a pipe:
- o Load increase in 1 of 2 snubbers/struts
 - o Alteration of dynamics of pipe system during seismic event
13. In Note 2 following page PS-01-4 of 4, Cygna decided to eliminate their stiffness criteria based on their knowledge that a report existed to address the problem (but without personal knowledge of what was contained

in the document in detail). Why didn't Cygna consult with their experts-- for example, Eric von Strijgeren (who was the editor on a paper by T.Y. Chow, C.H. Chen and O. Bilgen)--in reference to deviations from generic stiffnesses in pipe supports and the effects on piping systems.

o Third paragraph introduction et. seq. (CASE Ex. 884)

14. In Note 1, same source, did Cygna consider the additive effects of self weight excitation if the stiffness is considered from node point to hard point as opposed to the stiffness of the frame independent of hardware, local effects, base plate and anchor bolts?

o Spring rate of base plate/anchor bolts (particularly bearing-type joints) can be considerable (observation of base plate II finite analysis).

15. Was thermal lockup considered for anchors which restrain pipe radial growth?

o Induces frame moments

16. The base plate analysis is based on distribution of shear relative to load path/stiffness for all bolts in the pattern. Did Cygna address this problem?

o With oversized holes and the inability to eliminate construction tolerances (location of the bolts combined with location of the bolt holes), it is not possible for all of the bolts in the system to be active. (See CASE Exhibit 906).

o The stiffness of the bolts is such that deflection cannot be counted on as a means to achieve full pattern participation

o Even if deflection could result in full activity, the first bolts deflecting would receive the larger portion of the load in an ideal symmetrical and systems.

- o For non-symmetrical system and systems of variable stiffness, the inactivity of a number of the bolts will alter the accuracy of the computerized analysis.
17. Has Cygna verified the statement: "No 2-inch topping"?
- o This affects the calculations for Hiltis relative to embedment, since a non-monolithic shear plane has been established.
18. The base plate analysis performed without including stiffeners alters the stiffness matrix of the base plate and consequently the distribution of moments and tension to the bolts. Beyond this point, stiffeners remain unqualified. Has Cygna addressed this?

The preceeding questions are the primary areas in which I will be cross-examining Cygna witnesses. (Additional questions may be triggered by Cygna witnesses' answers.)

In addition, CASE has not yet received all of the documents which it requested from Applicants' on the Cygna report. Therefore, additional questions may be triggered from these documents (if and when they are supplied).

2/22/84

MATRIX OF EXHIBITS AND DOCUMENTS

<u>CASE Exhibit</u>	<u>Concerns</u>
891	1, 3, 4, 5, 6, 7, 11, 13, 14, 15, 16
892	9, minor question relative to pad width diameter + (Rt) ^{1/2}
893	8, 10, 14
894	1, 4, 5, 11, 14
895	14, 16
896	12, 14
897	1, 2, 3, 4, 5, 11, 14, 16
898	14, 15, 16, 18
899	14, 15, 16, 18
900	14, 15, 16
901	Has minimum weld violation (walk-down)
902	Has support completely rebuilt on CMC and then calculated

This matrix has been compiled to the best of our ability due to time constraints. (It is from notes, etc.)

BRIEF SUMMARY OF CROSS-EXAMINATION QUESTIONS

BY CASE WITNESS MARK WALSH TO CYGNA

Appendix E of Cygna Report

Section DC-2.4.4. What was the yield point used for A500 Grade B tube steel?

Observation Record PS-02-01: The Applicants did not consider shear cone interaction of adjacent bolts.

PI-01-01. There has been no detailed computer analysis performed to consider the concentrated loads (valves, etc.) and their effect on dead weight and seismic. Also, the seismic analysis will not be linearly proportional.

PI-02. Is there an error in the table shown?

CTS-00-03: See CASE Exhibit 889, sheet 129. F_{bx} = should be 21.2, not 23.2 or 22. The length is 6' not 5.5'.

See CASE Exhibit 890: 1) Why was only 1/2 SEE considered?
2) Why was 4% damping used; not consistent with FSAR? 3) Assumed cable tray was rigid when lumping the mass; this resulted in not combining the dynamic effects of the cable tray itself to the support; did not include effect on welds.
4) The validity that the cable trays have the capacity to transfer a load around a corner when one run of cable tray has no axial restraint, as shown on drawing 2323 EI-0601-01. (NOTE: We only have a 36"x48" drawing; please let us know when you want to look at it.). 5) What documentation did Cygna see that justified the hangers' receiving a lateral load around corners that resist the axial load from the tray segment that contains no axial restraints;

how did Cygna evaluate it? It appears the axial load has not been taken into account. 6) CASE Exhibit 902. Did not consider base plate flexibility.

CTS-00-05: In the description, it discusses a channel bent about its weak axis. The resolution does not consider this problem nor does the document CASE requested on discovery; see CASE Exhibit 907. On CMC 88306, are the originator and approver the same person?

CTS-00-06. What is the "significant design margin" as shown in the resolution?

CTS-00-07: The analysis that included the beam element did not consider prying action and the flexibility of the base plate to determine the center of compression.

WD-03-01: What documentation was there that "accept as is" was valid? Were there calculations to support this?

WD-07-02: What documentation did Cygna see that showed the temperature indicator would be installed at a later date?

Pipe stress checklist, note 3, item a: 1) What is the basis for considering that the effects were negligible? 2) What pipe stress run did Cygna look at, since the inclined load was used in the design of support RH-1-010-003-S22R?

Cable Tray Check List: CTS-11, Item 6, problem 4. This was not discussed in CTS-00-07.

The preceeding questions are the primary areas in which I will be cross-examining Cygna witnesses. (Additional questions may be triggered by Cygna witnesses' answers.)

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