CYGNA
ENERGY SERVICES
101 California Street, Suite 1000, San Francisco, CA 94111-5894
415/397-5600

November 28, 1984
84042.034

Mrs. Juanita Ellis
President, CASE
1426 S. Polk
Dallas, Texas 75224

Subject: Communications Report Transmittal #15
Comanche Peak Steam Electric Station
Independent Assessment Program - Phase 3
Texas Utilities Generating Company
Job. No. 84042

Dear Mrs. Ellis:

Enclosed please find communications reports associated with the Phase 3 Independent Assessment Program.

If you have any questions or desire to discuss any of these documents, please do not hesitate to call.

Very truly yours,

D. Oldag

D. Oldag
Administrative Assistant

Attachments

cc: Mr. D. Wade (TUGCO) w/attachments
Mr. S. Treby (USNRC) w/attachments
Ms. J. van Amerongen (TUGCO/EBASCO) w/attachments
Mr. D. Pigott (Orrick, Herrington & Sutcliffe) w/o attachments
Mr. S. Burwell (USNRC) w/attachments

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Communications Report

Company: Texas Utilities	☒ Telecon	☐ Conference Report	
Project: Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3		Job No. 84042	Date: 7/9/84
Subject: Phase 3 Status		Time: 10:30 A.M.	Place: Cygna-SFRO

Participants:	of
D. Wade	TUGCO
N. Williams	Cygna

Item	Comments	Required Action By
1.	<u>Valve Qualification for Valves with Snubbers Attached to the Activator</u> - Cygna has attempted, since March 12, to determine if the Main Steam Relief Valves can operate when subjected to the loads transferred to the snubbers from the latest as-built piping analysis (see telecon between H. Mentel and J. Minichiello, 3/12/84, item 1b). In addition, to determine if this could be a problem on other valves, Cygna reviewed all other valve specifications and found that the only other Fisher valve specification which allows supports on the valve activator is MS-600 and it does require the vendor to qualify the valves for the piping loads. In order to close this question on valve acceptability, Cygna needs confirmation from TUSI that the latest as-built loads will be sent to Fisher in order to qualify all Fisher valves with supported activators.	
2.	<u>Nozzle SIF's</u> - The ASME Code requires that a SIF be applied at all tapered transition points, which typically occur at valve ends, flange ends, and equipment nozzle weld preps. Unless one can show that the butt weld is outside the influence of the nozzle tapered joint, say by review of the vendor drawing, one must consider the appropriate SIF at this point. Gibbs & Hill admits, in their response to our question, that a TTJ SIF was not applied at all nozzles and that drawings were not always available. Given this response, Cygna cannot ensure that there is no design impact from using a SIF of 1.0 at nozzle TTJ's. To close this question would require a review of all nozzles at CPSES to determine which did	

Signed: N H Williams /ajb

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Communications Report

Item	Comments	Required Action By
	not use a TTJ. One could then review the equipment specifications to determine if the allowable nozzle loads effectively limited the piping stresses.	
3.	Mass Point Spacing - Cygna originally (3/19/84) asked a question concerning mass point spacing for stress problem AB-1-61A. In Gibbs & Hill's reply (4/25/84), they added two additional mass points, reran the analyses, and summarized results at two supports. Cygna concurred that the increase was small. In a second question on the effect of the added weight of insulation and fluid for valves and flanges, Gibbs & Hill reran AB-1-61A with the added mass and found increases of up to 45% in support loads. Surmising that this might be due to wide mass spacing, Gibbs & Hill reran AB-1-61A with additional mass points, both with and without fluid and insulation weight, and found that the increase in load between those two runs was minimal (7% maximum). Two of the mass points were those requested by Cygna for the first question. What Gibbs & Hill failed to do was compare the results from the relumped mass with fluid and insulation to the original (i.e., QA record) run without fluid and insulation. In the region which Cygna had originally questioned, the loads in the supports not summarized by Gibbs & Hill increased by as much as 400% (from 1,341 lbs. to 5,681 lbs.) A. Please provide the original rerun for the two added mass points so Cygna can verify that all support loads showed insignificant increases. B. Please justify the load increases (on certain supports) for the "relumped" run. Does this affect support design?	
4.	Cygna is reviewing D. Terao's (US NRC) concerns on the use of double trunnion axial restraint configurations.	
5.	Cygna is trying to contact Bonney Forge for information regarding stress intensification factors for weld-o-lets.	

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Communications Report

Company: Texas Utilities	☐ Telecon	☒ Conference Report	
Project: Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3		Job No.	84042
		Date:	9/6/84
Subject: Phase 3 Open Items - Mass Participation		Time:	10:00 A.M.
		Place:	Gibbs & Hill/NYC

Participants:	of
R. Iotti	EBASCO
R. Ballard, H. Mentel	Gibbs & Hill
D. Wade H. Levin	TUGCO TERA
N. Williams	Cygna

Item	Comments	Required Action By
	H. Mentel described Gibbs & Hill's revised plan for evaluating the effects of "missing mass" on the piping analysis. Using data from the piping reanalysis performed to date, Gibbs & Hill was developing plots of percent mass participation and percent support load increase. Dr. Iotti explained that the intent was to eventually demonstrate a trend in data from which an informed decision could be made regarding which piping analyses had to be rerun to ensure that additional modes do not contribute significantly to the pipe support loads. These plots would be made available for Cygna review to determine if this was a viable criteria. D. Wade expressed extreme concern about the fact that Cygna waited three weeks to respond to the Gibbs & Hill initial proposal of ensuring that the pipe supports saw at least the mass accelerated at the ZPA. N. Williams replied that Cygna's comment on the plan at the time related only to the fact that it would not comply with TUGCO's FSAR commitments. The fact that Cygna even made a comment on FSAR compliance was to prevent rework later, if in fact, this aspect of the problem had not been considered. Based on previous correspondence, Cygna was waiting for a report on the preliminary study of five problems before formally commenting on the program. This report was never published.	

Signed: N H Williams /ajb

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Company: Texas Utilities	X Telecon	☐ Conference Report	
Project: Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3		Job No.	84042
		Date:	10/30/84
Subject: Fisher Valve Qualification		Time:	8:45 AM
		Place:	SF
Participants: John Burgess		of	TUGCO
Jean Van Amerongen			EBASCO
L. J. Weingart			CES

Item	Comments	Required Action By
	In order to aid in closing the Phase 3 open issue regarding the qualification of the Fisher valves, TUGCO will send Cygna a copy of the new test report.	

Signed: N H Williams /rr Page 1 of 1

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Communications Report

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Company:	Texas Utilities	☒ Telecon	☐ Conference Report
Project:	Comanche Peak Steam Electric Station Independent Assessment Program - Phases 3	Job No.	84042
		Date:	11/1/84
Subject:	"Bumper" Restraint Open Item	Time:	7:15 a.m.
		Place:	SF
Participants:	J. Finneran	of	TUGCO
	J. Minichiello		Cygna

Item	Comments	Required Action By
	Cygna has reviewed the TUGCO reanalysis of lines AB-1-23B and -23D with the "bumper" removed. The data received consists of the ADLPIPE analysis and the support load summaries. Mr. Finneran stated that all supports on these lines were checked for acceptability under these loads, as documented in a PSE calculation file.	

Signed: N H Williams /dmm

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Communications Report

Company: Texas Utilities	☒ Telecon	☐ Conference Report	
Project: Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3		Job No. 84042	Date: 10/9/84
Subject: Phase 3 Open Items - Mass Participation		Time: 8:30 A.M.	Place: Cygna-SFRO

Participants	of
D. Wade	TUGCO
N. Williams	Cygna

Item	Comments	Required Action By
	D. Wade stated that to date, 98 stress problems have been reanalyzed using ADLPIPE version D. After reviewing the supports associated with these stress problems, only three supports were overstressed. However, these supports have water hammer loads and it appears there is some conservatism associated with this loading. TUGCO is checking this. TUGCO is estimating that a total of 147 stress problems will be eventually rerun. This will correspond to all problems with participation factors less than approximately 30%.	

Signed: N H Williams /ajb Page 1 of 1

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Communications Report

Company:	Texas Utilities	☒ Telecon	☐ Conference Report
Project:	Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3	Job No.	84042
		Date:	7/31/84
Subject:	Phase 3 Open items - Mass participation	Time:	
		Place:	CES-SFRO
Participants:	M. Vivarito, H. Mentel, S. Lim	of	Gibbs & Hill
	N. Williams		Cygna

Item	Comments	Required Action By
	M. Vivarito called to briefly discuss the mass participation program prior to issuing a revised plan. The analysis performed to date (5 study problems) on the new version of ADLPIPE showed that there were load increases, although this did not necessarily translate into a problem with pipe support design adequacy. M. Vivarito had heard through discussions with TUGCO personnel that perhaps Cygna agreed that the pipe supports must see at least the piping tributary mass accelerated at the ZPA. Further, M. Vivarito stated that G&H had review procedures from TVA which employed this technique of ensuring that the pipe support loads were equal to or greater than the mass accelerated at the ZPA. N. Williams responded by acknowledging that when Cygna is doing a review, a common way of checking the piping output for reasonableness is to compare the support loads against the mass accelerated at the ZPA. This is however a reasonableness check only. N. Williams also noted that the TVA approach sounded similar to approaches used by other design organizations in the early to mid seventies. In order to better understand the specifics of the approach, Cygna would like to review a copy of the TVA procedure. G&H was not sure if they could release the document but would check.	

Signed: N H Williams /ajb Page 1 of 1

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Communications Report

Company:	Texas Utilities	☒ Telecon	☐ Conference Report
Project:	Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3	Job No.	84042
		Date:	11/8/84
Subject:	0" Gap Box Frames	Time:	9:00
		Place:	SF
Participants:	J. Finneran	of	TUGCO
	J. Minichiello		Cygna

Item	Comments	Required Action By
	Cygna wanted to confirm their understanding of the use of box frames with 0" gap. It is Cygna's understanding that the use of these frames is effectively limited to systems with temperature below about 200° F, except for the isolated occurrence on the RHR/SI system in Phase 2. Mr. Finneran confirmed this and further referenced Cygna to page 33 of the SIT report, which discusses this in more detail. TUGCO has done calculations, similar to those Cygna has reviewed, for all 0" gap box frames. TUGCO found only one other instance of use above 200° F on a line where T_{MAX} = 240° F. TUGCO has performed the appropriate calculations.	

Signed: N H Williams /dmm Page 1 of 1

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Communications Report

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Company: Texas Utilities	☐ Telecon	☒ Conference Report
Project: Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3	Job No. 84042	Date: 6/13/84
Subject: Tugco Letter: A. Vega to Nancy Williams, dated 6/12/84	Time: 1:00 PM	Place: A. Vega's Office, CPSES
Participants: D. Wade, A. Vega, B. Scott, D. Hicks	of	Tugco
D. Smedley, N. Williams		Cygna

Item	Comments	Required Action By
1)	Meeting was held to discuss Tuyco's letter to N. Williams dated 6/12/84.	
2)	Discussions were centered on specific issues addressed in the letter. D. Smedley requested that answers to the questions be somehow clarified and A. Vega stated that for responses #1 and #2 supplemental responses would be written.	
3)	Item #1 discussion pertained to the issue of segregation. Cygna asked what measures were/are used to preclude inadvertent use of unsatisfactory items. Cygna stated that the response in the letter dealt with traceability, not with segragation. A. Vega and B. Scott agreed to supplement the response to #1 by discussing a worst case basis, economic risk rather than quality and the fact that unsatisfactory IP's are contained in work packages until they are closed, thus adding restraint to work affecting deficient items identified on unsatisfactory IR's.	
4)	Discussion on Item #2 dealt with documentation of corrective actions to correct deficiencies identified on unsatisfactory IR's. The basic question was "where is the paperwork that says what you did to correct unsatisfactory conditions identified on IR's?" Mr. Vega and Mr. Scott agreed that this too would be addressed in a supplemental response.	
5)	The response to Item #3 was not addressed in this meeting.	

Signed: N H Williams /ch — Page 1 of 1

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Communications Report

Company:	Texas Utilities	☐ Telecon	☒ Conference Report
Project:	Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3	Job No.	84042
		Date:	6/15/84
Subject:	Pipe Support Responses - Richmond Inserts (5/24 Telecon, Item 20)	Time:	2:30
		Place:	SITE
Participants:	G. Grace	of	TUEC
	J. Minichiello		CYGNA

Item	Comments	Required Action By
	In response to Cygna's question to Ed Bezcor of Gibbs & Hill (6/12 telecon, Item 4), Mr. Grace presented the attached.	

Signed: N H Williams /ceh Page 1 of 1

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84042 PIPE SUPPORT TECH FILE
RECD 6/15
Ref: GTN-69118

FACTOR OF SAFETY OF RICHMOND INSERT FOR CPSES BASED ON THE 1983 & 1984 FIELD TEST DATA

Background

The maximum working allowables for the 1"Ø and 1 1/2"Ø Richmond inserts recommended by the Richmond Screw Insert Anchor Co. in their Bulletin No. 6 are based on limited tension and shear tests conducted at the Polytechnic Institute of Brooklyn in 1957 and 1965. These test inserts were embedded in concrete with a nominal ultimate compressive strength of 3000 psi with minimal reinforcement.

The inserts at CPSES are embedded in concrete with a minimum ultimate compressive strength of 4000 psi (actual compressive strength is about 4500 psi) and more heavily reinforced. For this reason, G&H established the allowable values as shown in Specification SS-30 Appendix 3 which are moderately higher than those recommended by the Richmond Screw Anchor Co. Consequently, the G&H allowables result in a factor of safety of less than 3 when compared with the Richmond test loads. The basis and the methodology used in establishing the G&H allowables are explained in the response to ASLB question Item 8(i).

FIELD TEST PROGRAM

To put the factors of safety utilized for the Richmond anchors at CPSES in prospective and to establish the actual factors of safety, a series of controlled tests were performed utilizing the

same concrete mix and representative reinforcing steel as used for, the plant construction. The test was in accordance with ASTM E-488 "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements."

Five tests each on shear tension and combined shear and tension were performed in April 1984 on the 1"Ø and 1 1/2"Ø inserts. Also, nine 1 1/2"Ø inserts were tested in shear in March 1983.

FACTORS OF SAFETY OF INSERTS

(a) Service Load Conditions(Normal & Upset Conditions):

Maximum allowable working loads specified in G&H Specification SS-30 are used and compared with the test failure loads to establish the factors of safety. These are the factors of safety against insert failures (failure of insert, insert shear cone or both). The factors of safety of the anchor bolts used with the insert are not part of the test program as the anchor bolt working allowables used in SS-30 are based on AISC specification allowable values.

The factors of safety for the service load conditions are above 3 for tension shear and the combined tension and shear test loads on the 1"Ø and 1 1/2"Ø inserts. Table A lists the factors of safety for each group of inserts. The factors of safety for the combined loads are based on insert interaction

formula given in SS-30 Appendix 3, Page 2 of 10.

$$\left(\frac{T}{T'}\right)^{4/3} + \left(\frac{S}{S'}\right)^{4/3} \leq 1$$

Since the minimum factor of safety, in all cases, is above 3 which exceeds the Richmond's factor of safety recommendation of 3, the working allowables in SS-30 for Richmond inserts are well justified and are conservative.

(b) Factored Load Conditions (Emergency and Faulted Conditions): Allowable loads under factored load conditions are higher than those of the service load conditions. Based on FSAR, for steel design, the factored load allowables are equal to 1.6 times the normal (service) allowable loads. By applying the same ratio on the inserts, 3 ÷ 1.6 the minimum factor of safety is reduced to 1.87 for the factored load conditions.

ACI-349 "Code Requirements for Nuclear Safety Related Concrete Structures", Appendix B - Steel Embedments Section B.8.1 and B.9.2 stated that "Design allowable shall be based on actual test data of tests performed on inserts embedded in concrete......, A Ø factor of 0.5 shall be applied to the average test failure loads in determining strength requirements." This implied that a factor of safety of 2 for insert for factored loads.

Similarly, ASME code allows increased allowable for the

factored loads. However, no specific values are given for the inserts.

Based on the above understanding, the recommended factor of safety for Richmond inserts under factored load conditions should be in the range of 1.8 to 2.0 and 1.8 as a minimum.

In 1982, G&H issued allowable loads for the Emergency and Faulted conditions for the 1"Ø and 1 1/2"Ø Richmond inserts. These allowable loads are shown on DCA-15338. The factors of safety for these allowables against the test failure loads range from a low of 1.8 to a high of 4.6 which meet or exceed the recommended minimum factor of safety requirement for inserts under factored loads. Thus, the above DCA factored load values are justified and are valid for use. Table B lists in detail the factors of safety results.

TABLE A

F.S. OF R.I. UNDER SERVICE LOAD CONDITIONS

Maximum allowable working loads specified in Specification SS-30 are used and compared with the test failure loads to establish the factors of safety.

GROUP A: BASED ON THE 1984 TEST

Size	Bolt Type	Load	SS-30 Allowables	Test Failure Load	*Failure Mode	F.S.
	A307/A36	Tension	11.5K	41.28K	C&I	3.6
		Shear	7.85K	40.28K	B,I&C	5.1
1"ø		Combined	11.5K & 7.85K	28.36K	B	5.2
	A325/A490	Tension	11.5K	41.28K	C&I	3.6
		Shear	11.5K	40.28K	B,I&C	3.5
		Combined	11.5K & 11.5K	28.36K	B	4.2
	A307/A36	Tension	28.11K	101.96K	B,I&C	3.6
1½"ø		Shear	17.67K	94.34K	B	5.3
		Combined	28.11K & 17.67K	63.47K	B&I	5.0
	A325/A490	Tenson	31.3K	101.96K	B,I&C	3.3
		Shear	26.51K	94.34K	B	3.6
		Combined	31.3K & 26.51K	63.47K	B&I	3.7

GROUP B: BASED ON THE 1983 TEST

Size	Bolt Type	Load	BS-30 Allowables	Test Failure Load	Failure Mode	F.S
1¼"Ø	A307/A36	Shear	17.67^K	61.83^K	**	3.5
	A325/A490	Shear	26.51^K	92.42^K	**	3.5

* Failure Mode: B = Bolt; I = Insert; C = Concrete Cone

** Tests were halted before failure.

1"ø RICHMOND INSERT
TENSION - SHEAR INTERACTION CURVES

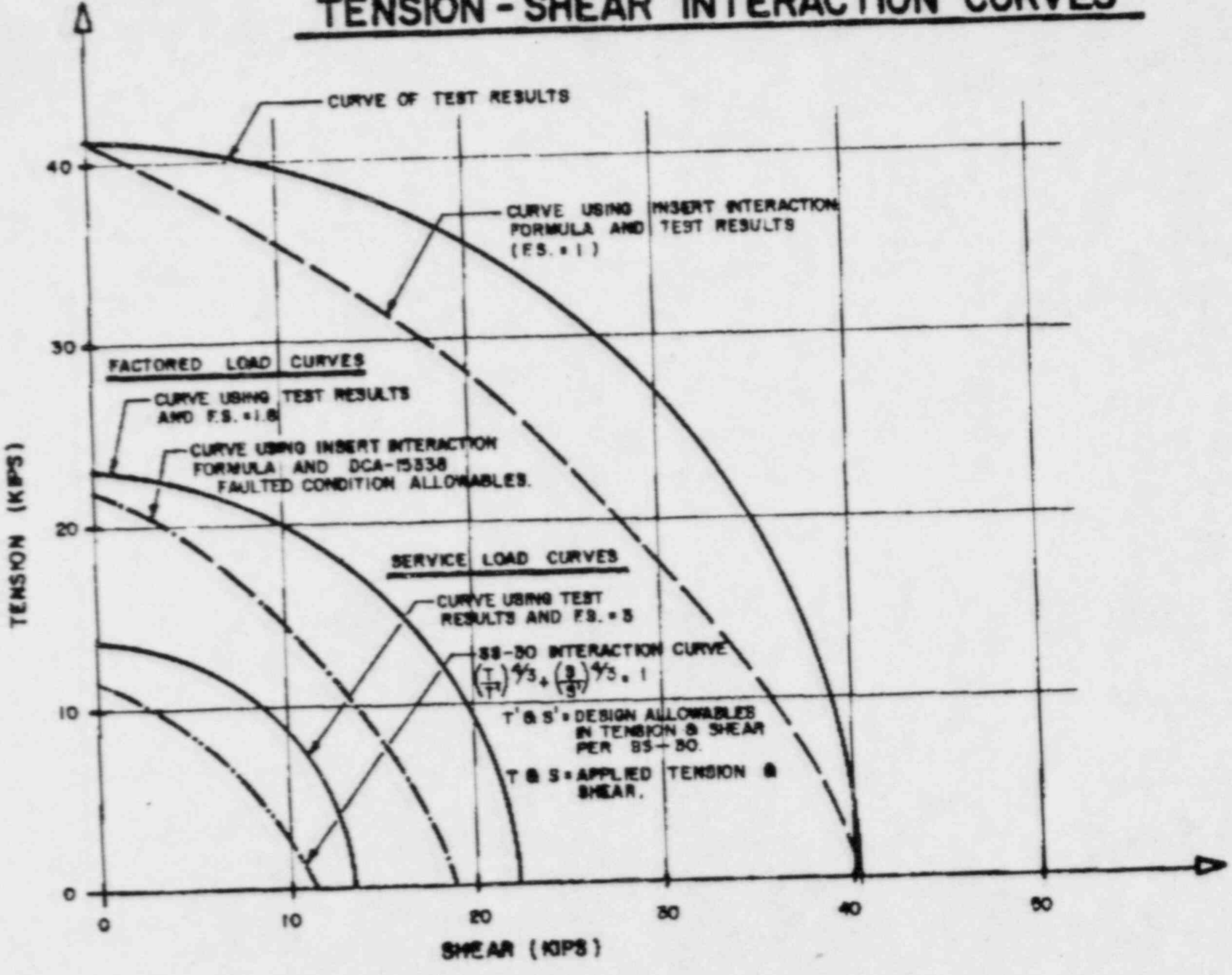


TABLE B F.S. OF R.I. UNDER

EMERGENCY (E) & FAULTED (F) CONDITIONS

Allowable loads as shown on DCA-15338 are used and compared with the test failure loads to establish the factors of safety.

GROUP A - BASED ON THE 1984 TEST

Size	Bolt Type	Load	Condition	DCA Allowables	Test Failure Load	*Failure Mode	F.S
1"⌀	A307/A36	Tension	E&F	19.4K	41.28K	C&I	2.1
		Shear	E	8.78K	40.28K	B,I&C	4.6
		Shear	F	9.7K	40.28K	B,I&C	4.2
		Combined	F	19.4K & 9.7K	28.36K	B	3.8
	A325/A490	Tension	E&F	22K	41.28K	C&I	1.9
		Shear	E	18.17K	40.28K	B,I&C	2.2
		Shear	F	18.85K	40.28K	B,I&C	2.1
		Combined	F	22K & 18.85K	28.36K	B	2.4
1½"⌀	A307/A36	Tension	E&F	45.12K	101.96K	B,I&C	2.3
		Shear	E	20.56K	94.34K	B	4.6
		Shear	F	22.56K	94.34K	B	4.2
		Combined	F	45.12K & 22.56K	63.47K	B&I	3.6
	A325/A490	Tension	E&F	58K	101.96K	B,I&C	1.8
		Shear	E	37.23K	94.34K	B	2.5
		Shear	F	42.4K	94.34K	B	2.2
		Combined	F	58K & 42.4K	63.47K	B&I	2.2

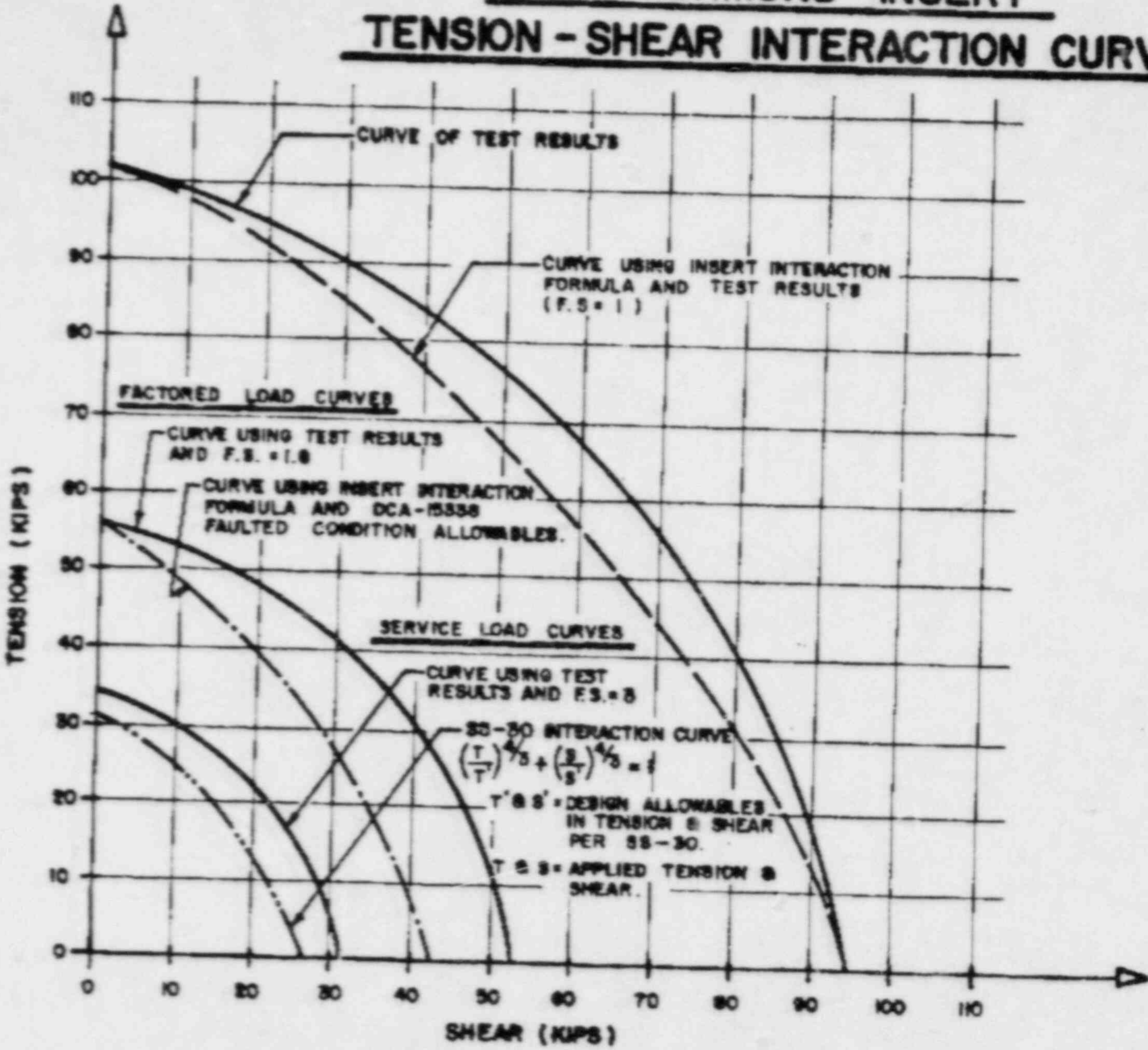
GROUP B - BASED ON THE 1983 TEST

Size	Bolt Type	Load	Condition	DCA Allowables	Test Mode	Failure Mode	F.S.
	A307/A36	Shear	E	20.56^K	61.83^K	**	3.0
1¼"ø		Shear	F	22.56^K	61.83^K	**	2.8
	A325/A490	Shear	E	37.23^K	92.42^K	**	2.5
		Shear	F	42.4^K	92.42^K	**	2.2

*Failure Mode: B = Bolt; I = Insert; C = Concrete Cone

**Tests were halted before failure.

1½"ø RICHMOND INSERT
TENSION - SHEAR INTERACTION CURVES



ATTACHMENT B

TEST REPORT

SHEAR AND TENSION LOADING

OF

RICHMOND INSERTS

1 1/2-INCH TYPE EC-6W

1-INCH TYPE EC-2W

APRIL 19, 1984

Prepared by

S.G. McBee
Civil Engineer

Approved by

R.M. Kissinger, P.E.
Project Civil Engineer

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TEST REPORT

SHEAR AND TENSION LOADING OF RICHMOND INSERTS 1 1/2-INCH TYPE EC-6W AND 1-INCH TYPE EC-2W

1.0 REFERENCES

A CP-EP-13.0 Test Control

B CP-EI-13.0-13 1 1/2" and 1" Richmond Insert Shear and Tension Tests

2.0 GENERAL

2.1 DEFINITIONS

Ulimate Load - The load applied to the specimen which caused a physical rupture of the specimen.

Failure Load - The load applied to the specimen beyond which, deflections increased considerably without substantial increase in the applied load.

2.2 PURPOSE AND SCOPE

These tests were performed to determine the characteristics of 1 1/2-Inch Type EC-6W and 1-Inch Type EC-2W Richmond Inserts when installed in concrete representative of that used in the power block structures at CPSES. The test specimens were subjected to shear, tension, and combined shear and tension loadings. The strength, deflections, and type of deformations produced by these loadings were the qualities to be determined.

2.3 RESPONSIBILITY

The tests were performed under the direction of the CP Project Civil Engineer. Witnesses to the tests were: A TUGCO site Quality Assurance representative and other site engineering personnel.

2.4 TEST APPARATUS

2.4.1 CONCRETE SLAB & EMBEDMENTS

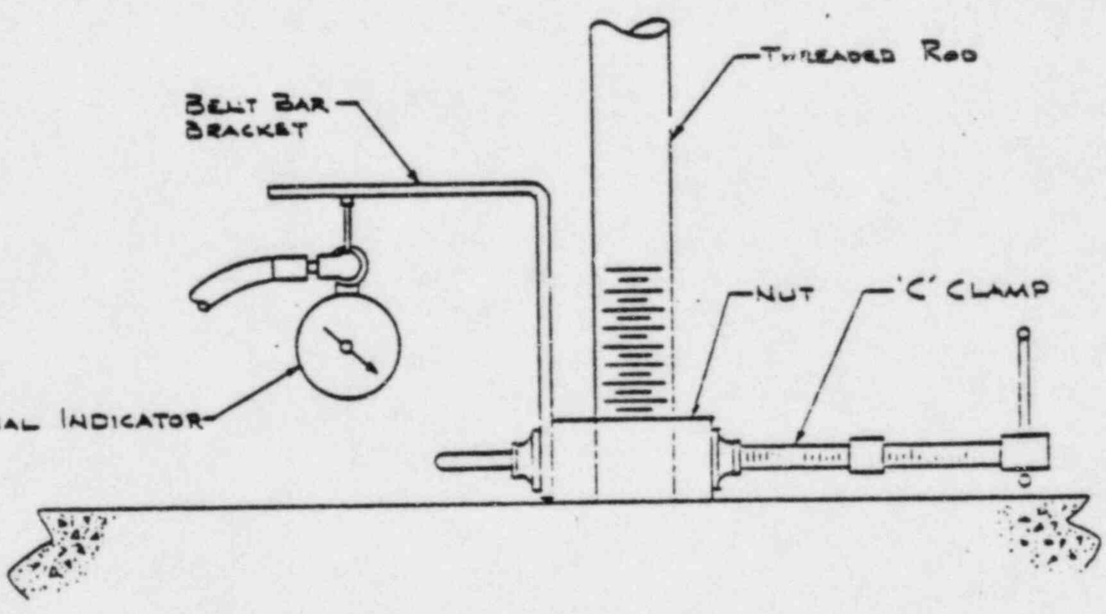
The arrangement and details of the test apparatus are shown on Drawing No. FSC-00464, Sheet 1, 2 and 3, which are included in Appendix 1 to this report. (Note that only MK C-14, C-15, C-16 and Assembly 'D' on Sheet 1 were used in this test.) The insert specimens tested were taken at random from the Constructor's stock on site and therefore, were representative of those installed in the plant structures. They were placed in a concrete slab cast specifically for these tests and which was composed of materials and reinforcement similar to those elements of the plant buildings. The concrete used was based on having a minimum design strength of 4000 pounds per square inch at 28 days. The laboratory test report on the concrete of which this slab is composed is included here in Appendix ~~1~~. 2.

2.4.2 SHEAR TEST APPARATUS

An apparatus for applying shear loads to the specimens was designed and built on site. This facility employed a 60-ton capacity, manually operated hydraulic ram whose thrust against a cross head was transmitted by tension rods to a 1 1/2-inch thick shear plate bolted to the insert specimen. The base reaction of the jack was transmitted through a structural steel "bridge" to the outer face of the concrete test slab. This arrangement, as shown in Appendix 1, provided a horizontal shear load on the vertically positioned insert without producing secondary or reactive concrete stresses in the vicinity of the specimen. Ram thrust was determined by multiplying the fluid pressure (PSI), as indicated by a calibrated gauge on the pump, by a number equal to the ram piston area in square inches. Deflections were measured by a calibrated dial indicator mounted on a remotely anchored bracket and with its spring loaded probe in contact with a lug welded to the shear plate directly behind the bolt head or threaded rod.

2.4.3 TENSION TEST APPARATUS

An apparatus for applying tension loads to the specimens was also designed and built on site. This facility employed a 60-ton capacity, manually operated hydraulic ram which serves as an end loading on a built-up steel beam. The other end of the beam was bearing against a well-supported round bar which served as a fulcrum and provided the other end reaction of the beam when the jack was operated to load the specimen. A threaded rod protruded through the beam at mid-span, through a nut and bearing plate on the beam with the opposite ana threaded into the Richmond Insert. This arrangement caused the load on the rod to be equal to twice the force applied to the jack. Location of the base plates for the reactions of the beam provided clearance from the insert of at least 4 times the overall insert height; i.e., at least 39 1/2 inches for the 1 1/2 inch inserts and 23 inches for the 1 inch inserts. Ram thrust was determined by miltiplying the fluid pressure (PSI), as indicated by a calibrated gauge on the pump, by a number equal to the ram piston area in square inches. Deflections were measured by a calibrated dial indicator mounted on a remotely anchored bracket and with its spring loaded probe in contact with a bracket which was securely clamped to the nut on the threaded rod, as shown in the sketch below.



2.4.4 COMBINED SHEAR AND TENSION TEST

The apparatus for the combined shear and tension test utilized the same equipment as that used on the individual shear and tension tests. For the shear portion, the equipment was set up identically to the individual shear test. For the tension portion, the equipment was arranged in a slightly different fashion. The hydraulic ram was not placed under the end of the beam, but instead, on the center of the beam on top. The ram thrust was applied directly to the threaded rod, which passed through the center of the ram, by means of a plate which was placed on top of the ram. The base reaction was resisted by the tension beam, loading which was supported by two wide flange stands at sufficient distance from the insert so as not to induce secondary or reactive concrete stresses in the vicinity of the specimen. This arrangement caused the load on the rod to be equal to the ram thrust. Both rams (one applying tension and one applying shear) were operated by a single hand pump with a calibrated pressure gauge. In this fashion, the shear and tension loads applied to the test specimen would be equal at all times.

3.0 TEST PROCEDURE

In performance of all of the tests, inserts were cleaned of concrete mortar and other trash that would affect bolt thread engagement. A new bolt (A-490) or threaded rod (SA-193 Grade B7) was used for each insert. The fasteners were all tightened "snug tight". The application of all loads was applied by the ram by operation of the manual hydraulic pump. As the load increased from zero (0), indications of fluid pressure (later converted to load) and simultaneous bolt head deflection were read at regular intervals. These intervals were at 400 PSI on the pressure gauge, corresponding to 5300 pounds thrust with the exception of the direct tension tests. On the direct tension test, these intervals were at 200 PSI on the pressure gauge, which also corresponded to 5300 pounds thrust on the specimen due to the configuration used. The load as indicated by these gauge pressures was maintained as constant as possible for a period of two (2) minutes. At the end of this time period, the deflection was again observed and noted. Load application on each specimen was carried out until ultimate failure of the specimen occured (except specimen no. 1, which was tested in shear). At this point, observations were made of the condition of the specimens and the failure mode.

4.1.2 TENSION TESTS

The ultimate load applied to the tension test specimens ranged from 87,650 lbs. to 114,150 lbs.. The failure loads ranged from 87,650 lbs. to 108,850 lbs.. The failure mode for specimens 11 and 12 was by striping the threads between the threaded rod and the Richmond Insert. Specimen 13 failed in the Richmond Insert by a failure of the welds between the axial strut rods to the upper threaded coil. Specimens 14 and 15 failed by concrete shear cone failures. All specimens were utilizing SA-193 Grade B7 threaded material.

SPECIMEN NO.	ULTIMATE LOAD	FAILURE LOAD
11	106,200	103,550
12	114,150	108,850
13	114,150	108,850
14	87,650	87,650
15	100,900	100,900
Average	104,610	101,960

Allowable Tension = 31.3k

$$\text{Factor of Safety (F.S.)} = \frac{\text{Average Failure Ld.}}{\text{Design Allowable Ld.}}$$

SPECIMEN NO.'s	AVERAGE FAILURE LOAD (k)	FACTOR OF SAFETY
11 thru 15	101.96	101.96/31.3 = 3.26

4.1.3 COMBINED SHEAR AND TENSION TESTS

The shear and tension loads applied to the specimens under this loading condition are equal and the ultimate loads ranged from 60,950 lbs. to 68,900 lbs.. The failure loads ranged from 58,300 lbs. to 67,575 lbs.. Specimens 6 through 9 failed by an abrupt shearing of the threaded rod. There was some deformation of the rod in bending at the shear zone (ranging for 20° to 45° bend). Upper insert washer moved from 1/2 inch to 3/4 inch with some concrete spailing on the compression side of the insert. Specimen 10 failed by striping the threads between the threaded rod and the insert. This failure lifted the upper insert washer from the struts, but the insert remained in place.

SPECIMEN NO.	ULTIMATE LOAD (lbs)	FAILURE LOAD (lbs)
6	68,900	67,575
7	67,575	67,575
8	60,950	58,300
9	61,613	61,613
10	64,925	62,275
Average	64,793	63,468

Allowable Tension = 31.3k

Allowable Shear = 27.0k

Factor of Safety (F.S.)

$$\left(\frac{\text{Average Failure Tension}}{\text{Design Allowable Tension x F.S.}}\right)^{4/3} + \left(\frac{\text{Average Failure Shear}}{\text{Design Allowable Shear x F.S.}}\right)^{4/3} = 1.0$$

SPECIMEN NO's.	TENSION AND SHEAR AVERAGE FAILURE LOAD (k)	FACTOR OF SAFETY
6 thru 10	63.47	$\left(\frac{63.47}{31.3 \times F.S.}\right)^{4/3} + \left(\frac{63.47}{27.0 \times F.S.}\right)^{4/3} = 1.0$ F.S. = 3.68

4.2 1-INCH RICHMOND INSERTS

4.2.1 SHEAR TESTS

From the test data sheets, the ultimate load applied to the specimens ranged from 39,750 lbs. to 50,350 lbs.. The failure loads ranged from 37,100 lbs. to 42,400 lbs.. Specimens 16 thru 19 failed by shear failure of the A-490 bolt. The top portion of the inserts deflected from 1/8 inch to 7/8 inch with some spalling on the compression side of the insert. Specimen 16 showed some rotation of the top of the insert. Specimen 17 and 18 showed no apparent sign of rotation. Specimen 19 failed by breaking the weld between the upper coil and the struts. The bolt then failed in bending after rotating with the upper portion of the coil. Specimen 20 failed by crushing the concrete on the compression side of the insert. The insert then rotated intact and the bolt ultimately failed in bending.

SPECIMEN NO.	ULTIMATE LOAD (lbs)	FAILURE LOAD (lbs)
16	46,375	42,400
17	43,060	37,100
18	50,350	42,400
19	46,375	42,400
20	39,750	37,100
Average	45,182	40,280

Allowable Shear = 11.5^k

Factor of Safety (F.S.) = $\frac{\text{Average Failure Ld.}}{\text{Design Allowable Ld.}}$

SPECIMEN NO's.	Average Failure Load (k)	Factor of Safety
16 thru 20	40.28	40.28/11.5 = 3.50

4.2.2 TENSION TESTS

The ultimate load applied to the specimens ranged from 41,270 lbs. to 43,920 lbs.. The failure foads ranged from 39,950 lbs. to 43,920 lbs.. Specimens 26, 28 and 29 failed by concrete shear cone failure. Specimens 27 and 30 failed by Richmond Insert failure. The inserts failed by a failure of the welds between the struts and the lower coil. There was some surface spalling associated with these failures.

SPECIMEN NO.	ULTIMATE LOAD (lbs)	FAILURE LOAD (lbs)
26	42,600	42,600
27	43,920	43,920
28	42,600	39,950
29	42,600	39,950
30	41,270	39,950
Average	42,598	41,276

Allowable Tension = 11.5^k

Factor of Safety (F.S.) = $\frac{\text{Average Failure Ld.}}{\text{Design Allowable Ld.}}$

SPECIMEN NO's.	AVERAGE FAILURE LOAD (k)	FACTOR OF SAFETY
26 thru 30	41.276	41.276/11.5 = 3.59

4.2.3 COMBINED SHEAR AND TENSION TESTS

The shear and tension loads applied to the specimens under this loading condition are equal and the ultimate loads ranged from 27,825 lbs. to 30,475 lbs.. The failure loads ranged from 27,825 to 29,150 lbs.. Specimens 21 thru 25 failed abruptly due to shear failure of the threaded rod. All inserts remained intact with only surface spalling of the concrete.

SPECIMEN NO.	ULTIMATE LOAD (lbs)	FAILURE LOAD (lbs)
21	27,825	27,825
22	29,150	29,150
23	30,475	29,150
24	29,150	27,825
25	28,487	27,825
Average	29,017	28,355

Allowable Tension = 11.5^k

Allowable Shear = 11.5^k

Factor of Safety (F.S.)

$$\left(\frac{\text{Average Failure Tension}}{\text{Design Allowable Tension x F.S.}}\right)^{4/3} + \left(\frac{\text{Average Failure Shear}}{\text{Design Allowable Shear x F.S.}}\right)^{4/3} = 1.0$$

SPECIMEN NO's	TENSION AND SHEAR AVERAGE FAILURE LOAD (k)	FACTOR OF SAFETY
21 thru 25	28,355	$\left(\frac{28.36}{11.5 \times F.S.}\right)^{4/3} + \left(\frac{28.36}{11.5 \times F.S.}\right)^{4/3} = 1.0$

F.S. = 4.15

5.0 CONCLUSIONS

These test results show that the performance capabilities of the 1 1/2-inch type EC-6W and the 1-inch type EC-2W Richmond Inserts in shear, tension and combined shear and tension exceed the design allowable by a ratio of more than 3 to 1. These conclusions are valid for the design allowables shown in Specification 2323-SS-30, based on a spacing of the Richmond Inserts such that a full shear cone can develop.

Based on this test, the design allowables for shear, tension and combined shear and tension are acceptable for use without further investigation or additional calculations. Richmond's recommendation of a minimum safety factor of 3 has been complied with.

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Communications Report

Company: Texas Utilities	☐ Telecon ☒ Conference Report
Project: Comanche Peak Steam Election Station Independent Assessment Program - Phase 3	Job No. 84042
	Date: 2 April 1984
Subject: Mechanical Review Document Request	Time: 12:45 p.m.
	Place: CPSES

Participants:	of
B. Wood	TUGCO
J. Russ	Cygna

Item	Comments	Required Action By
	Reference: Conference Report dated 2 April 1984, "Mechanical Review Document Request," B. Wood and J. Russ participating. Cygna received the following from Mr. Wood: 1. All documents requested in the referenced conference report. 2. Calculation package CC-1-028-004-A33K.	

Signed: N H Williams /dmm Page 1 of 1

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Communications Report

Company: Texas Utilities	☐ Telecon ☒ Conference Report
Project: Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3	Job No. 84042 Date: 4/2/84
Subject: Pipe Support Review Document Request	Time: 2:45 P.M. Place: CPSES Site
Participants: B. Wood	of TUGCO
J. Russ	Cygna

Item	Comments	Required Action By
	Please provide the latest revision of the load summary sheet for CC-2-009-003-A33R and TF/RB 1384 for MS-1-004-009-C62K.	

Signed: N H Williams /ajb Page 1 of 1

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Communications Report

Company:	Texas Utilities	☒ Telecon	☐ Conference Report
Project:	Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3	Job No.	84042
		Date:	7/2/84
Subject:	Design Control Review Project Letter 84042.007	Time:	9:00 A.M.
		Place:	Boston
Participants:	S. Bibo	of	Cygna
	Borys Czarnogorski		Gibbs & Hill

Item	Comments	Required Action By
	I received a call from Borys stating that he would be sending a response to a letter from Williams to Ballard (84042.007) dated 6/23/84. Borys stated that his cover letter was telecopied to Cygna San Francisco on Friday (6/29/84) but that there was an error. I advised him to supplement his original letter with the correct information and transmit it as soon as possible. Borys also stated that he would be on vacation until 7/20/84 and hoped Cygna could work around his schedule for Phase 4 at Gibbs & Hill in New York.	

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Communications Report

Company:	Texas Utilities	☒ Telecon	☐ Conference Report
Project:	Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3	Job No.	84042
		Date:	8/28 - 8/29
Subject:	Gibbs and Hill Mass Participation Study Phase 3 Open Items	Time:	8:00 AM -5:00 PM
		Place:	Gibbs and Hill/NY
Participants:	Steve Lim	of	Gibbs and Hill
	Henry Mentel (8/29 only)		Gibbs and Hill
	J. Minichiello		Cygna

Item	Comments	Required Action By
8/28	In order to determine Gibbs and Hill's progress to date, Cygna performed a review of the 5 sample problems run on the new version of ADLPIPE.	

Cygna reviewed the preliminary results for the 5 problems:

1 - 64D
2 - 68X
1 - 92A
1 - 23A
1 - 15G

Gibbs and Hill's summary of the support loads are presented for the following cases:

1) As-bui t total load without missing mass (unrefined spectra)

2) As-built total load with missing mass (unrefined spectra)

3) As-built total load with missing mass (refined spectra)

4) As-built total load with envelope of unrefined dynamic (w/o missing mass) and static "g" effect (refined spectra)

5) As-built total load with refined spectra run (with no cut-off frequency)

Signed: N H Williams /dkc

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Item	Comments	Required Action By
	The pipe stress results for 3 of the problems showed very little increase between the results with and without missing mass (less than 2% for SSE), as expected. The support results, however, showed substantial increases in inertia loads. Therefore, rather than try to draw conclusions from this small sample, Gibbs and Hill decided to use a larger sample (30), as described in GTN-69316. Letter GTN-69339 presented the first sample of 15 problems and GTN-69368 the second sample of 15. All 30 problems had been done using the unrefined spectra, as had a majority of the as-built work. Gibbs and Hill estimated only 20 problems had been done "as-built" with the refined spectra. After finishing the analysis for the first 15 problems using the refined spectra ZPA, Gibbs and Hill sent the resulting support loads to TUGCO for review.	
	Cygna confirmed that no other refinement was used in sending the loads to TUGCO; that is, any load increase (not just above 10%) was considered and SAM loads were not reduced. The loads given to TUGCO do represent the envelope of the previous inertia load and that due to the refined ZPA.	
8/29	In reviewing 1-23A on the previous day, Cygna noted that the ZPA results did not seem correct. After checking, Mr. Lim confirmed that an error existed in the ZPA analysis. As stated previously, those results were preliminary only and had not been checked.	
	Cygna then requested Gibbs and Hill provide a summary of the support loads for the 15 problems sent to TUGCO. Cygna will use the summaries to draw independent conclusions from the Gibbs and Hill data.	

Item	Comments	Required Action By

ATTACHMENT 1

GIBBS AND HILL PLAN FOLLOWING TUGCO EVALUATION OF SUPPORT LOAD INCREASES IN THE 30 PROBLEMS (USING UMBRELLA METHOD)

a) If no supports require redesign - - Gibbs and Hill plans to write a report describing what had been done and correlating the results to the mass fractions in the sample of 30, then make a decision concerning the applicability of the sample.

b) If any supports require redesign - -

(i) Gibbs and Hill will investigate each occurrence for uniqueness (i.e., near a valve station, low mass participation, size of pipe) or a trend (i.e., function of low mass fraction)

(ii) Gibbs and Hill will then expand the sample concentrating on problems exhibiting the characteristics found above

(iii) Gibbs and Hill will report results from the expanded sample to TUGCO for evaluation

(iv) Gibbs and Hill will issue an interim report describing the sample of 30, the investigation of (b)(i), and their plan for increasing the sample.

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Communications Report

Company:	Texas Utilities	☒ Telecon	☐ Conference Report
Project:	Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3	Job No.	84042
		Date:	11/7/84
Subject:	Engineering Review of Installation Procedure	Time:	12:30 p.m.
		Place:	SFRO
Participants:	J. Finneran	of	TUGCO
	J. Minichiello		Cygna

Item	Comments	Required Action By
	It is Cygna's understanding that CP-CPM 9.10 is the appropriate document to reference concerning when U-bolts are to be cinched. Also, CP-QAP-12.1 is the appropriate quality control document. Mr. Finneran confirmed these points. He stated that the cinching of U-bolts, when no gap is shown on the drawing, was standard procedure at CPSES. The words describing this were added to CP-CPM 9.10 at the suggestion of engineering. He also stated that engineering reviews construction procedures as they affect design. Any information not on a support drawing (for example, Hilti bolt torques) are placed in the installation procedure and reviewed by engineering.	

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Communications Report

Company: Texas Utilities	☒ Telecon	☐ Conference Report	
Project: Comanche Peak Steam Electric Station Independent Assessment Program - Phases 2 and 3		Job No. 83090 - 84042 Date: 9/21/84	
Subject: Welded Attachments		Time: 8:30 am Place: SFRO	
Participants: D. Terao		of NRC (MEB)	
J. Minichiello		CES	

Item	Comments	Required Action By
	I called Mr. Terao to determine the status of the NRC concerns on welded attachments. I first noted that Cygna had discussed five items on welded attachments in the July 3 meeting. These were:	

a) 20% increase in allowables
b) use in breaks exclusion zones
c) two directional supports (trunnions attached to trunnions)
d) spacing (circumferentially and axially)
e) design of double trunions as axial and rotational restraints.

I stated that Cygna had closed b, c, and d in the Phase 3 assessment, as explained on page 5-5 and Observation PI-00-02 of the Phase 3 Final Report, Rev. 0. Cygna is currently updating the Observation Record Review for Observation PI-00-02 of the Phase 2 report. This reflects our presentation in the July 3 meeting which addresses item a. For item e, Cygna has found, in all cases but one (out of 12), that the Gibbs and Hill analysts use 100% of the load on one trunnion in double trunnion arrangements. Thus, Cygna believes the G&H standard procedure is acceptable in evaluating double trunnions.

In addition to the above, I noted that, for the Main Steam and Feedwater piping local attachments, NPSI and TUGCO have performed additional finite element analyses. The purpose is to limit stresses in pads and trunnions to levels below

Signed: N. H. Williams /rb

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Communications Report

Item	Comments	Required Action By
	the limits derived from Appendix G of Section III of the Code. This is also explained in the Phase 3 report, Appendix J, note 2. Dave felt that Cygna had expanded their review as requested. Dave will now review the references we noted above and determine if he has further questions.	

/rb

CYGNA

23-C-82-1A

Communications Report

Company: Texas Utilities	☒ Telecon ☐ Conference Report
Project: Comanche Peak Steam Election Station Independent Assessment Program - Phase 4	Job No. 84042/84056 Date: 8/24/84
Subject: Cleanliness/Fouling Factors for CCW Heat Exchangers	Time: 11:30 Place: SFRO
Participants: John Irons	of Gibbs & Hill
J. Foley	Cygna

Item	Comments	Required Action By
	I told John that although we had researched "cleanliness" factors, and thought we understood the relationship of cleanliness factors to fouling factors, we were still not able to make a definite correlation for the CPSES CCW Heat Exchanger because of some apparent discrepancies in the data sheets Gibbs & Hill had sent us. He explained that the values given in the data sheets were not always easy to interpret because some were "design values" and other are "required values" for certain cases. He agreed to send other sheets which would clarify which are "design values". Using these numbers, we should be able to resolve this item (i.e., whether fouling factors specified by TEMA, or their equivalent, were used in the design of the CCW Heat Exchanger.	

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