

ENERGY
SERVICES

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Designated Original 9/17/87 AKCook

September 16, 1987
84056.119

Mr. W. G. Council
Executive Vice President
TU Electric
Skyway Tower
400 N. Olive St., L. B. 81
Dallas, TX 75201

*Subject: Pipe Stress Review Issues List - Rev. 4
Comanche Peak Steam Electric Station
Independent Assessment Program - All Phases
Job No. 84056*

Dear Mr. Council:

Enclosed is Revision 4 of the Pipe Stress Review Issues List (RIL). All changes are indicated by a revision bar in the right margin.

All technical issues associated with this discipline have been closed; however, Cygna is still waiting for a copy of Stone & Webster calculation No. 15454-NZ(B)-GENX-035, Rev. 2, to verify completion of commitments associated with RIL 11. Any procedural control issues associated with Cygna's original pipe stress reviews of Gibbs & Hill are being addressed as part of the ongoing design control assessments.

If you have any questions or require further information, please contact Cygna at your convenience.

Very truly yours,

N. H. Williams
Project Manager

Enclosure
NHW:rlr

- cc: Mr. J. Redding
- Mr. L. Nace
- Mr. W. Council
- Mr. J. Muffett
- Mr. D. Pigott
- Ms. A. Vietti-Cook
- Mr. C. Grimes
- Mr. E. Siskin
- Mr. R. Klause

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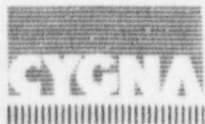
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1. Mass Participation/Mass Point Spacing

- References:
1. R.E. Ballard (G&H) letter to J.B. George (TUGCO), "Mass Participation," GTN-69454, September 14, 1984.
 2. N.H. Williams (Cygnà) letter to J.B. George (TUGCO), "Phase 3 Open Items - Mass Participation," 84042.017, September 21, 1984.
 3. N.H. Williams (Cygnà) letter to J.B. George (TUGCO), "Phase 3 Open Items - Mass Participation," 84042.019, October 2, 1984.
 4. L.M. Popplewell (TUGCO) letter to N.H. Williams (Cygnà) "Cygnà Potential Finding Report, Mass Participation, and the Mass Point Spacing Error in Problem AB-1-61A," December 7, 1984.
 5. N.H. Williams (Cygnà) letter to J.B. George (TUGCO), "Phase 3 Open Items - Mass Participation and Mass Point Spacing," 84042.021, February 8, 1985.
 6. Cygnà Phase 3 Final Report, TR-84042-01, Revision 1, Observation PI-00-05, and PFR-01.
 7. N.H. Williams (Cygnà) letter to W.G. Council (TUGCO), "Cygnà Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.
 8. Transcript of meeting between SWEC/TUGCO/Cygnà at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygnà concerns.
 9. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.
 10. Conference Report of Cygnà Audits at SWEC offices, March 17 and 18, 1987 (Cherry Hill, N.J.) and March 19, 1987 (Boston, MA), Job No. 84056 - Audit to Review Stone & Webster Pipe Stress and Pipe Support Reconciliation Procedures.



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11. W.G. Council (TU Electric) letter to N.H. Williams (Cygna), TU Log No. TXX-6280, Dated February 18, 1987, Attachment A.
12. Generic Technical Issues Report, TUGCO/SWEC, Revision 0, Status Date June 27, 1986, Appendices Q&R, Both Revision 0.
13. Transcript of meeting between TUGCO/Cygna/SWEC/Impell/ Ebasco at Glen Rose, TX, March 24 and 25, 1987-on Conduit Supports, Cable Trays, Pipe Stress and Pipe Supports (Volume II of II).

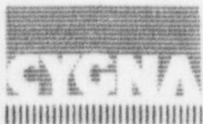
Summary: The pipe stress seismic analyses did not include sufficient modes to comply with the FSAR, which requires that the inclusion of additional higher order modes should not increase system response by more than 10%. In addition, the mass point spacing for the dynamic analyses did not always meet the project criteria.

Status: This issue is closed based on Cygna's review of Reference 11 and the discussion of Reference 10 that lead to the conclusion that SWEC's methods give reasonable results. Cygna's concern, as documented in Reference 8, was that the SWEC method of combining modal responses between the ZPA and the seismic analysis cutoff frequency of 50Hz may lead to incorrect results for the seismic analysis. SWEC completed a study using problems that were selected because they had the lowest frequencies at which the response spectrum returns to the ZPA value. A comparison of the results, determined by applying the missing mass correction at 50 Hz as opposed to the ZPA frequency, showed negligible differences.

2. Incorrect Pipe Schedule Used for Calculation of Nozzle Allowables

Reference: 1. Cygna Phase 1 and 2 Final Report, TR-83090-01, Revision 0, Observation PI-02-05

Summary: Cygna noted one instance in which the nozzle allowables were calculated using an incorrect wall thickness.



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Status: This issue is closed, based on an expanded review to include the pumps on the diesel generator system.

3. Finite Element Model Error in Flued Head Analysis

Reference: 1. Cygna Phase 1 and 2 Final Report, TR-83090-01, Revision 0, Observation PI-03-01

Summary: The flued head finite element model was found to contain a geometry error due to improper generation of some elements.

Status: This issue is closed, based on review of 15 of the remaining 18 flued head analyses.

4. Inclusion of Fluid and Insulation Weight at Valves and/or Flanges

Reference: 1. Cygna Phase 3 Final Report, TR-84042-01, Revision 1, Observation PI-00-04 and Section 5.1., Page 5-6

2. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Cygna Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.

3. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.

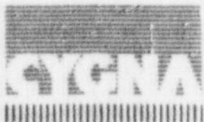
Summary: Cygna found that it was Gibbs & Hill's standard practice not to include fluid and insulation weight at valves and flanges.

Status: This issue is closed for the CCW system, based on a Gibbs & Hill study which demonstrated that the effect is minor. Cygna has reviewed the SWEC criteria (Ref. 3) and finds that this issue is properly addressed. Therefore, this issue is closed for all systems.

5. Discrepancies in Pipe Support Loads Between Analyses and Support Design

References: 1. Cygna Phase 3 Final Report, TR-84042.01, Revision 1, Observation PI-00-06

2. L.M. Poppelwell (TUGCO) letter to N.H. Williams (Cygna) dated August 29, 1984



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3. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69233, dated July 10, 1984
4. Communications Report between J. Finneran (TUGCO), N. Williams and J. Minichiello (Cygn) dated 7/13/84, 2:45 p.m.

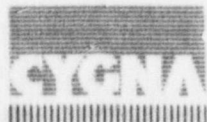
Summary: Cygna found that, in some instances, the latest support loads were not used in the pipe support design calculations.

Status: This issue is closed, except as a procedural question which is addressed in the Design Control RIL.

6. Snubbers on Fisher Valves

- References:**
1. Cygna Phase 3 Final Report, TR-84042-01, Revision 1, Observation PI-00-07 and PFR-02
 2. L.M. Popplewell (TUGCO) letter to N.H. Williams (Cygna) dated July 9, 1984
 3. L.M. Popplewell (TUGCO) letter to N.H. Williams (Cygna) dated August 29, 1984
 4. L.M. Popplewell (TUGCO) letter to N.H. Williams (Cygna) dated October 2, 1984.
 5. Communications Report between R. Manvelyan (Gibbs & Hill) and J. Minichiello (Cygna) dated 6/15/84, 10:30am.
 6. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.

Summary: The snubbers on the Fisher valve operators were not qualified for the as-built loads. This issue led to questioning whether the valve itself was capable of transmitting these loads and still maintaining operability.



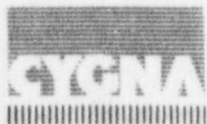
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Status: This issue is closed, based on TUGCO's requalification of all affected valves and snubbers. Cygna has reviewed the SWEC criteria (Ref. 6) and has found that this issue is properly addressed. However, the procedural interface remains as an open issue to be addressed in the Design Control RIL.

7. Snubbers Close to Equipment Nozzles

- Reference:**
1. Cygna Phase 4 Pipe Stress Walkdown Checklists (not issued).
 2. Transcript of meeting between SWEC/TUGCO/Cygna at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygna concerns.
 3. Stone & Webster's Pipe Stress/Support Requalification Procedure for CPSES Unit 1, CPPP-6, Ref. 2.
 4. Design criteria for Pipe Stress and Pipe Supports, Stone & Webster Engineering Corporation, CPPP-7, Revision 2, April 25, 1986.
 5. W.G. Council (TUGCO) letter to N.H. Williams (Cygna) Log No. TXX-6133, December 4, 1986, "TUGCO Commitments, from November 13, and 14, 1986 'Resolution of Cygna Concerns' Meeting", Enclosure A.
 6. Conference Report of Cygna audits at SWEC Offices, March 17 and 18, 1987 (Cherry Hill, N.J.) and March 19, 1987 (Boston, MA), Job No. 84056 - Audit to Review Stone and Webster Pipe Stress and Pipe Support Reconciliation Procedures.
 7. Transcript of Meeting between TUGCO/Cygna/SWEC/Impell/ Ebasco at Glen Rose, TX, March 24 and 25, 1987 - on Conduit Supports, Cable Trays, Pipe Stress and Pipe Supports.

Summary: Cygna noted several snubbers on the Component Cooling Water System (CCW) which were located close to equipment nozzles. Due to their proximity to a rigid attachment point, the dynamic displacements at these locations will be very small, such that the snubbers may not perform their intended



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function.

Status: This issue is closed based on Cygna's review of calculations in Reference 6. Cygna's concern was that SWEC lacked a specific criteria for snubber elimination. SWEC does not have a specific criteria for snubbers close to equipment nozzles since each stress problem is reviewed by an experienced pipe stress engineer and an experienced pipe support engineer before the stress analysis is performed. This review is documented in a Piping System Review Documentation (PSRD) calculation, which is very detailed and comprehensive and includes guidance as to the elimination of snubbers proximate to nozzles and rigid restraints. Cygna audited three calculations to assess guidance given concerning proximate snubbers, and in all cases Cygna concurred with the guidance given.

8. Lack of Traceability for ANSYS/Relap Runs

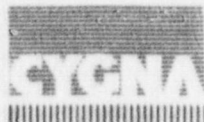
- Reference:**
1. Communications Report between S. Lim (Gibbs & Hill) and L. Weingart (Cygna) dated 3/8/84, 8:45 a.m.
 2. Communications Report between H. Mentel (Gibbs & Hill) and J. Minichiello (Cygna) dated 3/13/84, 3:00 p.m., Revision 1
 3. Communications Reports between S. Lim (Gibbs & Hill) and L. Weingart (Cygna) dated 3/15/84, 8:15 a.m.

Summary: There are four programs utilized by Gibbs & Hill in performing a steam hammer analysis:

1. RELAP
2. GHFORCE - provides imbalance loads
3. Program to convert to ANSYS format
4. ANSYS

Sufficient documentation did not exist to provide cross referencing of the four runs for a particular Main Steam loop.

Status: This finding was closed technically; however, it remains open from a procedural standpoint. This issue is being



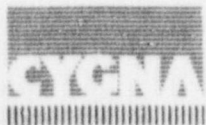
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addressed as part of Cygna's design control RIL.

9. Inclusion of Support Mass In Pipe Stress Analysis

- References:**
1. Communications Report between G. Krishnan (Gibbs & Hill SSAG) and J. Minichiello (Cygna) dated 3/19/84, 8:30 a.m.
 2. Gibbs & Hill letter GTN-68852 dated April 25, 1984
 3. Communications Report between H. Mentel (Gibbs & Hill), G. Grace (EBASCO), N. Williams and L. Weingart (Cygna) dated 5/24/84, 10:00 a.m.
 4. Prefiled Testimony of Nancy H. Williams, Response to Doyle Question No. 4, April 12, 1984
 5. Cygna Phase 1 and 2 Final Report, TR-83090-01, Revision 0, Pipe Stress Checklist General Note 1
 6. Communications Report between D. Wade (TUGCO) and N. Williams (Cygna) dated 10/11/84, 4:00 p.m.
 7. N.H. Williams (Cygna) letter to V. Noonan (USNRC), 84042.022, dated January 18, 1985 "Open Items Associated with Walsh/Doyle Allegations"
 8. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Cygna Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.
 9. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.
 10. Transcript of meeting between SWEC/TUGCO/Cygna at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygna concerns.

Summary: The weight of the pipe supports was included in the stress analyses for the Main Steam Inside Containment only. In Reference 1, Cygna requested justification for this practice. Gibbs & Hill responded in Reference 2 by pointing out that the supports associated with the Main Steam lines were



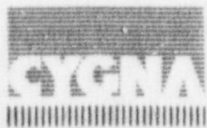
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relatively massive and, as such, a judgement was made to include their mass in the stress analysis. For other systems, a judgement was made that the effects would be negligible. Per Reference 4, the effect of this omission on support loads was shown to be as high as 24% on the RHR system.

Status: This issue is closed. Cygra has reviewed the SWEC criteria (Ref. 9). SWEC has considered the effects of support mass in the piping reanalysis effort. Per the commitment made in Ref. 10, SWEC will notify Cygra if the eccentric mass effect is implemented by changes to the mass/stiffness matrices as opposed to modeling of the eccentric support members (see Pipe Stress RIL Item 19).

10. Stress Intensification Factors (SIFs)

- References:**
1. Cygra Phase 1 and 2 Final Report, TR-83090-01, Revision 0, Observation PI-00-01
 2. Cygra Phase 3 Final Report, TR-84042-01, Revision 1, Observation PI-00-01
 3. N.H. Williams (Cygra) letter to W.G. Council (TUGCO), "Cygra Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.
 4. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.
 5. Transcript of meeting between SWEC/TUGCO/Cygra at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygra concerns.
 6. Transcript of meeting between SWEC/TUGCO/Cygra at Glen Rose, TX, December 15 and 16, 1986.
 7. Conference Report of Cygra audits at SWEC offices, March 17 and 18, 1987 (Cherry Hill, N.J.) and March 19, 1987 (Boston, MA), Job No. 84056 - Audit to Review Stone & Webster Pipe Stress and Pipe Support Reconciliation Procedures.
 8. Generic Technical Issues Report, TUGCO/SWEC, Revision 0,



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Status Date June 27, 1986, Appendix Z, Revision 0.

9. Transcript of Meeting between, TUGCO/Cygnas/SWEC/ Impell/Ebasco at Glen Rose, TX, March 24 and 25, 1987 - on Conduit Supports, Cable Trays, Pipe Stress and Pipe Supports.
10. Controlled Memo to Project File No. 038, Job No. 84056, May 18, 1987 - SIF for Weld Neck Flanges.

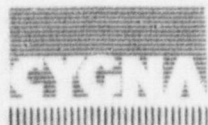
Summary: Cygna found numerous instances where Gibbs and Hill either neglected to input the required SIF into the stress analysis (References 1 & 2) or miscalculated the SIF (Reference 2).

Cygna has reviewed the SWEC criteria (Reference 4) and as documented in Reference 5, is reviewing SWEC's code reference for their exclusion of SIF's at weld neck flanges.

Status: This issue is closed based on Cygna's review of Reference 10 for weld neck flanges. The values used by SWEC are acceptable.

11. Welded Attachments

- References:**
1. Cygna Phase 1 and 2 Final Report, TR-83090-01, Revision 0, Observation PI-00-02, PI-02-03, and PI-02-04.
 2. Cygna Phase 3 Final Report, TR-84042-01, Revision 1, Observations PI-00-02 and PI-06-01.
 3. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Cygna Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.
 4. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.
 5. Stone & Webster's Piping and Pipe Support Requalification Program, CPSES Unit 1, Large Bore Piping Final Report, dated 11/7/86.
 6. Transcript of meeting between SWEC/TUGCO/Cygna at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygna concerns.



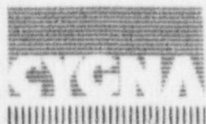
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7. Transcript of meeting between SWEC/TUGCO/Cygn at Glen Rose, TX. December 15 and 16, 1986.
8. Conference Report of Cygn audits at SWEC offices, March 17 and 18, 1987 (Cherry Hill, N.J.) and March 19, 1987 (Boston, MA), Job No. 84056 - Audit to Review Stone & Webster Pipe Stress and Pipe Support Reconciliation Procedures.
9. Conference Report of Cygn audits at SWEC offices, December 30, 1986 (Boston, MA), Job No. 84056 - Audit to Review Stone & Webster Procedure for Local Pipe Stress Evaluation.
10. Controlled Memo to Project File No. 036, Job No. 84056, April 21, 1987 - Use of MNS to Calculate Run Pipe Stress at Welded Attachments.
11. Generic Technical Issues Report, TUGCO/SWEC Revision 0, Status Date June 27, 1986, Appendix B, Revision 0.
12. Transcript of Meeting between TUGCO/Cygn/SWEC/Impell/Ebasco at Glen Rose, TX, March 24 and 25, 1987 - on Conduit Supports, Cable Trays, Pipe Stress and Pipe Supports.

Summary: Cygn found several problems with Gibbs and Hill's treatment of welded attachments:

- o An increased allowable was used in the evaluation of local stresses for upset and emergency combinations (Reference 1).
- o Thermal expansion loads were used rather than load ranges for evaluation of local stresses (Reference 1).
- o Local stresses were not considered in break exclusion zones (Reference 2).
- o Combined effects of two supports at a single welded attachment were not considered (Reference 2).

Status: This issue is closed contingent upon Cygn's review of SWEC



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Calculation No. 15454-NZ(B)-GENX-035, Revision 2 which evaluates the effects of pressure on pad weld stresses (see Reference 8, p. 11 and Reference 12, Volume II of II, p. 3). Cygna has reviewed the SWEC criteria (Ref. 4) and Large Bore Piping Final Report (Ref. 5) and has determined that all of the above concerns are properly addressed. Cygna's need for clarification of the procedures provided in Attachment 4-6A to Reference 4 was addressed in Reference 9.

12. Use of Incorrect Pipe Wall Thickness

Reference: 1. Cygna Phase 1 and 2 Final Report, TR-83090-01, Revision 0, Observation PI-01-01

Summary: Cygna found two piping segments which were input to the stress analysis with the incorrect wall thickness.

Status: This problem is considered isolated and closed, based on Cygna's recalculation of the pipe stresses.

13. Inclusion of Appropriate Response Spectra

References: 1. Cygna Phase 1 and 2 Final Report, TR-83090-01, Revision 0, Observation PI-02-01

Summary: Cygna noted that stress analysis problem AB-1-70 did not consider all the appropriate response spectra from all buildings.

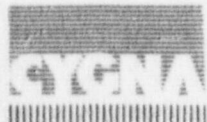
Status: This issue is closed, based on an evaluation of the omitted spectra and an expanded review to determine if this situation occurred in other stress problems.

14. Support Location Discrepancy

References: 1. Cygna Phase 1 and 2 Final Report, TR-83090-01, Revision 0, Observation PI-02-02

2. Cygna Phase 3 Final Report, TR-84042-01, Revision 1, Checklist PI-09, Item 14

Summary: Supports were modeled at locations outside of allowable



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tolerances. The Reference 1 observation was closed based on an evaluation of the pipe stresses and an assessment that these occurrences were sufficiently isolated. The Reference 2 discrepancy was noted and evaluated by Gibbs & Hill in their QA binder.

Status: This issue is closed.

15. Use of Incorrect Damping in Seismic Analyses

- Reference:**
1. Cygna Phase 3 Final Report, TR-84042-01, Revision 1, Observation PI-00-03.
 2. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Cygna Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.
 3. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.

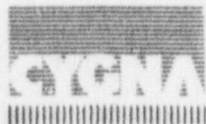
Summary: Cygna noted that Gibbs & Hill did not consider the lower damping response spectra in some systems with both large and small bore piping.

Status: This issue is closed, based on Cygna's expanded review. Cygna has reviewed the SWEC criteria (Ref. 3) and finds that this issue is properly addressed.

16. Combination of Safety/Relief Valve Thrust and Seismic Loads

- Reference:**
1. Cygna Phase 3 Final Report, TR-84042-01, Revision 0, Observation PI-06-02
 2. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.

Summary: In pipe stress problem AB-1-23B, the stresses/loads due to safety/relief valve thrust were not combined with those due to SSE for the emergency case. In the other three Main Steam lines outside containment, the two effects were combined. While not specifically required by the FSAR, Cygna believes it is appropriate to combine the two effects.



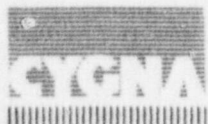
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Status: This issue is closed. TUGCO has filed an amendment to the CPSES FSAR which eliminates SSE from any emergency load combination. However, as stated in Ref. 2, SSE and SRV thrust loads are being combined and compared to a faulted allowable.

17. Force Distribution in Double Ported Safety Valves

- Reference:**
1. Communication Report between H. Mentel (Gibbs & Hill) and J. Minichiello (Cygna) dated 3/12/84, Item 2b.
 2. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Cygna Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.
 3. Transcript of meeting between SWEC/TUGCO/Cygna at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygna concerns.
 4. Generic Technical Issues Report, TUGCO/SWEC, Revision 0, Status Date June 27, 1986, Appendix Y, Revision 0.
 5. Conference Report of Cygna audits at SWEC offices, March 17 and 18, 1987 (Cherry Hill, N.J.) and March 19, 1987 (Boston, MA), Job No. 84056 - Audit to Review Stone & Webster Pipe Stress and Pipe Support Reconciliation Procedures.
 6. Communication Report Between H. Mentel (G&H), G. Grace (Ebasco) and L. Weingart, N. Williams (Cygna) dated May 24, 1984, Item 4.
 7. R.E. Ballard (Gibbs & Hill) Letter to J.B. George (TUGCO), "Responses to Cygna Questions dated March 12, 19 and 21, 1984", GTN - 68852, April 25, 1984 - Item 2b, responses to Cygna telecopied questions March 12, 1984, 9 a.m.
 8. Transcript of Meeting between TUGCO/Cygna/SWEC/Impell/Ebasco at Glen Rose, TX, March 24 and 25, 1987 - on Conduit Supports, Cable Trays, Pipe Stress and Pipe Supports.

Summary: By assuming a 55/45 split in the flow, instead of the 60/40



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suggested by Crosby Valve as general practice, the torque on the Main Steam pipe is halved.

Status: This issue is closed based on Cygna's review of a mainsteam calculation (Reference 5) with loads and stresses adjusted for the 60/40 flow split. SWEC's calculations are based on a 55/45 flow split but a 60/40 split will double the torsion on the pipe. The pipe stresses and the pipe support loads are still within the allowables even with the more conservative 60/40 flow split.

18. Fisher Valve Modeling

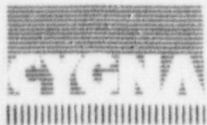
- Reference:**
1. Communication Report between H. Mentel (Gibbs & Hill) and J. Minichiello (Cygna) dated 3/12/84, Item 1c
 2. Communication Report between Krishnan/Ray (Gibbs & Hill) and Minichiello (Cygna) dated 6/12/84
 3. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Cygna Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.
 4. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.

Summary: Cygna has questions on the modeling of "flexible" valves ($F_n < 33$ cps). In the review, Cygna found that valves noted in Reference 2 (other than Fisher valves) were the only "flexible" valves within the Gibbs & Hill scope. Cygna determined that the valve accelerations for those valves were acceptable; however, Cygna did not address the modeling of the Fisher valve yoke, which is laterally supported at the end. If the yoke is modeled much stiffer than it actually is, this may affect the analysis results.

Status: This issue is closed. Cygna has reviewed the SWEC criteria (Ref. 4) and finds that this issue is properly addressed.

19. Eccentric Mass and Its Effect on Piping and Welded Attachments

- Reference:**
1. Communication Report between G. Krishnan (Gibbs & Hill) and J. Minichiello (Cygna) dated 3/21/84, Item 1



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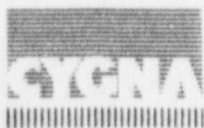
2. R.E. Ballard, Jr. (Gibbs & Hill) letter GTN-68852 to J.B. George (TUGCO) dated 4/25/84
3. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Cygna Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.
4. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.
5. Transcript of meeting between SWEC/TUGCO/Cygna at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygna concerns.

Summary: In modeling the masses of the supports in the Main Steam lines inside containment, Gibbs & Hill did not consider the eccentricity of the mass from the pipe centerline. In their response in Reference 2, Gibbs & Hill showed that the seismic effects were small on the overall pipe cross-section. They also showed that the local effects at the welded attachment were not significant for a 1.0g load. Further Cygna review showed that the seismic accelerations were on this order. Cygna's review did not consider the effect of fluid dynamic accelerations, nor other systems.

Status: This issue is closed. Cygna has reviewed the SWEC criteria (Ref. 4). Per Ref. 5, SWEC has modeled any eccentric support members. SWEC has committed to notify Cygna if the eccentric mass effect is accounted for by modifying the mass and stiffness matrices.

20. ANSYS Steam Hammer Analyses

- Reference:**
1. Communication Report between H. Mentel (Gibbs & Hill) and J. Minichiello (Cygna) dated 3/13/84, Item 2
 2. Communication Report between G. Krishnan (Gibbs & Hill) and J. Minichiello (Cygna) dated 3/21/84, Item 3
 3. R.E. Ballard, Jr. (Gibbs & Hill) letter GTN-68852 to J.B. George (TUGCO) dated 4/25/84
 4. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Cygna Questions/Comments on the CPRT Plan", 84056.085,



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5. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.
6. Transcript of meeting between SWEC/TUGCO/CYGNA at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygna concerns.
7. Communication report between H. Mentel (G&H), G. Grace (Ebasco) and L. Weingart, N. Williams (Cygna) dated May 24, 1984, Items 29, 30 and 32.
8. W.G. Council (TU Electric) letter to N.H. Williams (Cygna), TU Log No. TXX-6280, dated February 18, 1987, Attachment B.
9. Conference Report of Cygna audits at SWEC offices, March 17 and 18, 1987 (Cherry Hill, N.J.) and March 19, 1987 (Boston, MA), Job No. 84056 - Audit to Review Stone & Webster Pipe Stress and Pipe Support Reconciliation Procedures.
10. Transcript of Meeting between, TUGCO/Cygna/SWEC/Impell/Ebasco at Glen Rose, TX, March 24 and 25, 1987 - on Conduit Supports, Cable Trays, Pipe Stress and Pipe Supports.
11. Generic Technical Issues Report, TUGCO/SWEC, Revision 0, Status Date June 27, 1986, Appendix S, Revision 0.

Summary:

In reviewing the ANSYS model, Cygna questioned the mass point spacing and time step size used. Gibbs & Hill supplied the results of a sensitivity study in Reference 3. In addition, Cygna questioned the load output in two axial restraints, since they were less than the load input. Gibbs & Hill explained why the results were reasonable in Reference 3. Prior to the Reference 3 response, however, Cygna did not find any documentation indicating that either a sensitivity study had been done or that the ANSYS results had been reviewed for "reasonability".

As part of the Stone & Webster piping reanalysis effort, all fluid transient analyses were redone. Cygna has reviewed



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the SWEC criteria (Ref. 5). Based on this review, Cygna has the following concerns, as documented in Ref. 6:

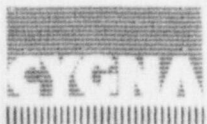
1. Mass point spacing is based upon bending mode frequencies up to 50 Hz. The timehistory analysis may include frequencies up to 200 Hz.
2. Attachment 3-1 to Ref. 5 requires timehistory analyses to include 80%, or more, of the piping system mode shapes. As documented in Ref. 6, Cygna is concerned with the acceptability of using more than 50% of the total number of modes.
3. Attachment 3-1 to Ref. 5 does not provide a clear explanation of how the predominant frequency of the input forcing function is determined and what corresponding analytical techniques are applied to calculate the Δt used in the timehistory analysis.
4. Attachment 3-1 to Reference 5 directs the analyst to determine the cutoff frequency based on a "Recognizable" support force. The term "Recognizable" must be quantified to assure that convergence is achieved.

Status: This issue is closed based on SWEC's commitment to issue a Project Memorandum modifying Attachment 3-1 to Reference 5, which will address Cygna's concerns:

- 1) Fluid transient analyses will be required to include all modes up to a minimum of 100 Hz;
- 2) The analyst will be required to "Recognize" at least 90% of the input step function value for support(s) "at or near" elbows. "At or near" means within approximately 1/2 the calculated mass point spacing of the line.

21. Valve Acceleration and Flange Load Generic Studies

- Reference:**
1. Cygna Phase 2 Final Report, TR-83090-01, Revision 0, Checklist PI-01, Notes 3 and 4
 2. Communication Report between G. Krishnan (Gibbs & Hill) and J. Minichiello (Cygna) dated 3/19/84, Item 7



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3. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Cygna Questions/Comments on the CPRT Plan", 84056.085, October 6, 1985.
4. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.
5. Stone & Webster's Pipe Stress/Support Requalification Procedure for CPSES Unit 1, CPPP-6, Rev. 2.

Summary: In Phases 1 and 2, Cygna found that Gibbs & Hill did not check valve accelerations or flange loads in every pipe stress calculation. Instead, Gibbs & Hill used a sampling process, which was reasonable, to determine the worst valves or flanges. They then showed, through two general studies, that all valves met the Specification allowables and that all flanges met Code allowables. In Phase 3, however, Cygna found one safety valve with an acceleration slightly above (2%) the allowable. This indicates that the sampling method may not be sufficient to address all valves or flanges.

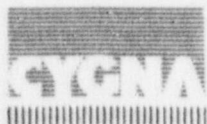
Status: This issue is closed. Cygna has reviewed the SWEC criteria and procedures (Refs. 4 and 5) and finds that this issue is properly addressed.

22. LOCA Load Cases

References: 1. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO) "Responses to Cygna Energy Services", GTN-70737, October 17, 1985.

Summary Westinghouse supplied Gibbs & Hill with the displacements at the steam generator nozzle during a LOCA event. Two sets of displacements were provided. The first set consisted of the displacements which result from a primary side break in the same loop as the main steam line being analyzed. This was called the "broken loop" case. The second set consisted of the displacements associated with a primary side break on a different loop. This was called the "unbroken loop" case.

Review of the main steam inside containment analyses noted the following:



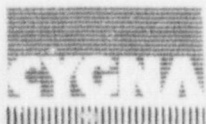
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- a. Two LOCA load cases were run: unbroken and broken loop.
- b. Unbroken loop loads and stresses were included in the emergency combination, while broken loop was used in the faulted combination.
- c. Broken loop loads and stresses were always higher than unbroken loop loads (as would be expected).
- d. The CPSES FSAR does not specifically require LOCA loads to be considered for the emergency condition.

Status: This issue is closed. Per Reference 1, the stress analyst initially assumed that the main steam was an essential system. The CPSES FSAR states that essential systems must meet a faulted allowable stress of 1.8S (normally the emergency allowable). Hence, unbroken loop LOCA was included in the emergency combination. After the stress analyst came to the understanding that the main steam was a non-essential system, the unbroken load case was no longer run.

23. Line Lists, Modes of Operation and Valve Lists.

- References:**
1. Communications Report between Manu Patel (Gibbs & Hill) and J. Oszowski (Cygna) dated 8/1/85.
 2. Communication Report between T. Hawkins (Gibbs & Hill) and R. Hess (Cygna) dated 6/7/84, 11:00am.
 3. Communications Report between T. Hawkins (Gibbs & Hill) and R. Hess (Cygna) dated 6/7/84, 3:00pm.
 4. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Information Requests - Pipe Stress Analyses," 84056.086, October 9, 1985
 5. Stone & Webster's Procedure for Review of Plant Operating Mode Conditions for CPSES Units 1 & 2, CPPP-10, Rev. 1.
 6. Stone & Webster's Pipe Stress/Support Requalification Procedure for CPSES Unit 1, CPPP-6, Rev. 2.



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Summary: Review of Gibbs & Hill Project Guide PG-25, dated 3/1/83, "Procedure for Preparation and Design Review of Line Lists, Modes of Operation and Valve Lists," indicates that line lists are to be generated on the form included as Exhibit 1 of that procedure. Cygna did not find evidence of this during the reviews conducted at the CPSES site. Instead, computer listings apparently were used which did not have all of the information indicated on Exhibit 1 of PG-25. Additionally, Cygna could not determine which procedure, if any, controlled the issuance of the computer listings.

Status: This issue is closed. Cygna has reviewed SWEC's procedures (Refs. 5 & 6) and finds that a procedure has been set up for review of operating modes and conditions and that these operating conditions are transmitted to the Lead Pipe Stress and Support Analysis Group Engineer.

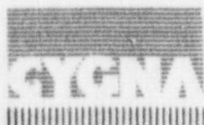
24. Support Orientation Tolerance

- References:**
1. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), "Responses to Cygna Energy Services," GTN-70737, October 17, 1985.
 2. Stone & Webster's Field Walk Procedure for CPSES Unit 1, CPPP-5, Rev. 2.
 3. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.

Summary: Cygna could not determine what tolerance, if any, was used for support orientation, (i.e., angle) when performing the as-built stress analysis.

Per Reference 1, an angular tolerance of five degrees was used, based on the manufacturers' permissible misalignment or angular motion. This tolerance was not documented. Instead, it was communicated verbally to all as-built analysis group leaders, as well as to the individual analysts, by the responsible job engineer.

Status: This issue is closed. Cygna has reviewed the SWEC criteria (Ref. 3) which, in Section 3.10.6.11, requires the as-built configuration to be modeled in the analysis. Any deviations must be justified in the pipe stress calculations. The SWEC



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walkdown procedure (Ref. 2) allows for a maximum support orientation deviation of ± 5 , from the as-built drawings.

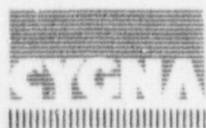
25. Hydrotest Loads

- References**
1. N.H. Williams (Cygna) letter to J.W. Beck (TUGCO) 84056.064, dated 4/23/85. "Review Issue List Transmittal". Cygna Pipe Support Review Issues List, Item No. 14, Revision 1
 2. Gibbs & Hill Specification 2323-MS-200, Revision 3
 3. Communication Reports between J. Minichiello (Cygna) and D. Rencher (TUGCO), dated 3/20/84, 2:00 p.m., Project 84042
 4. L.M. Popplewell (TUGCO) letter to N.H. Williams (Cygna), dated 4/9/84
 5. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Pipe Stress Review Questions," 84056.093, October 28, 1985
 6. Stone & Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Units 1 & 2, CPPP-7, Revision 2.

Summary: While reviewing the Cygna pipe stress data base and TUGCO's response to Cygna's comment on Hydrotest Loads (Reference 4), it was necessary to identify under which plant condition "hydrotest load" is considered. Gibbs & Hill Specification 2323-MS-200, Section 5.2.1, states that "testing conditions" are excluded from the Normal Plant Operating Conditions. In Section 5.2.5a, the specification states that "testing conditions" are considered as a normal plant operating condition.

In addition to this discrepancy, Cygna could not determine how the pipe stress and support designs accounted for the hydrotest load condition.

Status: This issue is closed. Cygna has reviewed the SWEC criteria (Ref. 6) and finds that this issue is properly addressed.



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Section 3.4.5.2 required a hydrotest load case to be analyzed for all steam piping and Table 3.5-1 defines the load combination in which this load case is to be used.

26. Pipe Stress Review of Welded Attachments

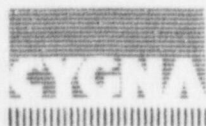
- References:**
1. N.H. Williams (Cygna) letter to J.W. Beck (TUGCO) 84056.064, dated 4/23/85. "Review Issue List Transmittal". Cygna Pipe Stress Review Issue List, item No. 11, Revision 1
 2. N.H. Williams (Cygna) letter to W.G. Council (TUGCO), "Pipe Stress Review Questions", 84056.093, October 28, 1985
 3. Stone & Webster's Pipe Stress/Support Requalification Procedure for CPSES Unit 1, CPPP-6, Rev. 2.

Summary: Based on Cygna's understanding that no formal process was established to allow the pipe stress analyst to review the pipe support designs, it was not possible to determine by which procedure welded attachments were identified for evaluation by the pipe stress analysts.

Status: This issue is closed. The SWEC requalification procedure (Ref. 3) requires that the assigned pipe stress engineer review the pipe support drawings in each package. The same procedure also directs integral attachments to be requalified by one of the methods identified in the piping criteria, CPPP-7.

27. Pipe Wall Thickness Below Code Minimum

- References:**
1. Stone & Webster Design Criteria for Pipe Stress and Pipe Supports for CPSES Units 1 and 2, CPPP-7, Revision 3, February 23, 1987.
 2. Transcript of meeting between SWEC/TUGCO/Cygna at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygna Concerns.
 3. Transcript of meeting between SWEC/TUGCO/Cygna at Glen Rose, Texas, dated December 15 and 16, 1986 - On Resolution of Cygna Concerns.



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4. Conference Report of Cygna audits at SWEC offices, March 17 and 18, 1987 (Cherry Hill, N.J.) and March 19, 1987 (Boston, MA), Job No. 84056 - Audit to Review Stone & Webster Pipe Stress and Pipe Support Reconciliation Procedures.
5. Transcript of Meeting between, TUGCO/Cygna/SWEC/Impell/Ebasco at Glen Rose, TX, March 24 and 25, 1987 - on Conduit Supports, Cable Trays, Pipe Stress and Pipe Supports.

Summary: The Stone & Webster procedure for evaluating pipe wall thinning (Ref. 1) allows the pipe wall thickness to be less than the ASME code minimum in certain situations.

Status: This issue is closed based on SWEC's commitment, during Cygna's Audit (Reference 4), to write a Project Memorandum deleting the provisions for piping minimum wall violations from Reference 1. Any Code required minimum wall violations will be forwarded to the Options Review Committee for evaluation and Cygna will be notified as well.

28. Design of Seismic/Non-Seismic Interface Anchors

- References:**
1. Stone and Webster's Pipe Stress and Pipe Support Design Criteria for CPSES Untis 1 & 2, CPPP-7, Revision 2.
 2. Transcript of meeting between SWEC/TUGCO/Cygna at Cherry Hill, New Jersey, dated November 13 and 14, 1986 - On Resolution of Cygna Concerns.

Summary: Attachment 4-10 to Reference 1 provides the procedure for the design of seismic/non-seismic interface anchors. This procedure considers the three global directions separately when determining limiting loads due to plastic hinges. As documented in Reference 2, Cygna feels that piping can supply full plastic bending moment or close to plastic bending moment and close to full plastic torsional moment simultaneously.

Status: For resolution of this issue, see Pipe Support RIL No. 45.

