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October 1, 1984
84042.018

Mr. J. B. George
Project General Manager
Texas Utilities Generating Company
Comanche Peak Steam Electric Station
Highway FM 201
Glen Rose, Texas 76043

Subject: Status of Cinched U-Bolt Testing and Analysis Program
Comanche Peak Steam Electric Station
Independent Assessment Program - Phase 3
Job No. 84042

References: (a) N. H. Williams (Cygn) letter to J. B. George (TUGCO) "U-Bolt Cinching Testing/Analysis Program - Phase 3 Open Item," 84042.015, dated August 23, 1984.

(b) Transcript of "Discussion between Cygn Energy Services and Texas Utilities Generating Company and EBASCO Services, Inc.," dated September 13, 1984

(c) R. C. Iotti (EBASCO) letter to N. Williams (Cygn), "Additional Information as follow-up to Meeting of 9/13/84," 3-Z-17(6.2) ETCY-1, dated September 18, 1984.

Dear Mr. George:

Reference (a) contained Cygn's questions on the TUGCO cinched U-Bolt testing and analysis program. Based on the results of the September 13, 1984 meeting (reference b) and the information provided in the September 18, 1984 EBASCO letter (reference c), Cygn considers the following reference (a) comments closed: 1, 3, 5, 7, 8, 10, 13, 14, 15, 16 and 17. The remaining comments require additional clarification and/or information in order for Cygn to understand TUGCO's stated position. Each item is discussed in more detail below.

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1/2 See Attached



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1. **Cygna Question 2 (transcript page 27)**
Re: Classification of Preload

TUGCO has classified the pipe stress due to preload as primary in the first alternative and increased the allowable primary stress. In the second alternative, TUGCO classifies only the membrane portion of the preload stress as primary, and then neglects the bending (or membrane) portion in the primary plus secondary evaluation. TUGCO's basis for this is that the stress is non-cyclic in nature (Robert C. Iotti and J. C. Finneran Affidavit Regarding Cinching of U-Bolts, pp. 57 and 67). In the first alternative, Cygna does not find sufficient justification for the use of $3S_m$ for primary stress limits. In the second alternative, Cygna does not find sufficient justification to neglect preload as part of the secondary range. In effect, while loads such as deadweight or settlement are non-cyclic in nature, they are compared to the appropriate Code allowables. Cygna believes that the total stress, due to all contributions at a point, should be considered in the evaluation. Therefore, what is the effect of considering preload as a cyclic load?

2. **Cygna Question 4 (transcript page 32)**
Re: Use of 250°F for 10" Pipe

Cygna has reviewed the thermal operating data for the RHR systems and has found that both the inlet and outlet to the RHR heat exchanger can be at 350°F. This can occur under normal (inlet) or upset (outlet) conditions, both of which must be included in any secondary analysis.

Please justify that the preload and stress levels due to a 350°F insulated pipe are similar to a 250°F uninsulated pipe.

3. **Cygna Question 9 (transcript page 130)**
Re: G&H Sample Size for Piping General Stresses

TUGCO has committed to provide data on the size of the Gibbs and Hill sample (transcript page 130).



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The remaining four questions 6, 12, 18 and 19, are somewhat related since they deal primarily with relaxation and stability. As such, they were part of one continuous discussion at the meeting. Cygna has the following questions on the four, in general.

4. **Cygna Questions 6, 12, 18, and 19**
Re: Cygna Question 6

Cygna has not received the A-36 steel stress relaxation graph and published report on stress relaxation (transcript page 77) nor a copy of TUGCO's answer to the NRC on this issue (transcript page 81). This information is necessary to complete our reviews.

Re: Cygna Questions 12 and 19

Please provide U-bolt torque values that will be used in the field for all pipe sizes and the corresponding lower bound preload level expected as discussed on transcript pages 123 and 94, respectively. Also, please provide preload versus torque data scatter and lower bound curves to be used (transcript page 100).

Re: Cygna Question 18

What is the minimum level of preload required to maintain stability for the anticipated worst loading condition for stability (i.e., preload plus push at 5°)? This question does not appear to have been answered by the finite element analysis (transcript page 122). Specifically, the first objective on page 1 of the finite element analysis has not been satisfactorily addressed. The fact that "adequate frictional forces exist" requires a judgment based upon what are known to be the necessary frictional forces for stability under the anticipated worst loading condition for stability. Since the necessary frictional forces for stability under this loading condition have not been determined, it is not possible to know if an adequate margin exists between the minimum expected preload in the field and the preload level necessary to maintain stability.



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Without knowing the minimum preload required to maintain stability with a push load at 5°, a judgment as to what constitutes adequate preload cannot be made. Maintaining a tensile load in the U-bolt legs does not guarantee stability.

Re: Cygna Questions 6, 12 and 18

Given that lower bound values of preload versus torque are to be provided in the field, how will these lower bound values be reduced to account for observed reductions in preload which occurred during the testing program (thermal cycling, vibration testing, etc.)? Also, what values of "necessary preload for stability" will these reduced values be compared to determine the margin against instability?

These requests for information and clarification are based on Cygna's review of the September 13, 1984 transcript. The context of these questions can be obtained by referring to the transcript. If, however, there are any questions or clarification is necessary, please don't hesitate to call.

Very truly yours,

A handwritten signature in cursive script that reads "N. H. Williams".

N. H. Williams
Project Manager

dmm/rb

cc: Mr. S. Burwell (USNRC)
Mr. S. Treby (USNRC)
Mr. D. Wade (TUGCO)
Mr. J. Van Amerongen (EBASCO/TUGCO)
Mrs. J. Ellis (CASE)
Dr. R. Iotti (EBASCO)

TO: DOCUMENT CONTROL

FROM: S. B. Burwell x27563

SUBJECT: Cygna Review (Phase 3) Comanche Peak

Attached is the following document:

October 1, 1984 - 84042.018

Cinched U-Belt Testing and Analysis Program

Cygna (Williams) to TUGCO (George)