(6)

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

August 6, 1984
84042.026

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

Subject: Responses to Cygna Design Control, Pipe Support, and Pipe Stress Questions
Comanche Peak Steam Electric Station
Independent Assessment Program - Phase 3
Texas Utilities Generating Company
Job No. 84042

Dear Mrs. Ellis:

Enclosed please find copies of additional responses to Cygna design control, pipe support and pipe stress questions.

Feel free to call me if you have any questions or wish to discuss the enclosed documents.

Very truly yours,

N. H. Williams

N.H. Williams
Project Manager

Attachments

cc: Mr. S. Treby, NRC, w/attachments
Mr. S. Burwell, NRC, w/attachments
Mr. D. Wade, TUGCO, w/o attachments
Mr. G. Grace, TUGCO, w/o attachments
Mr. D. Pigott, Orrick, Herrington & Sutcliffe, w/o attachments

50-445
50-446

8409040034 840806
PDR ADOCK 05000445
A PDR

2222
1/1

ATTACHMENTS

1. R.E. Ballard (Gibbs & Hill) letter to J. B. George (TUGCO), GTN-68572, "Computer Output for Unit 1 Main Steam As-Built Piping Stress Analysis," March 2, 1984.

2. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-68582, "Transmittal of Project Procedures Manual and Project Guide Table of Contents," March 6, 1984.

3. L.M. Popplewell (TUGCO) letter to N. Williams (Cygna), "Cygna Review Questions, Williams to Grace telecon dated May 16, 1984," May 17, 1984.

4. G. Grace (TUGCO) memo to N. Williams (Cygna) "Transmittal of G&H Procedures AEP-501 and AEG-502," May 30, 1984. (Attachments not included.)

5. R.P. Deubler (NPS) letter to C. Wong (Cygna), NPSI-12-2494, "Transmittal of Pad Analysis Input," June 6, 1984.

6. P. Corbo (NPSI) memo to C. Wong and S. Luo (Cygna), "Transmittal of Main Steam Pad Analysis for two hangers, Stress Analysis Reports by the Applied Mechanics Group for three supports, and pipe support detail original design for 17 NPS support numbers," May 31, 1984. (Attachments not included.)

7. R.E. Ballard (Gibbs & Hill) letter to J. B. George (TUGCO), GTN-69062, "Cable Tray Support Analysis - Equivalent Static Load Method - Justification of 1.0. Factor," May 31, 1984.

8. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69119, "Followup Information from G&H," June 15, 1984.

9. L.M. Popplewell (TUGCO) letter to N. Williams (Cygna), "Cygna Review Questions (Pipe Supports)," June 27, 1984.

10. L.M. Popplewell (TUGCO) letter to N. Williams (Cygna), "Cygna Review Questions (Pipe Supports)," June 28, 1984.

11. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69190, "Cygna letter 84042.007 dated 6/23/84," June 29, 1984.

12. L.M. Popplewell (TUGCO) letter to N. Williams (Cygna), "Cygna Review Questions - Pipe Supports," July 2, 1984.

ATTACHMENTS

13. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69176, "Mass Participation Fraction Sensitivity Study," June 29, 1984.

14. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69218, "Cygna Communications Reports dated March 19, 1984 and June 20, 1984," July 5, 1984.

15. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69219, "Welded Attachments in Break Exclusion Areas and Superposition of Stress at Multiple Welded Attachment Points," July 5, 1984.

16. G. Grace (TUGCO) memo to N. Williams (Cygna), "Transmitting STRUDL output for CC-1-028-024-S33R, ADLPIPE analysis for stress problem AB-1-23B, response to telecon of July 2 between G. Grace and L. Weingart, and memos concerning changes in AB-1-23B stress calculation between TSDRE and SSAG," July 5, 1984.

17. G. Grace (TUGCO) memo to N. Williams/L. Weingart (Cygna), "Main Steam Relief Valves," July 6, 1984.

18. R.E. Ballard (Gibbs & Hill) telecopy to J. Merritt, D. Wade, M. McBay (TUGCO), "Follow-up Information from G&H," July 11, 1984.

19. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69233, "Followup Information from G&H, Cygna Communications Report dated 7/2/84," July 10, 1984.

20. L.M. Popplewell (TUGCO) letter to N. Williams (Cygna), CPPA-39,734, "Cygna Review Questions (Fisher Valves)," July 9, 1984.

21. L.M. Popplewell (Gibbs & Hill) letter to N. Williams (Cygna), "Cygna Review - Pipe Supports," July 12, 1984.

22. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69250 "Followup Information from G&H - Cygna Communications Report dated 7/2/84," July 13, 1984.

ATTACHMENTS

23. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69212, "Cygna letter 84042.007 dated 6/23/84 and GTN-69190 dated 6/29/84," July 3, 1984.

24. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69245, "Additional Responses to Cygna letter 84042.007 dated 6/23/84," July 12, 1984.

25. R.E. Ballard (Gibbs & Hill) letter to J.B. George (TUGCO), GTN-69279, "G&H Followup Activities for Cygna (Phase 3)," July 20, 1984.

PROJECT FILE

TEXAS UTILITIES GENERATING COMPANY

OFFICE MEMORANDUM

To Nancy Williams Glen Rose, Texas May 30, 1984

Subject Telecon of May 24, 1984, 4:30 p.m.

Per the subject telecon, please find attached the following Gibbs & Hill procedures:

AEP-5C1
AEG-502

Please return these procedures after your review.

George Grace

GG/lp
Attachments

CYGNA	
JOB NO :	84042
DATE LOGGED:	6/1/84
LOG NO.:	818
FILE:	2.1.1 Inc. CR
CROSS REF. FILE	11.1.1 Tech. Files

NOTED JUN 0 - 1984 N.WILLIAMS

RECEIVED

JUN 1 1984

CYGNA - SAN FRANCISCO

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760-4438
Telex:
Domestic: 127636/968694
International: 428813/234475

A Dravo Company

PROJECT FILE

CC. N. Williams
T Witty
T Acum /PF

CYGNA
84042
3/16/84
2
2.1.1 Gnc. OR
2.1 Gnc OR 109

March 2, 1984

GTN- 68572

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Manager

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
COMPUTER OUTPUT FOR UNIT 1 - MAIN STEAM
AS-BUILT PIPING STRESS ANALYSIS

Per the request of Nancy Williams of CYGNA to Robert E. Ballard attached is a listing of, and the actual hardcopy computer outputs for the Unit 1 Main Steam Loops 1, 2, 3 & 4 piping stress analyses. Note that while these runs are stored on computer tape, these outputs are the sole hard copies and are your responsibility until returned. Upon receipt it is requested that the outputs be reviewed against the listing for consistency and a response made to this office verifying receipt of the complete package.

Very truly yours,

GIBBS & HILL, INC.

S McMorano

Robert E. Ballard, Jr.
Project Manager

HWM

REBa-HWMe:scf
1 Letter

cc: ARMS (P&R Site) OL
N. Williams (CYGNA) 1L
H. Harrison (TUSI Site) 1L, + Attachments

TUSI - CPSES UNIT 1
G&H APPLIED MECHANICS
MAIN STEAM AS-BUILT PIPING ANALYSIS
RELATED COMPUTER INPUTS

Volume	Contents
IA	Main Steam LP. 1 - Relap Results
IB	Main Steam LP. 1 - Ansys/Displ/Str. Pass
IC	Main Steam LP. 1 - Adlpipe Results
IIA	Main Steam LP. 2 - Relap Results
IIB	Main Steam LP. 2 - Ansys/Displ/Str. Pass
IIC	Main Steam LP. 2 - Adlpipe Results
IIIA	Main Steam LP. 3 - Relap Results
IIIB	Main Steam LP. 3 - Ansys/Displ/Str. Pass
IIIC	Main Steam LP. 3 - Adlpipe Results
IVA	Main Steam LP. 4 - Relap Results
IVB	Main Steam LP. 4 - Ansys/Displ/Str. Pass
IVC	Main Steam LP. 4 - Adlpipe Results

ATTACHMENT 1 TO SEISMIC ACCELERATION STUDY

NO.	MARK NO.	SCOPE	BUILDING / ELEV.	FUNDAMENTAL FREQUENCY (HZ)	ACCELERATIONS (G's) SSE	OBE	MAX. ANCHOR BOLT INTERACTION	MAX. MEMBER STRESS-ACTUAL ÷ ALLOWABLE
1	AF-1-026-001-S33R	ITT	SC / 792'-2"	fn-s = 213.2 fe-w = 61.5	0.47 0.47	0.37 0.37	0.24	0.12
2	AF-1-099-048-S63R	ITT	SG / 853'-7"	fn-s = 612.4 fe-w = 159.3	0.80 0.77	0.50 0.50	0.33	0.21
3	AF-1-101-034-S33R	ITT	SC / 803'-7"	fvert = 60.7 fn-s = 137.0 fe-w = 30.7	0.97 0.40 0.70	0.77 0.27 0.50	0.59	0.17
4	CC-1-140-705-E63R	PSE	EC / 863'-9"	fn-s = 12.5 fe-w = ~~173.4~~ 54.8	1.00 0.40	0.95 ~~0.40~~ .27	0.42	0.37
5	CC-1-162-725-A43R	PSE	AUX / 818'-8"	fvert = 45.7 fn-s = 14.8 fe-w = 12.2	0.80 0.65 0.70	0.80 0.80 0.90	N/A	0.36
6	CC-1-204-004-C53R	NPSI	RB / 843'-7"	fvert = 156.5 fn-s = 19.5 fe-w = 19.5	0.50 0.70 0.80	0.30 0.40 0.40	0.49	0.09
7	CC-1-212-006-C53R	NPSI	RB / 850'-0"	fn-s = 17.4 fe-w = 29.7	1.10 0.80	0.90 0.50	N/A	0.05
8	CH-2-239-407-E23R	NPSI	EC / 791'-10"	fvert = 23.7 fn-s = 313.0 fe-w = 77.2	1.00 0.30 0.40	0.68 0.20 0.20	0.57	0.14
9	CH-X-050-004-A75R	ITT	AUX / 881'-6"	fn-s = 23.9 fe-w = 27.9	0.78 0.61	0.57 0.38	0.81	0.13

SEISMIC ACCELERATION STUDY

A study has been completed to determine the net effects of seismic accelerations of pipe support structures. The study consisted of conservative hand calculations to determine the support fundamental frequency; determination of the seismic acceleration factor from the appropriate response spectra curve at the calculated frequency; application of the seismic acceleration factor on the pipe support structure; and evaluation of results obtained.

To assure completeness, aproximately 400 as-built pipe support drawings were examined in selecting frames for this study. Twenty-three (23) of what we consider to be enveloping case frames were chosen for an in-depth analysis. A representative of each pipe support design organization (ITT, NPSI, and PSE) perticapated in the calculations. Supports from each organization were included in the study.

The results of the seismic acceleration study are as follows:

(1) Conservatively calculated frequencies ranged from 10.2 HZ to well over 1000HZ (see attachment 1). The average frequency for the pipe support structures was around 250HZ. Frequencies not listed in Attachment 1 are greater than 1000HZ.

(2) The majority of the calculated frequencies were greater than 33HZ, which is considered rigid (see Attachment 2).

(3) The inclusion of the loads due to seismic acceleration of pipe support structures showed no over-stressed condition in any case (see Attachment 1). In the vast majority of cases, the additional loads were negligible.

The results of this study indicate that the approach that each design organization is taking with respect to consideration of these effects is adequate for their designs. No change in design approach is necessary.

The calculation package for each support included in the study is on file in Pipe Support Engineering at Site along with this summary.

John C. Finneran Jr.

John C. Finneran Jr.
Project Pipe Support Engineer
Date 12-8-82

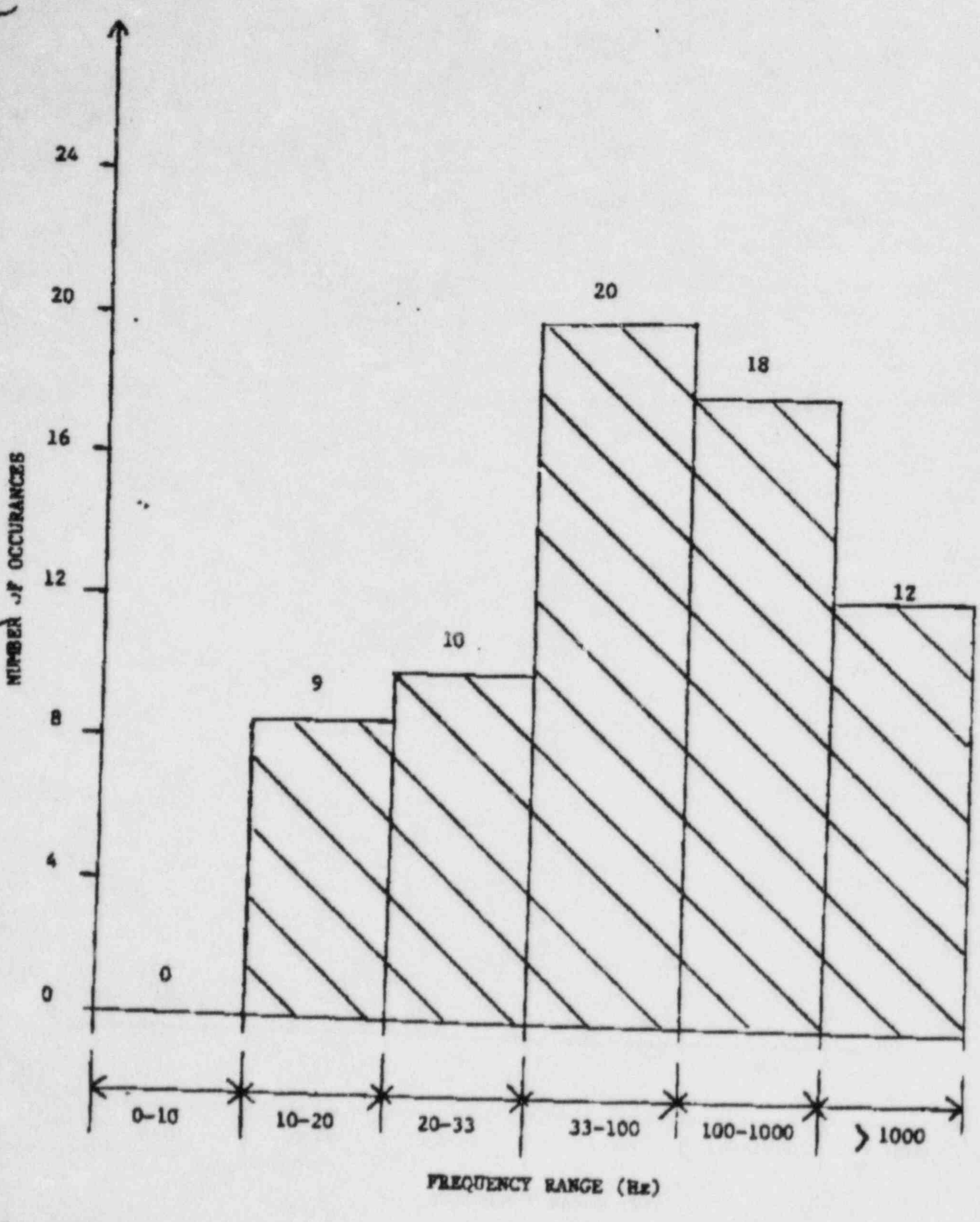
NO.	MARK NO.	SCOPE	BUILDING / ELEV.	FUNDAMENTAL FREQUENCY (HZ)	ACCELERATIONS (G's) SSE	ACCELERATIONS (G's) OBE	MAX. ANCHOR BOLT INTERACTION	MAX. MEMBER STRESS-ACTUAL ÷ ALLOWABLE
10	CH-X-071-003-A75R	ITT	AUX / 881'-6"	fvert = 148.4 fn-s = 61.3 fe-w = 24.3	0.66 0.50 0.66	0.40 0.40 0.40	0.93	0.32
11	CI-1-044-056-C46R SI-1-306-001-C42R	NPSI	RB / 822'-8"	fvert = ~~14.1~~ 11.1 fn-s = ~~10.9~~ 14.94 fe-w = ~~10.2~~ 10.55	~~1.61~~ .3 ~~1.05~~ .6 ~~1.5~~ 1.0	~~1.26~~ .45 ~~0.72~~ 0.70 ~~1.30~~ 1.2	~~0.80~~ 0.68	~~0.62~~ .478
12	CS-1-358-711-A53R	SITE	AUX / 848'-4"	fn-s = 58.4 fe-w = 117.0	0.46 0.42	0.50 0.48	0.69	0.13
13	CS-1-454-717-A52R	SITE	AUX / 838'-10"	fvert = 56.3 fn-s = 34.3 fe-w = 50.5	0.80 0.75 0.65	0.75 0.70 0.60	0.35	0.40
14	CS-2-358-013-A53R	ITT	AUX / 847'-7"	fvert = 34.8 fn-s = 38.0 fe-w = 522.8	0.90 0.47 0.47	0.57 0.27 0.27	0.56	0.31
15	CT-1-014-025-S32R	ITT	SG / 799'-3"	fvert = 44.4 fn-s = 54.4	1.20 0.50	1.00 0.37	0.37	0.33
16	CT-1-025-003-S22R	ITT	SG / 787'-4"	fvert = 21.8 fn-s = 32.9 fe-w = 92.9	1.37 0.43 0.37	1.00 0.30 0.23	0.26	0.70
17	CT-1-049-411-C82R	NPSI	RB / 930'-0"	fvert = 205.0 fn-s = 443.0 fe-w = 102.0	0.60 0.60 0.60	0.40 0.40 0.40	N/A	0.21
18	CT-1-117-411-C62R	NPSI	RB / 862'-4"	fn-s = 225.0 fe-w = 94.6	0.55 0.70	0.30 0.50	~~0.39~~ .189	0.02

NO.	MARK NO.	SCOPE	BUILDING / ELEV.	FUNDAMENTAL FREQUENCY (HZ)	ACCELERATIONS(G's)		MAX. ANCHOR BOLT INTERACTION	MAX. MEMBER STRESS-ACTUAL ÷ ALLOWABLE
					SSE	OBE		
19	DO-1-056-002-S53R	ITT	SG / 846'-7"	fvert = 54.3 fn-s = 25.0	1.28 1.28	0.77 0.77	0.66	0.33
20	DO-1-095-706-S53R	PSE	SG / 836'-6"	fvert = 337.0 fn-s = 421.0 fe-w = 305.0	1.00 0.80 0.80	1.00 0.80 0.80	0.77	0.02
21	FW-1-097-010-C62R	NPSI	RB / 871'-10"	fvert = 54.3	0.64	0.40	0.48	0.30
22	MS-1-416-018-S73R	ITT	SG / 876'-10"	fn-s = 23.1 fe-w = 70.9	1.10 0.77	0.96 0.47	0.36	0.21
23	RC-1-052-022-C41K	NPSI	RB / 824'-11"	fvert = 50.0 fn-s = 50.0 fe-w = 172.0	0.60 0.50 0.50	0.30 0.20 0.20	0.04	0.16

ATTACHMENT 2 TO SEISMIC ACCELERATION STUDY

BREAKDOWN OF CALCULATED FREQUENCIES

(3 CASES PER SUPPORT, ONE IN EACH ORTHOGONAL DIRECTION)



CPP-9977

TEXAS UTILITIES SERVICES INC.

OFFICE MEMORANDUM

Chris
Please set up a special File for this study

To M.R. McBay Glen Rose, Texas December 8, 1982

Subject COMANCHE PEAK STEAM ELECTRIC STATION
PIPE SUPPORT SEISMIC ACCELERATION STUDY

Attached hereto is the above referenced study. This is for attachment to the Deficiency Review Report on the same subject which you have been holding.

John C Finneran Jr.
John C. Finneran Jr.

JCF/cs

PROJECT FILE

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760- 4438
Telex
Domestic 127636/968694
International 428813/234475

A Dravo Company

CYGNA	
JOB NO.:	84042
DATE LOGGED:	3/13/84
LOG NO.:	#3
FILE:	2.1.1 Inc. cR/ls/o encl
CROSS REF. FILE	2.1. Gne. Cr Log

March 6, 1984

GTN-68582

cc: N. Williams
T. Acuna/PF

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Mgr.

Gentlemen:

TEXAS UTILTIIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323

By copy of this letter to Steve Bibo of CYGNA enclosed herewith is one (1) copy each of the following documents:

* a. Project Procedures Manual - Table of Contents

* b. Project Guide - Table of Contents

copies requested from S. Bibo 3/19/84 for

Very truly yours,

GIBBS & HILL, Inc.

for M Marano

Robert E. Ballard, Jr.
Project Manager

REBa-SMMa:lc
1 Letter
CC: ARMS (B&R Site) 1L
S. Bibo (CYGNA - Mass.) 1L 1A
N. Williams (CYGNA - Calif.) 1L

RECEIVED

MAR 13 1984

CYGNA - SAN FRANCISCO

Dravo

PROJECT FILE

NPS Industries, Inc.
300 Harmon Meadow Boulevard • P.O. Box 1535 • Secaucus, NJ 07094
201/865-6550 • Telex 14 1435

NPS INDUSTRIES

CYGNA	
JOB NO.	
DATE LOGGED	
LOG NO.	#19
FILE	
CROSS REF. FILE	

NPSI-12-2494
June 6, 1984

CYGNA Energy Services
101 California Street
San Francisco, CA 94111

ATTN: Mr. Chan Wong - 10th Floor

SUBJECT: Transmittal of pad analysis input

Dear Mr. Wong:

Per your request we are forwarding herewith copies of the loading conditions portion of the pad analysis for the NPS support #306, 380, 382, 384, 2921, 438, 443, 996 and 998. Supports #308, 442 and 447 which were also requested do not have pads.

Please let us know if you need anything further.

Very truly yours,

NPS INDUSTRIES, INC.

R. P. Deubler
Project Manager

RPD:ml

cc: J. Finneran - TUSI w/o
D. Rencher - TUSI w/a

RECEIVED

JUN 1984

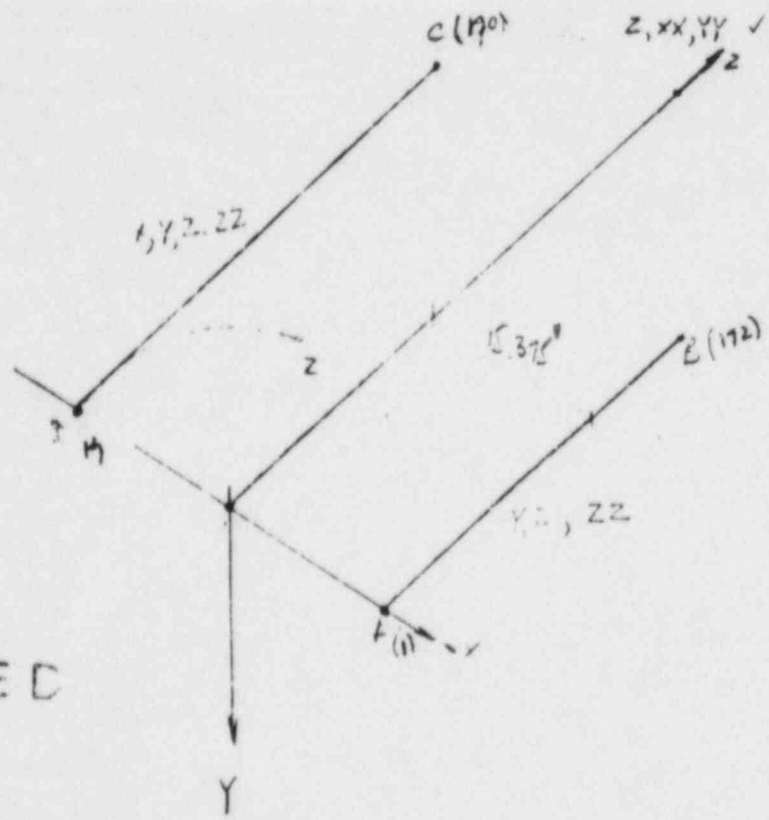
CYGNA - SAN FRANCISCO

JOB NO. 3010-91-2442
SHEET 5 OF 4

CLIENT/PROJECT TUSI
ENGR. CTR DATE 8-6 81
SUBJECT STRESS CALCULATION FOR PAD SUPPORT # 306 HS-1-01-003- C72K
CHK'D. VK DATE 8/1/81

3 BOUNDARY CONDITIONS AND LOADING CONDITION

3.1 Boundary conditions.



ALONG AB, SUPPORT YZ and ZZ
ALONG BC, SUPPORT Z and XX, YY
ALONG CD, SUPORT X, Y, Z and ZZ
ALONG DA, SUPORT Z

CLIENT/PROJECT TUSI

ENGR. CPB DATE 8-6-81

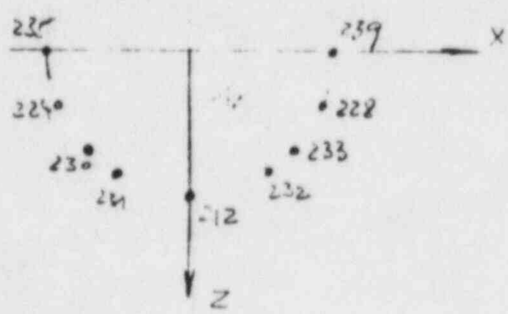
SUBJECT STRESS CALCULATION FOR PAD SUPPORT #306 MS-1-01-003-C72K

CHK'D. VL DATE 8/6/81

3.2 LOADING CONDITIONS

APPLIED FORCE

$$F = \frac{40000}{16} = 2500 \text{ lb}$$



$$F_{239} = \frac{2500}{2} = 1250 \text{ lb}$$

$$F_{228} = 1250 + \frac{2500}{2} = 2500 \text{ lb}$$

$$F_{233} = \frac{2500}{2} + \frac{1250}{2} = 1875 \text{ lb}$$

$$F_{232} = \frac{1250}{2} + 1.5\,\frac{2500}{2} = 2500 \text{ lb}$$

$$F_{212} = 3 \times 1250 = 3750 \text{ lb}$$

$$F_{231} = F_{232} = 2500 \text{ lb}$$

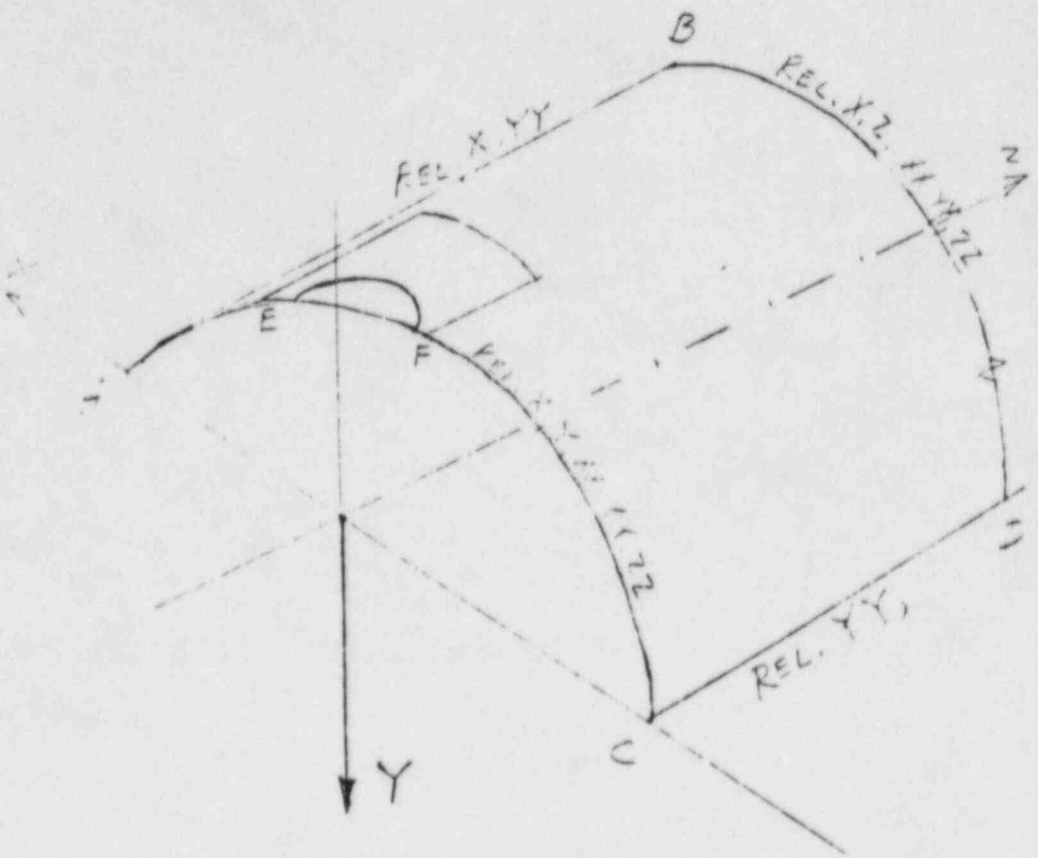
$$F_{230} = F_{233} = 1875 \text{ lb}$$

$$F_{224} = F_{228} = 2500 \text{ lb}$$

$$F_{235} = F_{239} = 1250 \text{ lb}$$

MS-1-002-004-C72K

3. BOUNDARY CONDITIONS
AND LOADING CONDITIONS



BOUNDARY CONDITION

AB - SUPPORT Y, Z, XX, ZZ

CD - SUPPORT X, Y, Z, XX, ZZ

AC - SUPPORT Z

BD - SUPPORT Y

EF - SUPPORT Y

JOB NO. 3010-91-14

SHEET 6 OF 11

CLIENT/PROJECT TUSI

ENGR. VK DATE [illegible]

SUBJECT PAD SSD

CHK'D. CH DATE 8/[illegible]

NS-1-002-004-C72K

LOADING CONDITION

340 FOR Y - 52[illegible]

[illegible] FOR Y - 1810

[illegible] FOR Y - 1552

[illegible] FOR Y - 511

[illegible] FOR Y - [illegible]

310 FOR Y - 212

352 FOR Y - 471

382 FOR Y - 51[illegible]

312 FOR Y - 559

[illegible] FOR Y - 1810

[illegible] FOR Y - 521

JOB NO. 3010-91-2442

SHEET 5 OF 10

CLIENT/PROJECT TUSI | ENGR. CPB | DATE 8-7-81

SUBJECT STRESS CALCULATION FOR PAD | CHK'D. VR | DATE 8-7-81

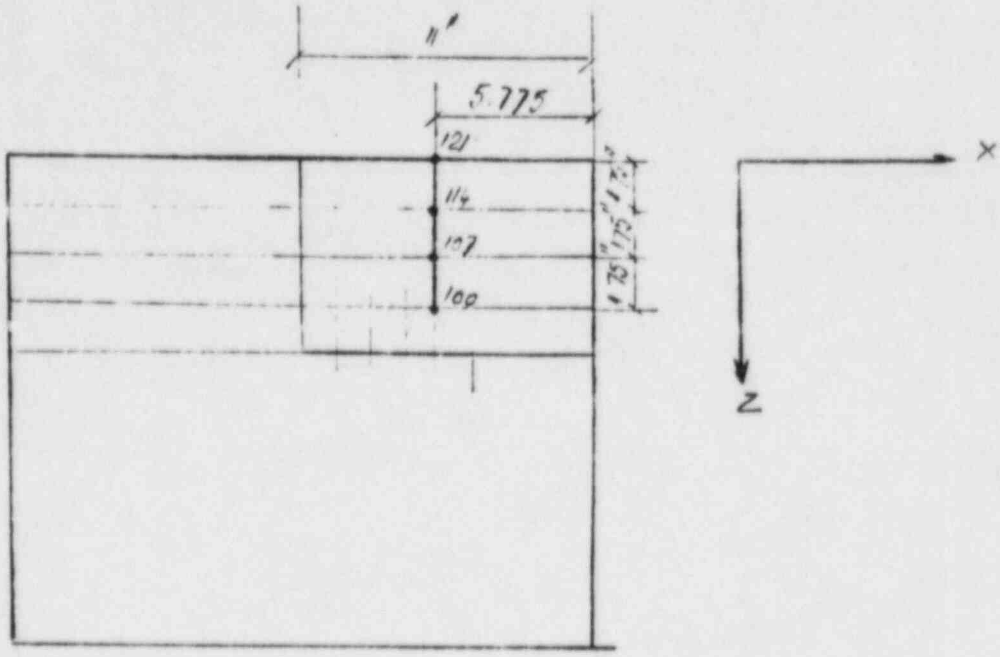
SUPPORT # 382 # HS-1-02-006 C72K

3 BOUNDARY CONDITIONS AND LOADING CONDITIONS:

3.1 Boundary conditions

see page 3, 4

3.2 LOADING CONDITIONS:



Forced applied

$$I = \frac{42000}{20} = 2100$$

$$F_{121} = F_{100} = 2100 \times \frac{1.75}{2} = 1838 \text{ lb}$$

$$F_{107} = F_{114} = 2100 \times 1.75 = 3675 \text{ lb}$$

CLIENT/PROJECT TUSI

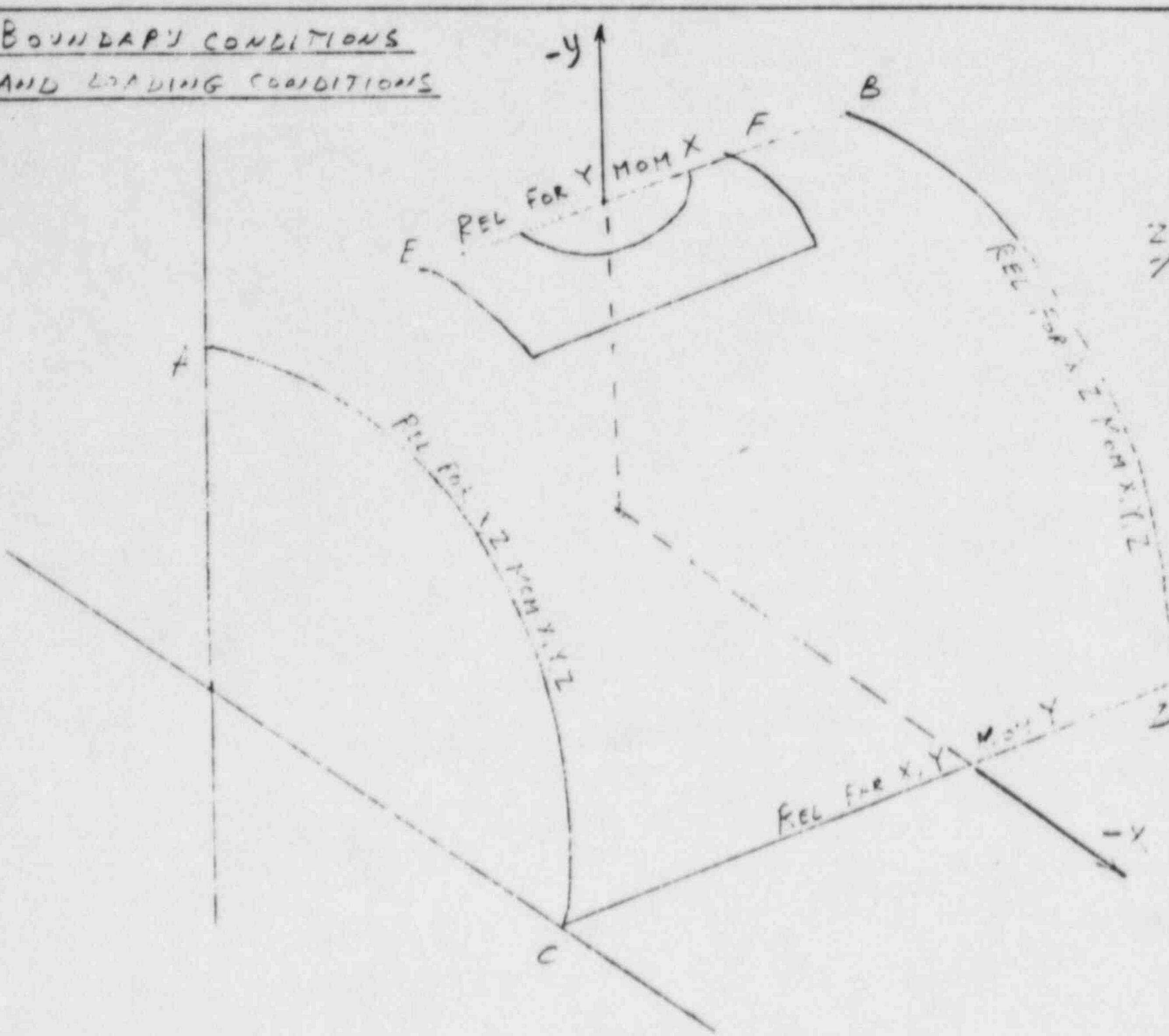
SUBJECT P&D 384

ENGR. YR DATE 8/6

CHK'D. VK DATE 8/1/91

MS-1-002-008-CTRK

3. BOUNDARY CONDITIONS AND LOADING CONDITIONS



BONDARY CONDITION

AB - SUPPORT X, Z, YY, ZZ
CD - SUPPORT Z, XX, ZZ
AC - SUPPORT Y,
BD - SUPPORT Y,
EF - SUPPORT X, Z, YY, ZZ

JOB NO. 3010-91-[illegible]

SHEET 7 OF 12

CLIENT/PROJECT TUSI

ENGR. VR DATE [illegible]

SUBJECT [illegible] 384

CHK'D VK DATE [illegible]

MS-1-002-008-C72K

LOADING CONDITION

[illegible]	FOR	Y	-.625
[illegible]	FOR	Y	-2402
3[illegible]	FOR		-3[illegible]2
[illegible]	FOR		3[illegible]
[illegible]	FOR	[illegible]	-2724
[illegible]	FOR		-5[illegible]
[illegible]	FOR		-23[illegible]
[illegible]	FOR		1072
32[illegible]	FOR	[illegible]	-120
[illegible]	FOR		172
[illegible]	FOR	[illegible]	375
[illegible]	FOR		40[illegible]
[illegible]	FOR	[illegible]	[illegible]

JOB NO. 3?10-?1-2242

SHEET 8 OF 13

CLIENT/PROJECT TUSI

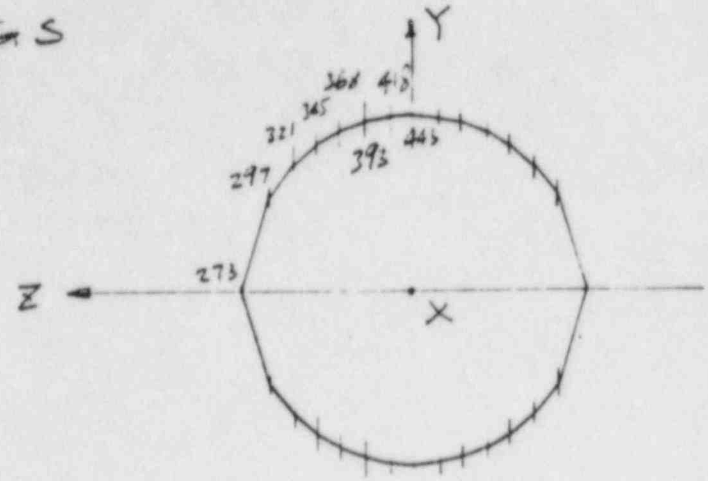
ENGR. [illegible] DATE 8/5/81

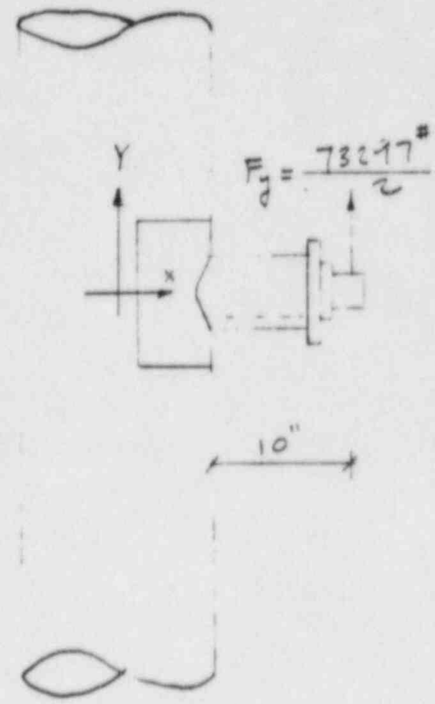
SUBJECT MS LINE PAD ANALYSIS

CHK'D [illegible] DATE 8.7.81

MS-1-02-013-C72K #2921

3. LOADINGS





$I_z = \pi r^3 t = \pi \times 8.625^3 \times 1 = 2015.7 \ in^3$

$M_z = \frac{73297^{\#}}{2} \times 10'' = 366475^{\#-''}$

$\tilde{\sigma}_x = \frac{M \cdot C}{I} = 181.81 \times C$ $\quad F_x = \tilde{\sigma}_x \times \frac{(l_i + l_{i+1})}{2}$ $\quad \tilde{\sigma}_y = \frac{F_y}{\Sigma l \times 4} = 660.55$

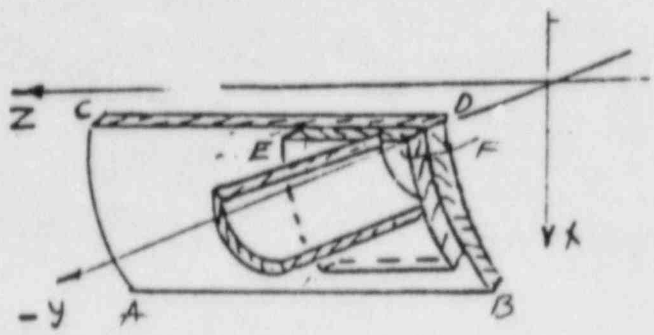
NODE	C	$\tilde{\sigma}_x$	l	F_x	F_y
443	8.625	1568	1.346	1055	444.6
418	8.52	1549	1.379	2111	900.5
393	8.201	1491	1.45	2109	934.4
368	7.652	1391	1.57	2100	997.4
345	6.836	1243	1.776	2080	1105.1
321	5.672	1031	2.215	2057	1318.1
297	3.91	711	4.134	3727	2096.9
273	0	0		—	2730.7

$\Sigma l = 13.87$

NOTE: THE CONTACT LINE BETWEEN TRUNION AND PAD IS ASSUMED TO BE A CIRCLE HERE FOR SIMPLIFICATION.

JOB NO. 3010-912442
SHEET 7 OF N
CLIENT/PROJECT TUSI
ENGR. VB DATE 8-5-..
SUBJECT MS LINE PAD ANALYSIS #438A
CHK'D VP DATE 8/6/8
MS-1-03-005-C72K

3. BONDORY CONDITION



JOINT NO. 222
ELEMENT NO. 189

AB - SUPPORT Y, Z
CD - SUPPORT Z, XX, YY.
EF - SUPPORT Z, XX, YY
AC - SUPPORT Y, ZZ
BD - SUPPORT X, YY, ZZ

3.1 LOADING CONDITION

P = 40398#

JOINT 185, 195, 204, 205, 206 P = 1667#

JOINT 179, 203 P = 833#

JOB NO. 3010-91-2442

SHEET 5 OF 10

CLIENT/PROJECT TUSI

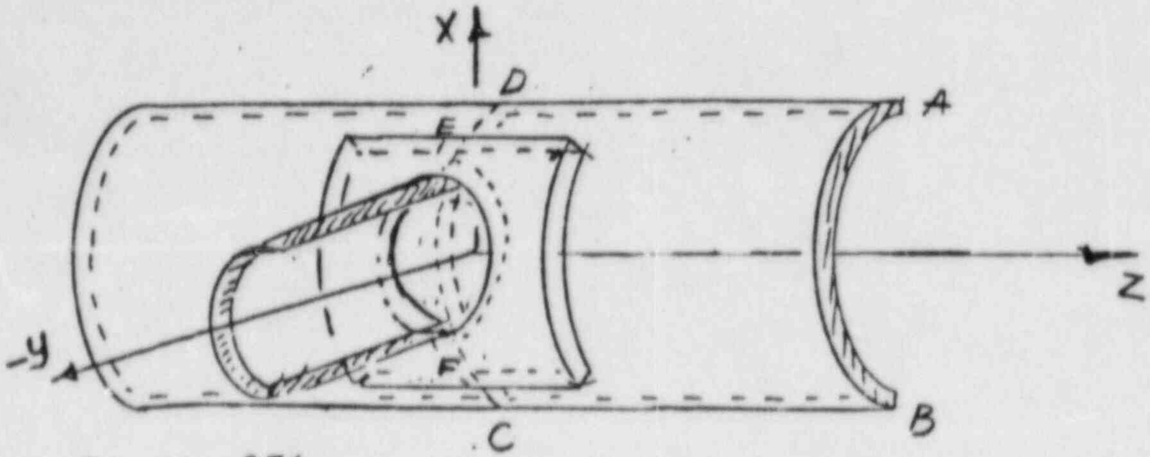
ENGR. VA DATE 8-4-

SUBJECT MS LINE PAD ANALYSIS #443A

CHK'D. CH DATE 8-7-8

MS-1-03-010-C 72K

3. BONDARY CONDITION



JOINT NO. 276

ELEMENT NO. 234

AB - SUPPORT Z

AD - SUPPORT y, Z, XX, ZZ

EF - SUPPORT y

CD - SUPPORT y

BC - SUPPORT X, y, Z, XX, ZZ

3.1 LOADING CONDITION

$P = 121504^{\#}$ $V = \frac{P}{2} = 60752^{\#}$

JOINT 124 $P = 14912^{\#}$

JOINT 192; 193 $P = 10465^{\#}$

JOINT 191; 194 $P = 4528^{\#}$

JOINT 141, 145 $P = 8463^{\#}$

JOB NO. 3010-91-2442
SHEET 5 OF
CLIENT/PROJECT TUSI
ENGR. CPB DATE 8 7 81
SUBJECT STRESS CALCULATION FOR PAD SUPPORT # 996 MS-1-04-005 C72K
CHK'D. VK DATE 8/7/81

3. BOUNDARY CONDITIONS AND LOADING CONDITIONS:

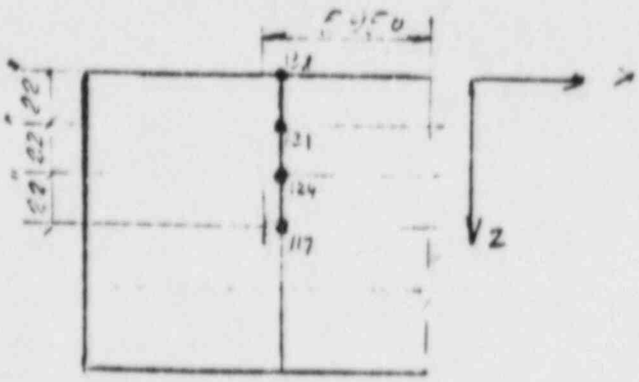
3.1 Boundary conditions:

See page 3 and 4

3.2 LOADING CONDITIONS:

Force applied $F = 87000$ lb
W 12 × 30 $L = 12.34 - 0.440 = 11.90$ in

$$F_1 = \frac{87000}{12 \times 2} = 3625 \text{ lb}$$



$F_{117} = F_{138} = 3625 \times 11 = 3987$ lb

$F_{124} = F_{131} = 3625 \times 22 = 7975$ lb

PS Form CO 101

JOB NO. 3010-91-2442

SHEET 2 OF 2

CLIENT/PROJECT TUSI / COMANCHE PEAK ENGR. CH DATE 8-7-81

SUBJECT MS LINE PAD ANALYSIS CHK'D. VP. DATE 8/7/81

MK NO. MS-1-04-007-C72K (NPS # 998A)

THE PAD ATTACHED IS THE SAME AS THAT OF SUPPORT MK NO. MS-1-04-009-C62K (NPS # 1000 A).

BUT, THE LOADS ARE DIFFERENT.

FORCES AND MOMENTS ACTING ON THE SURFACES OF PADS ARE :

	SUPP. # 998A	SUPP. # 1000A
FORCE	103161 #	5:846 #
MOMENT	$\frac{103161}{2} \times 12 = 618966$ IN#	$\frac{5400}{2} \times 10 = 27000$ IN-#

THE LOAD ON SUPP. # 998A IS 2.3 TIMES THAT OF SUPP. # 1000A

REFER TO THE REPORT OF SUPP. # 1000 A

$$\frac{\sigma_m}{\sigma_{m,ALLOW.}} = 24\% \times 2.3 = 55\%$$

$$\frac{\sigma_b}{\sigma_{b,ALLOW.}} = 28\% \times 2.3 = 64\%$$

THE PAD IS ADEQUATE.

RECEIVED

JUN 6 1984

CYGNA - SAN FRANCISCO

CYGNA
JOB NO: 4042
DATE LOGGED: 6/6/84
LOG NO.: # 21
TYPE: 2.1.1 Misc. LR (memo only)
CROSS REF. FILE: 2.1 Misc. LR Log #161

nps

INTER-OFFICE MEMO

To: C.K. WONG & S. LUO (CYGNA)

From: P. CORBO (NPSI)

Date: 5.31.84

Subject:

COPY OF THE FOLLOWING HAS BEEN GIVEN TO CYGNA:

1) MAIN STEAM LINE
PDD ANALYSIS

161.b HGRS: MS-1-004-009-C62K #1000

161.c MS-1-004-008-C72K #999

2) COPY OF APPLIED MECH. GROUP OF THE FOLLOWING

161.d MS-1-003-007-C72K #440

161.e MS-1-004-009-C62K #1000

161.g MS-1-004-008-C72K #999

161.g 3) COPY OF PIPE-SUPPORT DETAIL ORIGINAL DESIGN:

#306, 307, 310, 382, 385, 386, 2929, 192, 194, 442, 444, 445, 446, 196, 995, 997 & 999 (FOR REFE: ONLY)

Corbo & C.K. Wong.

CYGNA COPY

Distribution
NANCY WILLIAMS
J. Russ
G. Eyerkman
N. Williams
84056 File
ASB File

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760-4438
Telex:
Domestic: 127636/968694
International: 428813/234475

A Dravo Company

May 31, 1984

CYGNA	
JOB NO.:	
DATE LOGGED:	
LOG NO.:	
FILE:	
... FILE	

GTN-69062

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Mgr.

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
CABLE TRAY SUPPORT ANALYSIS
EQUIVALENT STATIC LOAD METHOD
JUSTIFICATION OF 1.0 FACTOR

Attached herewith please find a draft version of the justification document for the cable tray support analysis - equivalent static load method using a 1.0 factor times peak response spectra accelerations. Please review and comment as soon as possible.

We request that copies of this document be distributed to D. Wade, R. Kissinger and F. Patel for their concurrent review and comment.

Very truly yours,

GIBBS & HILL, Inc.

Robert E. Ballard, Jr.
Project Manager

REBa-ELB-EJBo/JCP:lc
1 Letter + 1 Attachment
CC: ARMS (B&R Site) OL + 1A
H. R. Deem (TUSI Site) 1L 1A (telecopied)

DRAFT

5/30/84 - JCP
G & H

JUSTIFICATION OF THE EQUIVALENT STATIC LOAD METHOD USING A FACTOR OF 1.0 TIMES PEAK SPECTRUM ACCELERATION FOR THE DESIGN OF CABLE TRAY SUPPORTS COMANCHE PEAK UNITS 1 & 2

1. INTRODUCTION:

For the design of cable tray supports, seismic loads are the dominating load condition that the supports have to withstand. Since the seismic loads are dynamic in nature, a case-by-case dynamic analysis could be performed in order to obtain the induced dynamic forces in the supports. In general, such a case-by-case dynamic analysis is not performed in the industry for cable tray support design due to its time consuming and costly process. Furthermore, designing cable tray supports based on such a case-by-case dynamic analysis imposes additional constraints in that each time a tray support is modified or changed due to field interference or for other reasons, a reanalysis would have to be performed. Therefore, instead of such a case-by-case dynamic analysis, the more practical yet conservative equivalent static load method is used. For this method, the equivalent static load is defined as the load resulting from a factor multiplied by the peak acceleration value of the applicable floor response spectrum.

When this load is applied statically to the cable tray system, the induced forces in the supports will be equal to or higher than those that would be obtained from specific case-by-case dynamic analysis.

During the design of the cable tray supports for the Comanche Peak project, a factor of 1.0 times the appropriate response spectrum peak was used partly based on the following statement in the Standard Review Plan, Sect. 3.7.2 (Reference 1) "For piping supported at only two points, the use of a static load equivalent to the peak of the floor response spectra is also acceptable." and partly from a simplified analysis performed to confirm the applicability of using this factor.

The purpose of this study is to document the use of a factor of 1.0 times the peak of the response spectrum for the design of cable tray supports (Reference 2), which has been stated in the Comanche Peak FSAR (Reference 3).

2. ANALYSIS AND RESULTS

The analytical procedures used to compute the factor which is applied to the peak response spectrum values in order to derive the equivalent static load are discussed below.

The procedures consist of performing both static and dynamic analyses for the cable tray system. The induced maximum forces and moments from the dynamic analysis are divided by those obtained from static analysis. The higher value of these ratios is conservatively considered as the factor in this study. The computer program NASTRAN is used for both the dynamic and static analyses.

A model as shown in Figure 1 is used for the present study. The horizontal beams represent the cable trays, while the vertical columns simulate the supports. Time-history dynamic analysis is performed to evaluate more accurately the dynamic responses. In order to obtain the most conservative results from the dynamic analysis, the stiffnesses of the supports are adjusted so that the fundamental frequency of the cable tray system will be within 1% of the frequency corresponding to the peak input spectrum. The spectrum broadening effect is thus included in this evaluation because the model for the cable tray system will always be subjected to the peak spectrum acceleration.

Static analysis is also performed using the same model.

Several cable tray sizes are considered in the analysis and subjected to various floor time histories from different buildings in order to encompass all possible situations. The parameters considered in the analysis are listed in Table 1. Up to six spans are considered in the analysis and the most conservative results are used in the evaluation of the factor.

The maximum design span length is used in the model (Reference 4). The influence of the height, h, of the support on the factor is studied using the height of 6', 9', 12' and 15'. The results show that this factor is not affected by the change of height. Hence, a normal maximum height of 12' was used in the analysis. The results of these analyses are tabulated in Table 2.

The cable tray supports are flexible in the transverse direction and rigid in the vertical direction (frequency higher than 33 Hz).** Hence the model used to study the factor in the vertical direction is based on a continuous beam supported on rigid supports (Figure 1). For this model, with the supports being rigid, the stiffness of the cable trays is predetermined from the maximum span length used in the model. There is no feasible way to adjust the model so that the fundamental frequency of the cable tray system will coincide with the peak spectrum value. Hence a different approach is followed. Instead of using the time history approach, spectrum dynamic analysis is used with a conservative enveloped spectrum as input excitation. This spectrum is the enveloped curve of all vertical spectra used in this study which were normalized to a 1.0g peak spectrum value. The results from this study show that a factor of 0.75 represents the worst case in the vertical direction. This verifies the conservatism in the factor of 1.0 that was used in design.

** For a few cantilever type supports, they are flexible in the vertical direction and rigid in the horizontal (transverse) direction.

3. DISCUSSION:

1) The cable tray supports are designed for earthquake loadings in both vertical and horizontal directions. In accordance with NRC requirements, the effects of seismic loads in different directions should be combined by the square root of the sum of the squares (SRSS) method. In Table 2, the combined factor obtained by the SRSS combination of the vertical and horizontal peak accelerations multiplied by the applicable factors are presented. The results show that the combined factor is actually less than or equal to the 1.0 factor that was used in design.

2) The fundamental frequency of virtually all cable tray supports in the transverse direction is in the range of 9 to 10 Hz (Reference 5). These frequencies are already off the peak of the response spectrum and located on the high frequency side of the peak value (References 6, 7 & 8). Hence the assumption used in the dynamic analysis that the cable tray system is always in resonance with the peak spectrum frequency is very conservative.

3) A cable tray weight of 35 psf is used in the design of the supports. However, the actual as-built weight is always less than this design value. The reduced tray weight will contribute

additional conservatism in two areas; first, the support load will be reduced proportionally and, second, the frequency of the cable tray system will increase. Since the cable tray supports have frequencies on the high frequency side of the peak of the floor response spectra, any further increase in the frequency will reduce the spectrum acceleration that the cable tray system is subjected to.

4) The maximum span length is used in the design of the generic supports. As installed in the plant, the span length is generally less than the maximum allowable value. This factor, similiar to the one discussed above, will reduce the support load due to the shorter span and increase the system frequency which will, in turn, further reduce the support load.

5) Each support has been designed for maximum possible number of trays of maximum weight each to be supported, e.g. three 2-foot trays for most suppports. But as constructed, each may support less than the maximum number of trays. This item like the previous two, will reduce the support loads due to the reduced number of trays and increase the system frequency.

6) The model used in this study (Figure 1) represents cable trays by a single beam which, implies that all trays are identical and vibrate in phase. However, one fully loaded support may have several different sizes of trays located at different elevations. Hence, it is expected that out-of-phase vibration will occur and the induced support forces and moments

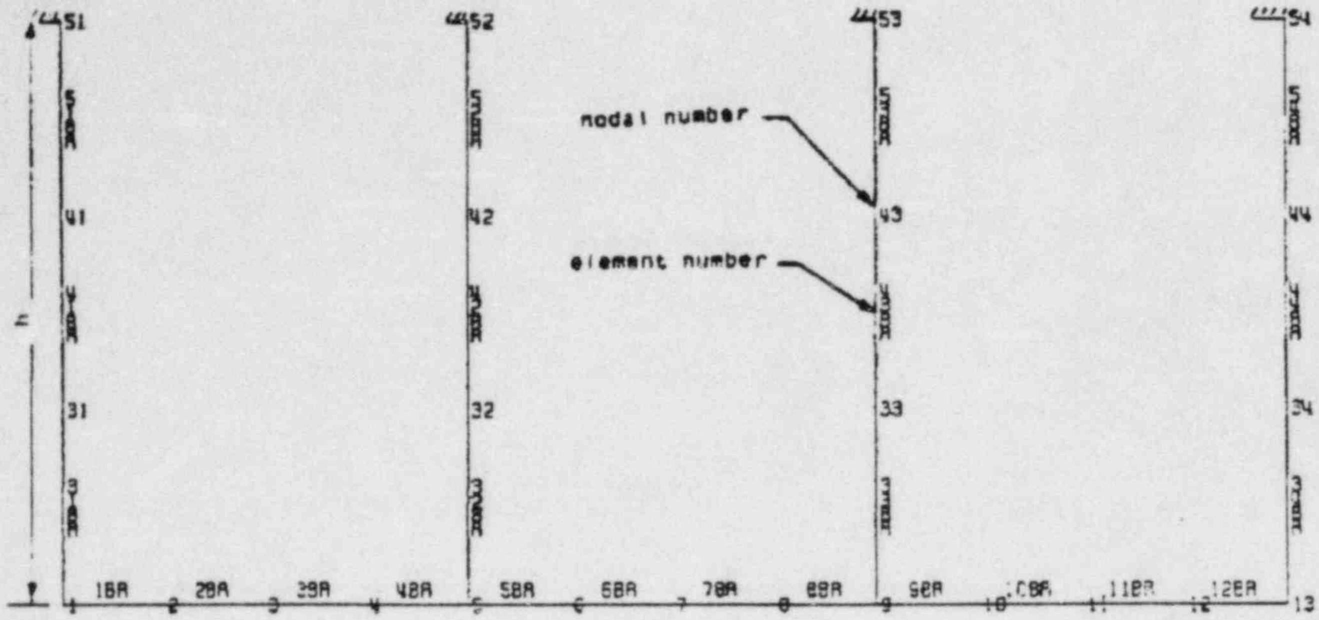
would be reduced.

4. CONCLUSION:

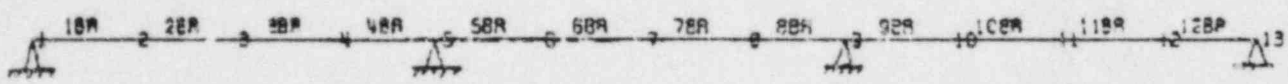
Based on the results shown in Table 2, we can conclude that the use of a factor of 1.0 times the response spectrum peak which was used for the CPSES cable tray support design is conservative. In addition, additional conservatism actually exists as explained in section 3, "Disscussion." No attempt has been made to quantify this additional conservatism; however, it is expected that any as-built case-by-case dynamic analysis of the cable tray system will indicate that the actual factor is less than the 1.0 - for CPSES design the 1.0 factor was conservatively used.

5. REFERENCES:

1) USNRC Standard Review Plan Section 3.7.2, June, 1975.
2) Calculation File DM1-14C.Set 1, Rev. 0
3) FSAR, Section 3.10B.3
4) G & H Specification 2323-ES-19, Rev. 3.
5) Computer File DMI-16P4, Rev.0.
6) Calculation File FRB-2C, Rev.0.
7) Calculation File FAB-1C, Rev.1.
8) Calculation File FSB-1C, Rev.1.



MODEL USED TO STUDY THE EFFECT OF TRANSVERSE EARTHQUAKE



MODEL USED TO STUDY THE EFFECT OF VERTICAL EARTHQUAKE

Note: These models are utilized to represent up to six span cases by using symmetrical boundary conditions.

Figure 1 Mathematical models for TUSI cable tray support study

TABLE 1. LIST OF PARAMETERS USED IN THE STUDY

SIZE OF CABLE TRAYS*	LOCATION OF TIME HISTORIES
12" 24" 36"	REACTOR BUILDING EL. 860.0 FT. " EL. 783.6 FT. AUXILIARY BUILDING EL. 899.5 FT. " EL. 790.5 FT. SAFEGUARDS BUILDING EL. 896.5 FT. " EL. 773.5 FT.

* THESE CABLE TRAY SIZES WERE USED FOR ALL BUILDINGS.

TABLE 2. EQUIVALENT STATIC FACTORS

ELEVATION	FACTOR IN THE VERTICAL DIRECTION	FACTOR IN THE TRANSVERSE DIRECTION	COMBINED FACTOR
REACTOR BUILDING			
885.5 FT.	0.75	1.08	1.00
860.0 FT.	0.75	1.08	0.98
832.5 FT.	0.75	1.08	0.91
808.0 FT.	0.75	1.08	0.84
783.6 FT.	0.75	1.08	0.84
SAFEGUARDS BUILDING			
896.5 FT.	0.75	1.05	0.98
873.5 FT.	0.75	1.05	0.96
852.5 FT.	0.75	1.05	0.94
831.5 FT.	0.75	1.05	0.91
810.5 FT.	0.75	1.05	0.85
790.5 FT.	0.75	1.05	0.82
785.5 FT.	0.75	1.05	0.81
773.5 FT.	0.75	1.05	0.81
AUXILIARY BUILDING			
899.5 FT.	0.75	1.08	1.00
886.5 FT.	0.75	1.09	1.00
873.5 FT.	0.75	1.09	0.97
852.5 FT.	0.75	1.10	0.96
831.5 FT.	0.75	1.11	0.92
810.5 FT.	0.75	1.11	0.85
790.5 FT.	0.75	1.12	0.83

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760-4438
Telex
Domestic 127636/968694
International 428813/234475

A Dravo Company

Distribution
84042 File
~~J. Minichiello~~
G. Bjorkman
N. Williams

June 15, 1984

CYGNA
JOB NO:
DATE LOGGED: 6/18/84

GTN-69119

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Manager

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
FOLLOWUP INFORMATION FROM G&H
REF: CYGNA COMMUNICATIONS REPORT OF 5-24-84

By copy of this letter to Nancy Williams of CYGNA, enclosed please find the supplemental response supplying justification for the G&H approach to welded attachment analysis when dealing with a β parameter that is greater than 0.5.

Should you have any questions contact Henry W. Mentel.

Very truly yours,

GIBBS & HILL, INC.

S M Marano

Robert E. Ballard, Jr.
Project Manager

REBa-HWMe:sce
1 Letter

cc: ARMS (B&R Site) OL
N. Williams (CYGNA, Calif.) 1L, 1A
L. Weingart (CYGNA, Calif.) 1L
G. Grace (CPPE Site) 1L, 1A
D. Wade (TUSI Site) 1L
J. Minichiello (CYGNA, TUSI Site) 1L, 1A

Reasons for Increasing the R (mean radius of the process pipe) in Cases where β is greater than 0.5.

Increasing the R value when β is larger than 0.5 can reduce the β value to less than or equal to 0.5 so that the attachment can be evaluated by the Welding Research Council Bulletin 107 method. It is acceptable to reduce β to a value of less than or equal to 0.5 using the WRC-107 method by artificially increasing the radius of the process pipe, since this increases the γ value and yields conservatively higher stress values. Justification is as follows:

- The tests shown in Appendix A of Welding Research Council Bulleting 107, were performed in order to provide external loading data for larger diameter ratios (β) and to extrapolate Bijlaard's curves for cylindrical shells with d/D ratios up to 1.

  Piping geometries usually fall into the "thick-walled" model data category since γ, (R/t) for piping is usually not more than 80. Bijlaard's curves were modified based on test results.

- In the work reported by W.G. Dodge in WRC-Bulletin 198, "Secondary Stress Indices for Integral Structural Attachments to Straight Pipe", the range of γ values considered was between 5 and 80. This range is adequate for piping.

- In the work reported by E.C. Rodabaugh, W.G. Dodge and S.E. Moore in Bulletin WRC-198 "Stress Indices at Lug Supports on Piping Systems", it is noted that stresses for all loading conditions increase with increased γ (i.e.; increased radius)

- Additionally, in view of limited number of tests which do not cover all values of γ and β, another significant conservatism in the WRC-107 method should be pointed out. Bijlaard's analysis applies to a simply supported cylindrical shell and therefore a portion of the resulting stress is due to beam action of the entire cross-section. Since general stress (ADLPIPE) is added to the local stress, the total stress will be conservative since it already contains some of this general stress.

- It is current practice in the industry to artificially increase the radius if $\beta \geq 0.5$.

TEXAS UTILITIES SERVICES INC.
P. O. BOX 1002 - GLEN ROSE, TEXAS 76043

June 27, 1984

JOB NO.:
DATE LOGGED:
LOG NO.:
FILE:
CROSS REF. F.:

NOTED JUN 28 1984 N.WILLIAMS

CYGNA Energy Services
101 California Street
San Francisco, CA 9411

Attention: Ms. Nancy Williams, Project Manager

COMANCHE PEAK STEAM ELECTRIC STATION
CPSES CYGNA REVIEW QUESTIONS
(PIPE SUPPORTS)

References: 1) June 15; Telecon between D. Rencher (TUGCO) and J. Minichiello (CYGNA),
2) June 19; Telecon between D. Rencher (TUGCO) and J. Minichiello (CYGNA),
3) June 20; Telecon between G. Grace (TUGCO) and J. Minichiello (CYGNA), and
4) June 21; Telecon between G. Grace/D. Rencher(TUGCO) and J. Minichiello (CYGNA)

Dear Ms. Williams:

Below are TUGCO's responses to the above referenced telecons.

Telecon of June 15:

CYGNA requested a stress calculation which TUGCO provided on June 20, 1984 per telecon with D. Rencher at 3:30 p.m.

Telecon of June 19:

CYGNA Comment: In reviewing Support No. CC-1-086-002-A43R, CYGNA has noted another example of a U-bolt with clip angles. Does TUSI plan to change this design in a similar fashion to those designs defined in the previous phase?

TUGCO Response: The design of Support No. CC-1-086-002-A43R will not be changed to remove the clip angles/U-bolt. As this is a trapeze assembly with two (2) struts, the support is sufficiently stable without the U-bolt, hence; there is no need to modify it.

Telecon of June 20:

CYGNA Comment: On Support No. CC-1-028-024-S33R, CYGNA had questioned the design for the bolt in Section B-B. CYGNA is concerned that a vertical load in the bolt (~7k from the calculation) will produce a bending moment in the bolt due to the 3/4" offset. The resulting bending stress in the 1" bolt may be excessive. CYGNA requested TUEC to address this concern in a further response to item 34.

TUGCO Response: Section 1.15.4 of AISC Code, for "Unrestrained Members", (i.e., pinned joints) states "Flexible beam connections shall accomodate end rotations of unrestrained (simple) beams. To accomplish this, inelastic action in the connection is permitted". This statement indicates that the code is well aware that field conditions can lead to situations where connections are loaded in such a way as to yield portions of the connections, yet the connection will still function in the mode assummed by the engineer; in this case, pinned. TUGCO has recently conducted tests of tube steel - Richmond Insert connections where the calculated bending stress on the A36 bolt would be in excess of 300,000 psi, and yet the bolt had not failed. This indicated that the bolt could not resist the bending load because of the tremendous flexibility of A-36 rod. Using the outer fiber membrane stress as an indicator of potential failure, it can be assumed for our bolt the bending stress on the bolt is $M/S = \frac{(7365)(.75)}{\frac{\pi(.847)^3}{32}} = 92,602$ psi

This value is greater than the yield bending stress of the bolt a similar situation to the tested bolt. Therefore modelling this connection as flexible is appropriate.

As indicated in our testimony appendix F to "Affidavit of J. C. Finneran, Jr., R. C. Iotti, and R. Peter Deubler, regarding Design of Richmond Inserts and there application to pipe supports". The test conclusions indicate that neglecting the bending stress in the bolt using the point of tangency method allows for a safety factor in excess of 4. In this case this method would cause an additional 1841 # of tension in the bolt well within allowables. Furthermore, the bolt would not resist the bending load but would ultimately be resisted by the tube steel (e.g., The bolt is physically constrained to deflect in bending). Therefore, modelling the connection as flexible and checking the ability of the tube steel to resist torsion as we have in our previous response of May 22, 1984 was appropriate.

Telecon June 21, 1984:

CYGNA Comment: (1) MS-1-001-005-S72R; CYGNA did not see evidence that the 5% decrease in I and S had been incorporated.

TUGCO Response: (1) All twelve (12) of the affected supports have been reviewed with respect to a 5% reduction in section properties and have been shown to be acceptable.

CYGNA Comment: (2) NPSI has stated they are responsible for the pads needing qualification to Appendix G. Their calculations (MS-1-001-003-C72K & MS-1-004-009-C72K) stated Gibbs & Hill is responsible. What organization is responsible for design and what allowables will be used.

TUGCO Response: (2) NPSI is responsible for pads requiring qualification per Appendix G (in lieu of impact testing). When the design drawing was revised to incorporate the note that "W/A is qualified per Appendix G of the ASME B&PV Code", the design engineer on site assumed Gibbs & Hill was doing the qualification. Actually, NPSI (Secaucus office) was doing the qualification. Thus, the note on the calculation cover sheet is erroneous as NPSI has the responsibility.

CYGNA Comment: (3) MS-1-003-004-C72S CYGNA requested weld calculations for 1"x12"x7" plate to tube steel (both composite section and load transfer) and an assessment of the washer plate stresses.

TUGCO Response: (3) Some very consepvative weld and stress calculations have been performed and the results shown that both plate and welds are well within allowable limits. Our calculation package has not been revised as we feel justified in our original conclusion that this connection is acceptable by engineering judgement.

If there are any further questions or comments, please contact Mr. George Grace at extension 500.

Very truly yours,

TEXAS UTILITIES GENERATING COMPANY

AP Baker for

L. M. Popplewell
Engineering Manager

GG/amd

REC'D
6/29/84

TEXAS UTILITIES SERVICES INC.

P. O. BOX 1002 · GLEN ROSE, TEXAS 76043

DIST:
N. WILLIAMS
2 Pgs. C. WONG
J. MINICHIELLO
PROJECT FILE

June 28, 1984

CYGNA Energy Services
101 California Street
San Francisco, CA 94111

Attention: Ms. Nancy Williams, Project Manager

COMANCHE PEAK STEAM ELECTRIC STATION
CPSES CYGNA REVIEW QUESTIONS
(PIPE SUPPORTS)

CYGNA
JOB NO.:
DATE LOGGED:
LOG NO.: 2.1.L.....R
FILE: 2.1.....
CROSS REF. FILE

Reference: 1) June 26, Telecon between D. Rencher (TUGCO) and J. Minichiello (CYGNA)

Dear Ms. Williams:

Below is TUGCO's response to the above referenced telecon.

Telecon of June 26 Regarding Support MS-1-003-004-C72S:

The question of structural acceptability of the 1"x7"x12" washer plate (item 17) is still open. In lieu of performing detailed calculations and finite element analyses to demonstrate acceptability, the problem will be simplified by making two (2) conservative assumptions:

1) Assume the washer is 1"x6"x6" and is centered over the insert. The rear bracket to plate to tube steel connection is separate.

2) Assume there is no weld between the 1"x6"x6" washer and the tube steel.

With the above assumptions, Table 7 of Section 20 of the NPSI Structural Design Manual (attached) may be applied directly. This table states that a 1" thick plate may be used for insert tension loads less than or equal to 17.5 kips. Based on the detailed calculation performed by NPSI, tension in the insert is 18.2 kips. This apparent slight overload is acceptable, however, for the following reasons:

1) Because of installation tolerances, skew angles of less than 5° are generally not considered in support design. Consideration of the 2.3° skew on this support increased the tension load in the insert from 15.8K to 18.2K. 15.8K would have been perfectly acceptable to use for design.

2) Conservative assumptions were made by NPSI in their sizing calculations for washer plates (e.g.: point load at center of plate and neglecting stiffening affect of tube steel). Actual stress in a 1" plate subjected to a 17.5K load is well below allowable limits.

3) Conservative assumptions were made on this support (see items (1) and (2) in first paragraph).

Based on the above reasoning, the 1"x7"x12" washer plate on MS-1-003-004-C72S is capable of performing its function as intended. This is further demonstrated by the fact that the support is installed and continuously subjected to its full design load and has not shown any signs of high stress.

If there are any further questions or comments, please contact Mr. George Grace at extension 500.

Very truly yours,

TEXAS UTILITIES GENERATING COMPANY

L. M. Popplewell

L. M. Popplewell
Engineering Manager

GG/amd

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760- 4438
Telex
Domestic 127636 968694
International 428813 234475

A Dravo Company

T [illegible]

8404? PF
S.[illegible]

June 29, 1984

CYGNA	
JOB NO.:	84042
DATE LOGGED:	7/16/84
LOC NO.:	#61
FILE:	2.1.1 Inc. Cr.
CROSS REF. FILE	2.1 Inc. Cr. Log

GTN- 69190

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Mgr.

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
REF: CYGNA LETTER 84042.007 DTD 6/23/84

By copy of this letter to CYGNA following is our response to concerns raised in the reference.

A. Concern No. 1 - A formal calculation was issued before resolving design reviewer's comments and that this calculation could have been used as input to other design documents.

Gibbs & Hill, Inc., Response - G&H has a high level of assurance that problems as described above are effectively controlled by our QA program.

The G&H Quality Assurance Design Review audit checklist covers this area thoroughly through the following checklist items.

1. Have design reviewer comments been incorporated in document?

2. Has design reviewer indicated acceptance of the changes made as a result of his review by signing and dating lower portion of design review form?

3. Has design review been performed before signoff of Job Engineer/Project Manager?

4. Has design review been completed before incorporation of information into other documents?

Action Taken to Correct the Concern - An investigation into the apparent failure of the Design Reviewer to acknowledge that his comments had been incorporated revealed that no QA requirement had been violated. Instead the appearance of a non-conformity arose from a numbering mix-up, explained as follows:

Calculation number 401-7, Rev. 3 was completed on May 30, 1978 with Design Reviewer's comments (copy attached). The comments were resolved and incorporated into the calculation and the Design Reviewer added his final acceptance signature on June 23, 1978.

Subsequently to this the calculation number was changed from 401-7, Rev. 3 to 403, Rev. 3. Since no other changes were made, the completed design review was still valid.

Based on the facts developed during this investigation, the QA Department has closed out open item No. 5A of Audit No. 9 (Mechanical Department) and changed the open item listing accordingly.

B. Concern No. 2a - Evidence was not found indicating that G&H performed surveillance activities from 1973 through 1977.

Gibbs & Hill, Inc., Response - Copies of surveillance reports performed during 1974, 1975, 1976 and 1977 were retrieved from Project Files. Copies of a sampling of the surveillances performed during these years are attached.

C. Concern No. 2b - Management Review Evaluation Reports could not be found for the time period from 1974 through 1976.

Gibbs & Hill, Inc., Response - During the time period 1974 through 1976, an ad hoc committee was active in reviewing internal audit reports in order to identify generic weaknesses in the QA program. Recommendations were made to Management suggesting programs and procedures to enhance the QA system. This was the Management review system in effect at that time.

We have not as yet been successful in locating the records documenting these activities, however, search efforts are continuing.

Gibbs & Hill, Inc., does not agree that Management review activities form an integral part of the Gibbs & Hill corrective action as stated by CYGNA. Recommendations made in the Management review report are based on a study of surveillance and internal audit reports. The QA corrective action system is derived from results of surveillance and internal audit findings and is not dependant on recommendations of the Management Review Team.

Very truly yours,

GIBBS & HILL, Inc.

R. E. Ballard

Robert E. Ballard, Jr.
Project Manager

REBa-MSM-BCz:lc
1 Letter + 1 Attachment
CC: ~~ARMS (B&R Site)~~ OL 1A
N. Williams (CYGNA, CA) 1L 1A
D. Wade (TUSI Site) 1L 1A
G. Grade (CPPE Site) 1L 1A
S. Bibo (CYGNA, Boston) 1L, 1A

DESIGN AND ENGINEERING
SURVEILLANCE RECORD SHEET

Project: Comanche Peak S.E.S. G&H Job No.: 2323

Client: Texas Utilities Services Inc. Project Manager: R.E. Hersperger

Job Engineer: E. Horovitz Squad Leader:

Document Identification:

Title: Flow Diagram - Steam Generator Feedwater System

Number: 2323-M1-0203 Issue Date: 5-7-75

~~Rev.~~/Issue/~~Amend~~. No.: '2' Date: 4-15-77

Design Review performed: Yes [X] No [ ] N/A [ ]

Comments: See comments as noted on the Drawing

Corrective action required: Yes [X] No [ ] N/A [ ]

Comments: Respond to comments and resubmit.

Signature P.S. for J. Jusko Date 5-13

Completion of corrective action verified: Yes [✓] No [ ] N/A [ ]

Comments: None

Signature P.S. for J. Jusko Date 6-7-

DESIGN AND ENGINEERING
SURVEILLANCE RECORD SHEET

Project: Comanche Peak S.E.S. G&H Job No.: 2323

Client: Texas Utilities Services Inc. Project Manager: R.E. Hersperger

Job Engineer: A.K. Jain Squad Leader: ______

Document Identification:

Title: Containment Polar Crane

Number: 2323-MS-39 Issue Date: 1-8-76

Rev./XXXXX/XXXXX. No.: 2 Date: 1-23-76

Design Review performed: Yes ☒ No ☐ N/A ☐

Comments: None

Corrective action required: Yes ☐ No ☒ N/A ☐

Comments: None

Signature A.S. for J. Justo Date 6.9.7

Completion of corrective action verified: Yes ☐ No ☐ N/A ☐

Comments: ______

Signature ______ Date ______

(GA

DESIGN AND ENGINEERING
SURVEILLANCE RECORD SHEET

Project: COMANCHE PEAK S.E.S. G&H Job No.: 2323

Client: TEXAS UTILITIES SERVICES, INC. Project Manager: R. E. Hersperger

Job Engineer: A. K. Jain Squad Leader:

Document Identification:

Title: Service Water Pumps

Number: 2323-MS-10 Issue Date: 12-27-74

Rev./Issue/Amend. No.: Date:

Design Review performed: Yes ☒ No ☐ N/A ☐

Comments: See comment on Design Review-Specification-Record Form.

Corrective action required: Yes ☐ No ☒ N/A ☐

Comments: Comment can be resolved in the evaluation or purchasing stage.

Signature J. Sabie Date 5-5-75

Completion of corrective action verified: Yes ☐ No ☐ N/A ☐

Comments:

Signature Date

DESIGN AND ENGINEERING
SURVEILLANCE RECORD SHEET

Project: Comanche Peak G&H Job No.: 2323Q

Client: TUSI Project Manager: R. E. Hersperger

Job Engineer: E. G. Nikitiadis Squad Leader: ____

Document Identification:

Title: Auxiliary Feedwater System

Number: 2323-MS-7 Issue Date: 9/16/74

Rev./Issue/Amend. No.: None Date: ____

Design Review performed: Yes ☒ No ☐ N/A ☐

Comments: Refer to design review comments sheet.

Corrective action required: Yes ☒ No ☐ N/A ☐

Comments: Per design review comments.

Signature [signature] Date 1/9/74

Completion of corrective action verified: Yes ☐ No ☐ N/A ☐

Comments: ____

Signature ____ Date ____

Texas Utilities Services Inc.
CLIENT

Comanche Peak S.E.S.
PROJECT

2323
G & H JOB N

Movements for Exp. Joint Specification Nuclear
CALCULATION DESCRIPTION

2/23/78
DATE

403 REV. 3
CALCULATION NO.

COMMENTS ARE AS NOTED ON CALCULATION SHEETS EXCEPT AS STATED HEREIN:

[illegible] REV. 2

COMMENTS [illegible]

REQUIRED ACTION RESPOND TO COMMENTS [illegible]

RECEIVED
MAY 3 1978
G & H QUALITY ASSURANCE

[illegible] 5/[illegible] R.K. Mini[illegible]
DESIGN REVIEWER

5/3/78
DATE

REQUIRED ACTION SATISFACTORILY COMPLETED YES ☑ NO ☐

COMMENTS NONE

PAF 6/23/78 R.K. Mi[illegible]
DESIGN REVIEWER

6/23/[illegible]
DATE

9/16/74
Rev. 0

TITLE Movements for Exp. Joint Specification Nuclear

JOB NO. 2323

CALC. NO. 403 Rev. 3

PREPARED BY KLF

DESIGN REVIEW PROCEDURE
MECHANICAL CHECKLIST - CALCULATIONS (Ref. DC-10)

ITEM	CONSIDERATION
Prior signoff, checking properly completed	✓
Previous comments have been incorporated	✓
Previous conditions, including sources are listed; inputs are correctly selected	✓
Scope, Purpose: covers all intended work, no interface gaps, no overlaps; purpose is stated	✓
Assumptions are listed, clearly defined, reasonable and marked for reverification (later in design)	✓
References including other calculations and sources, are listed	✓
Design method is accepted practice; formulas applicable and defined	✓
General approach and accuracy are reasonable; output reasonable compared to inputs	✓
Spot check of mathematics indicates satisfactory solution; or parallel check by a simplified method	✓

 9/16/74
Rev. 0

TITLE Movements for Exp joints Spec. Nuclear

JOB NO. 2323
CALC. NO. 403 Rev. 3
PREPARED BY HLF

DESIGN REVIEW PROCEDURE
MECHANICAL CHECKLIST - CALCULATIONS (Ref. DC-10)

ITEM	CONSIDERATION
Consistent with other similar mechanical calculations	✓
Void or superseded calculations have been properly dispensed	✓
Conformance to ASME code requirements	NA
ASME code classification is proper	NA
Conforms to PSAR, AEC Regulatory Guides	NA
Conformance to project criteria	✓
Conforms to other criteria, such as NSSS manufacturer's criteria	NA
Results to be used in design are identified: complete equipment parameters are listed	✓
Interface with other disciplines has been accomplished	✓
Properly indexed and filed	✓

F-711, A, 9-74

 9/16/74
Rev. 0

TITLE Movements for Exp. Joint Spec. Nuclear

JOB NO. 2323

CALC. NO. 403 REV. 3

PREPARED BY ALP

DESIGN REVIEW PROCEDURE
MECHANICAL CHECKLIST - CALCULATIONS (Ref. DC-10)

Note: Design reviewer's signature on Design Review Record DC-10, and design reviewer's signature on first sheet of calculations (DC-10), confirms that design reviewer has considered each item on the checklist.

✓ Signifies design reviewer's completion of review (comments to be made in accordance with DC-10).

NA Not Applicable

a. PROBLEM

DETERMINE TOTAL PIPE DISPLACEMENTS (THERMAL AND SEISMIC) FOR EXPANSION JOINT DESIGN. THE VALUES DETERMINED WILL BE ENTERED INTO THE DATA SHEETS OF REFERENCE SPECIFICATION.

NUCLEAR SAFETY RELATED EQUIPMENT

b. GIVEN ~~DATA~~

THERMAL PIPE DISPLACEMENTS FOR PLANT FAULTED CONDITION - DATA RECEIVED FROM FROM APPLIED MECHANICS (A RJ) ON 12/1/76 & 12/8/76

EXP. JNT. TAG NUMBER	DESCRIPTION	DISPLACEMENTS AXIAL	LATERAL	ANGULAR
RHEXVT-03 RHEXVT-04	VALVE ISO. TANK OUTLET (RHR)	0.5" (COMPR)	0.15"	0.001 RADS (0.06°)
CTEXVT-03 CTEXVT-04	VALVE ISO. TANK OUTLET (CSS)	0.8" (COMPR)	0.007"	0.15°
SWEXSW-01 SWEXSW-02	S.W. PUMP DISCHARGE	0.15" (COMPR)	0.15"	0.01 RADS (0.6°)

SEISMIC BUILDING DISPLACEMENTS - REF. MEMO FROM STRUCTURAL DATED 12-10-7[illegible] (ATTACHED)

BUILDING	ELEV.	ΔX	ΔY	ΔZ
FUEL BLDG.	826'-6"	±0.034"	±0.037"	±0.034"
SAFEGUARDS	803'-3"	±0.055"	±0.109"	±0.038"
CONTAINMENT	826'-6"	±0.137"	±0.204"	±0.138"
S.W. INTAKE STRUCTURE	800'-0"	±0.014"	±0.012"	±0.008"

BUILDING DISPLACEMENTS FOR ½ S.S.E. ARE EQUAL TO 0.6 x S.S.E. DISPLACEMENTS - FROM STRUCTURAL DEPT DESIGN DOCUMENTS: 1. "REACTOR, SAFEGUARDS, AUXILIARY & ELECTRICAL BUILDINGS RELATIVE DISPLACEMENTS" 2. "FUEL BUILDING & S. WATER INTAKE STRUCTURE RELATIVE DISPLACEMENTS".

Date 2/23/78
Calc By HLF
Chk'd/Apprd. By GGM

Gibbs & Hill, Inc.
ENGINEERS. DESIGNERS. CONSTRUCTORS
NEW YORK

Filing Code 403
Sheet No. 2 of 13
G & H Job No. 2323-C

Subject MOVEMENTS FOR EXP JOINT SPECIFICATION (NUCLEAR)
Ref. Dwg./Spec. No. MS-71A

NUCLEAR SAFETY RELATED EQUIPMENT

C. ASSUMPTIONS

1. THERMAL DISPLACEMENTS OF FUEL TRANSFER TUBE, GUARD PIPES AND PENETRATION SLEEVES ARE NEGLIGIBLE AND ARE ASSUMED ZERO.

2. SEISMIC DISPLACEMENTS ARE RELATIVE ~~WITH RESPECT TO GROUND DUE TO SAFE SHUT-DOWN EARTHQUAKE (SSE)~~ TO GROUND. REV. 3

3. FOR SEISMIC GIVEN DATA, ΔY IS VERTICAL, ΔX AND ΔZ ARE IN HORIZONTAL PLANE AS DEFINED IN SKETCHES.

4. MAXIMUM SEISMIC DISPLACEMENT BETWEEN TWO STRUCTURES OCCURS WHEN STRUCTURES ARE AT MAXIMUM DISPLACEMENT IN OPPOSITE DIRECTIONS

5. SEISMIC DISPLACEMENT ARE DUE TO THE FOLLOWING BUILDING MOTION
   (a) VALVE ISO. TANK EXP JOINTS : CONTAINMENT AND SAFEGUARDS
   (b) FUEL TRANSFER TUBE EXP. JOINTS : CONTAINMENT AND FUEL BLDG.
   (c) S.W. PUMP DISCH. EXP. JOINTS : S.W. INTAKE STRUCTURE

6. ONLY DISPLACEMENTS FOR UNIT 1 ARE CALCULATED. UNIT 2 TOT DISPLACEMENTS ARE ASSUMED EQUAL TO UNIT 1.

7. THE LATERAL THERMAL PIPE DISPLACEMENTS GIVEN ARE THE RESULTANTS OF THE LATERAL PIPE MOVEMENTS IN THE HORIZONTAL AND VERTICAL DIRECTIONS IN PLANE PERPENDICULAR TO PIPE. ASSUME THAT THE THERMAL LATERAL DISPLACEMENTS ARE IN SAME DIRECTION AS THE RESULTANT SEISMIC LATERAL MOTIONS TO OBTAIN THE MAXIMUM TOTAL SEISMIC-THERMAL LATERAL DISPLACEMENTS.

8. ASSUME NO ANGULAR MOVEMENT (BENDING) DUE TO SEISMIC ACTIO

9. ASSUME THAT DISPLACEMENT DUE TO SEISMIC RESPONSE OF PIPING IS 50% OF DISPLACEMENT OF SEISMIC MOTION OF BUILDINGS. (PER M. GIDEN - APPL. MECH. - MEMO DATED 6/13/78.

~~10. ASSUME INITIAL DEFLECTION DUE TO CONSTRUCTION TOLERANCE IS 1/16 INCH (0.063 inch) FOR LINEAR MOVEMENTS AND 0.1 DEGREE FOR ANGULAR MOVEMENTS.~~

DATE: 5/31/78

PAT

TO: E.R. Rock

FROM: J. Jusko

SUBJECT: TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
1980 - 82 - 2300 MW INSTALLATION
DESIGN REVIEW ACTION

Please be advised that the document(s) listed below have been returned by Design Review for corrections.

Written response to the design review comments by applicable discipline engineer must be submitted to QA Department not later than 6/7/78.

DOC. NO. & REV. ~~ADD./ISSUE NO.~~*		TITLE
401--7	3	Movements for Exp. Joint Specification NUclear

*indicate attachments

JJ/JC:

DESIGN REVIEW - CALCULATIONS - RECORD FORM

Tex-s Utilities Services Inc. — CLIENT
Comanche Peak S.E.S. — PROJECT
2323 — G & H JOB NO.

Movements for Exp. Joint Specification Nuclear — CALCULATION DESCRIPTION

401-7 Rev. 3 — CALCULATION NO.
2/23/78 — DATE

COMMENTS ARE AS NOTED ON CALCULATION SHEETS EXCEPT AS STATED HEREIN:

NOTE: ACCORDING TO QA DEPT. ONLY REV. 0 OF THIS CALCULATION HAS BEEN DESIGN REVIEWED. HOWEVER, CALC. ACTUALLY REVIEWED PREVIOUSLY WAS REV. 2.

COMMENTS AS NOTED.

REQUIRED ACTION RESPOND TO COMMENTS & RESUBMIT.

RECEIVED
MAY 31 1978
G & H QUALITY ASSURANCE

PRT
5/29/78

R.K. Mi... — DESIGN REVIEWER
5/3.../7... — DATE

REQUIRED ACTION SATISFACTORILY COMPLETED YES ☐ NO ☐

COMMENTS

DESIGN REVIEWER — DATE

DESIGN AND ENGINEERING
SURVEILLANCE RECORD SHEET

Project: Comanche Peak S.E.S. G&H Job No.: 2323

Client: Texas Utilities Services Inc. Project Manager: H.R. ROCK

Job Engineer: E Horovitz Squad Leader:

Document Identification:

Title: Movements for Exp. Joint Spec. Nuclear

Number: 401-7 Issue Date: 2/23/78

Rev./~~Issue/Amend~~. No.: 3 Date:

Design Review performed: Yes [X] No [ ] N/A [ ]

Comments: See design review form.

Corrective action required: Yes [X] No [ ] N/A [ ]

Comments: Revise and resubmit.

Signature J. Stoltzenberg for J Jek Date 5/3

Completion of corrective action verified: Yes [ ] No [ ] N/A [ ]

Comments:

Signature Date

 9/16/74
Rev. 0

TITLE Movements for Exp. Joint Specification Nuclear

JOB NO. 2323

CALC. NO. 401-7 Rev 3

PREPARED BY KLF

DESIGN REVIEW PROCEDURE
MECHANICAL CHECKLIST - CALCULATIONS (Ref. DC-10)

ITEM	CONSIDERATION
Prior signoff, checking properly completed	✓
Previous comments have been incorporated	✓
Previous conditions, including sources are listed; inputs are correctly selected	✓
Scope, Purpose: covers all intended work, no interface gaps, no overlaps; purpose is stated	✓
Assumptions are listed, clearly defined, reasonable and marked for reverification (later in design)	✓
References including other calculations and sources, are listed	✓
Design method is accepted practice; formulas applicable and defined	✓
General approach and accuracy are reasonable; output reasonable compared to inputs	✓
Spot check of mathematics indicates satisfactory solution; or parallel check by a simplified method	✓

 9/16/74
Rev. 0

TITLE Movements for Exp joints Spec. Nuclear

JOB NO. 2323

CALC. NO. 401-7 Rev. 3

PREPARED BY HLF

DESIGN REVIEW PROCEDURE
MECHANICAL CHECKLIST - CALCULATIONS (Ref. DC-10)

ITEM	CONSIDERATION
Consistent with other similar mechanical calculations	✓
Void or superseded calculations have been properly dispensed	✓
Conformance to ASME code requirements	NA
ASME code classification is proper	NA
Conforms to PSAR, AEC Regulatory Guides	NA
Conformance to project criteria	✓
Conforms to other criteria, such as NSSS manufacturer's criteria	NA
Results to be used in design are identified: complete equipment parameters are listed	✓
Interface with other disciplines has been accomplished	✓
Properly indexed and filed	✓

F-711, A, 9-74

TITLE Movements for Exp Joint Spec. Nuclear

JOB NO. 2323

CALC. NO. 401-7 REV. 3

PREPARED BY ALP

DESIGN REVIEW PROCEDURE
MECHANICAL CHECKLIST - CALCULATIONS (Ref. DC-10)

Note: Design reviewer's signature on Design Review Record DC-10, and design reviewer's signature on first sheet of calculations (DC-10), confirms that design reviewer has considered each item on the checklist.

✓	Signifies design reviewer's completion of review (comments to be made in accordance with DC-10).
NA	Not Applicable

REV 3

Date 2/23/78	Filing Code 401-7
Calc By HLF	Sheet No. 1 of 13
Chk'd/Appr'd By Bam / EH	G & H Job No. 2323:00
Subject MOVEMENTS FOR EXP. JOINT SPECIFICATION (NUCLEAR)	Ref. Dwg/Spec. No. 2323-MS-71A

Gibbs & Hill, Inc.
ENGINEERS, DESIGNERS, CONSTRUCTORS
NEW YORK

a. PROBLEM

DETERMINE TOTAL PIPE DISPLACEMENTS (THERMAL AND SEISMIC) FOR EXPANSION JOINT DESIGN. THE VALUES DETERMINED WILL BE ENTERED INTO THE DATA SHEETS OF REFERENCE SPECIFICATION.

NUCLEAR SAFETY RELATED EQUIPMENT

b. GIVEN DATA

GIVE REFERENCE (MEMO, ETC.)

- THERMAL PIPE DISPLACEMENTS FOR PLANT FAULTED CONDITION - FROM APPLIED MECHANICS (A.R.)

EXP. JNT. TAG NUMBER	DESCRIPTION	DISPLACEMENTS AXIAL	LATERAL	ANGULAR
RHEXVT-03 RHEXVT-04	VALVE ISO. TANK OUTLET (RHR)	0.5" (COMPR.)	0.15"	0.001 RADS (0.06°)
CTEXVT-03 CTEXVT-04	VALVE ISO. TANK OUTLET (CSS)	0.8" (COMPR)	0.007"	0.15°
SWEXSW-01 SWEXSW-02	S.W. PUMP DISCHARGE	0.15" (COMPR)	0.15"	0.01 RADS (0.6°)

SEISMIC BUILDING DISPLACEMENTS - REF. MEMO FROM STRUCTURAL DATED 12-10-7 (ATTACHED)

BUILDING	ELEV.	ΔX	ΔY	ΔZ
FUEL BLDG.	826'-6"	±0.034"	±0.037"	±0.034"
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CONTAINMENT	826'-6"	±0.137"	±0.204"	±0.138"
S.W. INTAKE STRUCTURE	800'-0"	±0.014"	±0.012"	±0.008"

GIVE REFERENCE (MEMO, ETC.) Bruse

BUILDING DISPLACEMENTS FOR ½ S.S.E. ARE EQUAL TO 0.6 x S.S.E. DISPLACEMENTS - FROM STRUCTURAL DEPT (EJBo)

REV 3

Date 2/23/78

Calc By H.L.F.

Chk'd/Appd. By GGM

Gibbs & Hill, Inc.
ENGINEERS, DESIGNERS, CONSTRUCTORS
New York

Filing Code 401-7

Sheet No. 2 of 13

G & H Job No. 2323-0

Ref. Dwg/Spec. No. MS-71A

Subject

NUCLEAR SAFETY RELATED EQUIPMENT

C. ASSUMPTIONS

1. THERMAL DISPLACEMENTS OF FUEL TRANSFER TUBE, GUARD PIPES AND PENETRATION SLEEVES ARE NEGLIGIBLE AND ARE ASSUMED ZERO.

2. SEISMIC DISPLACEMENTS ARE RELATIVE TO GROUND. ~~WITH RESPECT TO GROUND DUE TO SAFE SHUT-DOWN EARTHQUAKE (SSE)~~ REV. 3

3. FOR SEISMIC GIVEN DATA, ΔY IS VERTICAL , ΔX AND ΔZ ARE IN HORIZONTAL PLANE AS DEFINED IN SKETCHES.

4. MAXIMUM SEISMIC DISPLACEMENT BETWEEN TWO STRUCTURES OCCURS WHEN STRUCTURES ARE AT MAXIMUM DISPLACEMENT IN OPPOSITE DIRECTIONS

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   (b) FUEL TRANSFER TUBE EXP. JOINTS : CONTAINMENT AND FUEL BLDG.
   (c) S.W. PUMP DISCH. EXP. JOINTS : S.W. INTAKE STRUCTURE

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7. THE LATERAL THERMAL PIPE DISPLACEMENTS GIVEN ARE THE RESULTANTS OF THE LATERAL PIPE MOVEMENTS IN THE HORIZONTAL AND VERTICAL DIRECTIONS IN PLANE PERPENDICULAR TO PIPE. ASSUME THAT THE THERMAL LATERAL DISPLACEMENTS ARE IN SAME DIRECTION AS THE RESULTANT SEISMIC LATERAL MOTIONS TO OBTAIN THE MAXIMUM TOTAL SEISMIC-THERMAL LATERAL DISPLACEMENTS.

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9. ASSUME THAT DISPLACEMENT DUE TO SEISMIC RESPONSE OF PIPING IS 50% OF DISPLACEMENT OF SEISMIC MOTION OF BUILDINGS. (PER M. GIDEON - APPL. MECH.)

~~10. ASSUME INITIAL DEFLECTION DUE TO CONSTRUCTION TOLERANCE IS 1/16 INCH (0.063 inch) FOR LATERAL MOVEMENTS AND 0.1 DEGREE FOR ANGULAR MOVEMENT.~~

GIVE REF (MEMO, ETC.)

Date 2/23/78
Calc By HLF
Chk'd/Apprd. By RJM

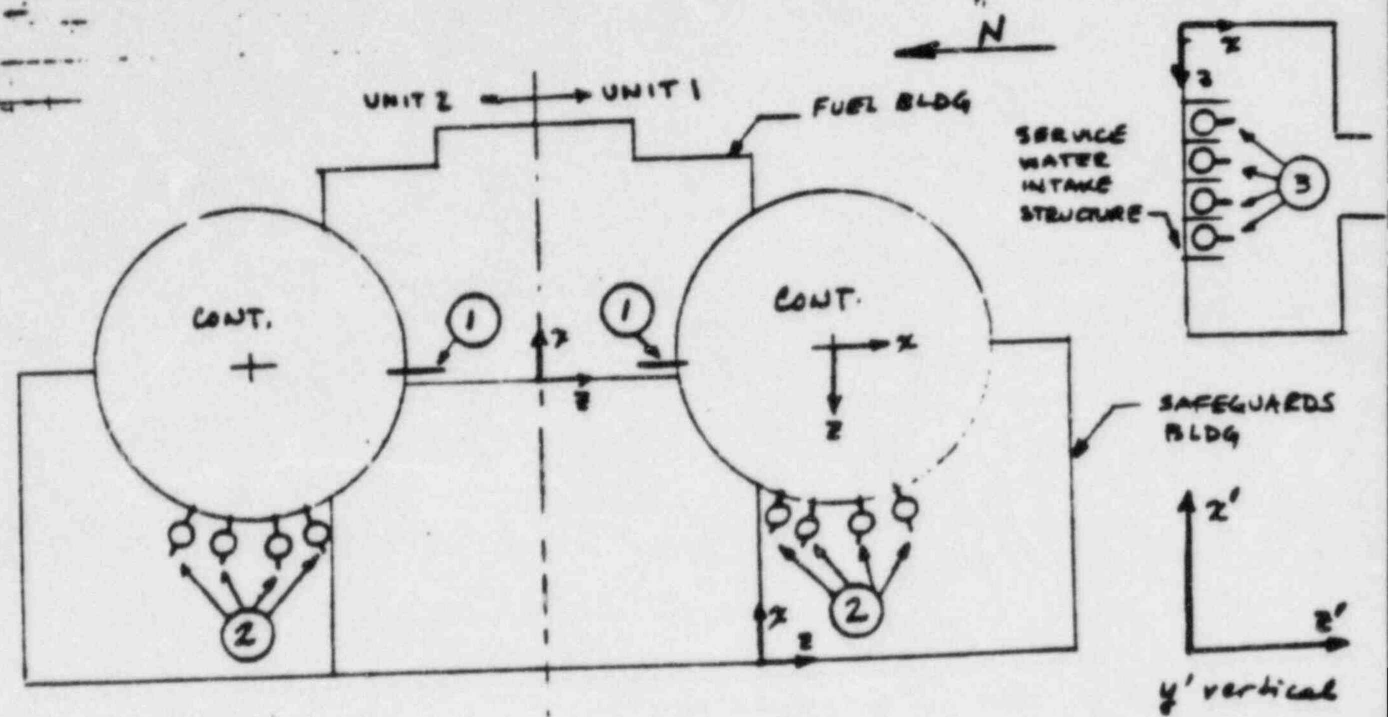
Gibbs & Hill, Inc.
ENGINEERS, DESIGNERS, CONSTRUCTORS
NEW YORK

Filing Code 401-7
Sheet No. 3 of 13
G & H Job No. 2322-0
Ref. Dwg./Spec. No. MS-71A
S

Subject

d. SOLUTION

NUCLEAR SAFETY RELATED EQUIPMENT



(1) FUEL TRANSFER TUBES

(2) VALVE ISOLATION TANKS

(3) SERVICE WATER PUMPS DISCHARGES

x, z, y - COORDINATE SYSTEMS FOR WHICH SEISMIC DISPLACEMENTS ARE GIVEN

z', x', y' - STANDARDIZED COORDINATE SYSTEM FOR REFERENCE

ARRANGEMENT SKETCH SHOWING RELATIVE LOCATION OF COMPONENTS REQUIRING EXPANSION JOINTS.

SEE ATTACHED FIGURES MS-71A-2, MS-71A-5, AND MS-71A-7 FOR EXPANSION JOINT ARRANGEMENTS.

NUCLEAR SAFETY RELATED EQUIPMENT

A. CALCULATION OF EXPANSION JOINT DISPLACEMENTS DUE TO SEISMIC (SSE) BUILDING MOVEMENTS.

1. FUEL TRANSFER TUBE

STD. COOR. DIRECTION	CONTAINMENT GIVEN COOR. DIR.	CONTAINMENT GIVEN DISPL.	FUEL BLDG. GIVEN COOR. DIR.	FUEL BLDG. GIVEN DISPL.	MAXIMUM RELATIVE DISPLACEM'T	EXP. JOINT MOVEMENT DESCRIPTION
Δx'	Δz	± 0.138"	Δx	±0.034"	± 0.172"	LATERAL
Δz'	Δx	± 0.137"	Δz	± 0.034"	±0.171"	AXIAL
Δy'	Δy	± 0.204"	Δy	± 0.037"	± 0.241"	LATERAL

C TOTAL LATERAL DISPLACEMENT IS THE RESULTANT OF Δx' AND Δy' COMPONENTS

$$\Delta LAT = \sqrt{(\Delta x')^2 + (\Delta y')^2} = \sqrt{0.0296 + 0.0581} = \sqrt{0.0877} = 0.296''$$

2. SERVICE WATER PUMP DISCHARGE

STD. COOR. DIRECTION	S.W. INTAKE STRUCTURE GIVEN COORD. DIR.	S.W. INTAKE STRUCTURE GIVEN DISPL.	MAXIMUM RELATIVE DISPLACEM'T	EXP. JOINT MOVEMENT DESCRIPTION
Δx'	Δz	± 0.008"	± 0.008"	LATERAL
Δz'	Δx	± 0.014"	± 0.014"	AXIAL
Δy'	Δy	± 0.012"	± 0.012"	LATERAL

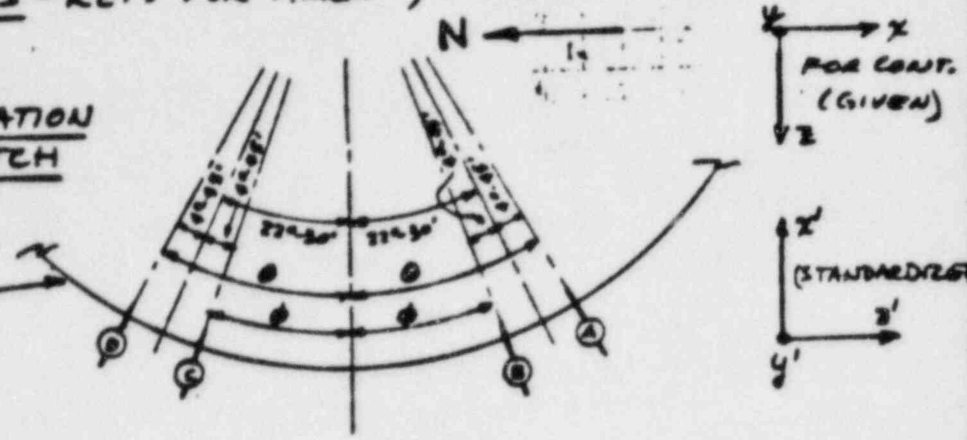
TOTAL LATERAL DISPLACEMENT IS THE RESULTANT OF Δx' AND Δy' COMPONENTS.

C $$\Delta LAT = \sqrt{(\Delta x')^2 + (\Delta y')^2} = (0.000064 + 0.000144)^{1/2} = \sqrt{0.000208} = 0.0144$$

3. VALVE ISOLATION TANKS - REF. FOR ARRM'T, DWG. 2323-M1-0522

EXP. JOINT ORIENTATION ARRANGEMENT SKETCH

UNIT 1 CONTAINMENT



TANK	EXP. JOINTS
A	CP1-CTEXVT-01 (INLET) CTEXVT-03 (OUTLET)
B	CP1-RHEXVT-01 (INLET) RHEXVT-03 (OUTLET)
C	CP1-RHEXVT-02 (INLET) RHEXVT-04 (OUTLET)
D	CP1-CTEXVT-02 (INLET) CTEXVT-04 (OUTLET)

$\theta = (22°\text{-}30') + (4°\text{-}45') = 27°\text{-}15' = 27.25°$

$\phi = (22°30') - (4°\text{-}45') = 17°\text{-}45' = 17.75°$

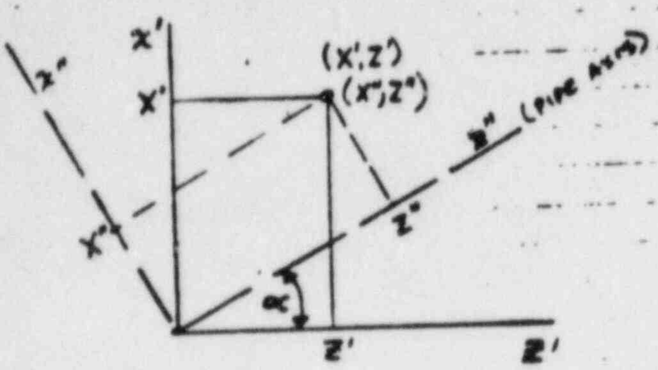
STD. COORD. DIRECTION	CONTAINMENT GIVEN COOR. DIR.	CONTAINMENT GIVEN DISPL.	SAFEGDS. BLDG GIVEN COOR. DIR.	SAFEGDS. BLDG GIVEN DISPL.	MAXIMUM RELATIVE DISPLACEM'T
$\Delta x'$	Δz	±0.138"	Δx	±0.055"	±0.193"
$\Delta z'$	Δx	±0.137"	Δz	±0.038"	±0.175"
$\Delta y'$	Δy	±0.204"	Δy	±0.109"	±0.313"

NUCLEAR SAFETY RELATED EQUIPMENT

3. VALVE ISO. TANKS (CONT.)

IN ORDER TO OBTAIN THE SEISMIC MOVEMENTS IN DIRECTION OF PIPING, COORDINATE ROTATIONS ARE REQUIRED SUCH THAT THE NEW COORDINATE "X" OF THE NEW COORDINATE SYSTEM (x'', z'', y'') COINCIDES WITH THE AXIAL DIRECTION OF EACH EXP. JOINT.

DETERMINING THE GENERAL COORDINATE ROTATION EQUATION:



$X'' = X'\cos\alpha - Z'\sin\alpha$

$Z'' = X'\sin\alpha + Z'\cos\alpha$

$\Delta x'' = \Delta x'\cos\alpha - \Delta z'\sin\alpha$ (EQN. 1)

$\Delta z'' = \Delta x'\sin\alpha + \Delta z'\cos\alpha$ (EQN. 2)

$\Delta y'' = \Delta y'$ (EQN. 3)

TANK DESIGNATION	A	B	C	D
VALUE OF ANGLE α	-27.25°	-17.75°	+17.75°	+27.25°
$\sin\alpha$	-0.458	-0.305	+0.305	+0.458
$\cos\alpha$	+0.889	+0.952	+0.952	+0.889

NUCLEAR SAFETY RELATED EQUIPMENT

3. VALVE ISO. TANKS (CONT.)

- CALCULATION OF SEISMIC DISPLACEMENTS IN TRANSFORMED COORDINATE SYSTEM USING EQNS. 1, 2 AND 3

FROM SHEET 5 : $\Delta x' = \pm 0.193''$
$\Delta z' = \pm 0.175''$
$\Delta y' = \pm 0.313$

FOR TANK A:

$\Delta x'' = (\pm 0.193)(0.889) - (\pm 0.175)(-0.458) = \pm 0.172 \pm 0.0802 \doteq \pm 0.252''$

$\Delta z'' = (\pm 0.193)(-0.458) + (\pm 0.175)(0.889) = \pm 0.0884 \pm 0.156 \doteq \pm 0.244''$

$\Delta y'' = \Delta y' = \pm 0.313''$

FOR TANK B:

$\Delta x'' = (\pm 0.193)(0.952) - (\pm 0.175)(-0.305) = \pm 0.184 \pm 0.0534 \doteq \pm 0.237''$

$\Delta z'' = (\pm 0.193)(-0.305) + (\pm 0.175)(0.952) = \pm 0.0589 \pm 0.167 \doteq \pm 0.226''$

$\Delta y'' = \Delta y' = \pm 0.313''$

FOR TANK C:

$\Delta x'' = (\pm 0.193)(0.952) - (\pm 0.175)(0.305) = \pm 0.184 \pm 0.0534 \doteq \pm 0.237''$

$\Delta z'' = (\pm 0.193)(0.305) + (\pm 0.175)(0.952) = \pm 0.0589 \pm 0.167 \doteq \pm 0.226''$

$\Delta y'' = y' = \pm 0.313''$

FOR TANK D:

$\Delta x'' = (\pm 0.193)(0.889) - (\pm 0.175)(0.458) = \pm 0.172 \pm 0.0802 \doteq \pm 0.252''$

$\Delta z'' = (\pm 0.193)(0.458) + (\pm 0.175)(0.889) = \pm 0.0884 \pm 0.156 \doteq \pm 0.244''$

$\Delta y'' = \Delta y' = \pm 0.313''$

NUCLEAR SAFETY RELATED EQUIPMENT

II. CALCULATION OF RESULTANT LATERAL DISPLACEMENTS (MAGNITUDE):

$$\Delta LAT = \sqrt{(\Delta z^{\circ})^2 + (\Delta y^{\circ})^2}$$

FOR TANK A: $\Delta LAT = [(0.244)^2 + (0.313)^2]^{1/2} = (0.1575)^{1/2} \doteq 0.397''$

FOR TANK B: $\Delta LAT = [(0.226)^2 + (0.313)^2]^{1/2} = (0.149)^{1/2} \doteq 0.386''$

FOR TANK C: $\Delta LAT = [(0.226)^2 + (0.313)^2]^{1/2} = \quad = 0.386''$

FOR TANK D: $\Delta LAT = [(0.244)^2 + (0.313)^2]^{1/2} = \quad = 0.397''$

SEISMIC RESPONSE MOVEMENTS

DISPLACEMENTS DUE TO VIBRATORY RESPONSE TO BUILDING MOVEMENTS ARE ASSUMED 50% OF SEISMIC DISPLACEMENTS DUE TO BUILDING MOTION.

NUCLEAR SAFETY RELATED EQUIPMENT

B. CALCULATION OF EXPANSION JOINT DISPLACEMENTS DUE TO SEISMIC (1/2 S.S.E.) BUILDING MOVEMENTS

1. FUEL TRANSFER TUBE

FROM PART A.1, EXPANSION JOINT DISPLACEMENTS FOR S.S.E. ARE:

AXIAL = ± 0.171" LATERAL = ±0.296"

DISPLACEMENTS FOR 1/2 S.S.E. ARE:

AXIAL = ± (0.6)(0.171)" = ± 0.103"

LATERAL = ± (0.6)(0.296) = 0.178"

2. SERVICE WATER PUMP DISCHARGE

FROM PART A.2, EXPANSION JOINT DISPLACEMENTS FOR S.S.E. ARE:

AXIAL = ± 0.014" LATERAL = 0.0144"

DISPLACEMENTS FOR 1/2 S.S.E. ARE:

AXIAL = ± (0.6)(0.014) = ± 0.008"

LATERAL = ± (0.6)(0.014) = 0.008"

3. VALVE ISOLATION TANKS

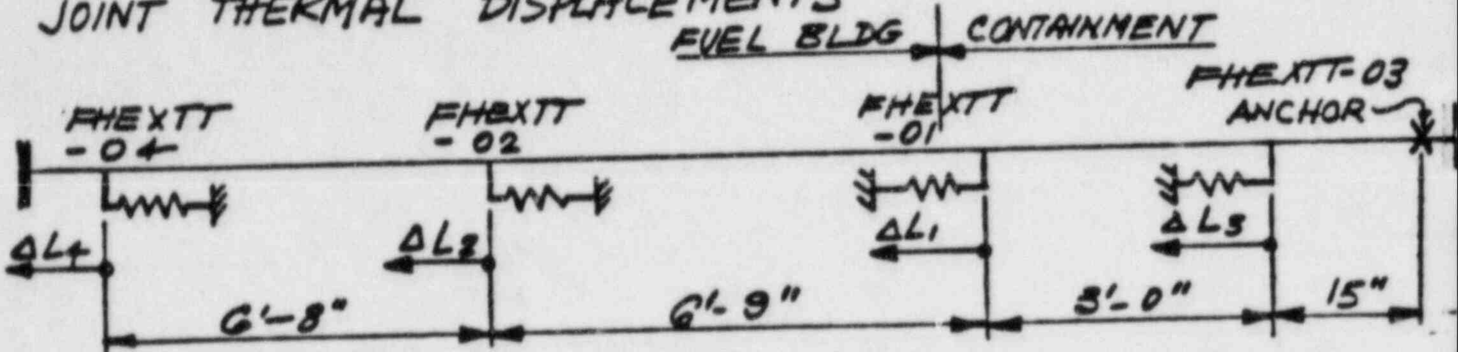
FROM PART A.3, EXPANSION JOINT DISPLACEMENTS FOR S.S.E. ARE:

	AXIAL	LATERAL
TANK A	± 0.252"	0.397"
B	± 0.237"	0.386"
C	± 0.237"	0.386"
D	± 0.252"	0.397"

I. DISPLACEMENTS FOR 1/2 S.S.E. (Δ 1/2 S.S.E. = 0.6 Δ S.S.E.)
ARE:

		AXIAL	LATERAL
TANK	A	± 0.151"	0.238"
	B	± 0.142"	0.232"
	C	± 0.142"	0.232"
	D	± 0.151"	0.238"

C. CALCULATION OF FUEL TRANSFER TUBE EXPANSION JOINT THERMAL DISPLACEMENTS



THERMAL CHANGE IN LENGTH $\Delta L = L_0 \alpha \Delta T$
WHERE L_0 = ORIGINAL LENGTH, INCHES, α = COEFFICIENT OF THERMAL EXPANSION IN/IN/°F (FROM ASME CODE), ΔT = CHANGE IN TEMPERATURE (FROM 70°F), °F.

L_{03} = 15" (FROM ANCHOR), L_{01} = 51", L_{02} = 132", L_{04} = 212"

1. NORMAL & UPSET PLANT CONDITIONS:
ASSUME TEMPERATURE IS 180° (MAX. TEMPERATURE OF WATER IN REFUELING CAVITY & TRANSFER CANAL)
$\alpha = 9.30 \times 10^{-6}$ IN/IN/°F, $\Delta T = 180° - 70° = 110°F$
$\Delta L_3 = 15"(9.30 \times 10^{-6})(110°) = 0.015"$, $\Delta L_1 = 0.052"$, $\Delta L_2 = 0.135"$
$\Delta L_4 = 0.217"$

2. EMERGENCY & FAULTED PLANT CONDITIONS:
ASSUME TEMPERATURE IS 280°F (CONTAINMENT TEMPERATURE) FOR THESE CONDITIONS:
$\alpha = 9.45 \times 10^{-6}$ $\Delta T = 280° - 70° = 210°F$

NUCLEAR SAFETY RELATED EQUIPMENT

Date 2-23-78

Calc By H.L.F.

Chk'd/Apprd. By SAM/55J

Gibbs & Hill, Inc.
ENGINEERS, DESIGNERS, CONSTRUCTORS
NEW YORK

Filing Code 401-7
Sheet No. 11 of 13
G & H Job No. 2323-001
Ref. Dwg./Spec. No. MS-71A

Subject

$\Delta L_3 = 0.130''$, $\Delta L_1 = 0.101''$, $\Delta L_2 = 0.262''$, $\Delta L_4 = 0.421''$

SUMMARY OF FUEL TRANSFER TUBE EXPANSION JOINT THERMAL DISPLACEMENTS (AXIAL)

	FHEXTT-03	FHEXTT-01	FHEXT-02	FHEXT-04
NORMAL & UPSET	0.015" (COMPR.)	0.052" (COMPR.)	0.135" (EXT.)	0.217" (EXT.)
EMERGENCY & FAULTED	0.130" (COMPR.)	0.101" (COMPR.)	0.262" (EXT.)	0.421" (EXT.)

NUCLEAR SAFETY RELATED EQUIPMENT

Date 2-23-78
Calc By HLF
Chk'd/Appd. By CAM/SI/

Gibbs & Hill, Inc.
ENGINEERS, DESIGNERS, CONSTRUCTORS
New York

Filing Code 401-7 rev 3
Sheet No. 12 of 13
G & H Job No. 2323-001
MS-71A

Subject: NUCLEAR SAFETY RELATED EQUIPMENT

e. SUMMARY

TABULATION OF DISPLACEMENTS
(LINEAR DISPL. IN INCHES, ANGULAR DISPL. IN DEGREES)

	RHR VALVE ISOLATION TKS				CSS VALVE ISOLATION TKS				FUEL TRANSF TUBE	SSW PUMP DISCH.
	TANK B RHEXVT-01	TANK C RHEXVT-02	TANK B RHEXVT-03	TANK C RHEXVT-04	TANK A CTEXVT-01	TANK D CTEXVT-02	TANK A CTEXVT-03	TANK D CTEXVT-04	FHEXTT 01 02 03 04	SWEXSW 01 SWEXSW 02
AXIAL COMPR										
THERMAL	0	0	0.500	0.500	0	0	0.800	0.800	SEE SH.11	0.150
SSE* BLDG	0.237	0.237	0.237	0.237	0.252	0.252	0.252	0.252	0.171	0.014
SSE* VIBR	0.119	0.119	0.119	0.119	0.126	0.126	0.126	0.126	0.086	0.007
½ SSE* BLDG	0.142	0.142	0.142	0.142	0.151	0.151	0.151	0.151	0.103	0.008
½ SSE* VIBR	0.071	0.071	0.071	0.071	0.076	0.076	0.076	0.076	0.051	0.004
AXIAL EXT.										
THERMAL	0	0	0	0	0	0	0	0	SEE SH.11	0
SSE* BLDG	0.237	0.237	0.237	0.237	0.252	0.252	0.252	0.252	0.171	0.014
SSE* VIBR	0.119	0.119	0.119	0.119	0.126	0.126	0.126	0.126	0.086	0.007
½ SSE* BLDG	0.142	0.142	0.142	0.142	0.151	0.151	0.151	0.151	0.103	0.008
½ SSE* VIBR	0.071	0.071	0.071	0.071	0.076	0.076	0.076	0.076	0.051	0.004
LATERAL										
THERMAL	0	0	0.150	0.150	0	0	0.007	0.007	0	0.150
SSE* BLDG	0.386	0.386	0.386	0.386	0.397	0.397	0.397	0.397	0.296	0.014
SSE* VIBR	0.193	0.193	0.193	0.193	0.199	0.199	0.199	0.199	0.148	0.007
½ SSE* BLDG	0.232	0.232	0.232	0.232	0.238	0.238	0.238	0.238	0.178	0.008
½ SSE* VIBR	0.116	0.116	0.116	0.116	0.119	0.119	0.119	0.119	0.089	0.004
ANGULAR										
THERMAL	0	0	0.06	0.06	0	0	0.15	0.15	0	0.6
NOTE - NO SEISMIC ANGULAR DISPL ARE POSTULATED.										

* DISPLACEMENT DUE TO A SEISMIC EVENT IS EQUAL TO THE SUM OF THE BUILDING & EQUIPMENT VIBRATORY DISPLACEMENTS.

Date 2-23-78
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Subject

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Filing Code 401-7 rev 3
Sheet No. 13 of 13
G & H Job No. 2323-001
Ref. Dwg./Spec. No. MS-71A

E. CONCLUSION

THE DISPLACEMENTS TABULATED ON SHEETS 11 & 12 WILL BE USED IN SPECIFICATION 2323-MS-71A "EXPANSION JOINTS - NUCLEAR" WHEN IT IS SENT OUT FOR BIDS.

NUCLEAR SAFETY RELATED EQUIPMENT

Rec. 7-2-84

Distribution
J.C. Minichiello
C. Wong
N. Williams
84042 PF

TEXAS UTILITIES GENERATING COMPANY
P. O. BOX 1002 · GLEN ROSE, TEXAS 76043

July 2, 1984

PROJECT FILE

CYGNA Energy Services
101 California Street
San Francisco, CA 94111

ATTENTION: Ms. Nancy Williams, Project Manager

COMANCHE PEAK STEAM ELECTRIC STATION
CPSES CYGNA REVIEW QUESTIONS
(PIPE SUPPORTS)

Reference: 1) June 29; Telecon between D. Rencher (TUGCO) and J. Minichiello (CYGNA)

Dear Ms. Williams:

Below is TUGCO'S response to the above referenced telecon regarding Flare Bevel Welds.

CYGNA Questions:

a) It is our interpretation of existing weld standards that the effective throat of a flare bevel weld (te) is 5/16R. Assuming R=2t, then te=5/8t. What justification does TUGCO have for using te=t in flare bevel weld design?

b) Please provide documentation which instructs engineers how to calculate the effective throat of a flare bevel weld with a fillet cap.

TUGCO Response:

a) Per AWS D1.1, 1979 edition, figure 10.13.1.3B, an effective throat of t is specified (see attached). Based on the geometry of the joint, te=t is a reasonable value.*

b) Calculation of weld effective throat (in any joint) is based on the shortest distance from the root of the weld to the face of the weld. For a flare bevel with a fillet cap, the engineer uses this approach in calculating te. The example supplied to CYGNA for MS-1-003-013-C72K, shows this calculation is done.

CYGNA
TO/FROM 84-
DATE LOGGED
LOG NO. 46
FILE
CROSS REF. FILE

TEXAS UTILITIES GENERATING COMPANY
P. O. BOX 1002 · GLEN ROSE, TEXAS 76043

* Please note that the ASME code does not address flare bevel weld design.

If there are any further questions or comments, please contact Mr. George Grace at extension 500.

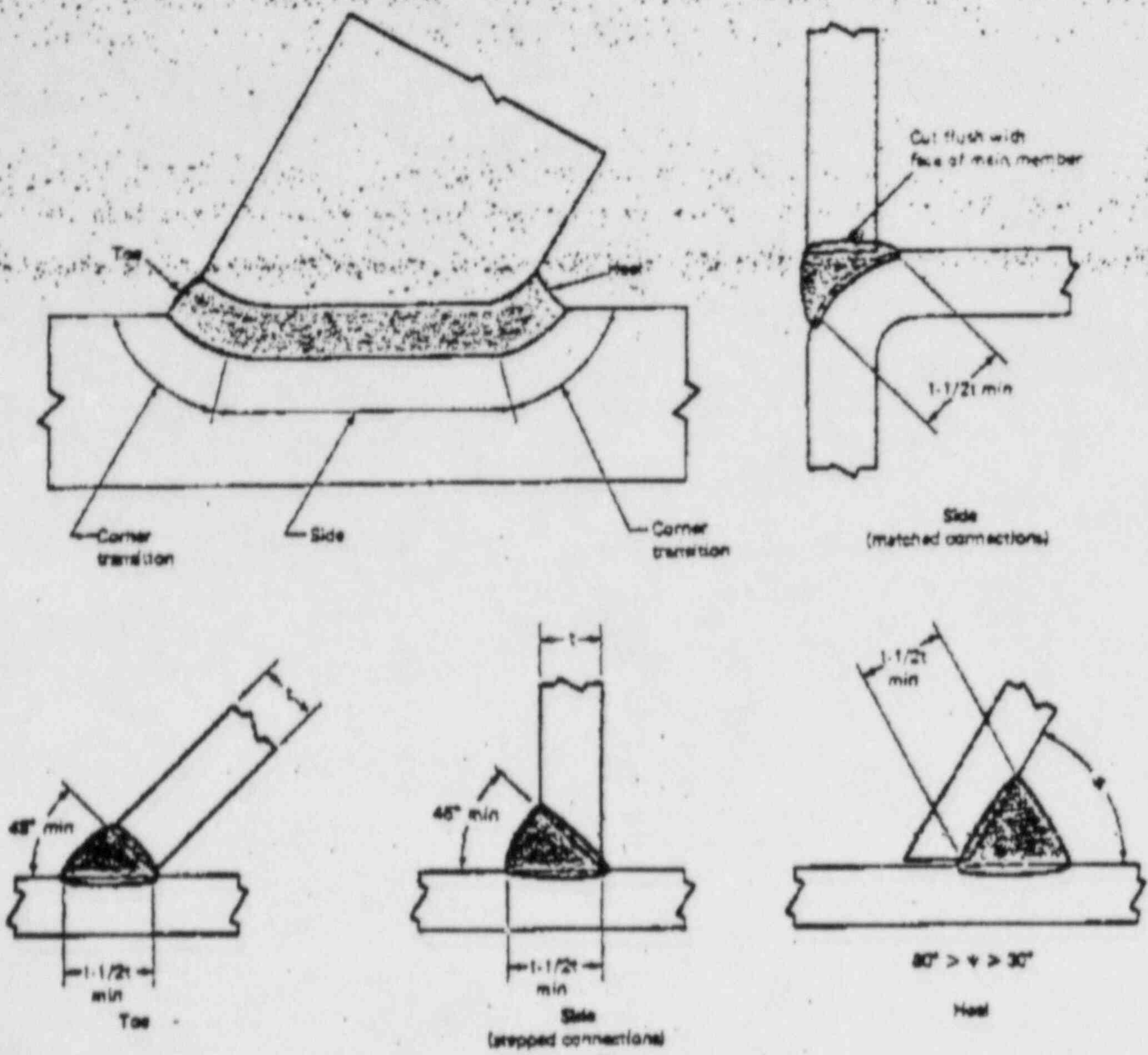
Very truly yours,

TEXAS UTILITIES GENERATING COMPANY

RP Baker for

L. M. Popplewell
Engineering Manager

GG/jrf



Notes:

1. t = thickness of thinner section
2. Depth of bevel = t
3. Root opening 0 to 3/16 in. (4.8 mm)
4. Not prequalified for ψ under 30°
5. Effective throat = t
6. Joint preparation for corner welds shall provide a smooth transition from one detail to another. Welding shall be carried continuously around corners, with corners fully built up and all starts and stops within flat faces.

Fig. 10.13.1.3B—Partial joint penetration prequalified box connections made by shielded metal arc, gas metal arc, or flux cored arc welding

Gibbs & Hill, Inc.

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Domestic 127636/968694
International 428813/234475
A Dravo Company

CYGNA
JOB NO: 84042
DATE LOGGED: 7/2/84
LOG NO.: #49
FILE: 21.1 Inc. Cor.
CROSS REF. FILE: 21.3 In. Cor. log

June 29, 1984

bcc: N. Williams
L. Weingart
J. Minichiello
84042/PF

GTN- 69176

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Mgr.

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
MASS PARTICIPATION FRACTION SENSITIVITY STUDY
REF 1: GTN-69162 DATED JUNE 26, 1984
REF 2: CYGNA LETTER NO. 84042.008 DTD 6/24/84

By copy of this letter to Nancy Williams of CYGNA, attached is Item 1 and 2a corresponding to the plan of action established in reference 1. In particular Item 2a is the selection of problems for mass fraction re-analysis.

In accordance with reference 2, Gibbs & Hill will be contacting Dr. Gordon Bjorkman regarding the transfer of a magnetic tape of the input files for the selected problems. It is Gibbs & Hill's intent to adjust the execution files to be compatible to ADLPIPE version 2D34D and for economic reasons to analyze only the seismic inertia and anchor movement load cases.

Should you have any questions on the selected problems or our intended approach contact Henry W. Mentel.

Very truly yours,

GIBBS & HILL, Inc.

S M Marano

Robert E. Ballard, Jr.
Project Manager

96####

REBa-HWMe:lc
1 Letter
CC: ARMS (B&R Site) OL 1A
N. Williams (CYGNA Calif.) 1L 1A
B. Bjorkman (CYGNA MA.) 1L 1A
G. Grace (CPPE Site) 1L 1A
D. Wade (TUSI Site) 1L 1A
P. M. Milam (TUSI NY) 1L 1A

MASS PARTICIPATION FRACTION SENSITIVITY STUDY
(Ref: GTN-69162 Dated June 26, 1984)

Plan of Action, Item 1

The simplified table of results of the Gibbs & Hill survey of mass participation presented in GTN-69098 dated June 11, 1984 was developed as follows:

a. 272 Stress Analysis Problems (Large Bore - Gibbs & Hill New York As-Built Piping Stress Analysis Scope) were considered including problem revisions which brought the total to 300 problems.

b. The mass participation percentages were calculated for each direction x, y and z. The method of calculation was to extract from the ADLPIPE analysis the system weight (taken from "shock" execution deck analysis), convert this to mass and then divide the square of the individual direction participation factors for each mode by this mass. This was done on a per mode basis with the cumulative mass fractions being calculated with successive modes. (Examples of these calculations and methodology are attached as part of item 2a.)

c. The table of results indicates for this rough survey (the adjective rough being utilized since the 300 calculations were done expeditiously without the benefit of formal checking) the number of problems exhibiting a particular range of percent mass, i.e., Fraction = .26, therefore in the range of between 20 and 30 percent mass. The average was determined by using the median value of the range times the number of problems falling into that range and then divided by the total.

Upon further review of the raw data, this survey and its results has been subsequently refined. Specifically some 41 problems were discarded due to the fact that the results were misleading. This was a result of the incorrect total weight from ADLPIPE being utilizing. The total weight printed by ADLPIPE is based upon the input geometry and does not include concentrated weights identified in the seismic execution deck. With these problems discarded the data for the remaining 259 problems was converted into mass fraction plots (see Attachment I).

Upon review of these plots, the following averages are evident:

X Direction Mass Fraction = .426
Y Direction Mass Fraction = .341
Z Direction Mass Fraction = .425
Combined X, Y, Z Mass Fraction = .392
(Average taken of X, Y and Z for each problem, then plotted)

Plan of Action, Item 2a

Five problems have been selected for further analysis. This selection was performed on the basis of the criteria established in the proposed plan of action in GTN-69162 dated June 26, 1984.

Attachment II provides descriptive information on each of the problems.

ATTACHMENT I

MASS FRACTION PLOTS

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CPSES

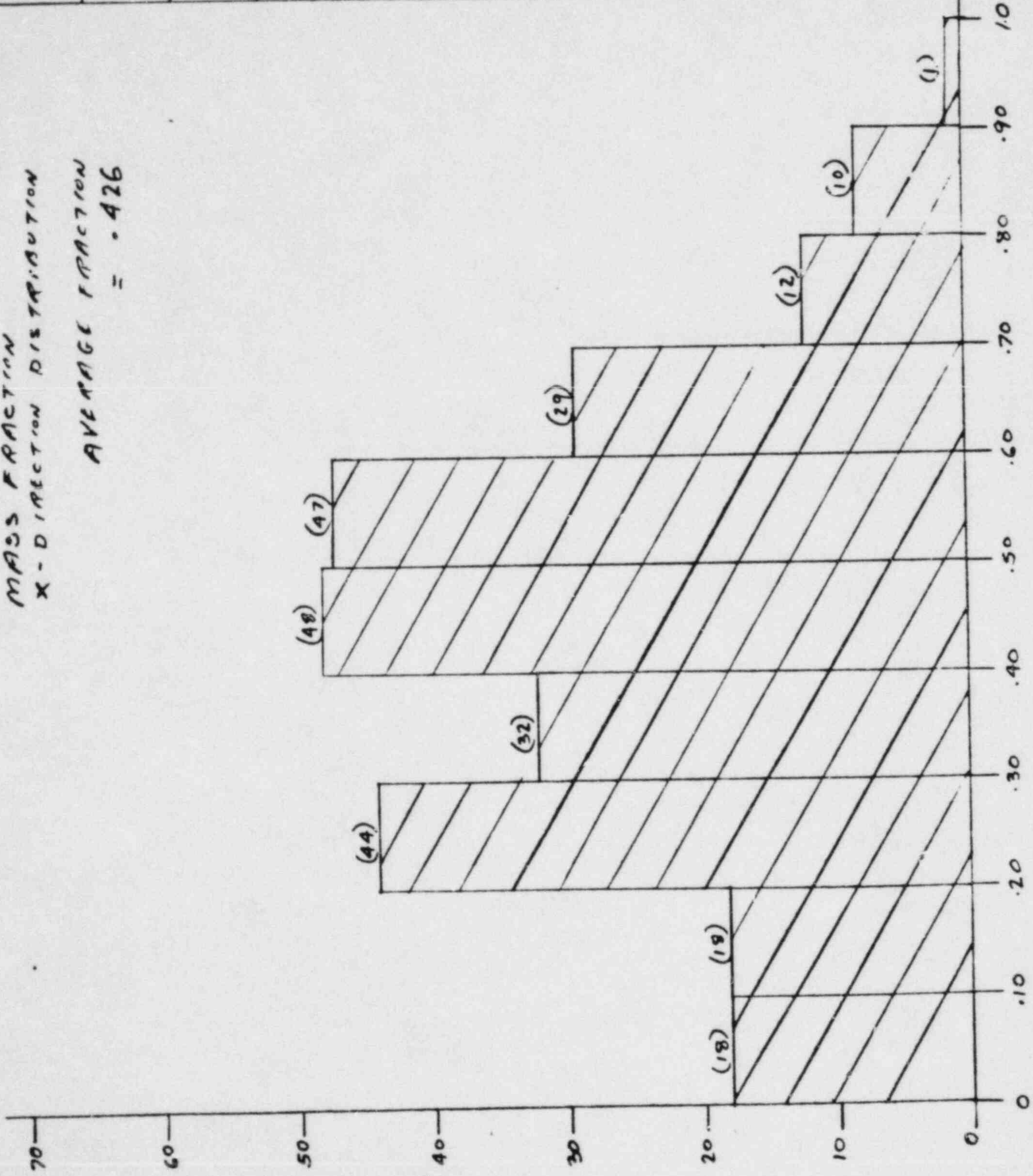
Subject MASS FRACTIONS CHART 1 X DIRECTION

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[signature]	6/25/84									
Checker											

MASS FRACTION
X-DIRECTION DISTRIBUTION

AVERAGE FRACTION = .426

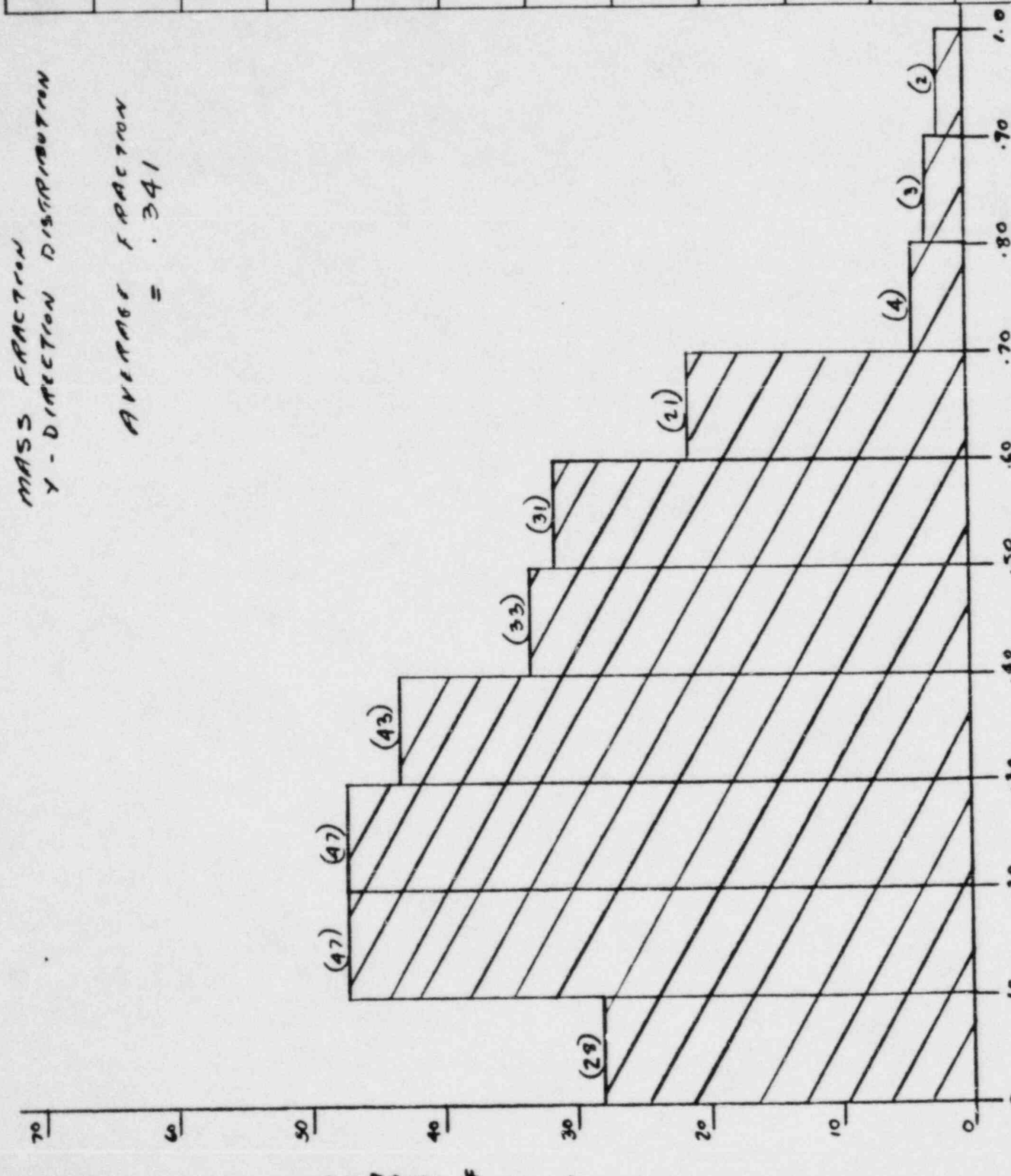


Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc.	Job No. 2323	Client TUSI / CPSES
Subject MASS FRACTIONS	CHART 2 Y DIRECTION	
Calculation Number		Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[signature]	6/25/84								
Checker										



Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CPSES

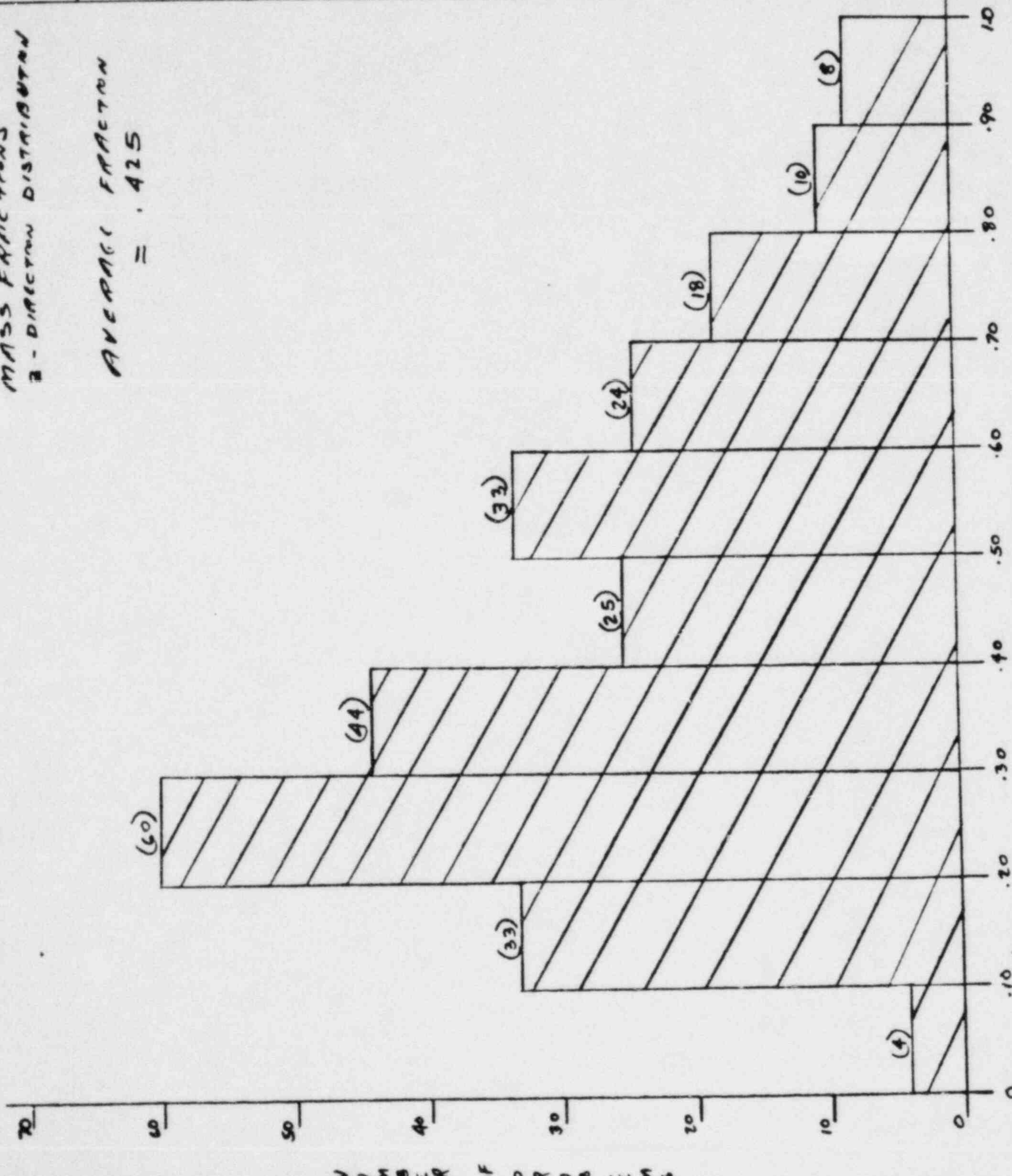
Subject MASS FRACTIONS CHART 3 Z DIRECTION

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[signature]	6/25/84									
Checker											

MASS FRACTIONS
Z-DIRECTION DISTRIBUTION

AVERAGE FRACTION
= .425



Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

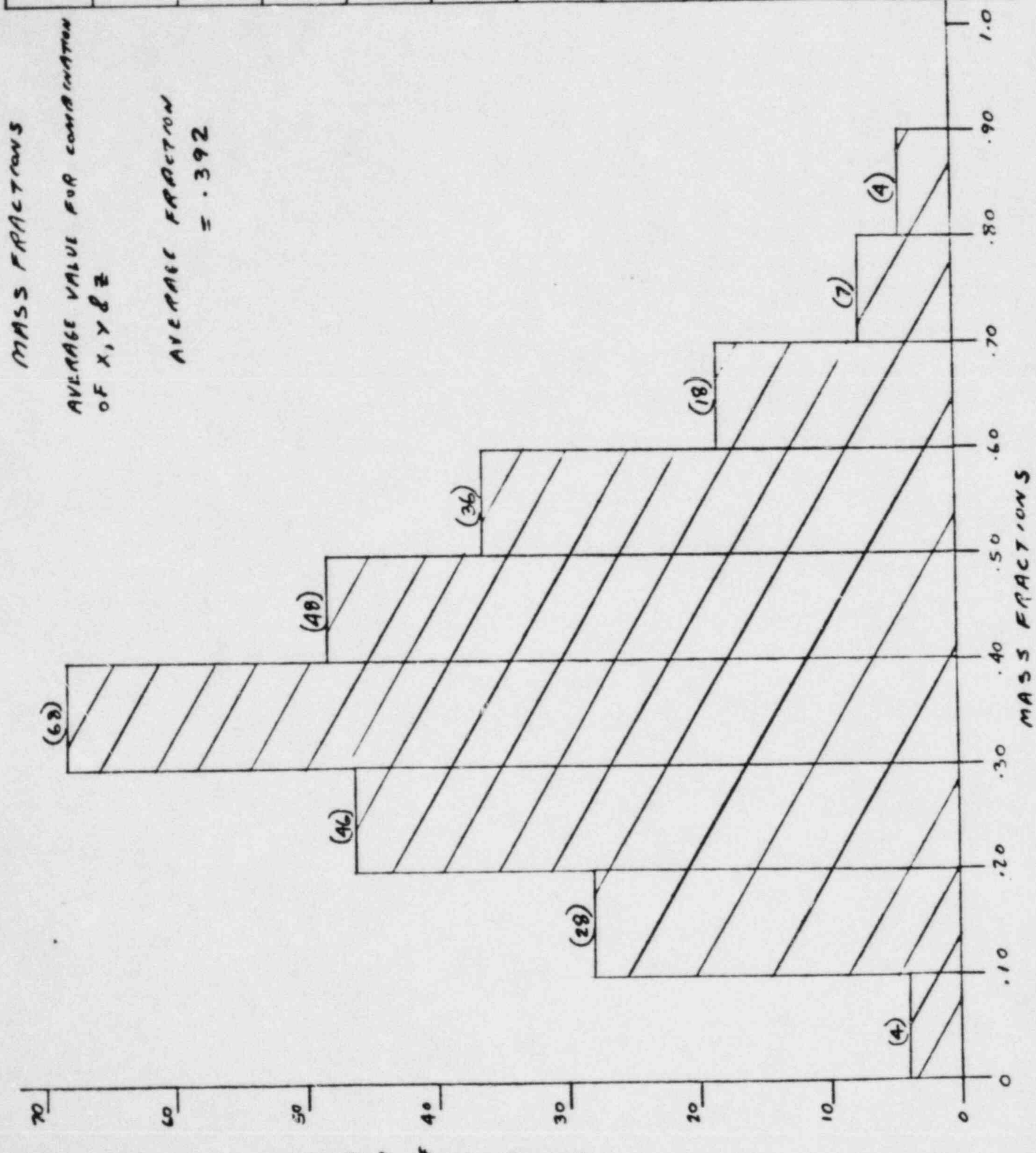
F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI / CPSES

Subject MASS FRACTIONS CHART 4 X, Y, Z AVERAGE

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[signature]	6/25/94									
Checker											



Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CPSES

Subject MASS FRACTION AVERAGES

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[illegible]	6/26/84									
Checker											

FROM CHART 1 X-DIRECTION

USING MEDIAN FOR MASS FRACTION RANGES ie

0 → .10 = .05

.10 → .20 = .15

RANGE	# OF PROBLEMS	MEDIAN	
0 – .10	18	.05	0.9
.10 – .20	18	.15	2.7
.20 – .30	44	.25	11.0
.30 – .40	32	.35	11.2
.40 – .50	48	.45	21.6
.50 – .60	47	.55	25.85
.60 – .70	29	.65	18.85
.70 – .80	12	.75	9.0
.80 – .90	10	.85	8.5
.90 – 1.0	1	.95	.95
—	259	—	110.55

110.55 / 259 = $\boxed{.426}$ AVERAGE

FROM CHART 2 Y-DIRECTION

RANGE	# OF PROBLEMS	MEDIAN	
0 – .10	28	.05	1.4
.10 – .20	47	.15	7.04
.20 – .30	47	.25	11.75
.30 – .40	43	.35	15.05
.40 – .50	33	.45	14.85
.50 – .60	31	.55	17.05
.60 – .70	21	.65	13.65
.70 – .80	4	.75	3.0
.80 – .90	3	.85	2.55
.90 – 1.0	2	.95	1.9
	259	—	88.24

88.24 / 259 = $\boxed{.341}$ AVERAGE

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CASES

Subject MASS FRACTION AVERAGES

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[illegible]	6/26/84									
Checker											

FROM CHART 3 Z DIRECTION

RANGE	# OF PROBLEMS	MEDIAN	
0 - .10	4	.05	0.2
.10 - .20	33	.15	4.95
.20 - .30	60	.25	15.00
.30 - .40	44	.35	15.40
.40 - .50	25	.45	11.25
.50 - .60	33	.55	18.15
.60 - .70	24	.65	15.60
.70 - .80	18	.75	13.50
.80 - .90	10	.85	8.50
.90 - 1.0	8	.95	7.6
—	259	—	110.15

110.15/259 = $\boxed{.425}$ AVERAGE

FROM CHART 4 X, Y, Z AVERAGE

RANGE	# OF PROBLEMS	MEDIAN	
0 - .10	4	.05	0.2
.10 - .20	28	.15	4.2
.20 - .30	46	.25	11.5
.30 - .40	68	.35	23.8
.40 - .50	48	.45	21.6
.50 - .60	36	.55	19.8
.60 - .70	18	.65	11.7
.70 - .80	7	.75	5.25
.80 - .90	4	.85	3.4
.90 - 1.0	0	.95	0
—	259	—	101.45

101.45/259 = $\boxed{.392}$ AVERAGE

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

ATTACHMENT II

SELECTED PROBLEMS

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CPSES

Subject SELECTED PROBLEM FOR MASS FRACTION STUDY

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[illegible]	6/27/84								
Checker										

STRESS PROBLEM: AB-1-23A

SYSTEM: MAIN STEAM LOOP 1 OUTSIDE CONTAINMENT

PIPE SIZE(S): 32 IN. ; 8 IN.

APPLICABLE RESPONSE SPECTRA:

BLDG.	ELEVATION (FT)
CONTAINMENT	EL. 905.75
SAFEGUARD	EL. 896.5
SAFEGUARD	EL. 873.5

SAM LOAD CASE APPLICABLE: YES

MASS FRACTIONS EXHIBITED IN PRESENT ANALYSIS:

SEE ATTACHED SHTS.
- X DIR. = .704
- Y DIR. = .027
- Z DIR. = .940

AVERAGE X, Y, Z = .557

NUMBER OF SUPPORTS IN PROBLEM: 11

NUMBER OF FABRICATED ANCHORS IN PROBLEM: 0

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CASES

Subject MAIN STEAM SYSTEM — OUTSIDE CONT. — MASS FRACTION CALCULATION

Calculation Number AB-1-23A Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[illegible]	6/1/84									
Checker											

AB-1-23A (J146A DTD. 8/20/82)

W = TOTAL SYSTEM WEIGHT = 91318.23 Lbs
(W OBTAINED FROM REFERENCED OUTPUT — ADDITION OF LUMPED WEIGHTS)

g = 32.1740 ft/sec² = 386.088 in/sec²

M = TOTAL DYNAMIC MASS = W/g = 91318.23 / 386.088

M = 236.522

γ_i = MODAL PARTICIPATION FACTOR $i = x, y, z$

$\frac{\gamma_i^2}{M}$ = MASS FRACTION PER DIRECTION $i = x, y, z$

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI / CASES

Subject MAIN STEAM SYSTEM - OUTSIDE CONT. - MASS FRACTION CALCULATION

Calculation Number AB-1-23A Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[illegible]	6/1/84									
Checker											

$m = 236.522$

S	γ_x	γ_y	γ_z	$\frac{\gamma_x^2}{m}$	$\frac{\gamma_y^2}{m}$	$\frac{\gamma_z^2}{m}$	$\Sigma \frac{\gamma_x^2}{m}$	$\Sigma \frac{\gamma_y^2}{m}$	$\Sigma \frac{\gamma_z^2}{m}$
21.747	-8.18	-0.23	-0.04	.283	.000	.000	.283	.000	.000
25.746	0.02	-0.02	-2.56	.000	.000	.028	.283	.000	.028
28.230	-0.03	0.66	-14.41	.000	.002	.878	.283	.002	.906
29.998	-4.49	0.22	0.10	.085	.000	.000	.368	.002	.906
35.893	4.94	0.13	0.04	.103	.000	.000	.471	.002	.906
36.347	0.22	-0.89	-0.22	.000	.003	.000	.471	.005	.906
37.205	-2.80	0.02	0.06	.033	.000	.000	.504	.005	.906
37.223	0.16	-0.03	0.52	.000	.000	.001	.504	.005	.907
37.480	-3.59	-0.01	-0.01	.054	.000	.000	.558	.005	.907
37.518	-2.97	0.01	0.01	.037	.000	.000	.595	.005	.907
37.573	-0.03	-0.02	-0.15	.000	.000	.000	.595	.005	.907
37.662	-0.00	-0.06	0.06	.000	.000	.000	.595	.005	.907
38.082	-0.06	0.81	-2.44	.000	.003	.025	.595	.008	.931
45.838	-5.00	-2.14	0.10	.106	.019	.000	.701	.027	.931
48.084	-0.77	0.27	-1.43	.003	.000	.009	.704	.027	.940
							70.4%	2.7%	94%

Checking Method #

1. Line-by-line checking
2. Alternative Calculation Results compared
3. Identical Calculation Results compared
4. Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUGI/CPSES

Subject SELECTED PROBLEM FOR MASS FRACTION STUDY

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[illegible]	6/27/84									
Checker											

STRESS PROBLEM: AB-1-64D

SYSTEM: COMPONENT COOLING WATER SYSTEM

PIPE SIZE(S): 4 INCH.

APPLICABLE RESPONSE SPECTRA:

BLDG.	ELEVATION (FT)
CONTAINMENT	860.00
CONTAINMENT	805.50
SAFEGUARD	852.50
SAFEGUARD	831.50

SAM LOAD CASE APPLICABLE: YES

MASS FRACTIONS EXHIBITED IN PRESENT ANALYSIS:

SEE ATTACHED SHTS.

X DIR. = .303

Y DIR. = .265

Z DIR. = .227

AVERAGE X, Y, Z = .265

NUMBER OF SUPPORTS IN PROBLEM: 2

NUMBER OF FABRICATED ANCHORS IN PROBLEM: 1

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CASES

Subject MASS FRACTION CALCULATION

Calculation Number AB-1-64D Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[illegible]	6/27/84									
Checker											

AB-1-64D (J29 DTD. 5/8/82)

W = TOTAL SYSTEM WEIGHT = 1249.8 LBS

(W OBTAINED FROM REFERENCED OUTPUT - ADDITION OF LUMPED WEIGHTS)

g = 32.1740 FT/SEC^2 = 386.088 IN/SEC^2

M = TOTAL DYNAMIC MASS = W/g = 1249.8/386.088

M = 3.237

γ_i = MODAL PARTICIPATION FACTOR $i = X, Y, Z$

$\frac{\gamma_i^2}{M}$ = MASS FRACTION PER DIRECTION $i = X, Y, Z$

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI / CPSES

Subject MASS FRACTION CALCULATION

Calculation Number AB-1-64D Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[illegible]	6/27/84								
Checker										

$M = 3.237$

S	γ_x	γ_y	γ_z	$\frac{\gamma_x^2}{M}$	$\frac{\gamma_y^2}{M}$	$\frac{\gamma_z^2}{M}$	$\Sigma \frac{\gamma_x^2}{M}$	$\Sigma \frac{\gamma_y^2}{M}$	$\Sigma \frac{\gamma_z^2}{M}$
23.65	-0.85	-0.39	-0.56	.223	.047	.097	.223	.047	.097
28.033	-0.51	-0.84	0.65	.080	.218	.130	.303	.265	.227
							30.3%	26.5%	22.7%

Checking Method #
1. Line-by-line checking
2. Alternative Calculation Results compared
3. Identical Calculation Results compared
4. Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CPSES

Subject SELECTED PROBLEM FOR MASS FRACTION STUDY

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[signature]	6/27/84									
Checker											

STRESS PROBLEM: AB-2-68X

SYSTEM: STATION SERVICE WATER

PIPE SIZE(S): 10 INCH.

APPLICABLE RESPONSE SPECTRA:

BLDG.	ELEVATION
SAFEGUARD	823.895
AUXILIARY	823.895
AUXILIARY	787.750

SAM LOAD CASE APPLICABLE: YES

MASS FRACTIONS EXHIBITED IN PRESENT ANALYSIS:

SEE ATTACHED SHTS.
X DIR. = .807
Y DIR. = .45
Z DIR. = .56

AVERAGE X, Y, Z = .606

NUMBER OF SUPPORTS IN PROBLEM: 32

NUMBER OF FABRICATED ANCHORS IN PROBLEM: 0

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc.	Job No. 2323	Client TUSI/CPSES
Subject		MASS FRACTION CALCULATION
Calculation Number AB-2-68X		Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[illegible]	6/27/84									
Checker											

AB - 2-68X (J457 DTD 8/10/82)

W = TOTAL SYSTEM WEIGHT = 22259.45

(W OBTAINED FROM REFERENCED OUTPUT - ADDITION OF LUMPED WEIGHTS)

g = 32.1740 FT/SEC^2 = 386.088 IN/SEC^2

M = TOTAL DYNAMIC MASS = W/g = 22259.45/386.088

M = 57.654

γ_i = MODAL PARTICIPATION FACTOR $i = x, y, z$

$\frac{\gamma_i^2}{M}$ = MASS FRACTION PER DIRECTION $i = x, y, z$

Checking Method #
1. Line-by-line checking
2. Alternative Calculation Results compared
3. Identical Calculation Results compared
4. Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI / CPSES

Subject MASS FRACTION CALCULATION SHT. 101

Calculation Number AB - 2-68X Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[illegible]	6/27/84								
Checker										

$M = 57.654$

S	γ_x	γ_y	γ_z	$\frac{\gamma_x^2}{M}$	$\frac{\gamma_y^2}{M}$	$\frac{\gamma_z^2}{M}$	$\Sigma \frac{\gamma_x^2}{M}$	$\Sigma \frac{\gamma_y^2}{M}$	$\Sigma \frac{\gamma_z^2}{M}$
10.078	1.19	.03	.19	.025	.000	.000	.025	.000	.000
10.594	-.34	.06	-2.53	.002	.000	.111	.027	.000	.111
10.867	.13	-.57	-.38	.000	.006	.003	.027	.006	.114
11.815	.05	-.73	-.09	.000	.009	.000	.027	.015	.114
12.102	-.23	-.43	-.01	.001	.003	.000	.028	.018	.114
12.590	-2.40	.36	.41	.10	.002	.003	.128	.02	.117
13.604	.19	-.87	.45	.001	.013	.004	.129	.033	.121
13.780	-1.36	-.14	-1.15	.032	.000	.023	.161	.033	.144
15.109	-1.53	.10	.63	.041	.000	.007	.202	.033	.151
15.419	-.68	.05	-1.13	.008	.000	.022	.21	.033	.173
16.512	-1.36	.94	-.06	.032	.015	.000	.242	.048	.173
17.027	-.67	-1.42	.13	.008	.035	.000	.25	.083	.173
19.04	-3.01	.30	1.19	.157	.002	.025	.407	.085	.198
19.662	-.66	-1.16	-0.17	.008	.023	.001	.415	.108	.199
20.462	-2.91	.06	.05	.147	.000	.000	.562	.108	.199
20.764	-.42	-1.56	-.50	.003	.042	.004	.565	.15	.203
24.302	-.92	-.95	1.03	.015	.016	.018	.58	.166	.221

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI / CPSES

Subject MASS FRACTION CALCULATION

Calculation Number AB-2-68X Sheet No. SHT. 2 OF :

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[illegible]	6/27/84								
Checker										

$M = 57.654$

S	δ_x	δ_y	δ_z	$\frac{\delta_x^2}{M}$	$\frac{\delta_y^2}{M}$	$\frac{\delta_z^2}{M}$	$\Sigma \frac{\delta_x^2}{M}$	$\Sigma \frac{\delta_y^2}{M}$	$\Sigma \frac{\delta_z^2}{M}$
24.619	-1.36	-.59	.60	.032	.006	.006	.612	.172	.227
25.145	-2.58	1.75	-.91	.115	.053	.014	.727	.225	.241
26.459	-.10	-.86	.20	.000	.013	.001	.727	.238	.242
26.911	-1.33	-2.37	.93	.031	.097	.015	.758	.335	.257
28.148	-1.51	-.58	-.54	.04	.006	.005	.798	.341	.262
32.305	-.16	-.35	-.32	.000	.002	.002	.798	.343	.264
32.960	-.47	-.21	-2.27	.004	.001	.089	.802	.344	.353
33.284	-.35	-2.43	-.64	.002	.102	.007	.804	.446	.36
33.675	.44	-.50	-3.40	.003	.004	.200	.807	.45	.56
							80.7%	45.7%	56%

Checking Method #
1 Line-by-line checking
2 Alternative Calculation: Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CPSES

Subject SELECTED PROBLEM FOR MASS FRACTION STUDY

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[illegible]	6/27/84								
Checker										

STRESS PROBLEM: AB-1-92A

SYSTEM: CHEMICAL AND VOLUME CONTROL SYSTEM

PIPE SIZE(S): 3 INCH ; 4 INCH.

APPLICABLE RESPONSE SPECTRA:

BLDG.	ELEVATION
SAFEGUARDS	852.5
SAFEGUARDS	810.5

SAM LOAD CASE APPLICABLE: NO

MASS FRACTIONS EXHIBITED IN PRESENT ANALYSIS:

SEE ATTACHED SHTS.
- X DIR. = .217
- Y DIR. = .126
- Z DIR. = .189

AVERAGE X, Y, Z = .177

NUMBER OF SUPPORTS IN PROBLEM: 14

NUMBER OF FABRICATED ANCHORS IN PROBLEM: 2

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CPSES

Subject MASS FRACTION CALCULATION

Calculation Number AB-1-92A Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[signature]	5/27/84								
Checker										

AB-1-92A (J 784 DTD 5/28/82)

W = TOTAL SYSTEM WEIGHT = 923.32

(W OBTAINED FROM REFERENCED OUTPUT - ADDITION OF LUMPED WEIGHTS)

g = 32.1740 FT/SEC^2 = 386.088 IN/SEC^2

M = TOTAL DYNAMIC MASS = W/g = 923.32/386.088

M = 2.391

γ_i = MODAL PARTICIPATION FACTOR $i = x, y, z$

$\frac{\gamma_i^2}{M}$ = MASS FRACTION PER DIRECTION

$i = x, y, z$

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI / CPSES

Subject MASS FRACTION CALCULATION

Calculation Number AB-1-92A Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[illegible]	6/27/84								
Checker										

$M = 2.391$

f	γ_x	γ_y	γ_z	$\frac{\gamma_x^2}{M}$	$\frac{\gamma_y^2}{M}$	$\frac{\gamma_z^2}{M}$	$\Sigma \frac{\gamma_x^2}{M}$	$\Sigma \frac{\gamma_y^2}{M}$	$\Sigma \frac{\gamma_z^2}{M}$
13.133	-0.61	-.07	.02	.156	.002	.000	.156	.002	.000
23.136	-0.02	-0.44	0.21	.000	.081	.018	.156	.083	.018
26.742	-0.30	-0.26	-0.04	.038	.028	.001	.194	.111	.019
27.336	0.21	0.06	-0.09	.018	.002	.003	.212	.113	.022
28.376	-0.11	-0.14	0.05	.005	.008	.001	.217	.121	.023
31.001	0.03	-0.11	-0.63	.000	.005	.166	.217	.126	.189
							21.7%	12.6%	18.9%

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI/CPSES

Subject SELECTED PROBLEM FOR MASS FRACTION STUDY

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[illegible]	[illegible]								
Checker										

STRESS PROBLEM: AB-1-156

SYSTEM: AUXILIARY FEEDWATER SYSTEM

PIPE SIZE(S): 12 INCH

APPLICABLE RESPONSE SPECTRA:

BLDG.	ELEVATION
SAFEGUARDS	852.5
SAFEGUARDS	790.5

SAM LOAD CASE APPLICABLE: NO

MASS FRACTIONS EXHIBITED IN PRESENT ANALYSIS:

SEE ATTACHED SHTS.
X DIR. = .364
Y DIR. = .027
Z DIR. = .289

AVERAGE X, Y, Z = .227

NUMBER OF SUPPORTS IN PROBLEM: 5

NUMBER OF FABRICATED ANCHORS IN PROBLEM: 1

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

Gibbs & Hill, Inc. Job No. 2323 Client TUSI / CPSES

Subject MASS FRACTION CALCULATION

Calculation Number AB-1-156 Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[illegible]	6/27/84									
Checker											

AB - 1-156 (J 354 DTD 5/25/83)

W = TOTAL SYSTEM WEIGHT = 6020.1

(W OBTAINED FROM REFERENCED OUTPUT - ADDITION OF LUMPED WEIGHTS)

g = 32.1740 FT/SEC^2 = 386.088 IN/SEC^2

M = TOTAL DYNAMIC MASS = W/g = 6020.1 / 386.088

M = 15.593

γ_i = MODAL PARTICIPATION FACTOR $i = x, y, z$

$\frac{\gamma_i^2}{M}$ = MASS FRACTION PER DIRECTION

$i = x, y, z$

Checking Method #
1. Line-by-line checking
2. Alternative Calculation Results compared
3. Identical Calculation Results compared
4. Compare inputs and results of computer with corresponding inputs and results of similar codes

Gibbs & Hill, Inc. Job No. 2323 Client TUSI / CPSES

Subject MASS FRACTION CALCULATION

Calculation Number AB- 1-156 Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #										
Preparer	[illegible]	6/27/84								
Checker										

$M = 15.593$

$	δ_x	δ_y	δ_z	$\frac{\delta_x^2}{M}$	$\frac{\delta_y^2}{M}$	$\frac{\delta_z^2}{M}$	$\Sigma \frac{\delta_x^2}{M}$	$\Sigma \frac{\delta_y^2}{M}$	$\Sigma \frac{\delta_z^2}{M}$
23.352	-0.46	0.17	1.80	.014	.002	.208	.014	.002	.208
23.927	-2.24	-.62	-0.52	.322	.025	.017	.336	.027	.225
29.609	-0.66	0.02	-1.00	.028	.000	.064	.364	.027	.289
							36.4%	2.7%	28.9%

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compar[illegible]
3 Identical Calculation Results compar[illegible]
4 Compare inputs and results of com[illegible] with corresponding inputs and results of similar codes.

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760- 4438
Telex
Domestic 127636/968694
International 428813/234475

A Dravo Company

bcc. N. Williams
L. Weingart
T. Acuba / PF

July 5, 1984

CYGNA	
JOB NO :	84042
DATE LOGGED:	7/6/84
LOG NO. :	#49 (w/o attach
FILE:	211 Mc CR
CROSS REF. FILE	2.1 Mc CR Log; 4.1 Tech Files (attach (#180-183)

GTN- 69218

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George,
Vice President/Project Gen. Mgr.

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
FOLLOW-UP INFORMATION FROM G&H
REF: CYGNA COMMUNICATION REPORTS
DATED MARCH 19, 1984 AND
JUNE 20, 1984

By copy of this letter to Nancy Williams of CYGNA attached please find either responses to or supplemental responses to CYGNA queries on the following items:

#180 a. AB-1-61A - Revised analysis results regarding the inclusion of [illegible]lation and water weights at vales and flanges.

#181 b. AB-1-61D - Response to weldolet section modulus question.

#182 c. Equipment nozzle tapered transition stress intensification factors.

#183 d. Mass point spacing displacement plots - Sensitivity study information.

Should you have any questions, please contact Henry W. Mentel.

Very truly yours,

GIBBS & HILL, Inc.

R. E. Ballard

Robert E. Ballard, Jr.
Project Manager

REBa/HWMe:gw
1 Letter

cc: ARMS (B&R Site) OL
N. Williams (CYGNA, Calif) 1L, 1A
G. Grace (TUSI Site) 1L, 1A
D. Wade (TUSI Site) 1L
P.M. Milam/F. Bleck (TUSI/NY) 1L

180

G&H REVISED RESPONSE TO ITEM 8 OF
CYGNA COMMUNICATIONS REPORT DATED MARCH 19, 1984
REFERENCE: AB-1-61A INSULATION AND FLUID WEIGHT
NEGLECTED AT VALVES/FLANGES

In G&H's responses to CYGNA's questions, G&H concurred with CYGNA that the effect of water and insulation weight was not accounted for in the modeling of flanges and valves. Included in the response was an evaluation of this neglected weight for deadweight and seismic inertia loads. The analysis was performed for a small portion of the piping system where this neglected weight was deemed to be most significant. The seismic inertia loading was analyzed using an equivalent static "g" value analysis.

CYGNA in reviewing the response had additional questions and decided, with G&H's concurrence, that a complete re-analysis was required to more accurately gauge the effect of missing insulation and water weights for flanges and valves. The results of the reanalysis indicated a maximum load increase of 48% at support CC-1-031-003-S43K (See Table 1). A review of the support load increases indicate that the large percentage load increases are confined to the 18-CC-1-031-152-3 line and are due mainly to seismic contributions. A further investigation indicated that lin 18-CC-1-031-152-3 has almost the same identical routing as 18-CC-1-077-152-3, but yet did not feel the same percentage load increases. The reason for the differences in load increases in the two lines was attributed to the differences in the number and location of the lump mass points. The 18-CC-1-077-152-3 had a finer mass point distribution and as such was not subjected to large changes in support loads for small changes in total mass. A sketch indicating lump mass locations are shown on Sketch 1.

It was decided that a truer comparision of the seismic effect of neglected weights of water and insulation for flanges and valves would be to re-run the analysis with and without the neglected weights with a finer mass point distribution for line 18-CC-1-031-152-3. A sketch indicating the additional mass points are shown on Sketch 2.

The result of the refined analysis indicated that the maximum load increase in the upset condition is 6.46% for support CC-1-031-007-S33R. This increase of 6.46% represents a load increase of only 30 lbs. The results of the refined lumped mass model analyses indicated that if the water and insulation weights are a small percentage of the total span weight, its effect on the overall system response is small.

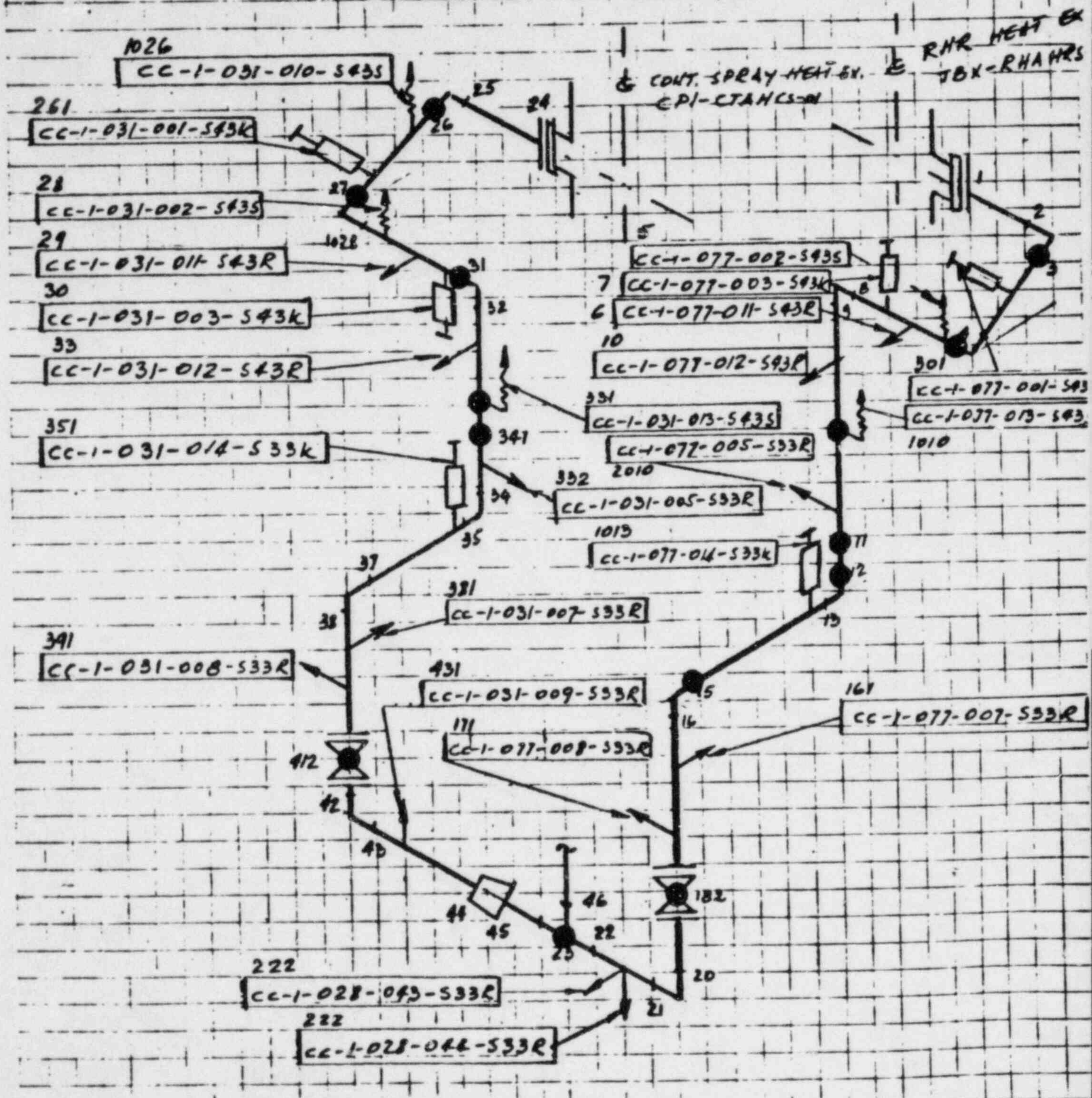
Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUGCO

Subject ORIGINAL LUMPED MASS LOCATION

Calculation Number AB-61A Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #	1										
Preparer	[illegible]	6/22/84									
Checker											

SKETCH 1.



Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUGCO

Subject

Calculation Number AB-1-61A Sheet No. 1

Revision	Original	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Drawing	1									
Preparer	Vsogh	6/21/84								
Checker										

TABLE 1

SUPPORT DRAWING NUMBER	NODE No	UP SET ORIGINAL LUMPED MASS: No ADD. WT Max	No ADD. WT Min	ADD. WT Max	ADD. WT Min	UP % Max	UP % Min
CC-1-009-001-A33R	1134	3181	3089	3248	3152	1.98	2.04
CC-1-009-003-A33R	142	2951	2941	2971	2961	.7	.68
CC-1-009-004-A33R	146	2576	2557	2680	2661	4.04	4.06
CC-1-009-007-A33R	134	1801	-2098	1830	-2128	1.61	1.43
CC-1-009-008-A33K	130	±8207		±8251		.54	
CC-1-009-014-A33R	141	1577	-1418	1585	-1426	.51	.56
CC-1-009-015-A33R	138	996 3064	-961 3029	1010 3084	-975 3048	1.41 .65	1.46 .63
CC-1-020-001-A33K	124	±5200		±5240		.77	
CC-1-020-002-A33R	122	8338	5916	8339	5918	.0119	.03
CC-1-021-001-A33R	118	7968	7420	8343	7795	4.71	5.05
CC-1-028-001-A33R	104	7853 7771	6112 -9505	7853 7756	6111 -9490		
CC-1-028-003-A33R	94	19105	16222	19082	16199		
CC-1-028-004-A33K	991	±16247		±16228			
CC-1-028-005-A33R	99	5149	-4494	5097	-4442		
CC-1-028-006-A33R	1094	9843	-10890	9758	-10805		
CC-1-028-007-S33R	1571	5659	5568	5630	5539		
CC-1-028-017-S33R	721	8308	-13946	8305	-13943		
CC-1-028-019-S33R	731	9386 5422	2215 -3367	9381 5420	2210 -3364		
CC-1-028-020-S33R	76	8073 2517	6025 -2894	8071 2517	6023 -2894		
CC-1-028-022-S33K	772	±17535		±17529			
CC-1-028-023-S33R	773	11880 6006	8862 -5248	11877 6005	8859 -5247		
CC-1-028-024-S33R	83	11144 3752	7153 -4291	11139 3758	7147 -4296		
CC-1-028-026-S33R	842	7482 4063	5865 -4007	7479 4060	5862 -4004		
CC-1-028-027-S33R	87	8551 14129	7223 -13382	8550 14127	7222 -13379		
CC-1-028-033-S33K	891	±15066		±15063			
CC-1-028-034-S33R	50	5911	-3853	5879	-3823		
CC-1-028-035-S33R	521	6532	-5692	6520	-5679		

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUGCO

Subject

Calculation Number AB-1-61A Sheet No. 2

Revision	Orig.	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Drawing Issue	1									
Preparer	[signature]	6/21/84								
Checker										

SUPPORT DRAWING NUMBER	NODE No	UP SET ORIGINAL LUMPED MASS				UP Max %	UP Min %	
		NO ADD. WT		ADD. WT				
		Max	Min	Max	Min			
CC-1-028-036-S33R	54	6819	5482	6813	5476			
CC-1-028-038-S33R	47	2519	-3690	3078	-4238	21.16	14.85	
CC-1-028-039-S33R	50	4459	-4394	4452	-4387			
CC-1-028-042-A33R	100	14302	11394	14294	11387			
CC-1-028-043-S33R	222	3262	-3897	3461	-4106	6.1	5.36	
CC-1-028-044-S33R	222	10316	5492	11283	6459	9.37	17.6	
CC-1-028-700-A33R	1110	5108	4602	5107	4601			
CC-1-028-701-A33R	1000	8148	-6790	8219	-6860	.87	1.03	
CC-1-028-713-S33K	642	±16346		±16334				
CC-1-028-714-S33K	661	±3240		±3236				
CC-1-028-720-S33R	602	3276 6583	-4529 6087	3268 6577	-4522 6081			
CC-1-028-721-S33R	63	9754 10855	-5938 9471	9752 10849	-5936 9466			
CC-1-028-723-S33R	66	18395	15166	18386	15157			
CC-1-028-725-S33R	552	8771	-4470	8675	-4373			
CC-1-028-726-S33R	571	±3875		±3869				
CC-1-031-001-S43K	261	±1402		±1791		27.75		
CC-1-031-002-S43S	28	900		898				
CC-1-031-003-S43K	30	±899		±1336		48.6		
CC-1-031-005-S33R	332	609	-381	652	-421	7.1	10.5	
CC-1-031-007-S33R	381	1194	-1458	1732	-1997	45.05	37.	
CC-1-031-008-S33R	391	737	-2818	1001	-3145	35.82	11.6	
CC-1-031-009-S33R	431	9484	6236	11134	7886	17.39	26.5	
CC-1-031-010-S43S	1026	1294		1294				
CC-1-031-011-S43R	29	2049	-1313	2200	-1460	7.4	11.2	
CC-1-031-012-S43R	33	1431	-2001	1524	-2094	6.5	4.65	
CC-1-031-013-S43S	331	3256		3260		.12		
CC-1-031-014-S43K	351	±574		±594		3.48		

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of other codes

Gibbs & Hill, Inc. Job No. 00-23 23-030 Client TUGCO

Subject

Calculation Number AB-1-61A Sheet No. 3

Revision	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
	1									
Preparer	[illegible]	6/21/84								
Checker										

SUPPORT DRAWING NUMBER	NODE No	UPSET [illegible] LUMPED MASS				UP %	UP %
		NO ADD. WT		ADD. WT			
		Max	Min	Max	Min	Max	Min
CC-1-077-001-S33K	301	±1341		±1382		3.06	
CC-1-077-002-S43S	5	1620		1619			
CC-1-077-003-S43R	7	±989		±989			
CC-1-077-005-S33R	2010	-1544	-1750	-1578	-1784	2.2	1.9
CC-1-077-007-S33R	161	2563	-3085	2492	-3010		
CC-1-077-008-S33R	171	2683	818	2722	857	1.45	4.76
CC-1-077-011-S43R	6	3388	-2381	3402	-2391	.4	.4
CC-1-077-012-S43R	10	1908	-2361	1946	-2399	2.	1.61
CC-1-077-013-S43S	1010	3191		3196		.16	
CC-1-077-014-S43K	1013	±880		±953			8.3

Checking Method #
1 Line by line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar cases

F-166, 7-[illegible]

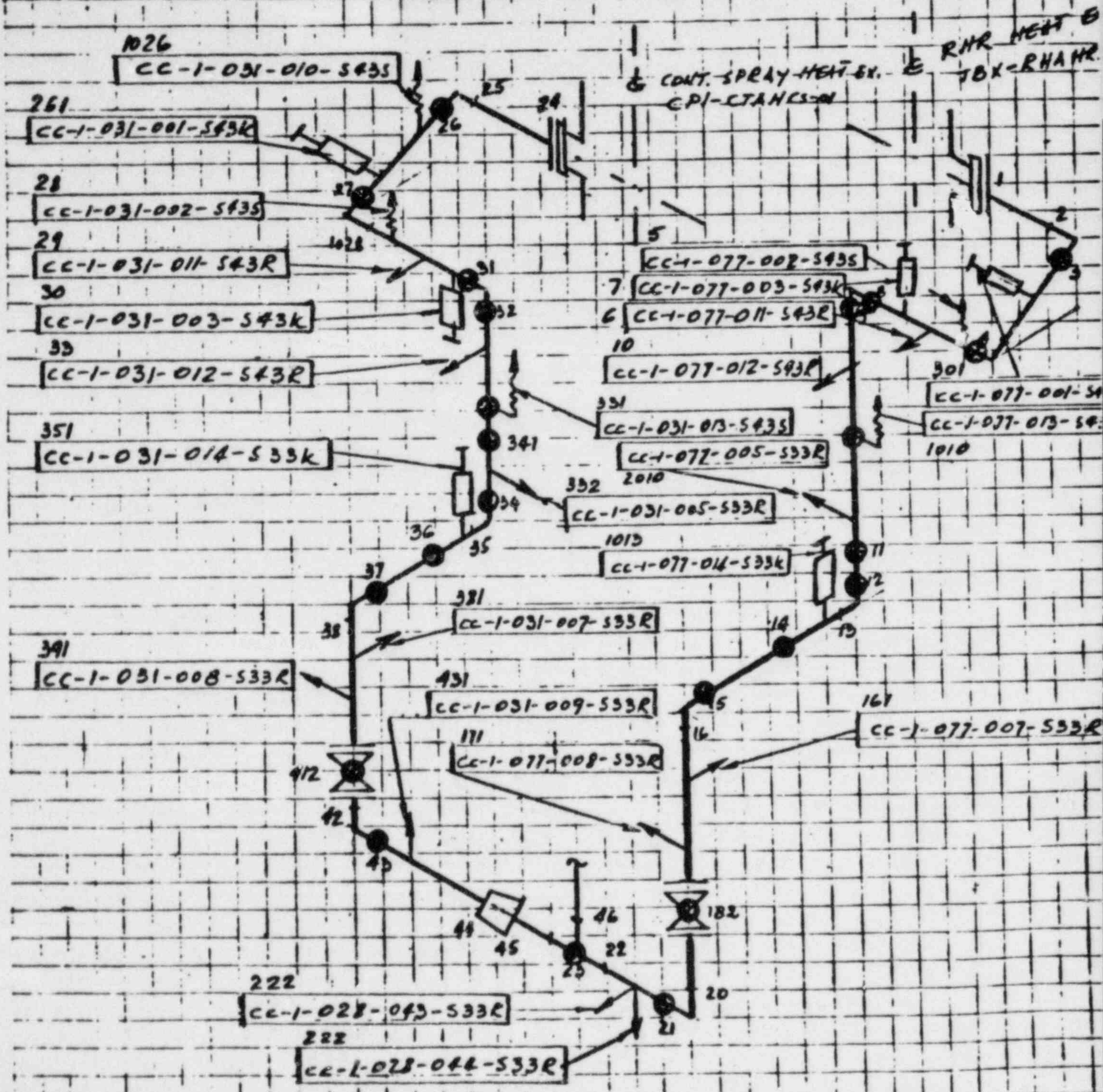
Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUGCO

Subject RELUMPED MASS LOCATION

Calculation Number AB-61A Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #	1						4			
Preparer	P. [illegible]	6/22/84								
Checker										

SKETCH 2



Checking Method #
1. Line-by-line checking
2. Alternative Calculation Results compared
3. Identical Calculation Results compared
4. Compare inputs and results of computer with corresponding inputs and results of similar codes.

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUGCO

Subject

Calculation Number AB-61A Sheet No. 1

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method	1									
Preparer	O pople	6/22/84								
Checker										

TABLE 2.

SUPPORT DRAWING NUMBER	NODE No.	UPSET RELUMPED MASS NO ADD. WT MAX	MIN	ADD. WT MAX	MIN	UP % MAX	UP % MIN
CC-1-009-001-A33R	1134	3183	3091	3245	3153	1.95	2.01
CC-1-009-003-A33R	142	2957	2948	2969	2960	.41	.41
CC-1-009-004-A33R	146	2577	2558	2695	2676	4.58	4.61
CC-1-009-007-A33R	134	1800	-2098	1823	-2121	1.27	1.906
CC-1-009-008-A33K	130	±8266		±8251		±.55	
CC-1-009-014-A33R	141	1578	-1419	1534	-1375		
CC-1-009-015-A33R	138	996 3068	-961 3032	999 3080	-964 3044	.3 .39	.3 .4
CC-1-020-001-A33K	124	±5201		±5249		±.92	
CC-1-020-002-A33R	122	8339	5917	8350	5929	.13	.2
CC-1-021-001-A33R	118	7968	7420	8302	7753	4.19	4.49
CC-1-028-001-A33R	104	7858 7812	6117 -9546	7778 6543	6036 -8277		
CC-1-028-003-A33R	94	19202	16319	17573	14690		
CC-1-028-004-A33K	991	±16265		±15866			
CC-1-028-005-A33R	99	5097	-4442	5052	-4397		
CC-1-028-006-A33R	1094	9814	-10860	8575	-9621		
CC-1-028-007-S33R	1571	5624	5533	5554	5463		
CC-1-028-017-S33R	721	8303	-13940	7168	-12805		
CC-1-028-019-S33R	731	9383 5424	2212 -3369	9058 4901	1887 -2846		
CC-1-028-020-S33R	76	8122 2526	6075 -2901	7361 2381	5314 -2757		
CC-1-028-022-S33K	772	±17630		±16597			
CC-1-028-023-S33R	773	11940 6017	8922 -5259	10940 5875	7922 -5117		
CC-1-028-024-S33R	83	11228 3765	7236 -4303	9726 3281	5734 -3819		
CC-1-028-026-S33R	842	7513 4075	5896 -4018	6941 3943	5324 -3886		
CC-1-028-027-S33R	87	8553 14131	7225 -13383	8511 14178	7184 -13430	.33	.35
CC-1-028-033-S33K	891	±15074		±15109		±.23	
CC-1-028-034-S33R	50	6029	-3972	5927	-3870		
CC-1-028-035-S33R	521	6652	-5812	5558	-4717		

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUGCO

Subject

Calculation Number AB-1-61A Sheet No. 2

Revision	Orig. Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method	1									
Preparer	0/30/12	6/22/84								
Checker										

SUPPORT DRAWING NUMBER	NODE No	UPSET RELUMPED MASS				UP %	UP %
		NO ADD. WT		ADD. WT			
		MAX	MIN	MAX	MIN	MAX	MIN
CC-1-028-036-S33 R	54	6813	5476	6769	5432		
CC-1-028-038-S33 R	47	2580	-3751	2303	-3493		
CC-1-028-039-S33 R	50	4392	-4327	4337	-4271		
CC-1-028-042-A33 R	100	14298	11453	14296	11388		
CC-1-028-043-S33 R	222	3211	-3847	3120	-3765		
CC-1-028-044-S33 R	222	9627	4803	9284	4460		
CC-1-028-700-A33 R	1110	5107	4601	5084	4578		
CC-1-028-701-A33 R	1000	8166	6809	7723	-6364		
CC-1-028-713-S33 K	642	±16405		±12126			
CC-1-028-714-S33 K	661	±3287		±2542			
CC-1-028-720-S33 R	602	3313 6573	-4566 6076	3107 6591	-4361 6094		
CC-1-028-721-S33 R	63	9786 10849	-5970 9465	9889 9802	-6073 8418		
CC-1-028-723-S33 R	66	18385	15156	16427	13198		
CC-1-028-725-S33 R	552	8614	-4312	8433	-4131		
CC-1-028-726-S33 K	571	±3923		±3729			
CC-1-031-001-S43 K	261	±2920		±2662			
CC-1-031-002-S43 S	28	900		898			
CC-1-031-003-S43 K	30	±704		±655			
CC-1-031-005-S33 R	332	1333	-1105	1227	-996		
CC-1-031-007-S33 R	381	464	-728	494	-758	6.46	4.12
CC-1-031-008-S33 R	391	751	-2832	682	-2826		
CC-1-031-009-S33 R	431	7873	4625	7831	4583		
CC-1-031-010-S43 S	1026	1294		1294			
CC-1-031-011-S43 R	29	1917	-1181	1829	-1089		
CC-1-031-012-S43 R	33	1003	-1573	957	-1526		
CC-1-031-013-S43 S	331	3256		3260		.12	
CC-1-031-014-S43 K	351	±774		±752			

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar cases

Gibbs & Hill, Inc. Job No. 00-2323-030 Client

Subject

Calculation Number AB-1-61A Sheet No. 3

Revision	Orig. Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Drawing Affected	1									
Preparer	[illegible]	6/21/84								
Checker										

SUPPORT DRAWING NUMBER	NODE No	UPSET RELUMPED MASS NO ADD. WT MAX	MIN	ADD WT MAX	MIN	UP % MAX	UP % MIN	
CC-1-077-001-S33K	301	±6040		±5681				
CC-1-077-002-S43S	5	1620		1619				
CC-1-077-003-S43K	7	±1433		±1368				
CC-1-077-005-S33R	2010	2637	-3113	2504	-2984			
CC-1-077-007-S33R	161	1727	-2250	1499	-2018			
CC-1-077-008-S33R	171	3552	1687	3484	1620			
CC-1-077-011-S43R	6	3056	-2049	3116	-2105	1.96	2.73	
CC-1-077-012-S43R	10	1362	-1815	1405	-1859	3.16	2.42	
CC-1-077-013-S43S	1010	3191		3196		.15		
CC-1-077-014-S43K	1013	±681		±693		1.76		

Checking Method #
1 Line by line checking
2 Alternate Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-8

181

G&H RESPONSE TO ITEM 8 FOLLOW-UP QUESTION IN CYGNA
COMMUNICATIONS REPORT DATED JUNE 20, 1984
REFERENCE: **AB-1-61D** WELDOLET

Regarding problem No. AB-1-61D and the weldolet connection between the 24 inch run pipe and 10 inch branch pipe, G&H concurs with CGYNA on the following:

1. The G&H analyst utilized an SIF=1.5 at nodes 461 and 2459. This was noted as an error by the G&H checker.

2. A calculation generating an SIF of 7.9 was performed. This was done on the basis of the code branch formula which is a function of Rp - The radius of the integral attachment between the run and branch pipe.

3. The above SIF=7.9 was used to correct the adlpipe stresses. However, also utilized was the weldolet section modulus which has no code justification.

Upon review, the branch formula should not have been used. More applicable formulae are presented by Bonney Forge in their weldolet catalog. From their Designer's Data section, the appropriate SIF for a full size weldolet is calculated as follows:

$$h = 3.3\ T/r$$
$$i = .9/h^{2/3}$$

T = Run Pipe Thickness
r = Run Pipe Mean Radius

While in this application (61D) the weldolet is for a reducing not full size outlet the SIF determined by the above formulae is conservative (by analogy, considering that the SIF represents the area of the header).

Utilizing the above formulae:

24 Inch Pipe T = .375 inch
r = 11.8125 inche

$$h = 3.3\ (.375)/11.8125 = .10476$$
$$i = .9/(.10476)^{2/3} = 4.05$$

CYGNA 1/10
JOB NO.: 84042
DATE LOGGED: 7/6/84
LOG NO.: #181
FILE: II.1 Tech Files
II Tech Files
CROSS REF.: 2.1.1 ~~(#49)~~

The present adlpipe stresses for nodes 461 and 2459 are as follows:

Node	EQ. 8 (psi)	EQ. 9	EQ. 10	EQ. 11
461	2739	3068	3729	6468
2459	1981	2576	11156	13137

Application of the ratio 4.05/1.5 across the board without deleting the pressure term from EQS. 8,9 and 11 results in:

461	7395	8284	10068	17464
2459	5349	6955	30121	35470
Allowables	15000	18000	22500	37500

While EQ. 10 for 2459 fails the allowable, EQ. 11 passes adequately.

Gibbs & Hill, Inc. Job No. 2323 Client CPSES/TUSI

Subject CYGNA ITEM 8

Calculation Number Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer	[illegible]	7/2/84									
Checker											

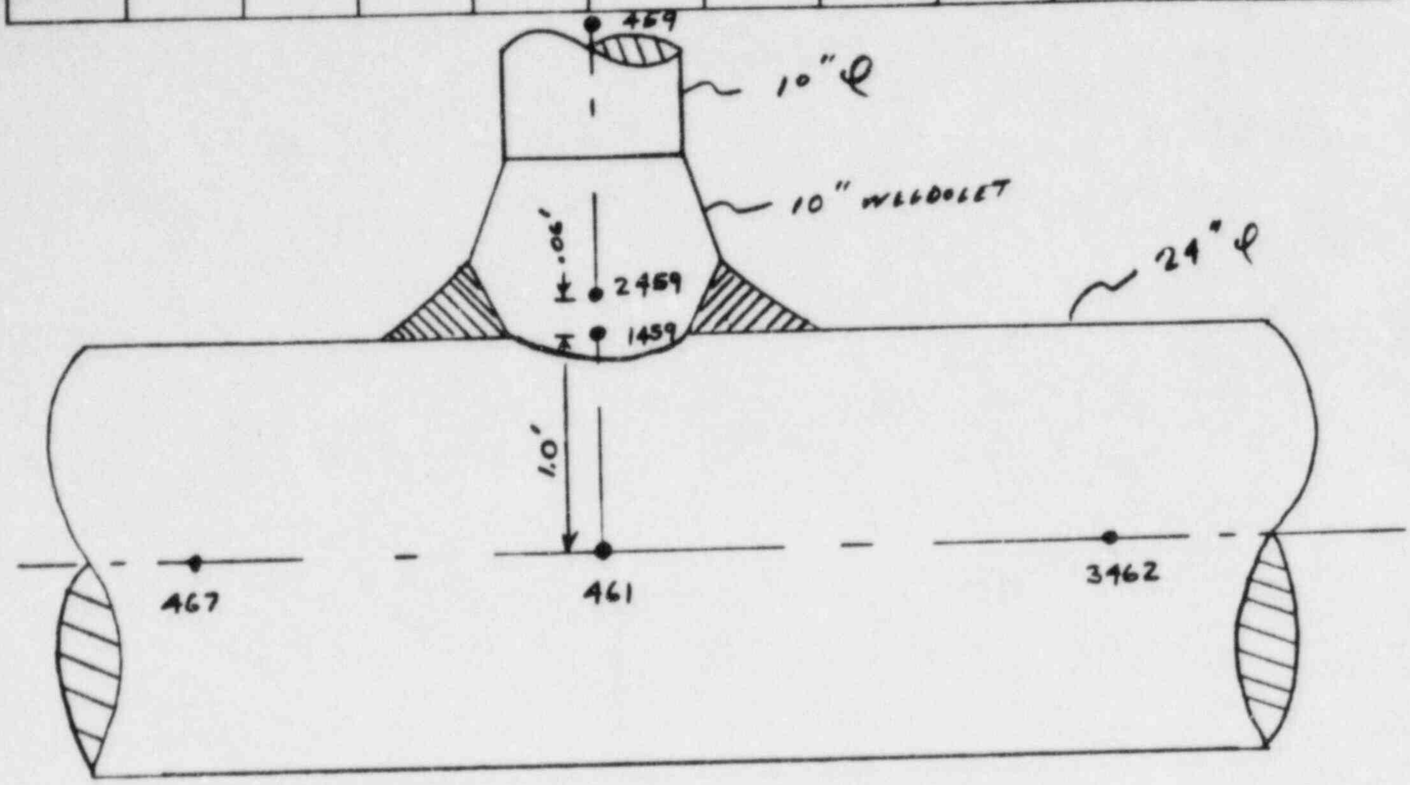


FIGURE 1

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-82

G&H RESPONSE TO ITEM 8 OF
CYGNA COMMUNICATIONS REPORT DATED JUNE 20, 1984
REFERENCE: EQUIPMENT NOZZLE TTJ

The G&H As-Built Stress Analysis Checklist (part of G&H Procedure AB-1) requires that an SIF=1.9 be supplied for all taper transition joints (TTJ), specifically connections between valves and piping; weld neck flange and piping. While not specifically called out, the checklist question inherently requires an SIF=1.9 on equipment nozzles. However, while the TTJ SIF is always required on valves and weld neck flanges the requirement for the nozzles is dependent on the weld preparation of the nozzle. The G&H analysts used available in-house vendor information and their own experience in deciding whether or not an SIF should be applied. The TTJ SIF was not applied across the board on all nozzles. Weld preparation details were not available in many instances. Also there are instances where the SIF of the connecting component was higher and utilized in place of the TTJ SIF (Example: CYGNA Item 3a in communications report dated March 12, 1984 - G&H Response was that the connection in AB-1-1,2,3, and 4 between the Steam Generator and Piping was by an elbow with an SIF=2.245. Therefore, a TTJ SIF=1.9 was not input into the analysis).

MAIN STEAM LOOP 3 - MASS POINT SENSITIVITY STUDY

A analysis was performed to determine the sensitivity of the steam hammer solution for mass point location. An analysis was performed using main steam loop 3 to determine the effect of additional mass points on support loads and the displacement profile of various node points. A sketch of the piping system with the additional chosen lump mass points is shown on Figure A. A table of support load comparision is shown in Table 1.

The results in Table 1 indicate that there was virtually no change in support load between the original as-built model and the additional lump mass model.

Attached are also displacement plots of various node points (Figures 1 thru 30). A comparison of the displacement plots indicate virtually identical responses for the two models.

Gibbs & Hill, Inc. Job No. Client

Subject COMPARISON OF STEAMHAMMER LOADS FOR LOOP 3 - REFINED & UNREFINED MASS POINTS

Calculation Number Sheet No.

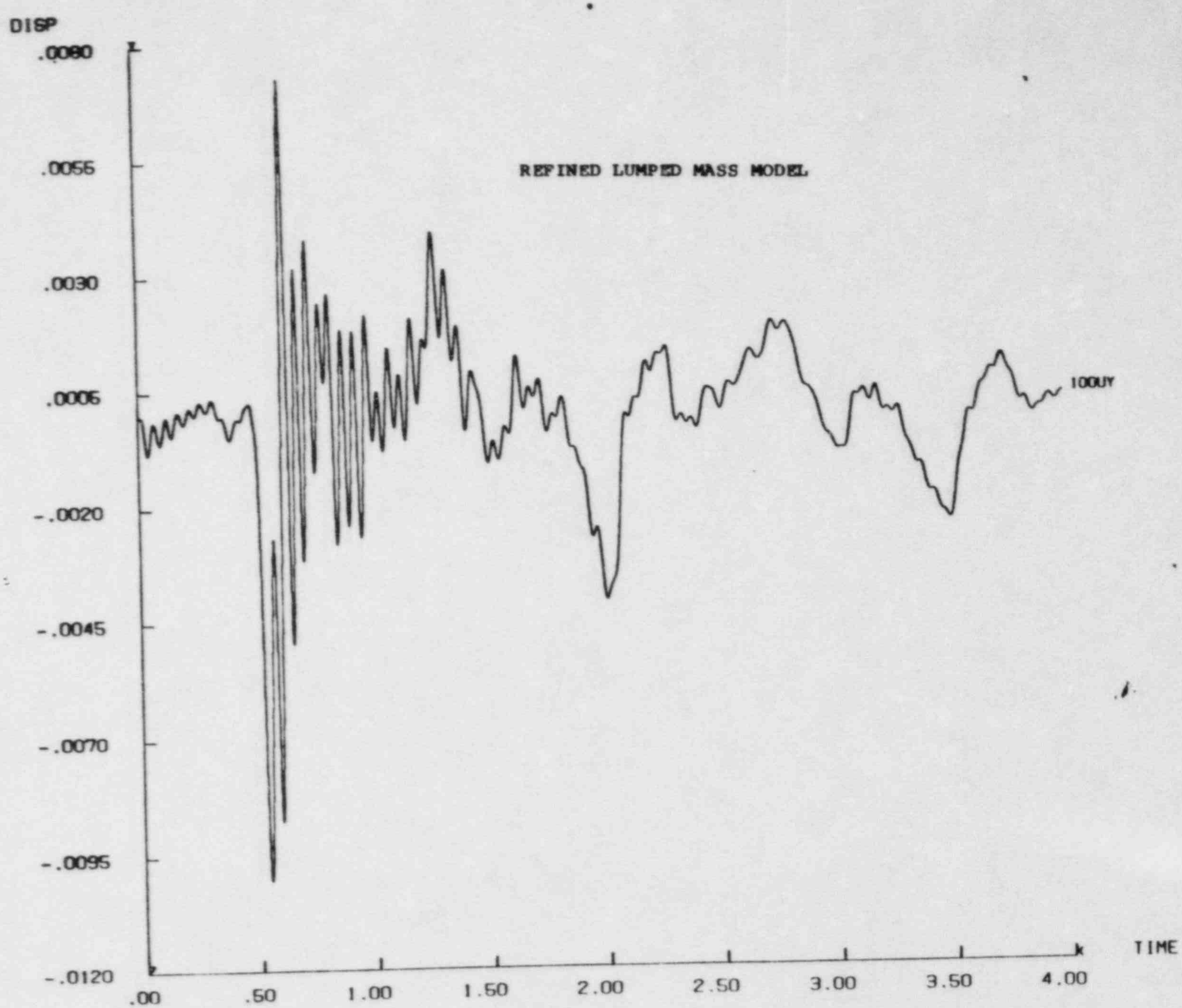
Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method #											
Preparer											
Checker											

TABLE - 1.

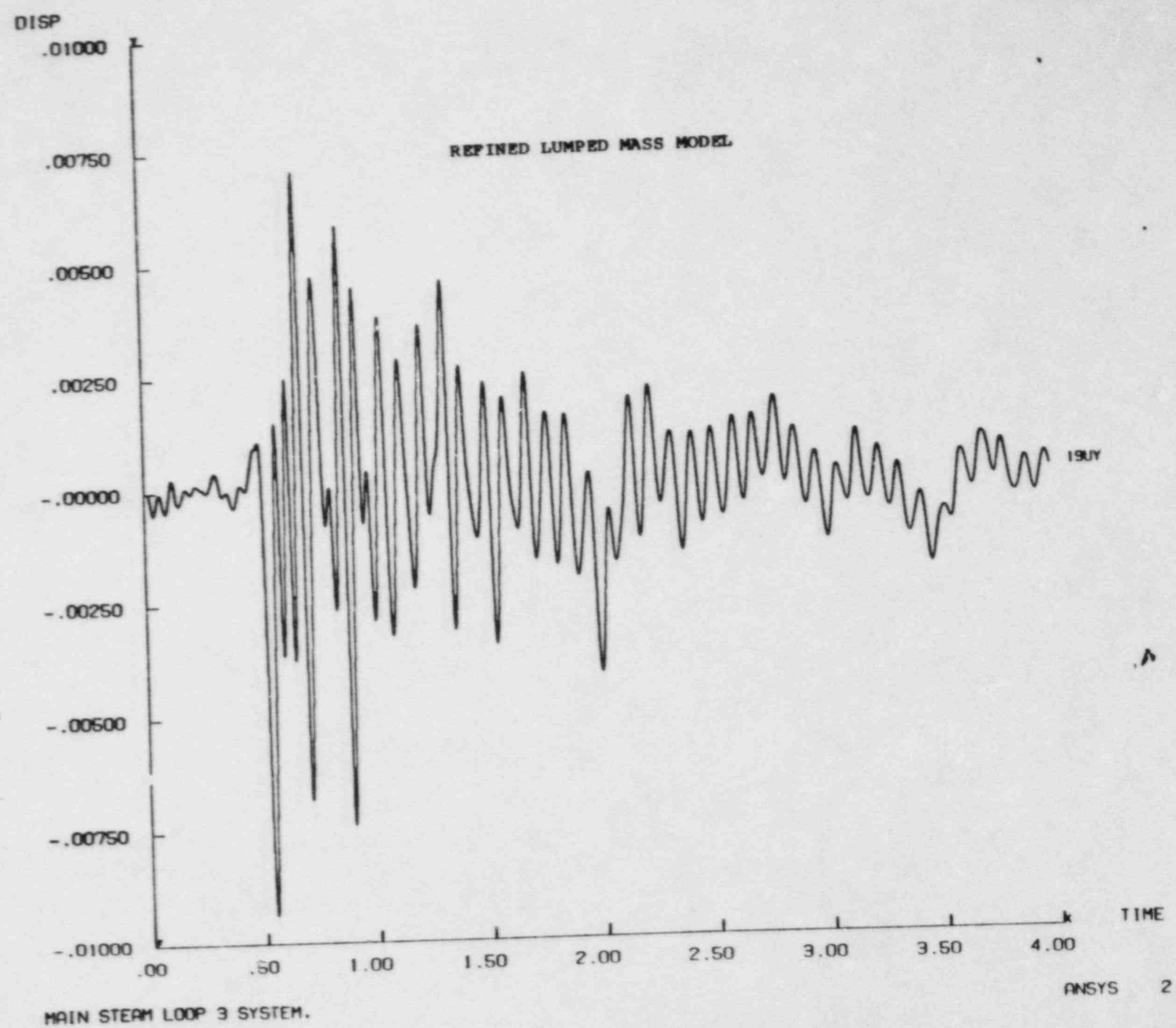
MARK Nº	ORIGINAL AS-BUILT MODEL STEAMHAMMER LOAD (KIPS)	REFINED LUMPED MASS MODEL - STEAM HAMMER LOAD (KIPS)
MS-1-03-005-C72K	± 7.04	± 7.03
-006-	± 2.78	± 2.78
-007-	± 44.79	± 44.72
-008-	± 0.55	± .54
-009-	± 54.62	± 54.18
-010-	± 53.76	± 53.43
-011-	± 1.10	± 1.13
-012-	± 13.47	± 13.46
-013-	± 11.91	± 11.83
-014-	± 20.13.	± 20.63

F-166, 7-82

Checking Method #
1. Line-by-line checking
2. Alternative Calculation Results compared
3. Identical Calculation Results compared
4. Compare inputs and results of computer with corresponding inputs and results of similar codes



MAIN STEAM LOOP 3 SYSTEM.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2.00
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3.00
3.50
4.00
TIME
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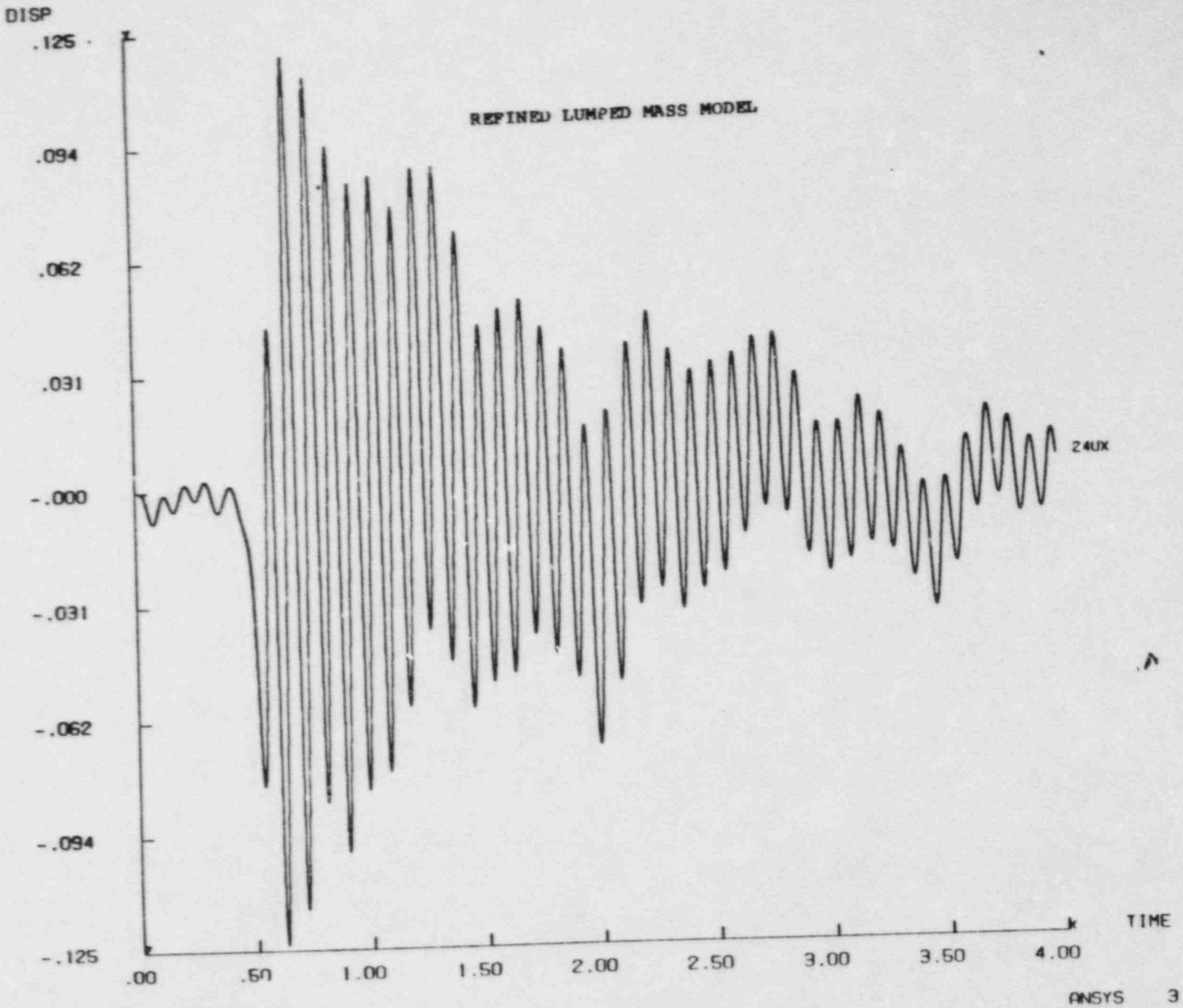
MAIN STEAM LOOP 3 SYSTEM.



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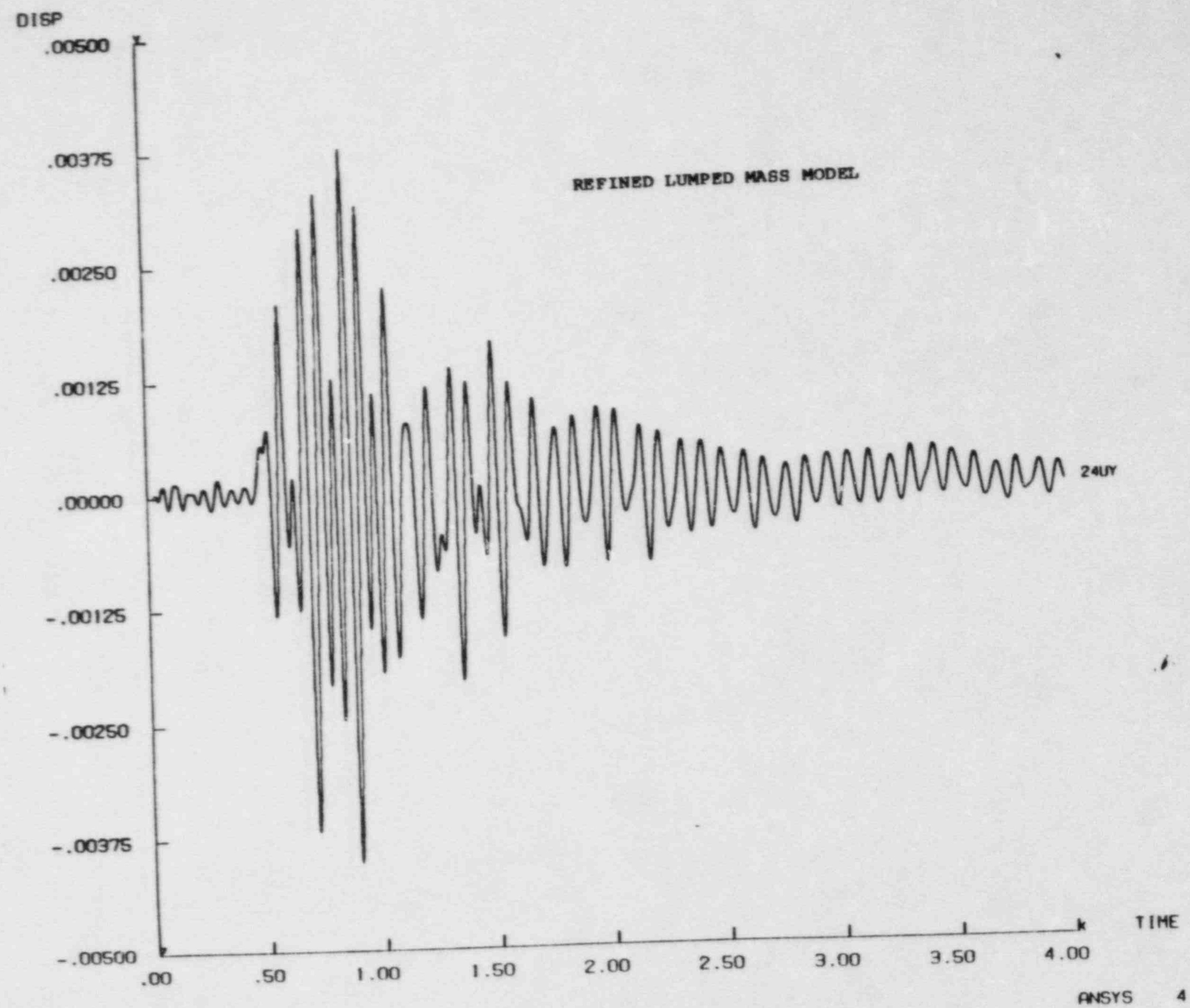

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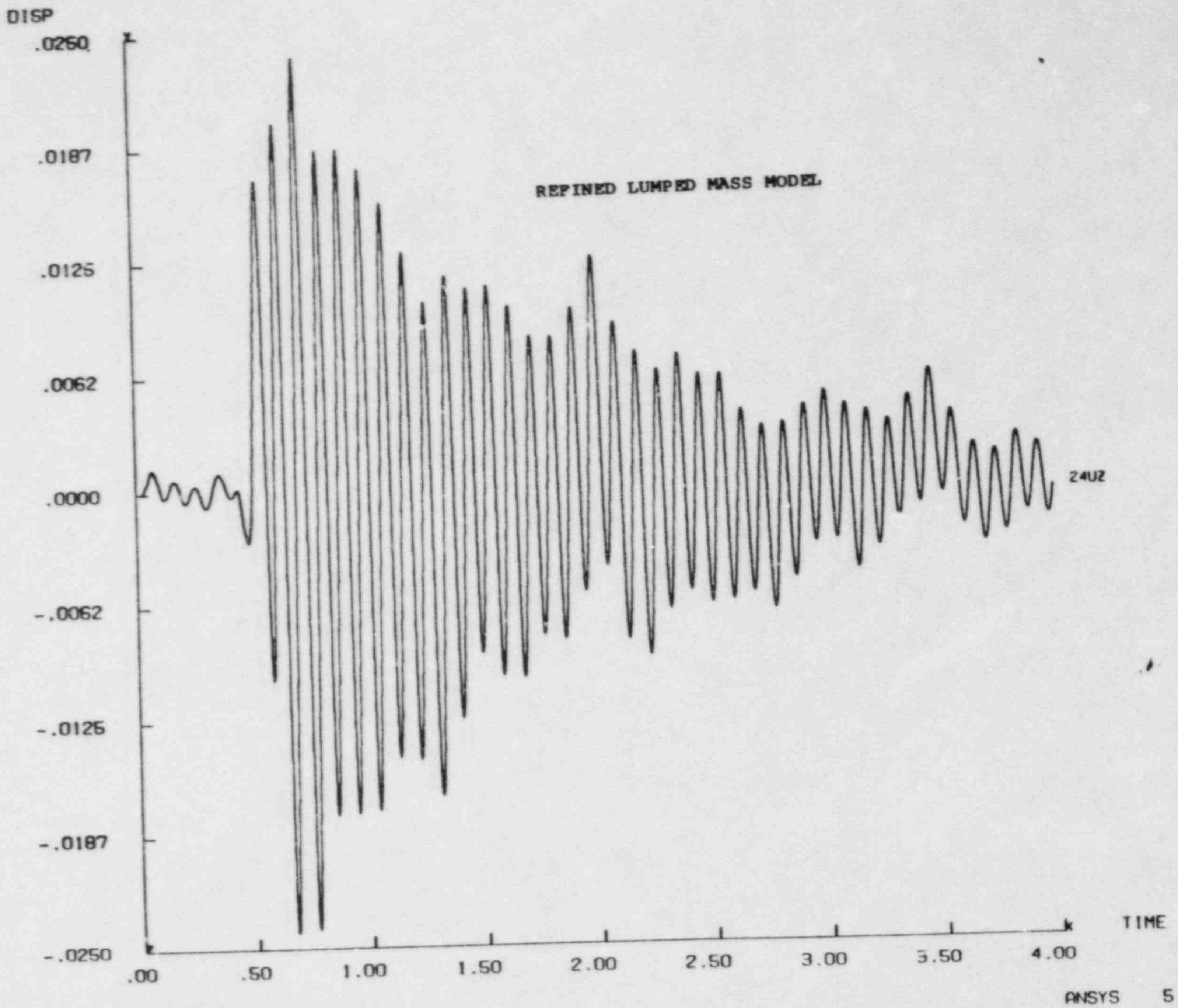

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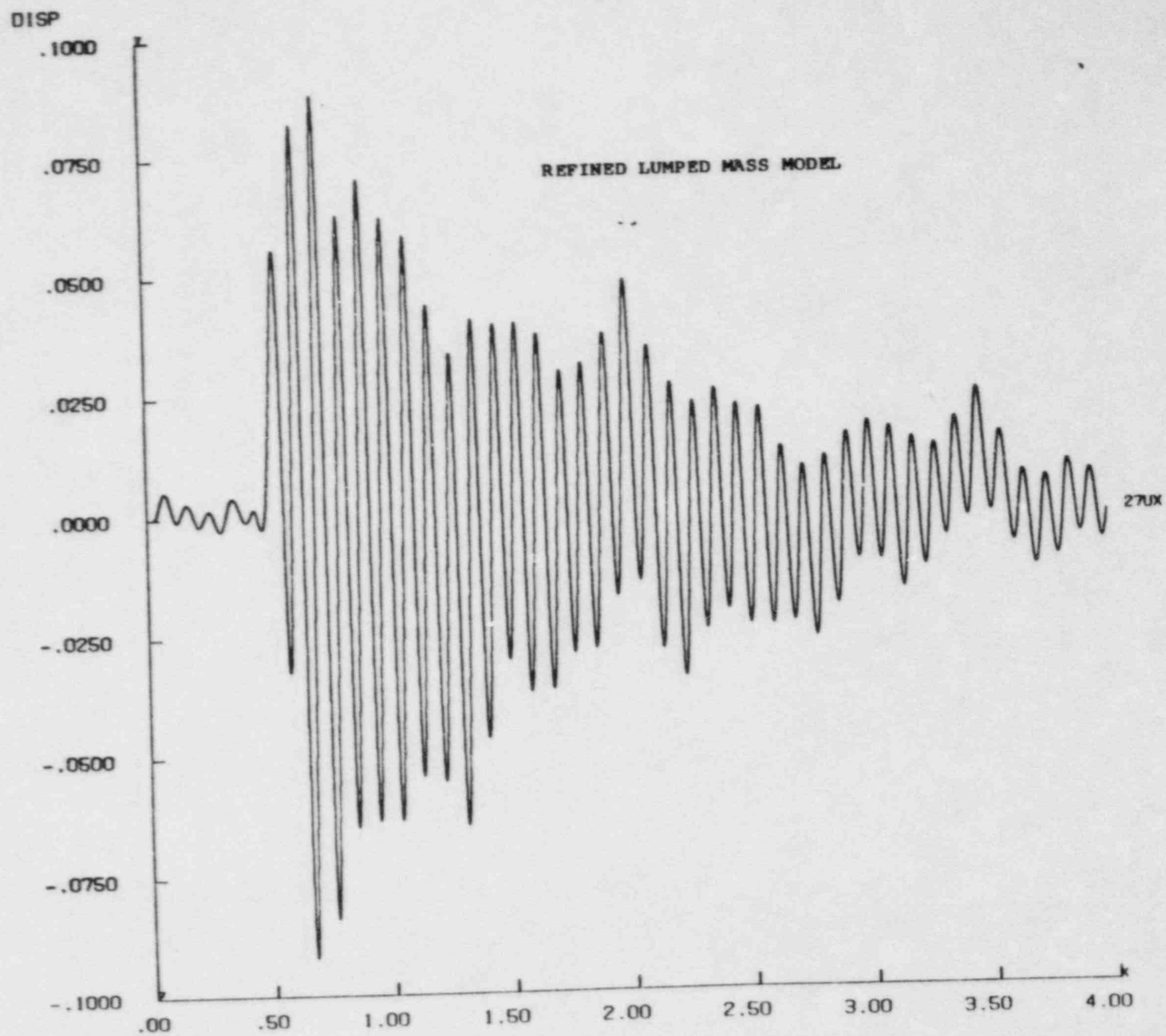

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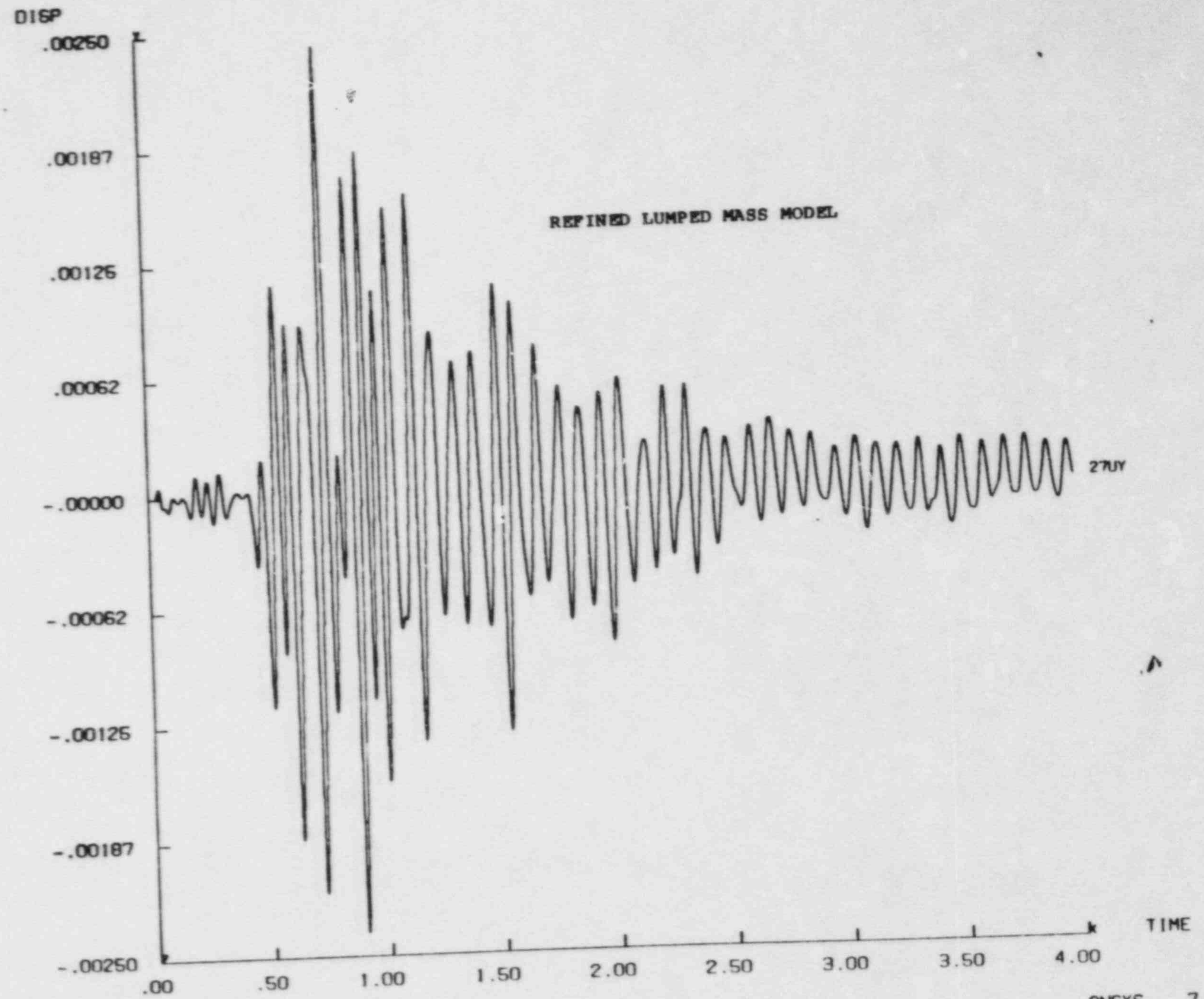

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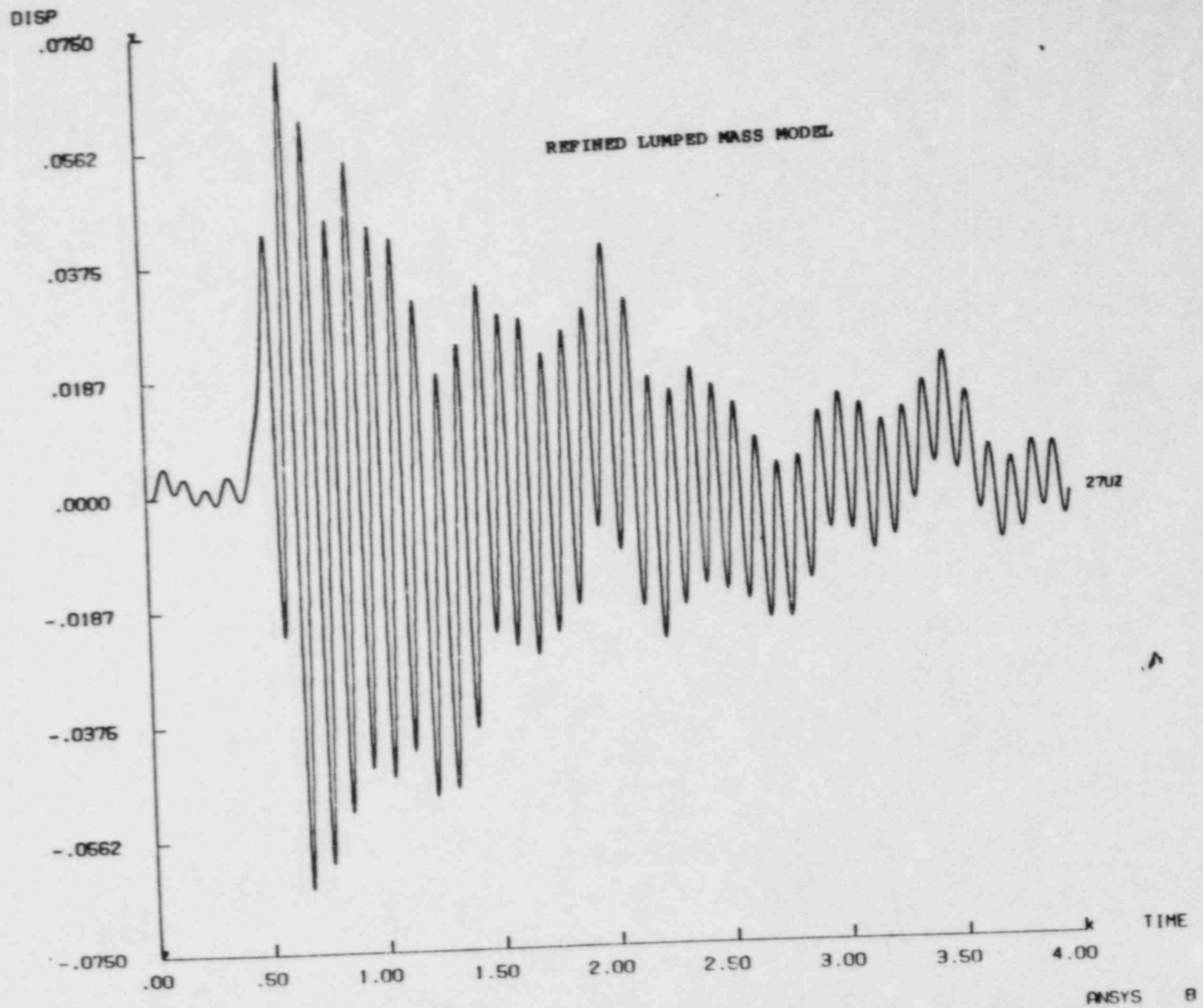

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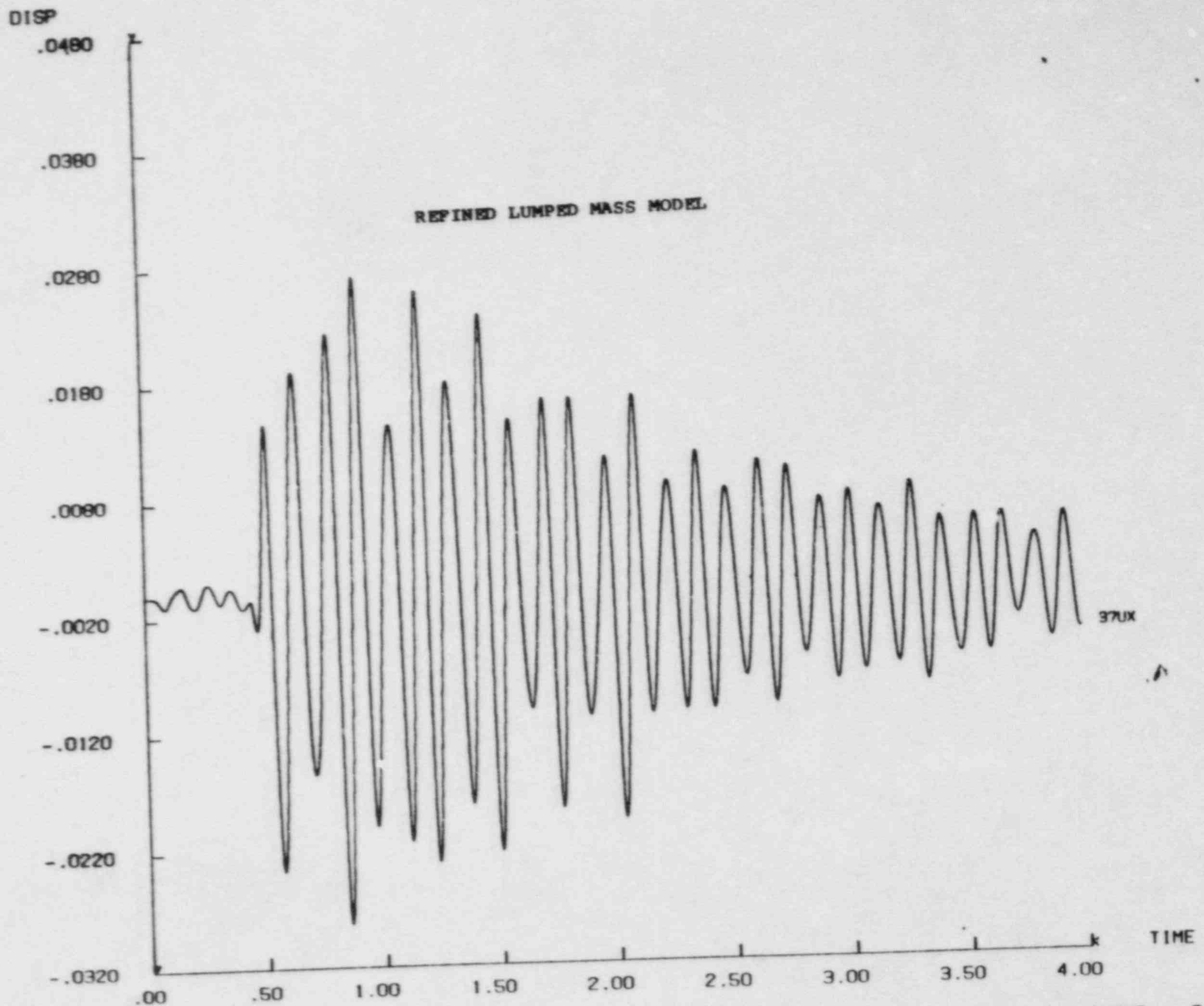

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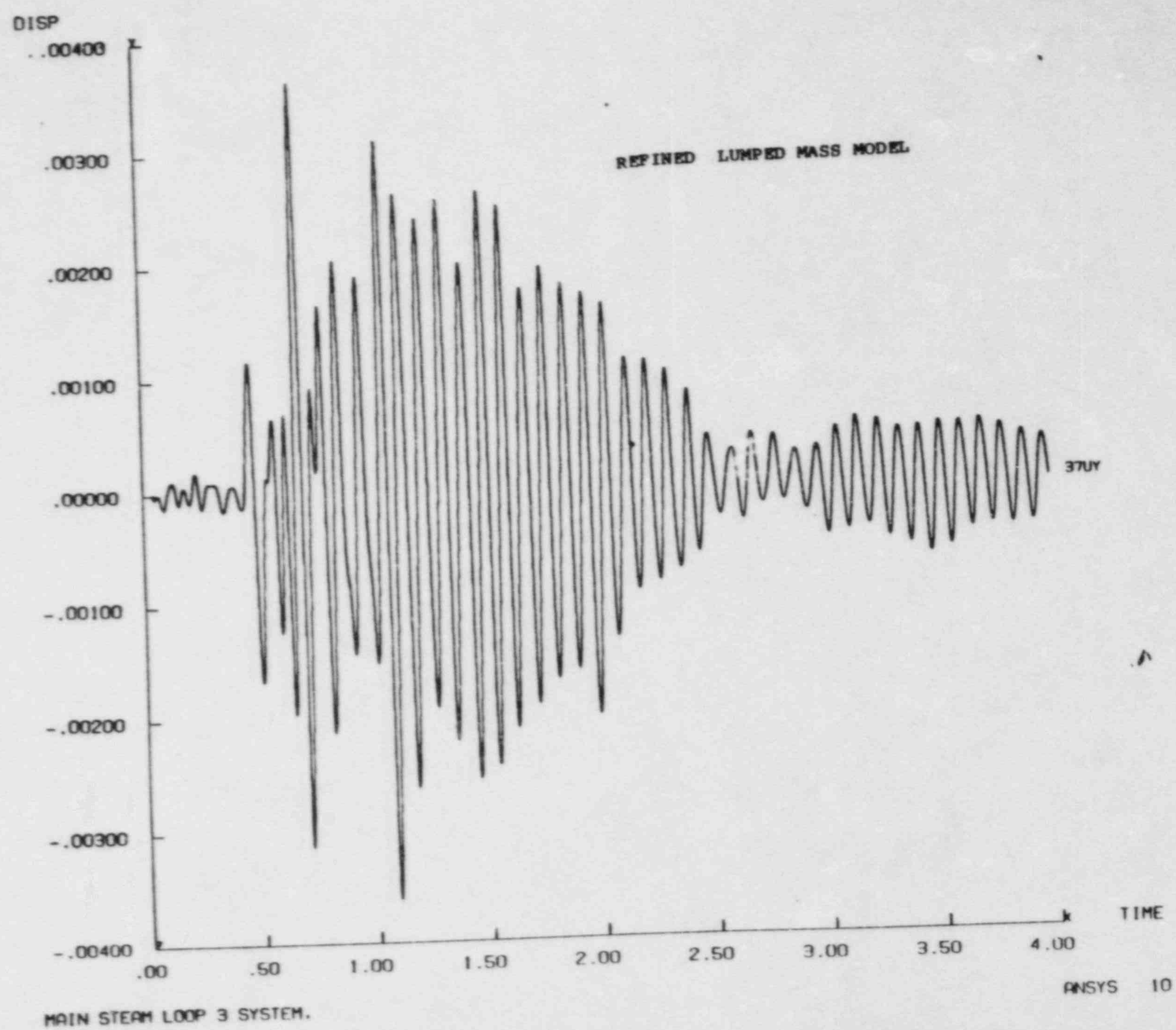
MAIN STEAM LOOP 3 SYSTEM.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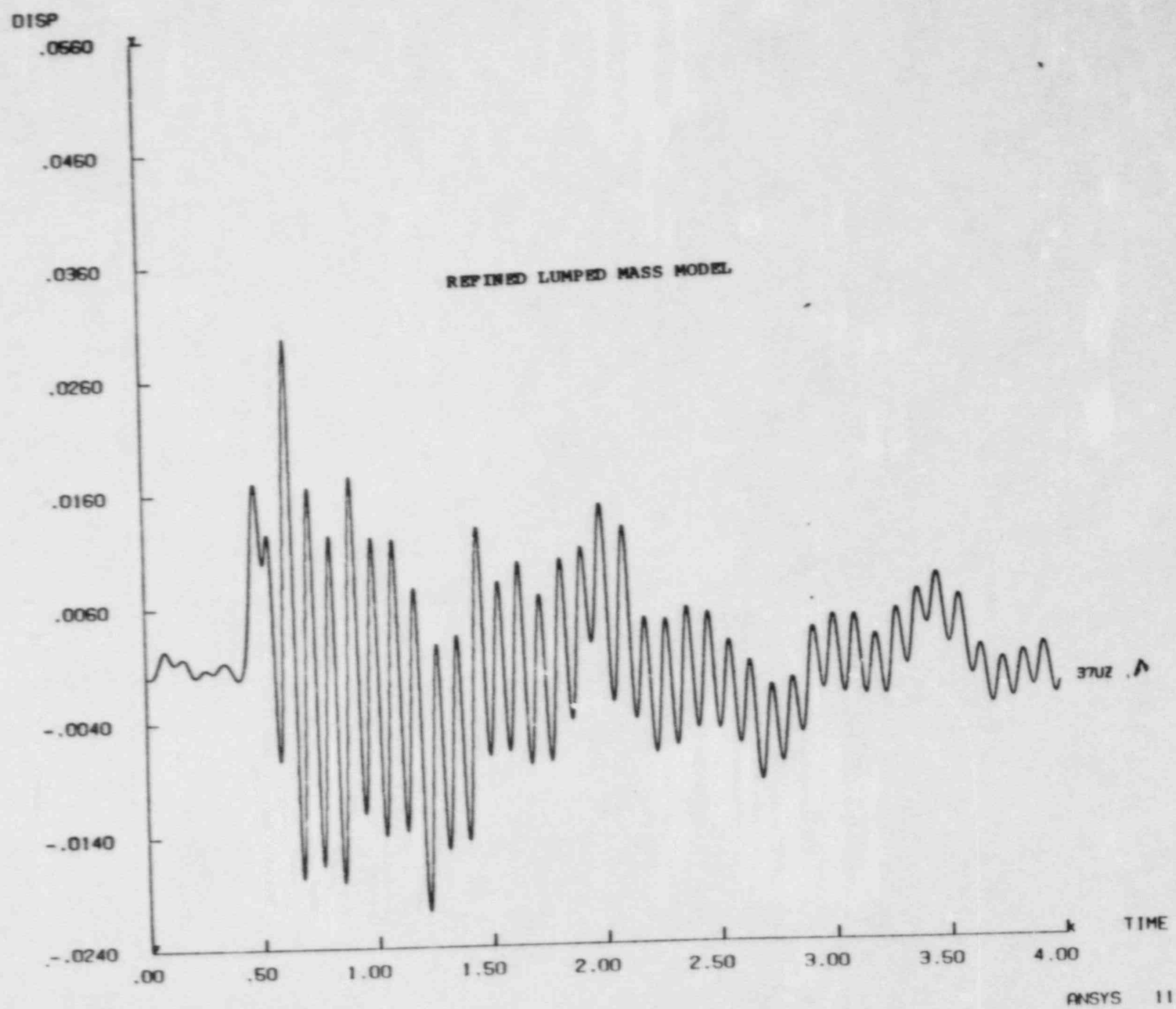

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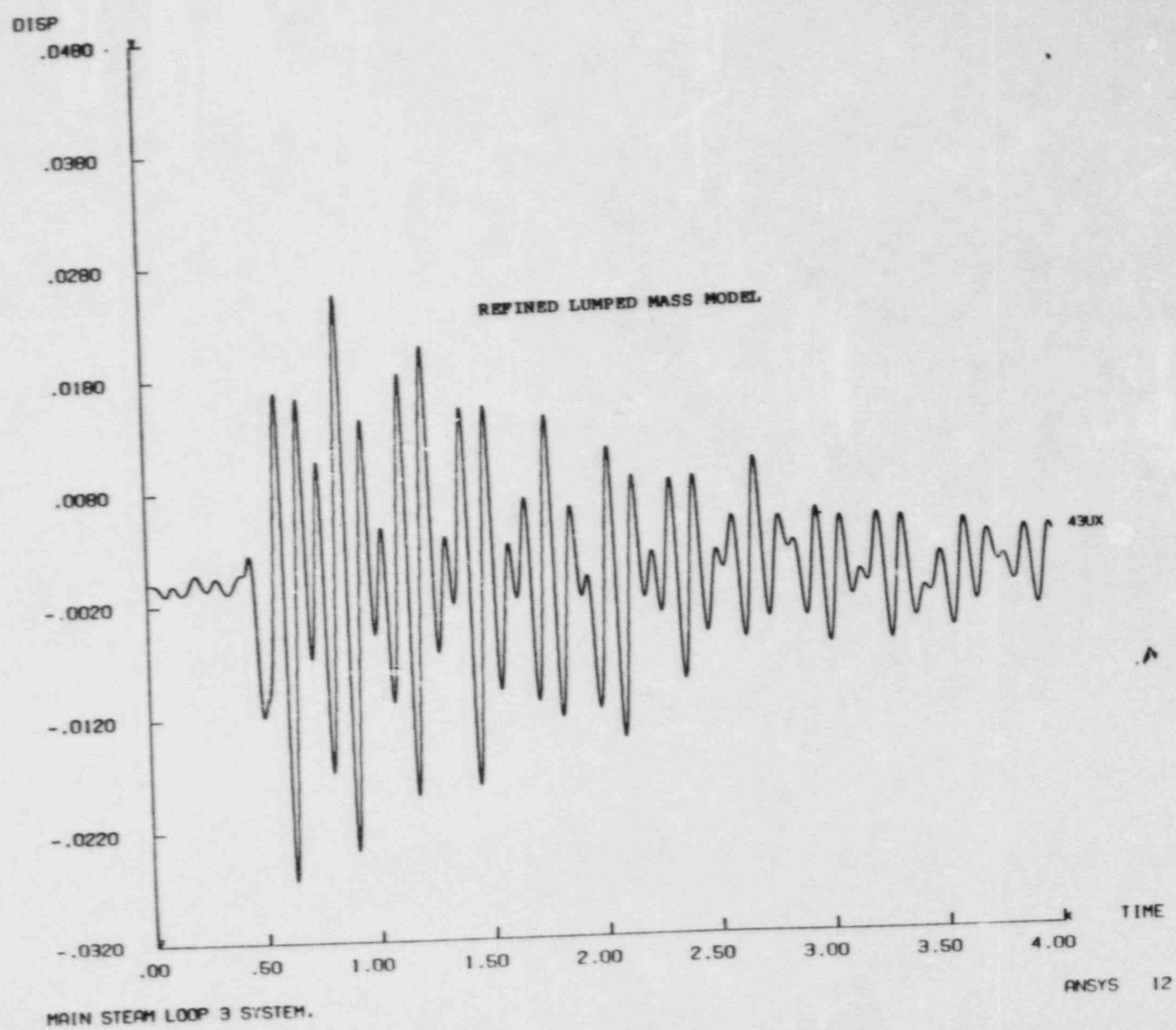
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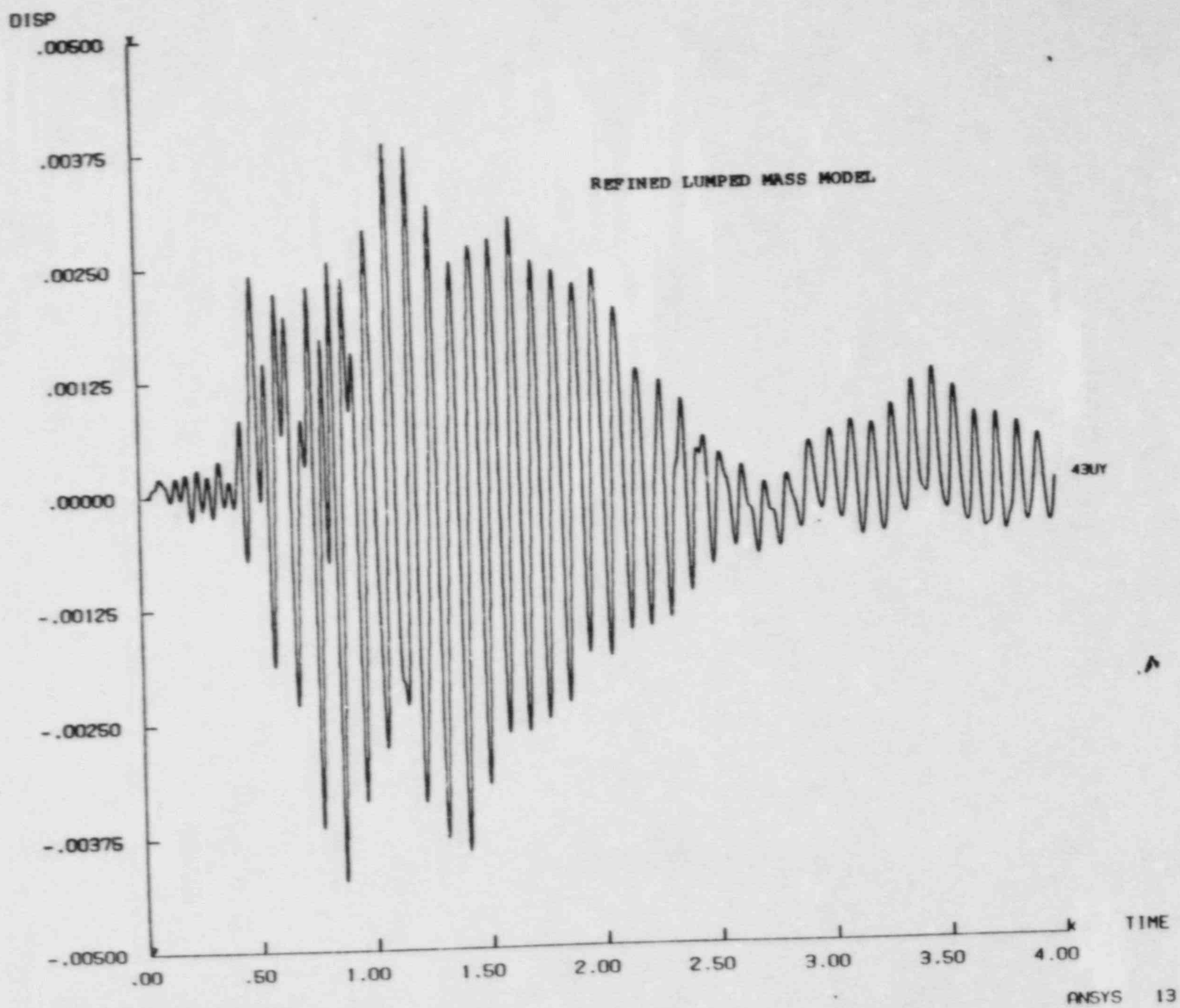
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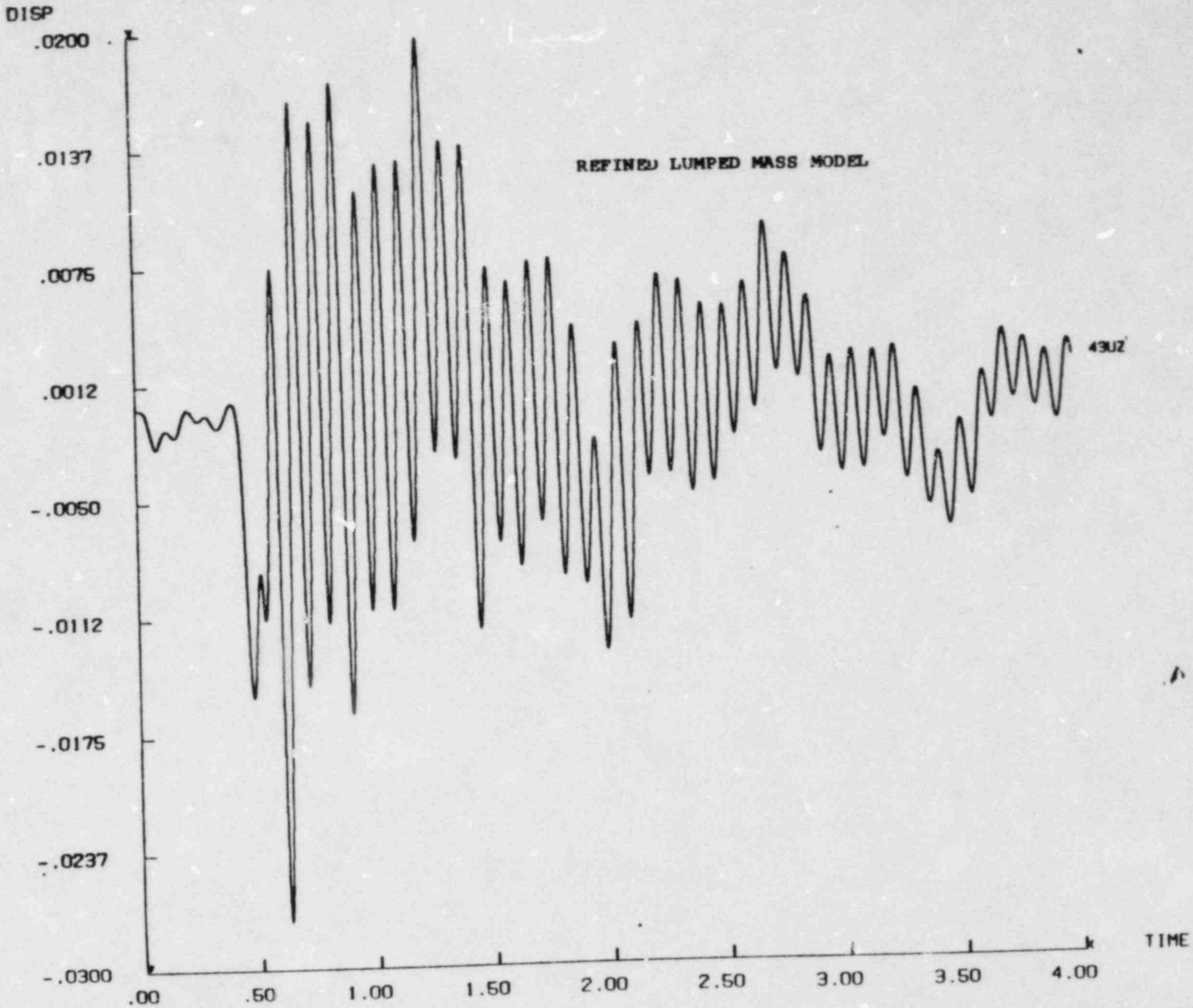

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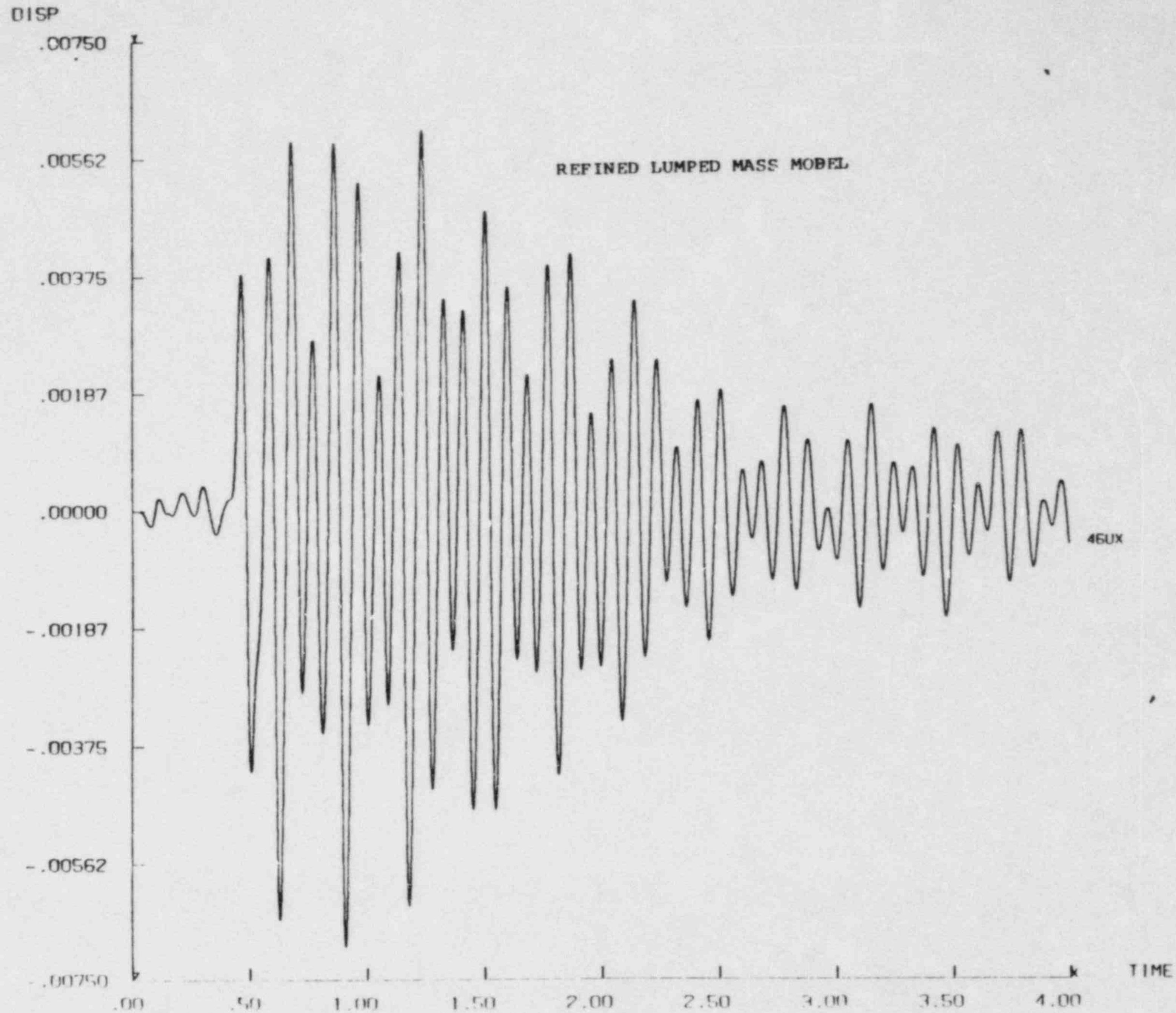

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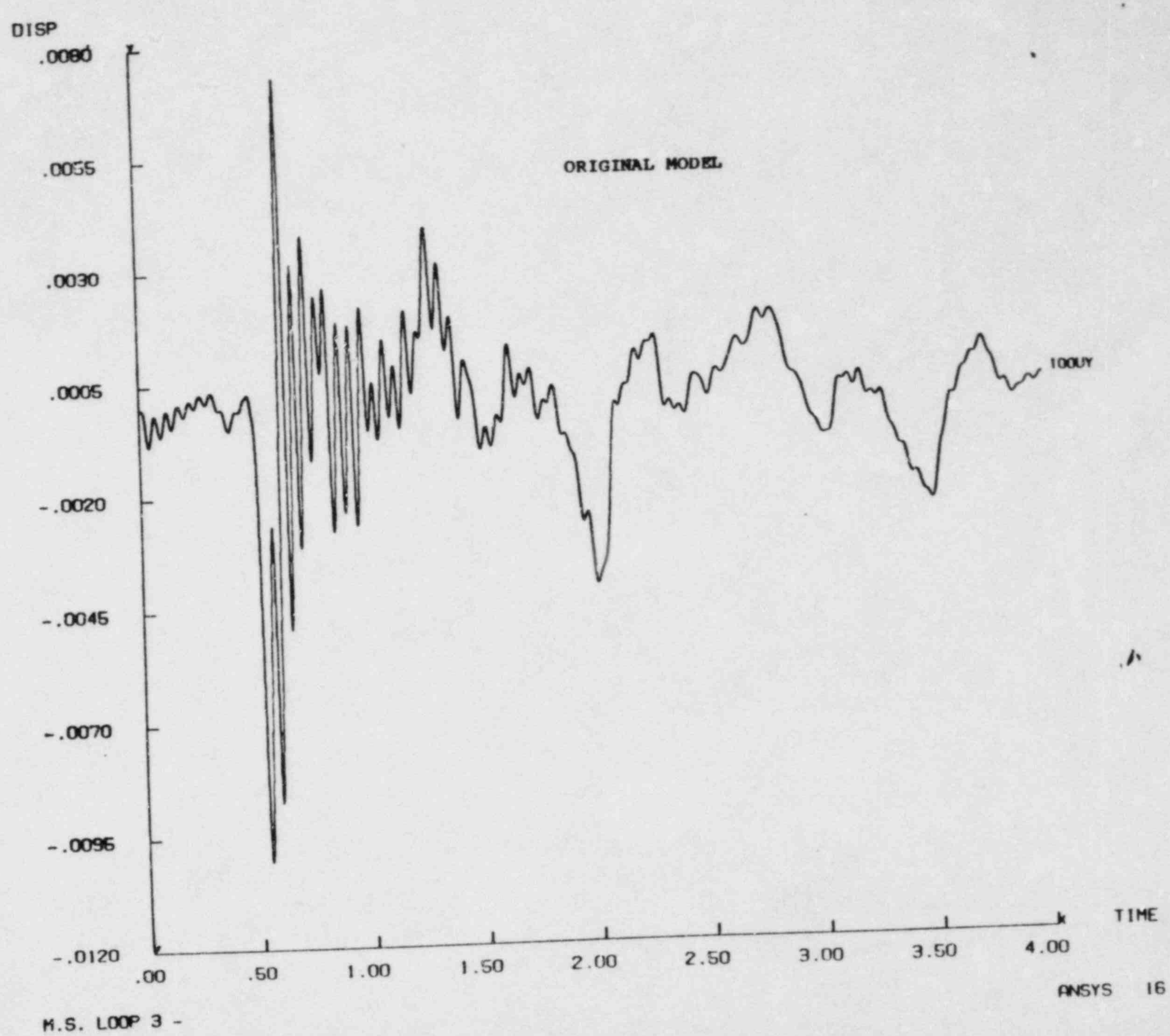

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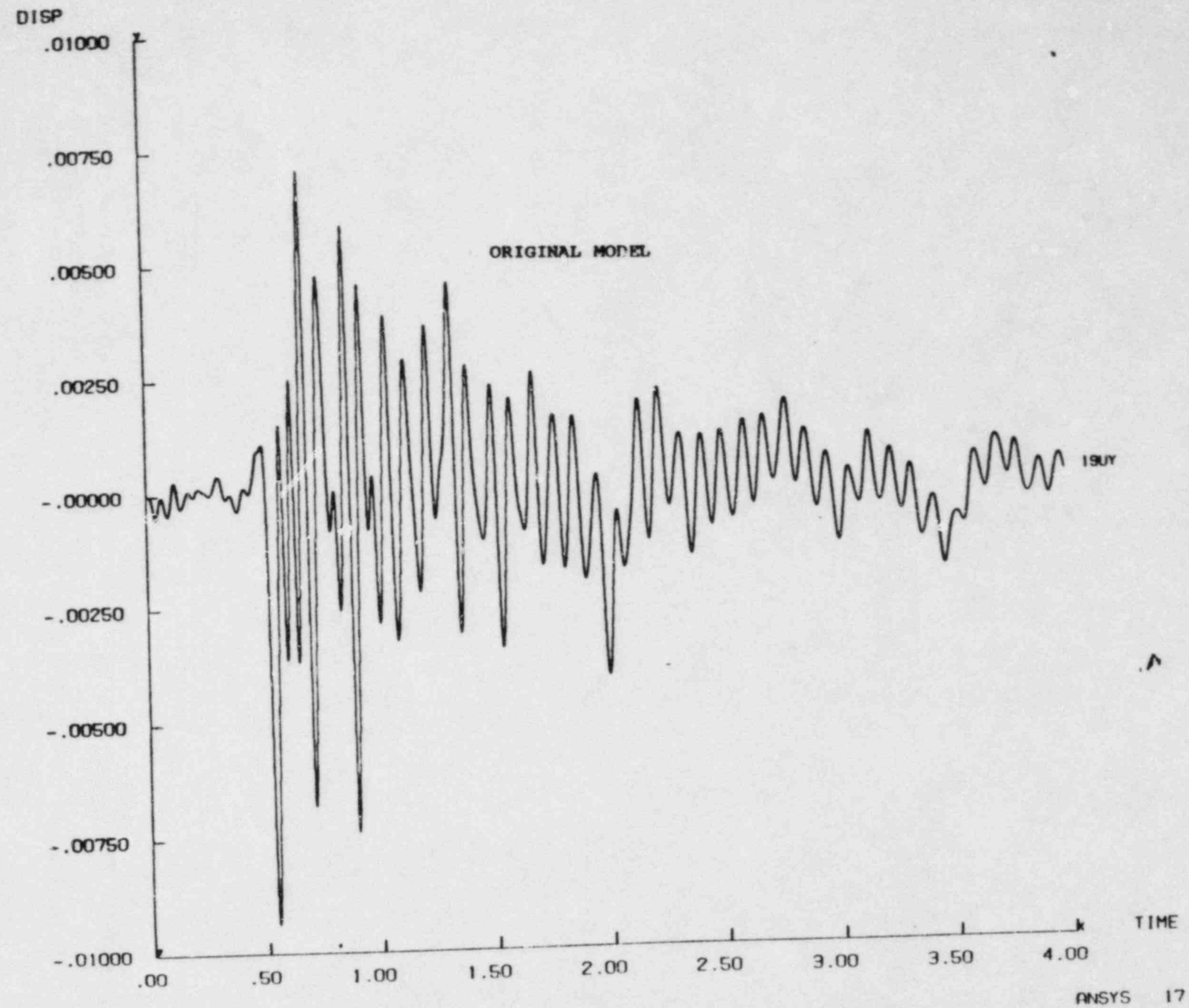
M.S. LOOP 3 -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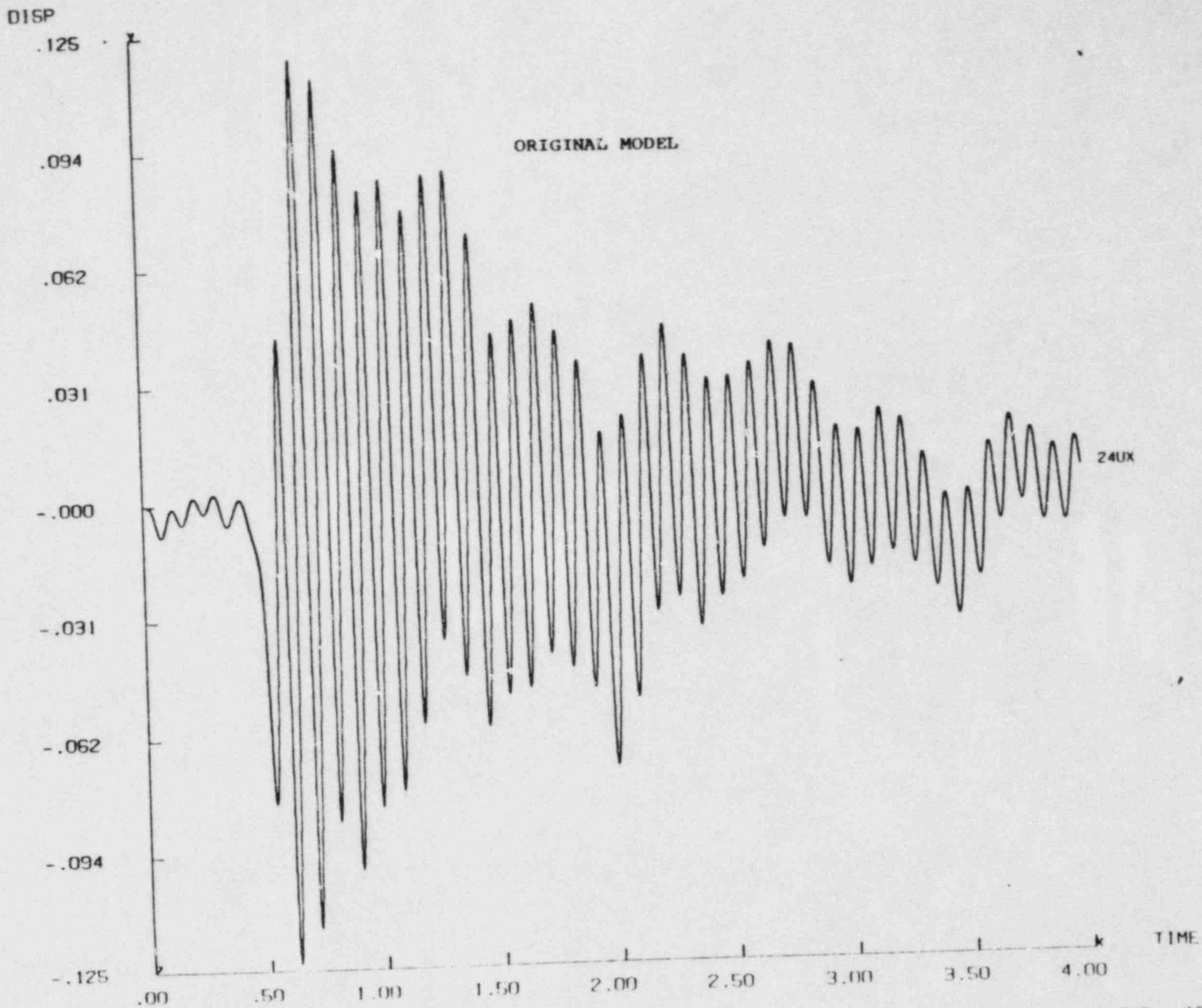

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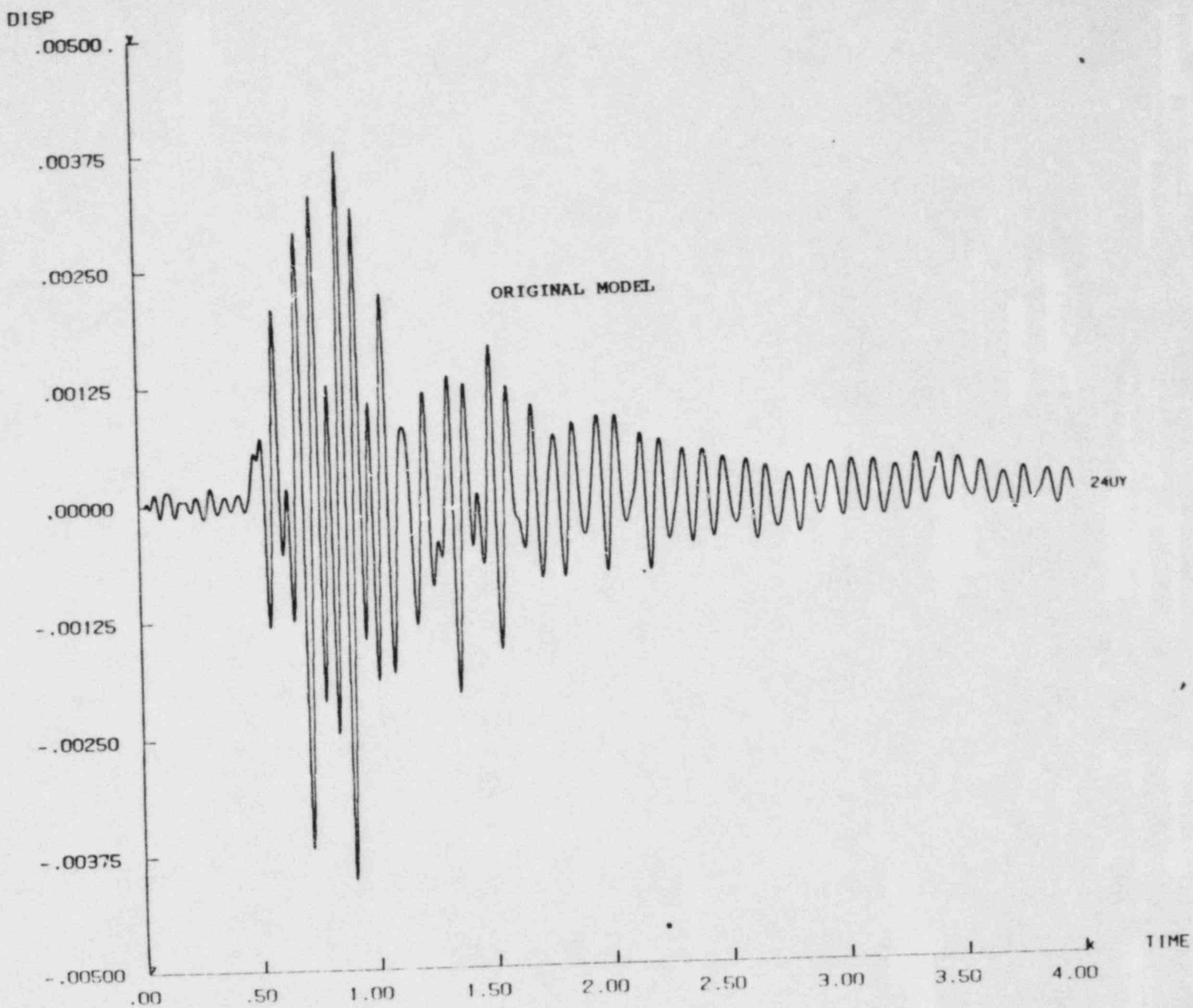

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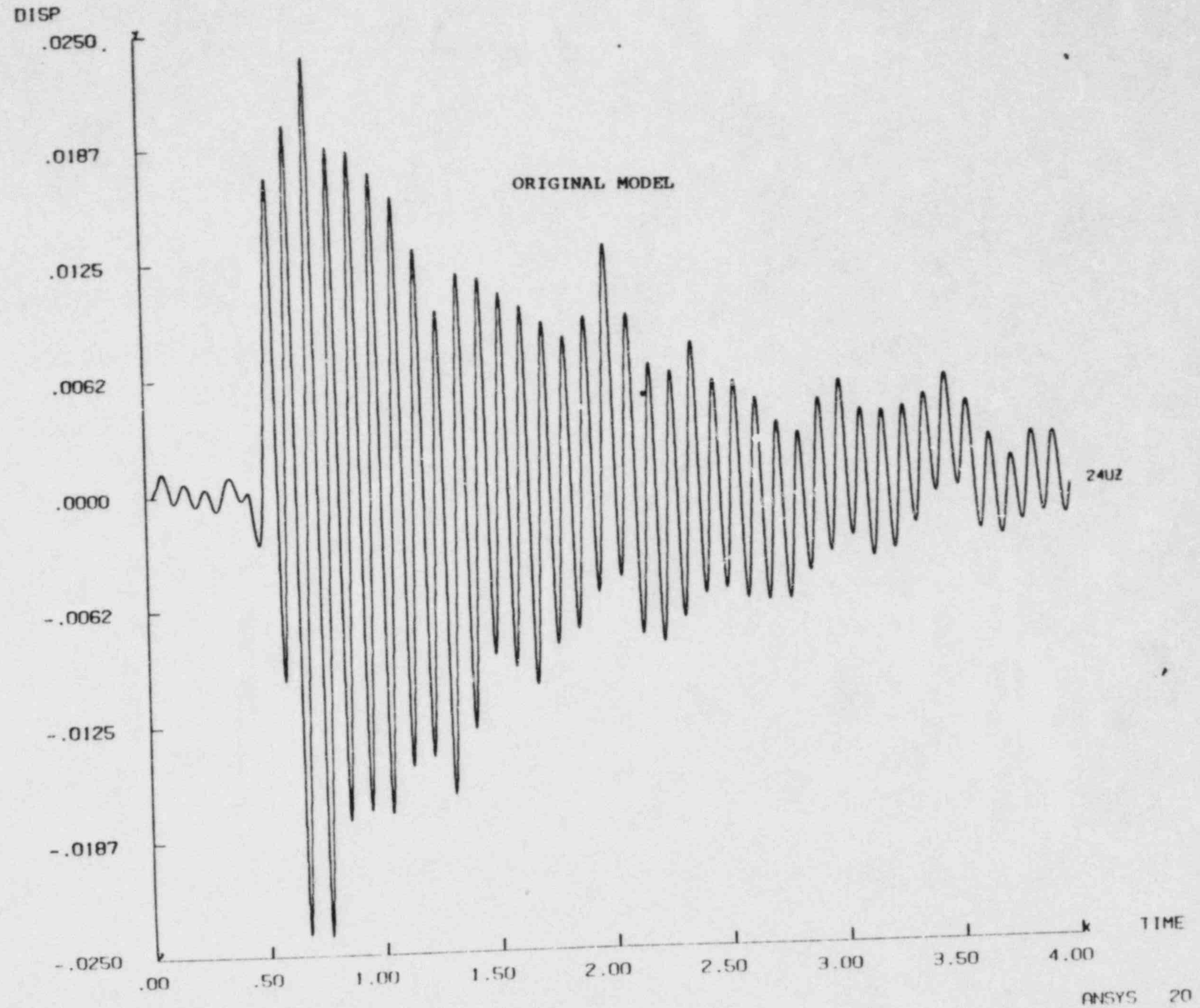
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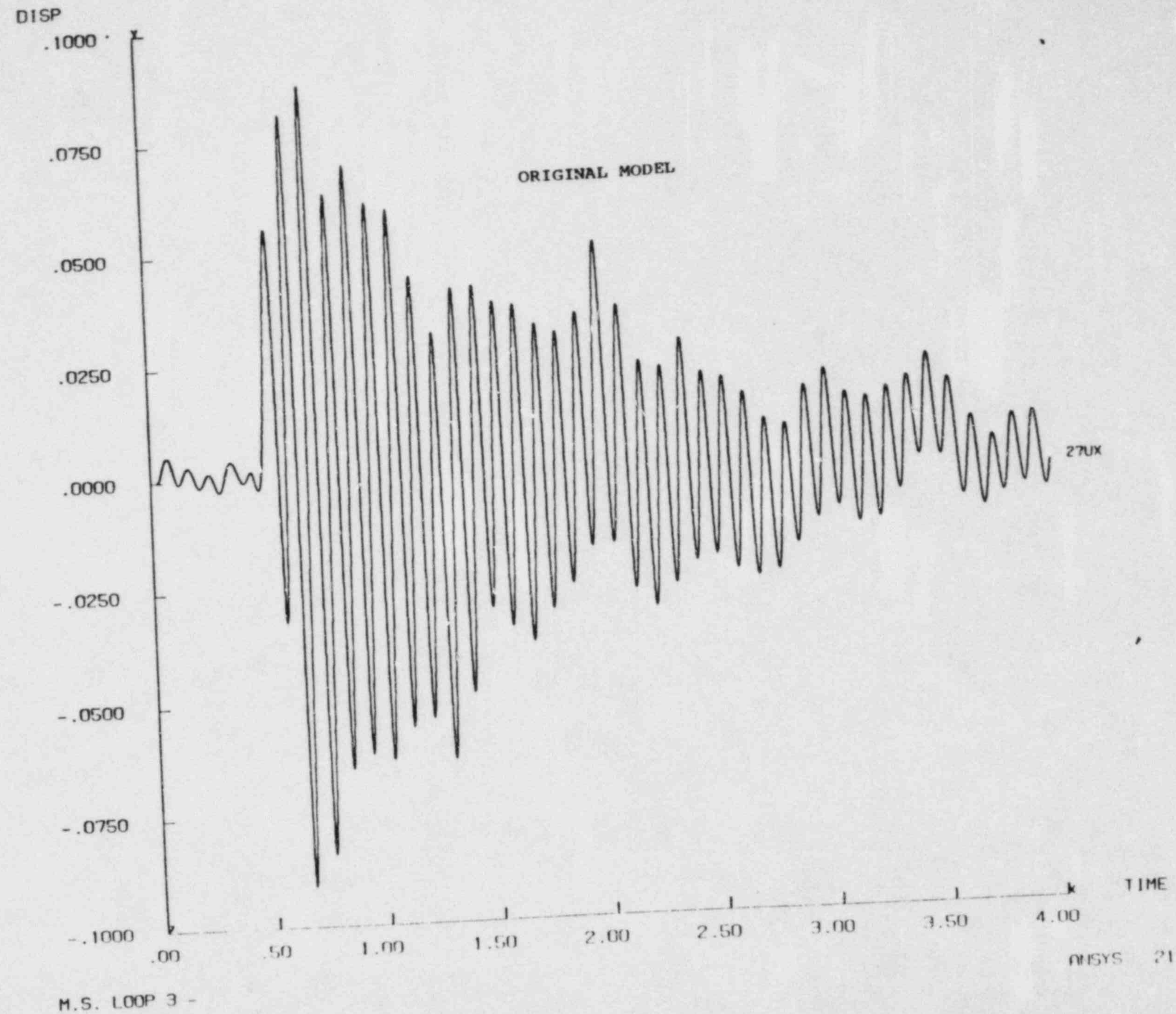
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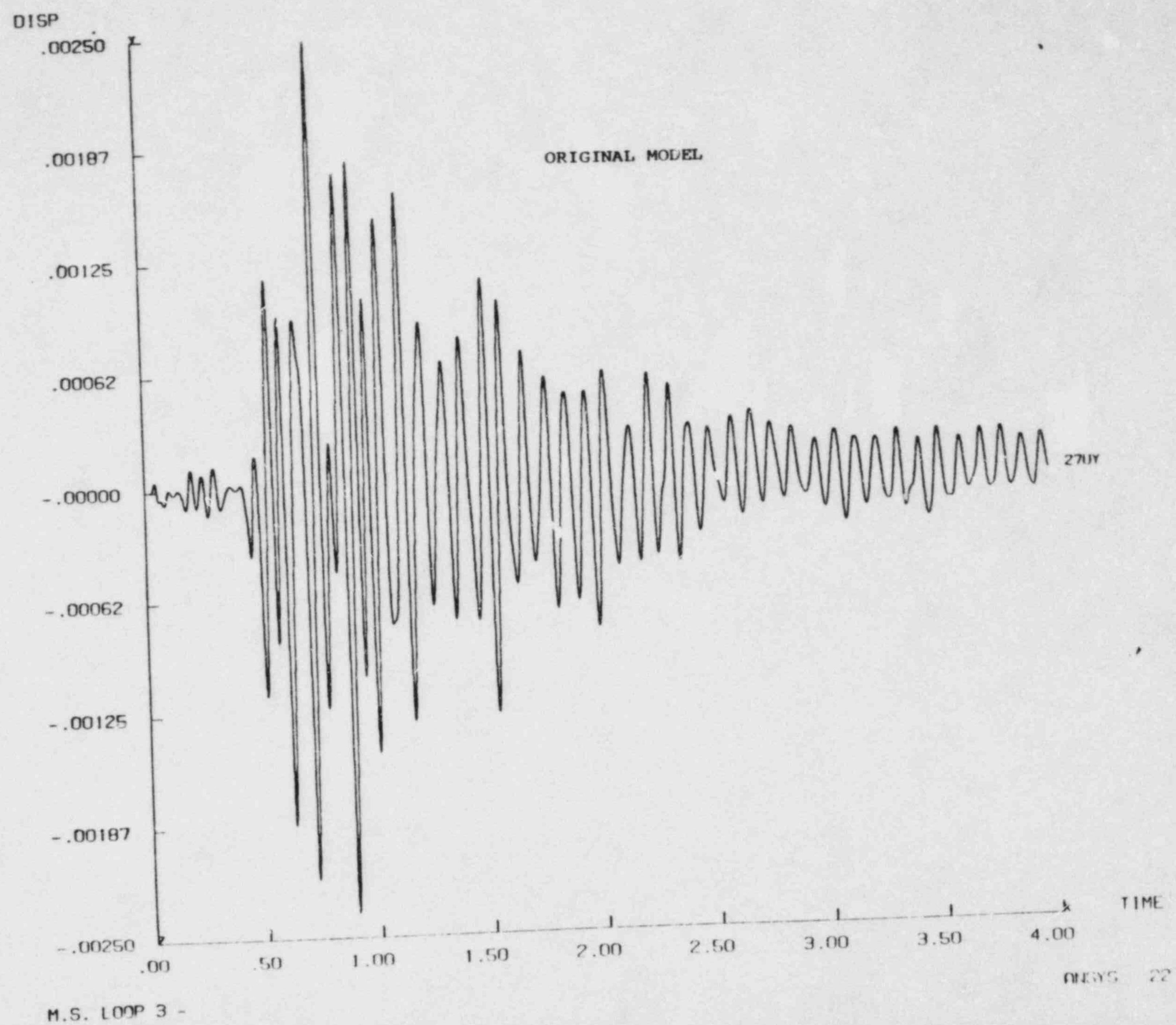
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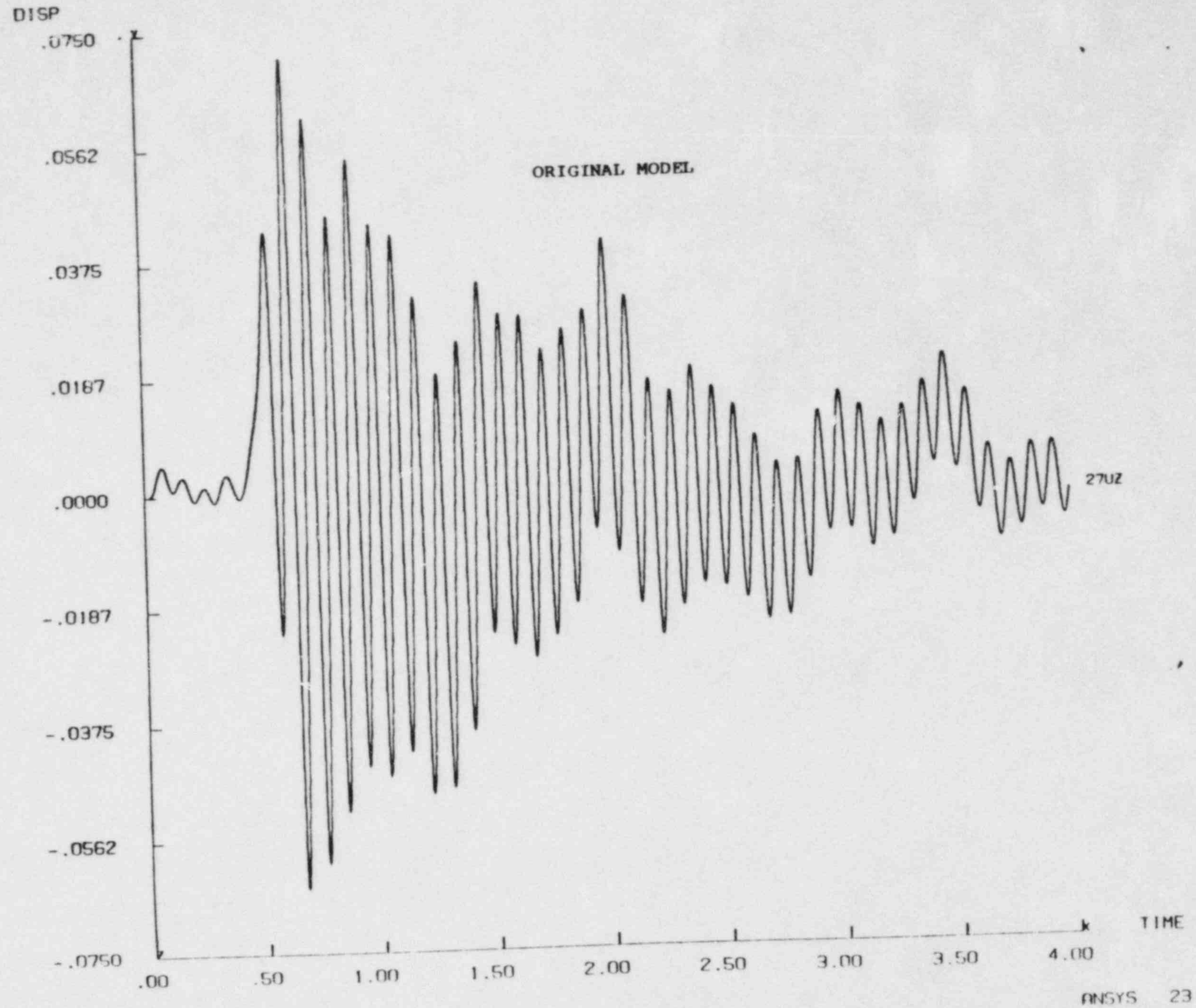
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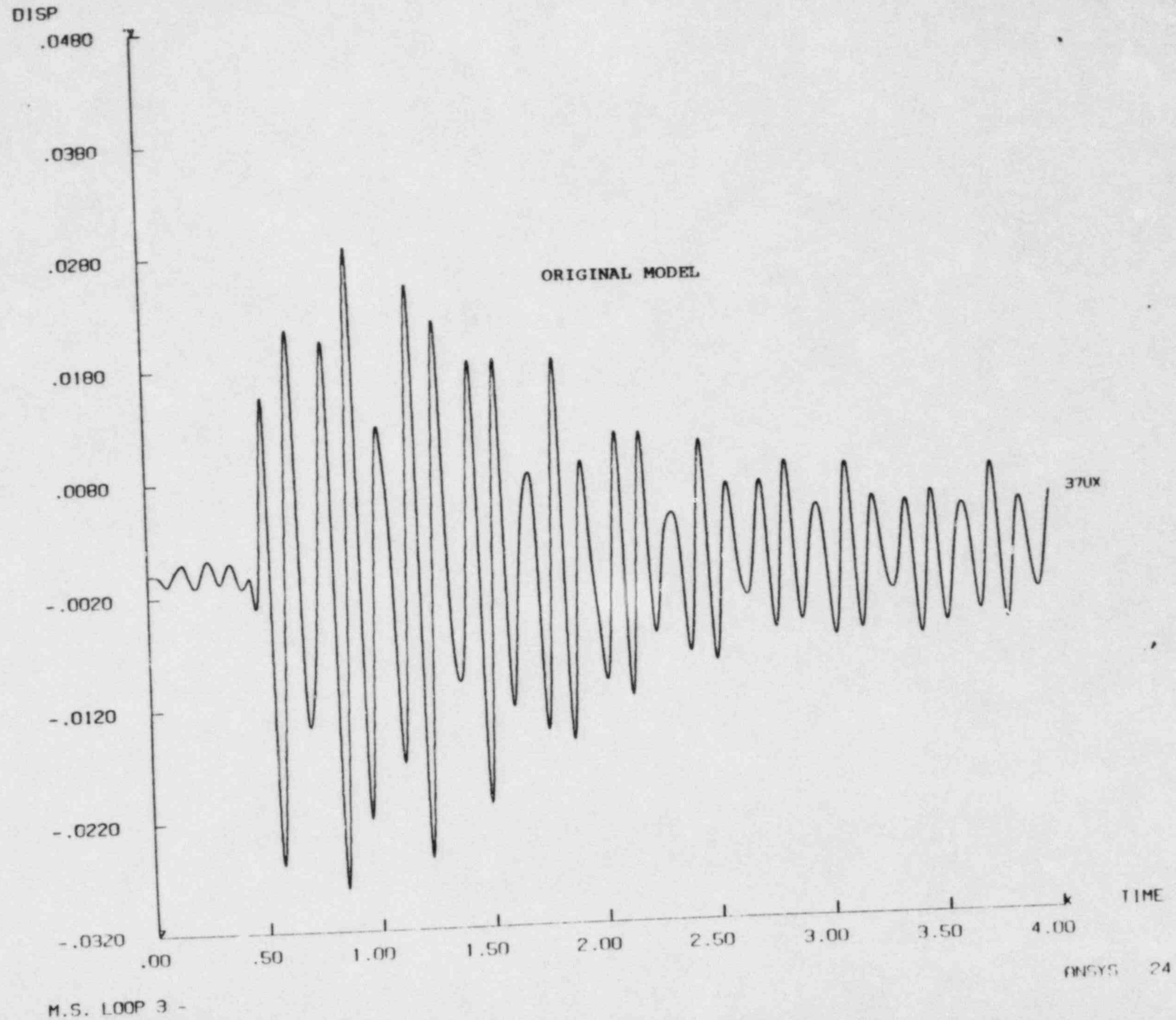
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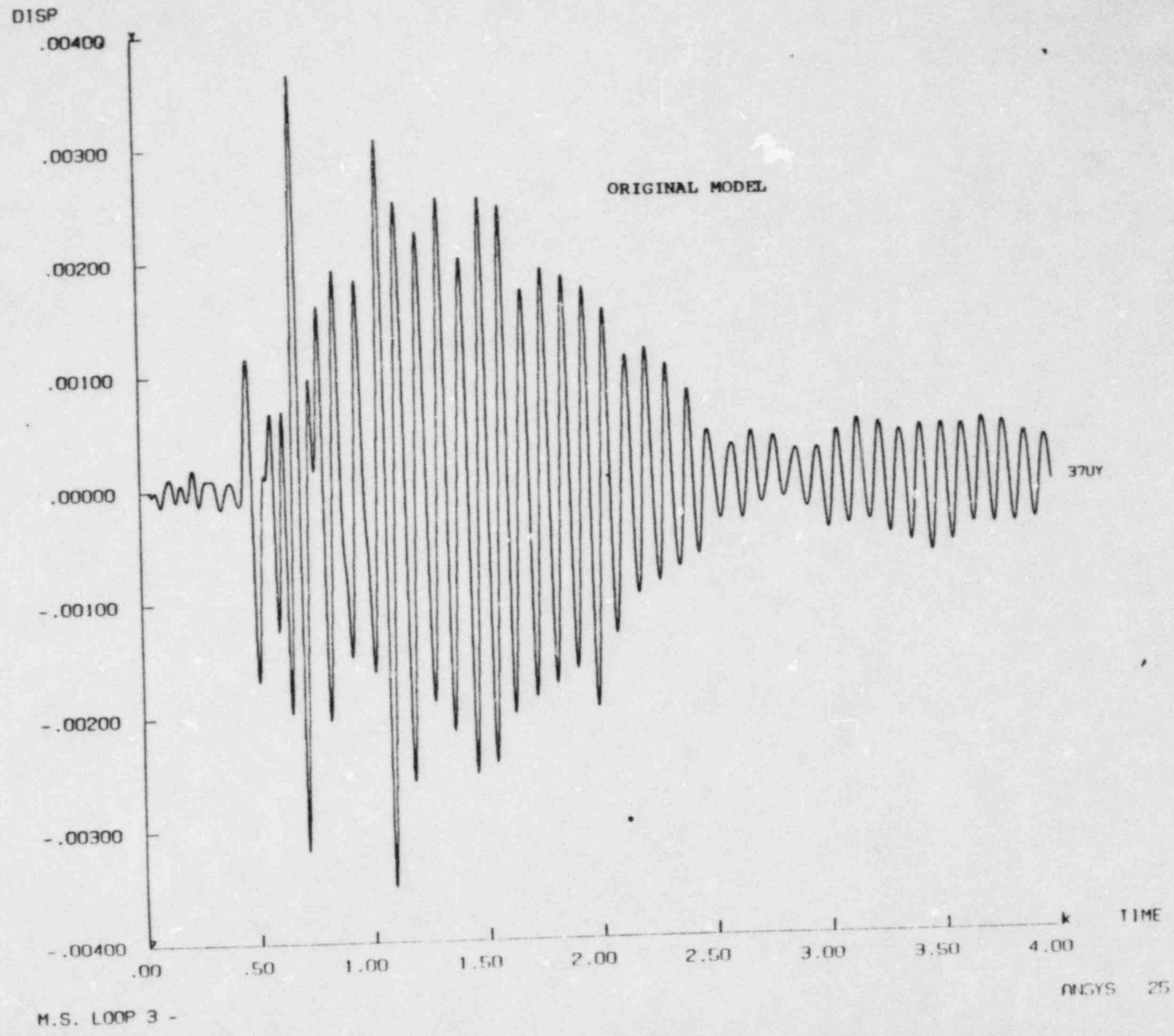
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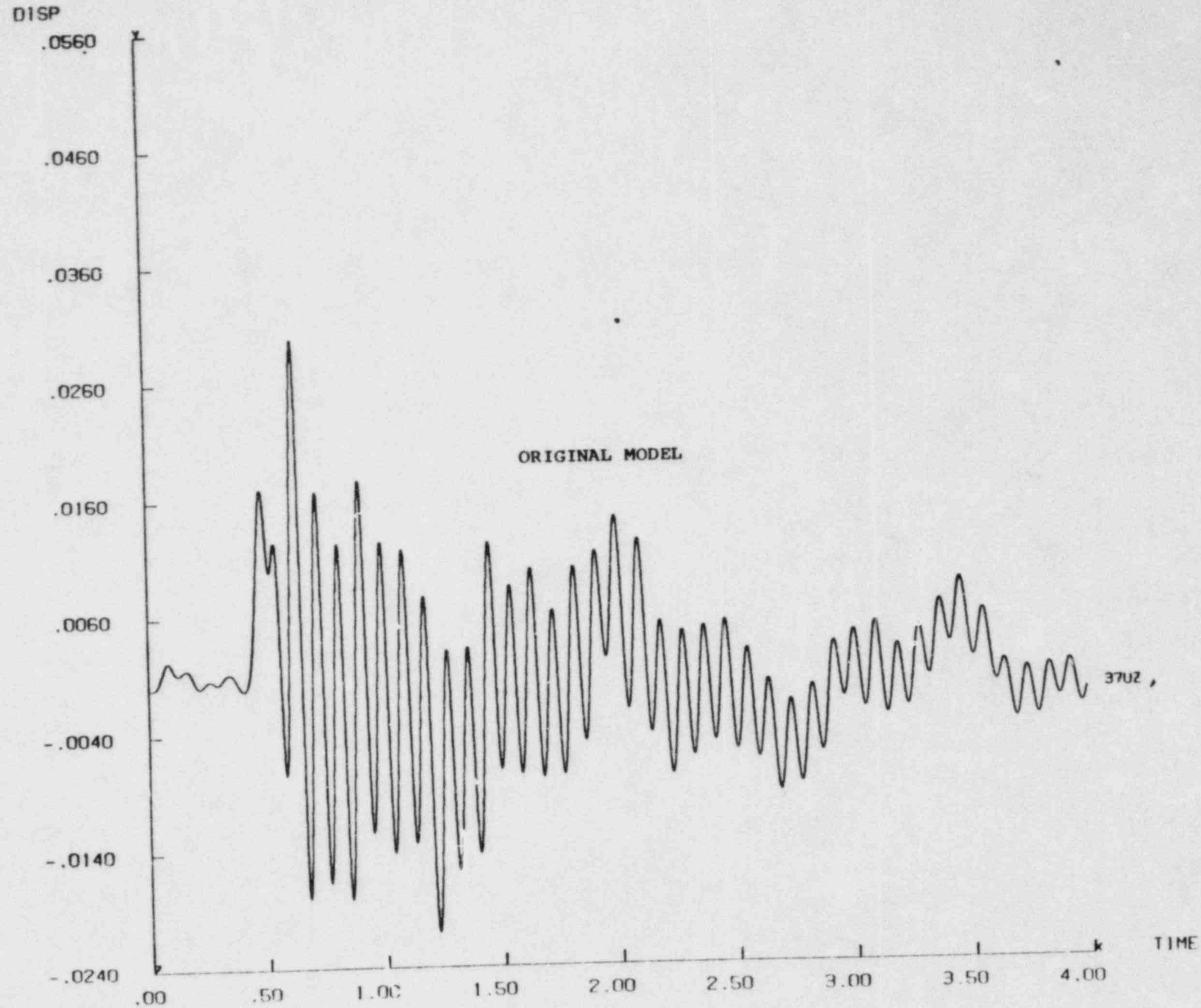

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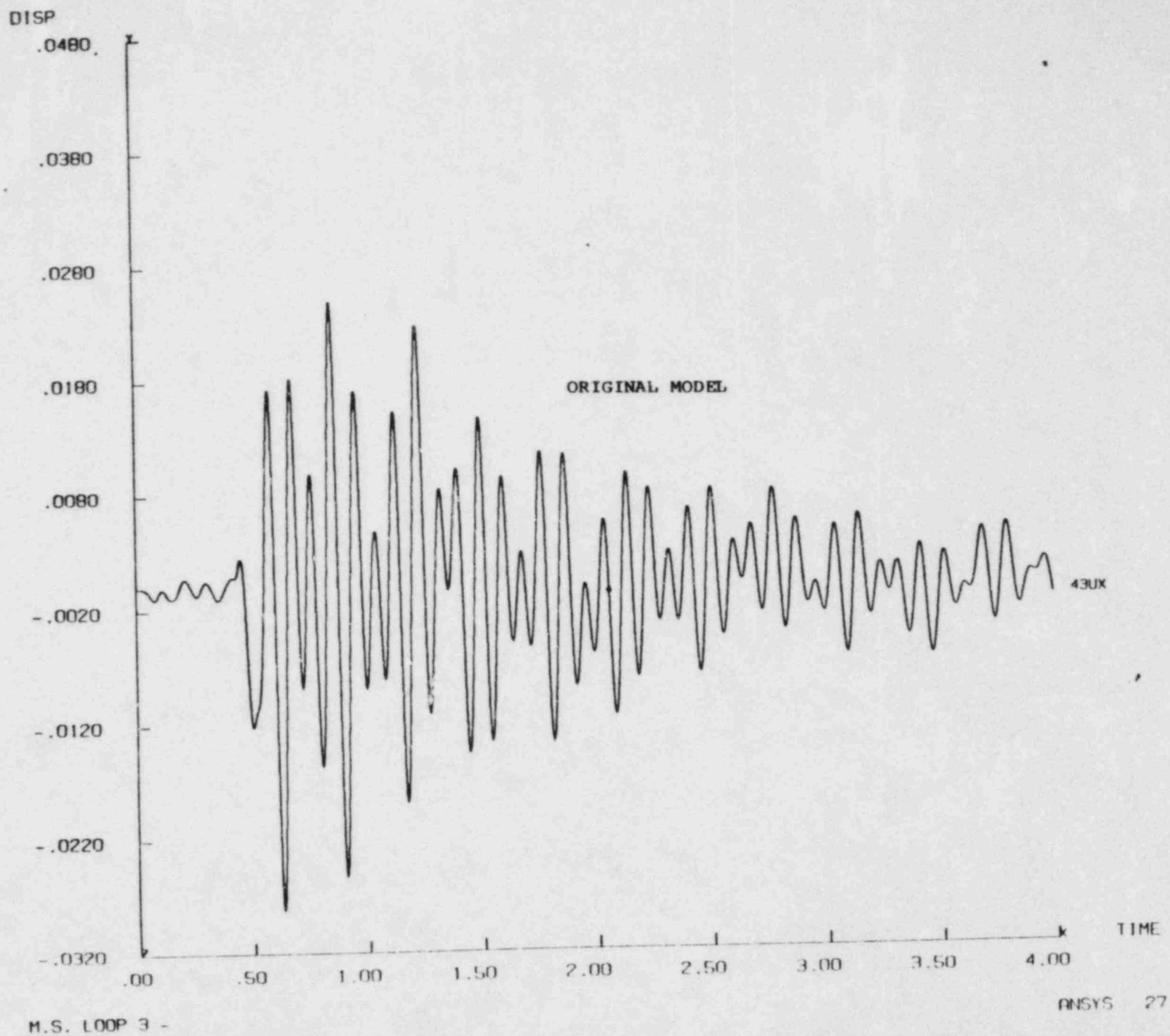
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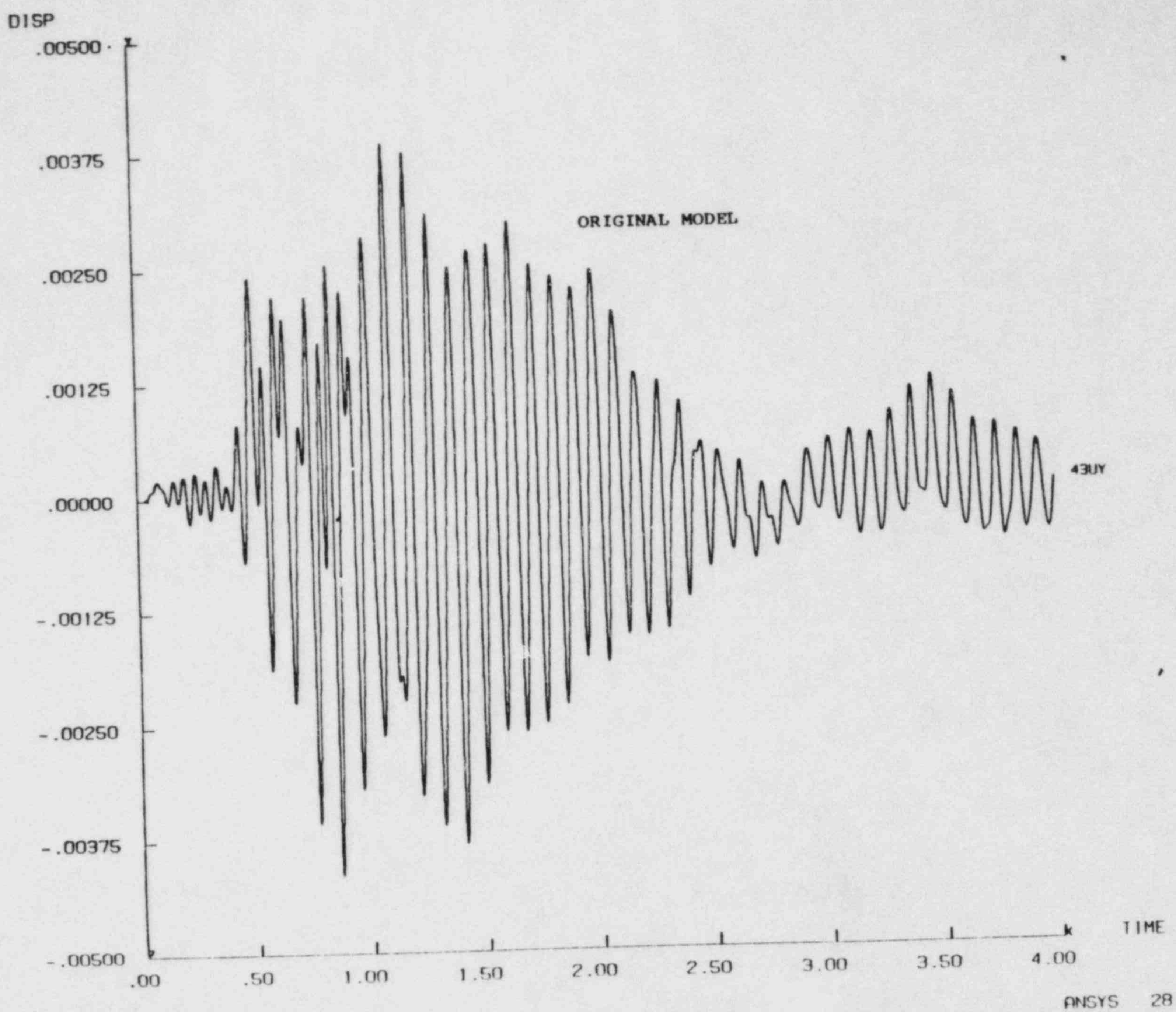
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TIME
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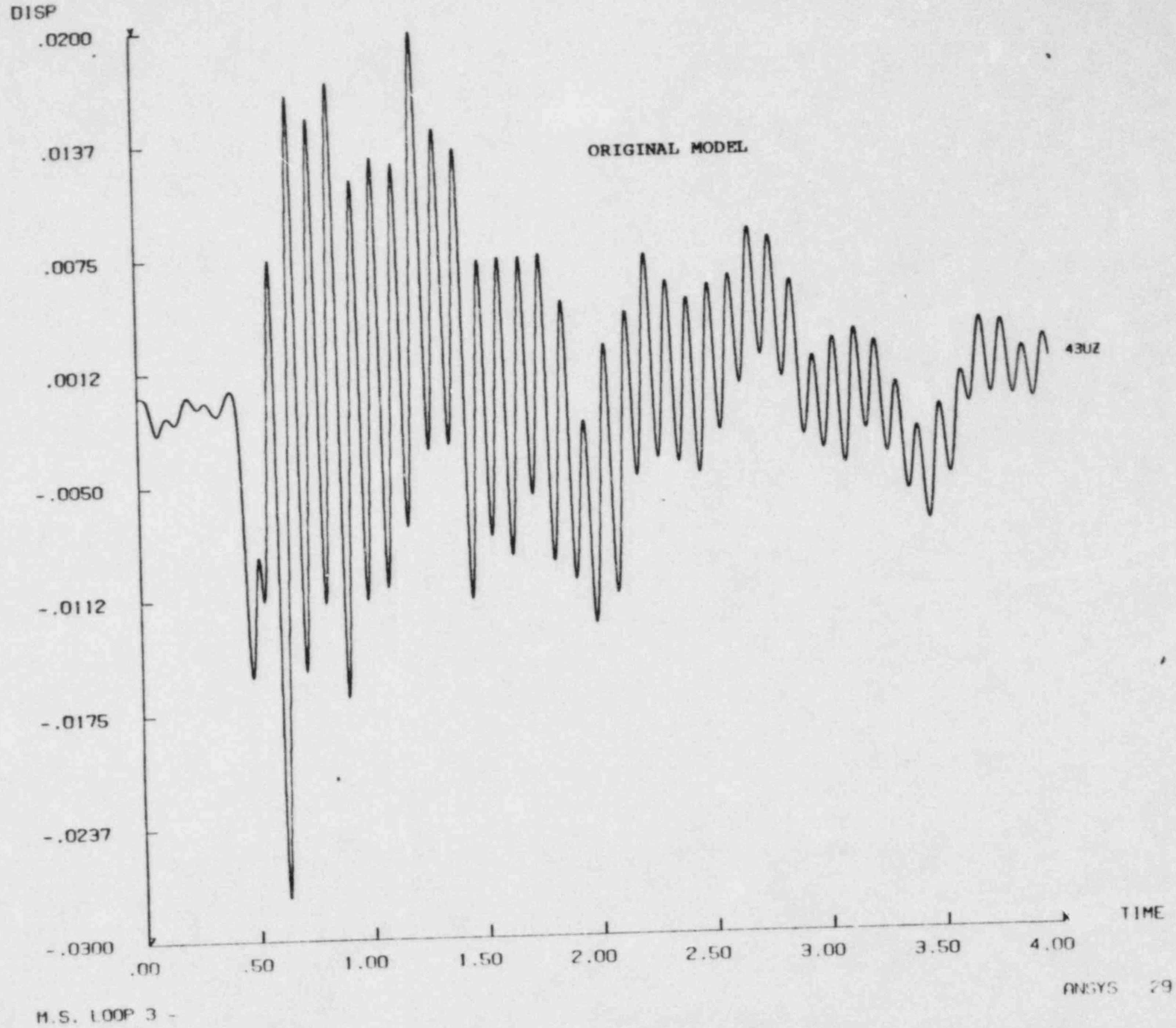
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3.50
4.00
TIME
ANSYS 29
M.S. LOOP 3 -

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760-4438
Telex
Domestic 127636/968694
International 428813/234475

A Dravo Company

July 5, 1984

bcc: N Williams
L Weingart
T. Arne / PF

GTN- 69219

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George,
Vice President, Project Gen. Mgr.

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323

184 1. WELDED ATTACHMENTS IN BREAK EXCLUSION AREAS
185 2. SUPERPOSITION OF STRESS AT MULTIPLE WELDED ATTACHMENT POINTS

By copy of this letter to Nancy Williams of CYGNA, attached is Gibbs & Hill's response to the above referenced questions.

Should you have any questions or comments regarding the enclosed responses, contact Henry W. Mentel.

Very truly yours,

GIBBS & HILL, Inc.

R.E. Ballard

Robert E. Ballard, Jr.
Project Manager

HWM for HWM

REBa/HWMe:gw
1 Letter + 1 Attachment

cc: ARMS (B&R Site) OL, 1A
N. Williams (CYGNA, Calif.) 1L, 1A
G. Bjorkman (CYGNA, Boston) 1L, 1A
G. Grace (CPPE Site) 1L, 1A
D. Wade (CPPE Site) 1L, 1A
P.M. Milam/F. Bleck (TUSI/NY) 1L

Dravo

184

1) WELDED ATTACHMENTS IN BREAK EXCLUSION AREAS

CYGNA has questioned the local stresses in welded attachments with regards to break and crack postulation criteria outlined in Branch Technical Position MEB 3-1. The question is as follows:

1. In containment penetration areas (break exclusion areas) will the total stress (General + Local) at welded attachments for EQ9 and EQ10 be within 0.8 (1.2 S_h + S_a) in accordance with paragraph B.1.b(2)?

Applied Mechanics has done a study identifying all welded attachments in break exclusion areas. The list is as follows:

Problem No.	Support No.
1-10B	FW-1-098-004-S62R
1-10C	AF-1-017-002-S62R
1-23A	MS-1-147-700-S75R MS-1-257-001-S72K MS-1-257-002-S72K MS-1-001-005-S72R MS-1-001-003-S72R MS-1-001-004-S72R
1-23B	MS-1-146-700-S75R MS-1-240-001-S72K MS-1-240-002-S72K MS-1-002-001-S72R MS-1-002-003-S72R MS-1-002-005-S72R MS-1-002-004-S72R
1-23C	MS-1-003-002-S72R MS-1-003-003-S72R MS-1-003-004-S72R MS-1-003-005-S72R MS-1-003-006-S72R MS-1-223-001-S72K MS-1-223-002-S72K MS-1-145-700-S75R
1-23D	MS-1-148-700-S75R MS-1-274-001-S72K MS-1-274-002-S72K MS-1-004-003-S72R MS-1-004-004-S72R MS-1-004-005-S72R MS-1-004-001-S72R

The above restraints do meet the requirements of MEB 3-1, paragraph B.1.b(2)

$$EQ9 + EQ10 \leq 0.8\ (1.2S_h + S_a)$$

It should be noted that the intent of MEB 3-1 is to consider primary, secondary and fatigue effects in defining break and crack exclusion areas. Primary effects are considered in Equation 9 and hence local membrane stress should be added to the general stress. For Equation 10, however, secondary and fatigue effects are considered, so the total local stress including local bending should be added to the general stress.

Problem 1-10B, Support FW-1-098-004-S62R

Ref: As-Built Stress Analysis Calcuation Book, Calc. AB-1-10B

Equation 9 (Primary Stress)

General Stress from "ADLPIPE" = 5610 psi

Local Membrane Stress = 318 psi

Total Membrane Stress = 5928 psi

Equation 10 (EQ11-EQ8) (Secondary Stress)

General Stress from "ADLPIPE" = 11946 - 4802 = 7144 psi

Total Local Stress - (0.673-0.072) 2198 = 1321*

Total Stress = 7144 + 1321 = 8465 psi

Equation 9 + Equation 10 = 5928 + 8465 = 14393 psi

Allowable = 0.8 $(1.2S_h + S_a)$ = 32400

*Note Local Membrane Stress =

(EQ11 Actual Load - EQ8 Actual Load) x (Unit Load Combined Stress Intensity from "CYLNOZ")

Problem 1-10C, Support AF-1-17-002-S62R

Ref: As-Built Stress Analysis Calculation Book, Calc. AB-1-10C

Equation 9 (Primary Stress)

General Stress From "ADLPIPE"	=	6360 psi
Local Membrane Stress	=	645 psi
Total Membrane Stress	=	7005 psi

Equation 10 (EQ11-EQ8) (Secondary Stress)

General Stress from "ADLPIPE"	=	7023 psi
Total Local Stress	=	4837 psi
Total Stress	=	11860 psi

Equation 9 + Equation 10 = 7005 + 11860 = 18865 psi

Allowable = $0.8\ (1.2S_h + S_a)$ = 32400

Main Steam Problems

The main steam break exclusion area welded attachments were surveyed. In most cases EQ9 + EQ10 stresses were low but in a few cases these stresses approached the allowables. The worst case by far was support MS-1-003-006-S72R on Problem 1-23C, which was highly loaded and had high unit load local stresses as well. Additionally, this was the particular support questioned by CYGNA, so it is fitting that this one be addressed in detail.

Problem 1-23C, Support MS-1-003-006-S72R

The following approach was taken to alleviate the overstress condition in the problem:

The pad dimensions are 50.27 inches circumferentially by 3 inches longitudinally. In the analysis, a circumferential pad length of only 12 inches was used. This was to satisfy the requirement in CYLNOZ that β_1/β_2 4. (β_1/β_2 is proportional to the ratio of the pad dimensions). This ficticiously small pad size penalizes the analysis greatly because the load is distributed over an area that is much smaller than in the actual case.

This analysis was rerun increasing the longitudinal pad size from 3 to 4.3 inches. This allowed a circumferential pad size of 17.2 inches. Though the increase from 3 to 4.3 inches is unconservative, the 43% increase allows a circumferential dimension that is closer to reality, though still approximately 66% small on the conservative side. The total area of the pad used in the reanalysis is 4.3 x 17.2 = 74 in sq. The actual area is 50.27(3) = 150 sq. in. The load then is still being distributed on an area only one half of the real area which gives a ficticiously high stress. This justifies the dimensional change.

The results of this analysis for a 1^k unit load are:

Combined Membrane Stress Intensity 70.94 psi

Combined Stress Intensity 225.68 psi

Recalculating the stresses for break postulation:

Equation 9 (Primary Stress)

General Stress from "ADLPIPE" = 8267 psi

Local Membrane Stress = 70.94(62.91) = 4463 psi

Total Membrane Stress = 12730 psi

Equation 10 (EQ11-EQ8) (Secondary Stress)

General Stress from "ADLPIPE" - 12795 - 7622 = 5173

Total Local Stress = (101.539 - 11.048)(225.68) = 20422 psi

Total Stress - 5173 + 22264 - 25595

Equation 9 + 10 = 12730 + 25595 = 38325

$.8\ (1.2\ S_h + S_a) = .8(1.2\ (17500) + 26250) = 37800$ psi

There is still a 1% overstress. This could be alleviated by further increasing the longitudinal pad dimension, but this is not advisable because the analysis should be kept as close to the real dimensions as possible. Another way to further reduce the stress would be to combine the general and local stresses acting at a point more precisely. ADLPIPE simply takes a vector sum of X and Y bending moments whose resultant will be on some plane other than the edges of the welded pad where CYLNOZ combines stresses. By combining the stresses accurately at the points of interest (i.e. locations A,B, C,D, of CYLNOZ) a significant reduction in stress can be realized, often upwards of 20%. The calculation is rather lengthy and will not be shown here, but will be provided at your request if needed.

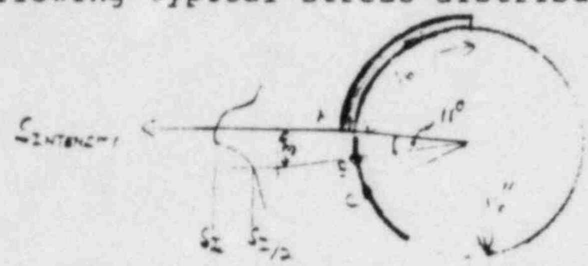
In conclusion, it can then be readily demonstrated that all welded attachments satisfy the intent of MEB 3-1 for break and crack exclusion areas even if local primary and secondary stresses are properly included. Concerning the one main-steam welded attachment it should be further pointed out that a finite element analysis distributing the load over the proper area should yield a stress level well below the allowable limits.

2) RESPONSE TO CYGNA

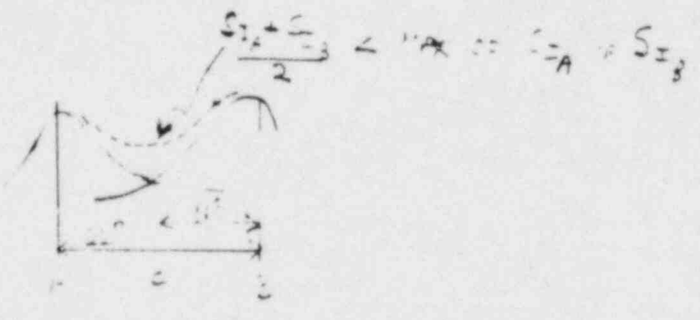
SUPERPOSITION OF STRESS AT
MULTIPLE WELDED ATTACHMENT POINTS

In response to Item No. 1 in the telecon (dated June 28, 1984) between H. Mentel and F. Colucci of G&H and L. Weingart, N. Williams and J. Minichiello of CYGNA, we have revived the 13 locations containing multiple welded attachments at the same pipe location. Out study has shown that the stress levels are within an acceptable range.

In general, local stresses at welded attachments decay very rapidly with distance from the attachment/pipe weld. Finite element analysis we have performed, for example, shows the following typical stress distribution.



The peak value decays to less than 1/2, 11° away from the edge of the pad. If a 22° space is maintained between attachment boundaries then (usually the case-see case (2), supports CC-2-158-407, 408, A43K for example) then even superimposing stresses would give a valve less than either peak.



Notwithstanding the above considerations we have examined each of the 13 multiple location attachments individually, superimposing peak stresses conservatively if the same components were non-zero at neighboring edges. Results are summarized below. Detailed documentation is included as an attachment.

CYGNA

RECEIVED
JUL 2 1984
APPLIED MECHANICS

Communications Report

Company:	Texas Utilities	X Telecon	☐ Conference Report
Project:	Comanche Peak Steam Electric Station Independent Assessment Program - Phase 3	Job No.	84042
		Date	June 28, 1984
Subject:	Pipe Stress Review	Time	11:15 am
		Place	Cygna - SFRO
Participants	H. Mentel, F. Colucci	of	G&H
	L. Weingart, N. Williams		Cygna
	J. Minichiello		

Item	Comments	Required Action By
1.	**WELDED ATTACHMENTS**	

In the course of performing expanded review of local stress calculations for welded attachments, Cygna observed that there are a number of instances where four trunnions are placed 90^{o} apart from one another. The two across from one another are considered to be one support. The local stresses from the resulting two supports are not combined. Cygna believes it is necessary to consider the combined effects of the two adjacent supports.

The following list, compiled by CYGNA, consists of all of the instances of this configuration for Unit 1:

	Pipe Support Nos.	Problem No.
1.	CT-1-076-409-C82R 476 CT-1-076-403-C82R	AB-1-35A
2.	CC-2-158-407-A43K CC-2-158-408-A43K	AB-2-63B
3.	CT-1-013-406-C82R 477 CT-1-013-420-C82R	AB-1-35A
4.	CT-1-013-411-C52R 478 CT-1-013-422-C52R	AB-1-35A
5.	CT-1-014-415-C72R 76? CT-1-014-416-C72R	AB-1-37W

Signed

/rb

CYGNA

Communications Report

Item	Comments	Required Action By
	6. CT-1-014-413-C82R 707 CT-1-014-414-C82R — AB-1-37W	
	7. DO-1-090-002-S65S 61 DO-1-090-001-S65K 73 — AB-1-167F	
	8. DO-1-089-003-S65S DO-1-089-004-S65K 483 — AB-1-167C	
	9. DO-1-029-001-S53K DO-1-029-002-S43R — AB-1-167C	
	10. FW-1-097-020-C62R FW-1-097-019-C62R — AB-1-154	
	11. FW-1-096-020-C62R 552 FW-1-096-021-C62R 503 FW-1-096-022-C62R 496 — AB-1-153	
	12. MS-1-151-046-C52K MS-1-151-047-C52R — AB -1-76B	
	13. MS-1-151-034-C52R MS-1-151-035-C52R — AB-1-76B	
	Please provide either an evaluation of the above concern or justification for not combining the local stresses.	
2.	**MASS PARTICIPATION** In a brief discussion of the G&H letter of 6/26/84 regarding the plan of action for resolving the mass participation question, CYGNA confirmed that the missing mass option in ADLPIPE version 2D34D is fully automated. G&H plans to send an additional response containing the selection of stress problems to be rerun on the Cygna computer. Mr. Mentel will notify Nancy Williams when and who G&H will send to Boston for the re-analysis.	
3.	**WELDED ATTACHMENTS IN BREAK EXCLUSION ZONES** G&H understands the logic presented in the CYGNA letter 84042.009 to R. Ballard dated June 27, 1984. G&H will follow-up and check the points with welded attachments considering the localized bending effects.	
4.	**STEAM GENERATOR LOCA DISPLACEMENTS** G&H has received the telecons between CYGNA and Westinghouse regarding LOCA displacements used in the main steam piping analyses. CYGNA will get back to G&H this afternoon to discuss what actions are required to resolve this issue.	

RESPONE TO CYGNA 84042-6.28.84, PARAGRAPH 1

PIPE STRESS REVIEW - Welded Attachments CYGNA 84042-6.28.84

1. Supports CT-1-076-409-C82R
   CT-1-076-403-C82R

   Stresses resulting from both supports and ADDLPIPE are to be combined. Calculation sheet is attached.

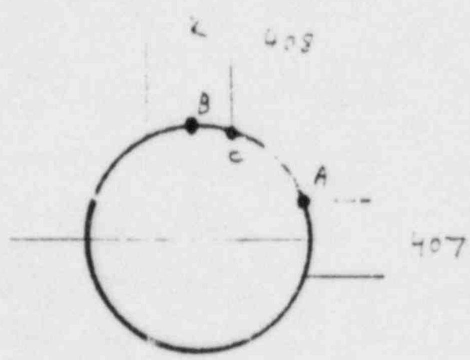
   Total local stress exceeds allowable by 3% in Eq. 9. Is acceptable since the calculation includes all peak stresses as produced at the same point - Actually, locations of high stressed points of the two supports differ by 0.8".

2. Supports CC-2-158-407-A43K
   CC-1-076-408-C82R

   No combination is needed.

   Support -407- is transversal and the peak stress is at Point A while Support -408- is longitudinal and the peak stress is at Point B. Local stress depicted at Point C is zero.

   Note: Even combining stresses they will be well under allowable.



3. Supports CT-1-013-406-C82R
   CT-1-013-420-C82R

   Stress combination is attached. Exceeds 7.2% - Acceptable.

4. Supports CT-1-013-411-C52R
   CT-1-013-422-C52R

   Stress combination is attached.

5. Supports CT-1-014-415-C72R
   CT-1-014-414-C82R

   In this case the analyst has already combined stresses from the two welded attachments.

6. Supports CT-1-014-413-C82R
   CT-1-014-414-C82R

   In this case the analyst has already combined stresses from the two welded attachments.

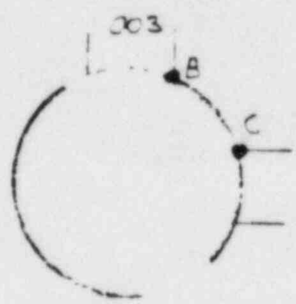
7. Supports DC-1-090-001-S65R
   DC-1-090-002-S65S

   Stress combination is attached.

8. Supports DC-1-089-003-S65S
   DC-1-089-004-S65R

   No combination is needed.

   Support -003- is transversal and peak stress at Point B. but -004- is longitudinal and peak stress at "A" (at "C" no local stress)

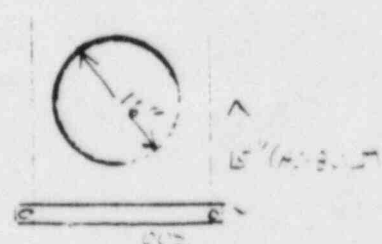


9. Support DC-1-029-001-S53R
   DC-1-029-002-S43R

   a. BRH of -002- says "not installed"

   b. ~~As per coordinates there is not room enough~~.

   c. -002- is a clamp (not a welded attachment).



10. Supports FW-1-097-020-C62R
    FW-1-097-019-C62R

Stress combination attached.

11. Supports FW-1-096-020-C62R
FW-1-096-021-C62R
FW-1-096-022-C62R

Stress combination attached.

12. Supports MS-1-151-046-C52K
MS-1-151-047-C52K

Peak stresses due to the two supports are located 90 apart (on the trunnion). No need to be added.

13. MS-1-151-034-C52R
MS-1-151-035-C52R

Stress combination attached.

185

CYGNA

JOB NO.:	84042
DATE LOGGED:	7/6/84
LOG NO.:	# 185
FILE:	11.1.1 Tech. Files
CROSS REF. FILE	11.1 Tech. Files [illegible]

2) SUPERPOSITION OF STRESS AT MULTIPLE WELDED ATTACHMENT POINTS

BACKUP DOCUMENTATION

Gibbs & Hill, Inc. Job No. 002323-030 Client TUSI - CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS

Calculation Number AB-1-35A Sheet No.

Revision	Orig'nl Calc	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method										
Preparer	VIB	7-5-84								
Checker										

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO AM-WA-476

SUP. MARK NOS. CT-1-076-403-C82R NODE NOS. 1831
CT-1-076-409-C82R 2831

BOTH SUPPORTS ARE INSTALLED AT THE SAME CROSS SECTION

FOR UNIT LOAD 1000 #

MAX. COMBINED STRESS INTENSITY : (S') = 2342

MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 1054

ACTUAL AND ALLOWABLE STRESS **

EQ	FILE COMB.	LOAD (1) UP / DOWN	FACTOR 17-403- / 17-409-	(PSI) GENERAL STRESS AVERAGE	CYL NCZ PSI MEMBRANE STRESS	CYL NCZ PSI TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE
8	11	74 / 6	0.074 / 0.006	2199	78 / 6		2283	$1.0S_h = 16600$
9 (1/2 SSE)	11+31 +S.H.	1443 / 4778	1.443 / 4.778	16209	1521 / 5036		22766	$1.5S_h = 24900$
9 (1/2 SSE)	11+31 +SH	1443 / 4778	1.443 / 4.778	16209		3380 / 11190	30779	$1.8S_h = 29880$ *
11	51 or 52 + +11+40	3199 / 640	3.199 / 0.64	12038		7492 / 1499	21029	$(S_A+S_h) = 44250$
9 (SSE)	11+131+ SH+70	1450 / 4761	1.45 / 4.761	16165	1528 / 5018		22711	$2.16S_h = 35856$

NOTE: MATERIAL SA 312 or SA 358 TYPE 304 or 316

(1): G - - [illegible] Engineering Manual [illegible]

$S_h = 16600$ psi $S_c = 18800$ psi

$S_A = 1.25S_c + .25S_h = 27650$ psi

* ALLOWABLE EXCEEDED BY $\frac{30779-29880}{29880} = \frac{899}{29880} = 0.03 \rightarrow 3\%$ - ACCEPTABLE

USED [illegible]

Gibbs & Hill, Inc. Job No 11-2323-032 Client TUGCO-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS -OTHER CALCULATIONS

Calculation Number AB-1-35A Sheet No 34

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
	1									
Prepare	DJO	1/7/83								
Check	[illegible]	1/11/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

NODE NO.: 2831

REF. NO.: AM-WA- 476

MARK NO.: CT-1-076-409 - C82R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 2342 psi

2). MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 1054 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE psi	CYLNOZ MEMBRANE STRESS psi	CYLNOZ TOTAL STRESS psi	TOTAL = GEN. + LOCAL psi	ALLOWABLE (1) psi
8	11	6	.006	2199	6		2205	1.0 Sh = 16,600
9 (1/2 SSE)	11 + 31	4778	4.778	16,211	5036		21,247	1.5 Sh = 24,900
9 (1/2 SSE)	11 + 31	4778	4.778	16,211		11,190	27,401	1.8 Sh = 29,880
11	11 + 40 + RANGE	640	.640	12,036		1499	13,535	(Sa + Sh) = 44,250
9 (SSE)	11 + 131	4761	4.761	16,167	5018		21,185	2.16 Sh = 35,856

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

NOTE: MATERIAL: SA-312 + SA 358 type 304 or 316

S_h = 16,600 psi S_c = 18,800 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 psi

Checking Method #

F-155.4-E

Gibbs & Hill, Inc. Job No 11-2323-032 Client TUGCO-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number AB-1-35A Sheet No 33

	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Revision	0									
Status	1									
Prepare	DJO	1/7/83								
Checker	[illegible]	1/18/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

NODE NO.: 1831

REF. NO.: AM-WA-476

MARK NO.: CT-1-076-403-C82R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 2342 psi

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 1054 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1) psi
8	11	74	.074	2199	78		2277	1.0Sh = 16,600
9 (1/2SSE)	11+31	1443	1.443	16,209	1521		17,730	1.5Sh = 24,900
9 (1/2SSE)	11+31	1443	1.443	16,209		3380	19,589	1.8Sh = 29,880
11	11+40 + RAIV.E	3199	3.199	12,038		7493	19,531	(SA+Sh) = 44,250
9(SSE)	11+131	1450	1.450	16,165	1528		17,693	2.16Sh = 35,856

REF (1): G&H ANALYTICAL ENGINEERING MANUAL AEG-511.

NOTE: MATERIAL: SA-312 & SA-358 TYPE 304 or 316

S_h = 16,600 psi S_c = 18,800 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 psi

F-155.4-1

Checking Method #

Gibbs & Hill, Inc. Job No. 002323-030 Client TUSI - CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS

Calculation Number AB-1-35A Sheet No.

Revision	Orig	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Drawing Revised										
Preparer	VIB	7-5-84								
Checker										

LOCAL STRESS DUE TO WELDED ATTACMENTS

REF. NO AM-WA-476

SUP. MARK NOS. CT-1-076-403-C82R NODE NOS. 1831
CT-1-076-409-C82R 2831

BOTH SUPPORTS ARE INSTALLED AT THE SAME CROSS SECTION

FOR UNIT LOAD 1000#

MAX. COMBINED STRESS INTENSITY : (S') - 2342

MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 105

ACTUAL AND ALLOWABLE STRESS **

EQ	FILE COMB.	LOAD (lb) UP : SUPT-403- DOWN : SUPT-409-	FACTOR	(PSI) GENERAL STRESS AVERAGE	CYL NOZ PSI MEMBRANE STRESS	TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE
8	11	74 6	0.074 0.006	2199	78 6		2283	$1.0 S_h = 16600$
9 (1/2 SSE)	11+31 + S.H.	1443 4778	1.443 4.778	16209	1521 5036		22766	$1.5 S_h = 24900$
9 (1/2 SSE)	11+31 + SH	1443 4778	1.443 4.778	16209		3380 11190	30779	$1.8 S_h = 29880$ *
11	51 or 52 + 11+40	3199 640	3.199 0.64	12038		7492 1499	21029	$(S_A + S_h) = 44250$
9 (SSE)	11+131+ SH+70	1450 4761	1.45 4.761	16165	1528 5018		22711	$2.16 S_h = 35856$

NOTE : MATERIAL SA 312 or SA 358 TYPE 304 or 316

Ref(1) : G-H Analytical Engineering Manual AEG-...

$S_h = 16600$ psi $S_c = 18800$ psi

$S_A = 1.25 S_c + .25 S_h = 27650$ psi

* ALLOWABLE EXCEEDED BY $\frac{30779 - 29880}{29880} = \frac{899}{29880} = 0.03 \rightarrow 3\%$ - ACCEPT...

** DAJ. USED FOR VERIFICATION AS PER QA BOOK AB-1-35A Page/Sheets 34 and 35

Gibbs & Hill, Inc. Job No 11-2323-031 Client [illegible]

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER [illegible]

Calculation Number AB-1-35A Sheet No 34

Revision	O	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
[illegible]	1									
Prepare	DJO	1/7/83								
Checker	[illegible]	1/11/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA- 476 NODE NO.: 2831

MARK NO. : CT-1-076-409 - C82R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 2342 psi

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 1054 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE.	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	6	.006	2199	6		2205	1.0Sh = 16,600
9 (UPSET)	11+31	4778	4.778	16,211	5036		21,247	1.5Sh = 24,900
9 (UPSET)	11+31	4778	4.778	16,211		11,190	27,401	1.8Sh = 29,880
11	11+40 + [illegible]	640	.640	12,036		1499	13,535	(Sc+SA) = 44,25
9(SSE)	11+131	4761	4.761	16,167	5018		21,185	2.16Sh = 35,85

NOTE: MATERIAL: SA-312 + SA358 Type 304 or 316

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

S_h = 16,600 psi S_c = 18,800 psi

$S_A = 1.25\,S_c + 0.25\,S_h$ = 27,650 psi

F-155

Checking Method # [illegible]

Gibbs & Hill, Inc. Job No 11-2323-035 Client [illegible]

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER [illegible]

Sheet No 33

Calculation Number AB-1-35A

Revision	By	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
[illegible]	1										
Prepared	DJO	1/7/83									
Checked	[illegible]	1/18/83									

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

NODE NO.: 1831

REF. NO.: AM-WA-476

MARK NO.: CT-1-076-403-C82R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 2342 psi

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 1054 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	74	.074	2199	78		2277	1.0Sh = 16,600
9 (UPSET)	11+31	1443	1.443	16,209	1521		17,730	1.5Sh = 24,900
9 (UPSET)	11+31	1443	1.443	16,209		3380	19,589	1.8Sh = 29,880
11	11+40 +[illegible]	3199	3.199	12,038		7493	19,531	(Sh+SA) = 44,2[illegible]
9(SSE)	11+131	1450	1.450	16,165	1528		17,693	2.16Sh = 35,8[illegible]

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

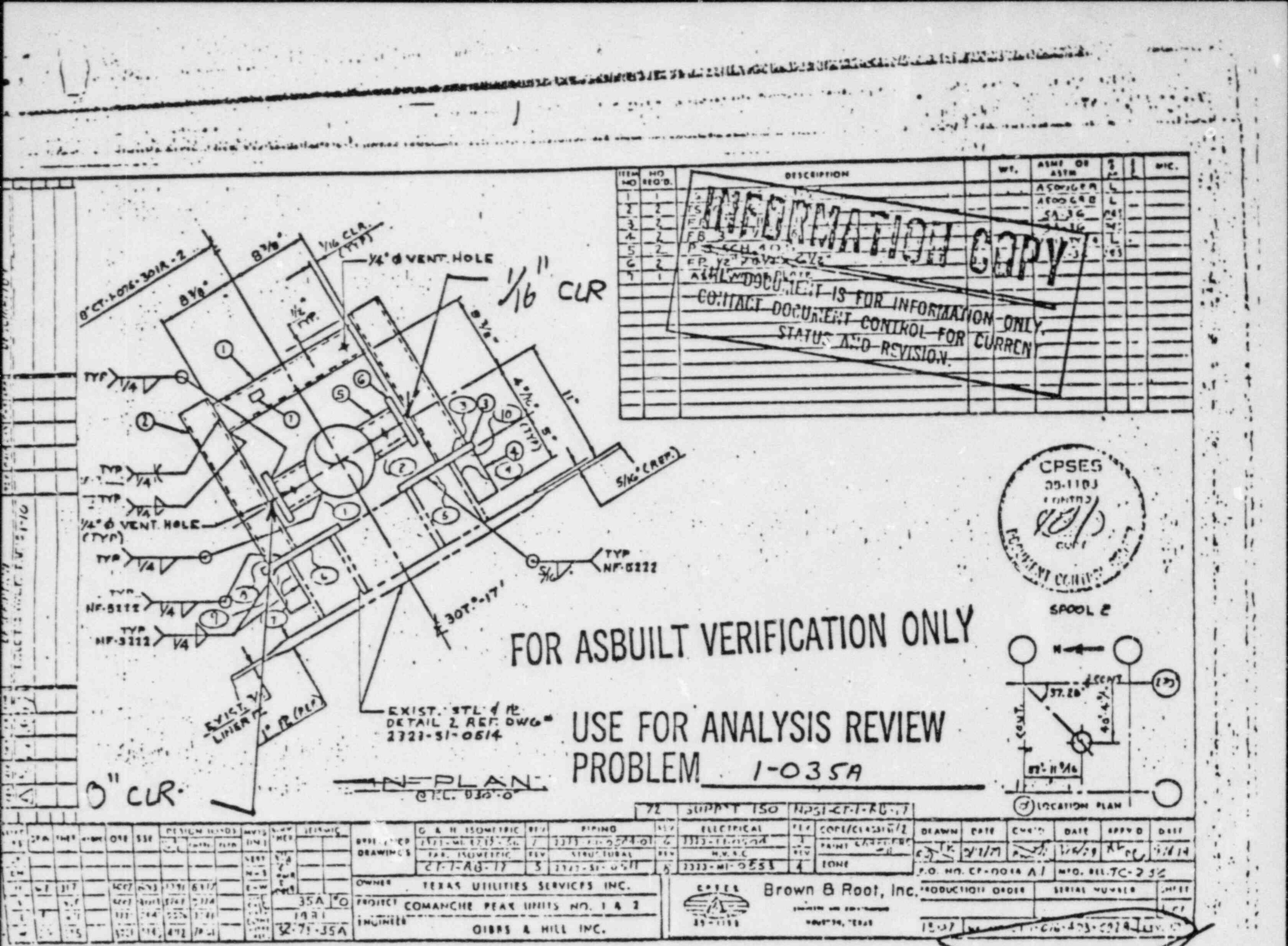
NOTE: MATERIAL: SA-312 & SA358 TYPE 304 & 316

S_h = 16,600 psi S_c = 18,800 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 psi

F-15

Checking Method # [illegible]



INFORMATION COPY
THIS DOCUMENT IS FOR INFORMATION ONLY.
CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION.
8"CT-1-016-301R-2
8 3/8"
1/16 CLR. (TYP)
1/4" Ø VENT HOLE
1/16" CLR
1/4" Ø VENT HOLE (TYP)
TYP 1/4
TYP NF-5222
5/16" (REF)
EXIST. STL & PL DETAIL 2 REF. DWG 2323-S1-0614
EXIST. 3/4 LINER PL
30T°-17'
PLAN
3" CLR
FOR ASBUILT VERIFICATION ONLY
USE FOR ANALYSIS REVIEW
PROBLEM 1-035A
CPSES
DOCUMENT CONTROL
SPOOL 2
LOCATION PLAN
SUPPORT
DESCRIPTION
WT.
ASME OR ASTM
DWG.
DRAWN
DATE
CHK'D
DATE
APPR'D
REFERENCED DRAWINGS
G & H ISOMETRIC
PIPING
ELECTRICAL
STRUCTURAL
H.V.A.C.
CT-1-AB-17
2323-MI-0553
OWNER TEXAS UTILITIES SERVICES INC.
PROJECT COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER GIBBS & HILL INC.
Brown & Root, Inc.
HOUSTON, TEXAS
35A
PRODUCTION ORDER
SERIAL NUMBER
SHEET

SCHAUER

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. 12499 REV. 8

(1) APPLICATION: PIPE SUPPORT WELD MOD. [X] Q [X] NON-Q [N/A] ~~DESIGN CHANGE~~/DEVIATION [X]

(2) DWG. NO. BRH-CT-1-076-403-C82R Rev. 0 / A1507

(3) LINE NO./COMPONENT NO. N/A

(4) REASON FOR CHANGE: To comply w/min weld size. Liner off location. Pipe off location. For better fit-up. ISO. CT-1-RB-17

(7) Originator: OLIVER | HEBERT
Name

[X] CPPB

[N/A] Original Designer

(8) APPROVED BY:

	DATE
Jeffrey W. Oliver	13-Feb-80
Joe Schaefer	7/1/81
Joe Schaefer	7/24/81
[illegible]	5-10-82

(5) INSTRUCTIONS:

REMOVE [X]

Delete It# 1, 2

Note: Transfer It. 7 (ASME NAMEPLATE) to It. 8 w/ANI & Q.C. present

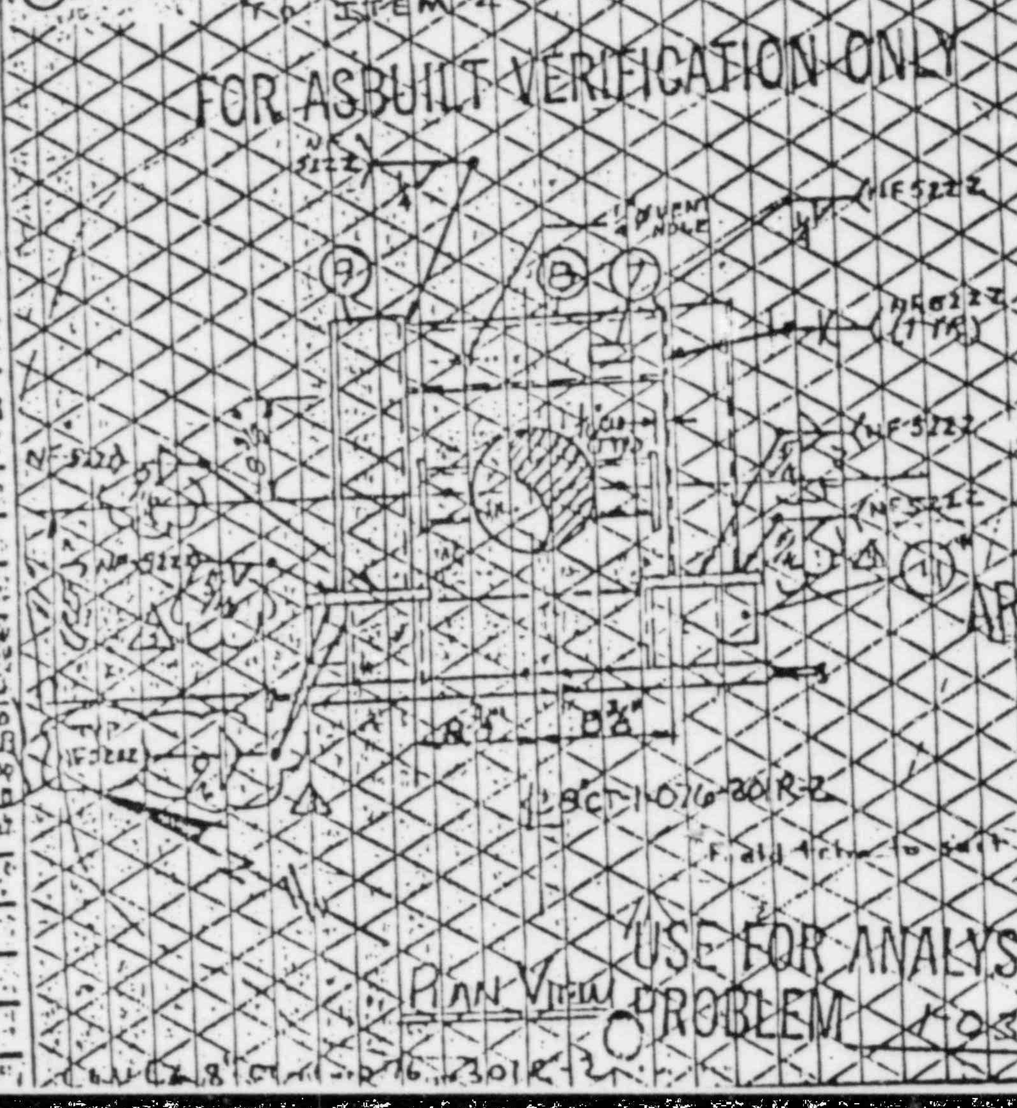
ADD [X]

It. 6 (1) TS 6 x 6 x 3/8 x 16 9/16 (A500 Gr B)

It. 9 (2) TS 6 x 6 x 3/8 x 19 5/16 (A500 Gr B)

(6) SKETCH: Add note "Field trim to suit" to item 4

FOR ASBUILT VERIFICATION ONLY



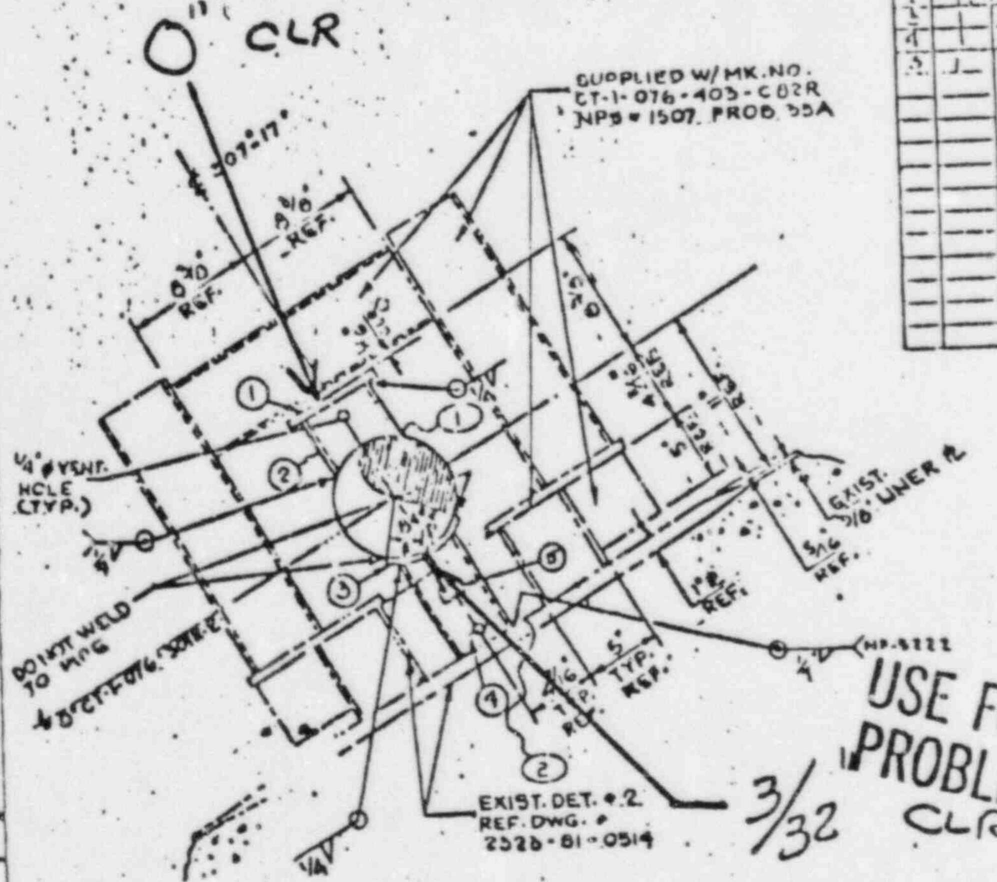
USE FOR ANALYSIS REVIEW

PROBLEM

(9) DISTRIBUTION

DISTRIBUTION	DCC CNTL NO.	QTY
AREA MANAGEMENT INFO		
TECH SERVICES	INFO	2
STUDY GROUP	INFO	
SYSTEMS PLANNING	INFO	1

THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO. CMC 12499 REV 2



PLAN AT EL. 930'-0"

ITEM NO	NO REQ'D	DESCRIPTION	ASME OR ASTM
1		FP-1/2" x 6 1/2	SA-36
2		P5 SCH 40	
3		FP-1/2" x 0	
4		P4 SCH 40	
5	1	ASME 45A	

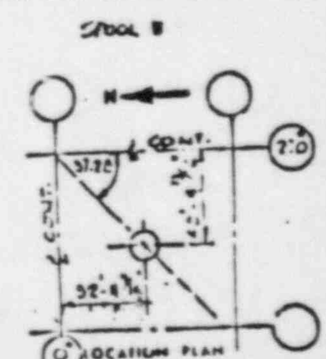
INFORMATION COPY

THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION.

FOR ASBUILT VERIFICATION ONLY

USE FOR ANALYSIS REVIEW

PROBLEM 1-035A



SUPPT. 150 NPS -CT-1-RB-17

REFERENCE DRAWINGS		REV		REV		REV
G & H ISOMETRIC	2323-MI-3232-54	6	PIPING 2323-MI-0503-01	6	ELECTRICAL 2323-MI-05-54	
FAB. ISOMETRIC	CT-1-RB-17	5	STRUCTURAL 2323-S1-0611	0	H.V.A.C. 2323-MI-0555	4

OWNER: TEXAS UTILITIES SERVICES INC.

PROJECT: COMANCHE PEAK UNITS NO. 1 & 2

ENGINEER: GIBBS & HILL INC.

Brown & Root, Inc.

MFG. REF. TC-236

CT-1-016-409-C62R

JAN 13 1981

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. Nº 31313 (2)

(1) APPLICATION: PIPE SUPPORT WELD MOD. [X] Q [X] NON-Q [N/A] ~~DESIGN CHANGE~~/DEVIATION [X]

(2) DWG. NO. UP8R-0 BRHR-0
T-1-076-409-C82R #2773

(3) LINE NO./COMPONENT NO.
N/A

(4) REASON FOR CHANGE:
MODIFY EMBED
(2) PPE OFF LOCATION
ISO: CT-1-RB-17

(5) INSTRUCTIONS:

REMOVE [X]

DELETE IT.#4

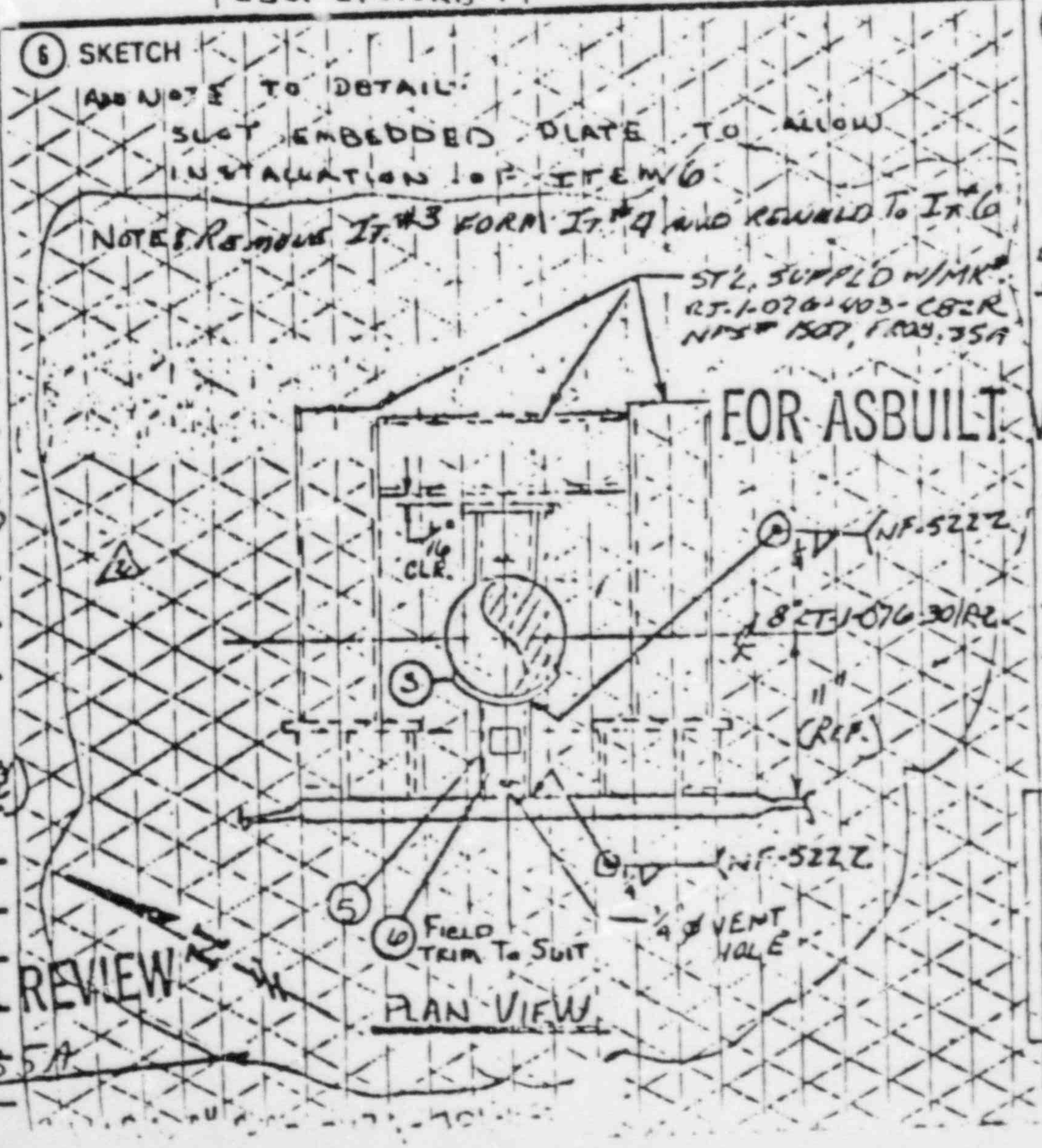
(2) STEP: REMOVE IT.#5 (ASME NAMEPLATE) FROM IT.#4 AND REINSTALL ON IT.#6 W/ ANI & QC PRESENT

ADD [X]

IT.#6 (1) P4·SCH40·(A-53 GR.B)

FOR ANALYSIS REVIEW
T-035A

(6) SKETCH



FOR ASBUILT VERIFICATION ONLY

(7) ORIGINATOR
OLIVER / HERBERT
NAME
[X] CPPE
[N/A] ORIGINAL DESIGNER

(8) APPROVED BY:

	DATE
Jeffrey W. Oliver	27-Feb-80
W. Oliver	29-Feb-80
[illegible]	1-13-81

(9) DISTRIBUTION	DCC CNTL NO.	QTY
UP32	TUTO	2

THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO. 31313 REV. 1

Gibbs & Hill, Inc. Job No 11-2323-036 Client TUGCO-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER [illegible] Sheet No 25

Calculation Number PROB: AB-2-63B

	By	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Revision	0									
	/									
Prepared	BGH	1/8/83								
Checked	BKG	3/30/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-703 DATED 12/9/82 NODE NO.: 1809

MARK NO.: CC-2-158-408-A43K X SNUBBER

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 1048 PSI

2). MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 355 PSI

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1)
8	11	0	0	1785	0		1785	1.0Sh = 15000
9 (UPSET)	11+31	5472	5.472	2663	1942		4605	1.5Sh = 22500
9 (UPSET)	11+31	5472	5.472	2663		5734	8397	1.8Sh = 27000
9 (UPSET)	11+31	5472	5.472	2663		5772	9198	(Sh+SA) = 3750[illegible]
11	61 62	5508 -5508	5.508	3426				
9 (SSE)	11+131	6984	6.984	2922	2479		5401	2.16Sh = 3240[illegible]

REF (1): G+H ANALYTICAL ENGINE[ERING] MANUAL AEG-511.

NOTE: MATERIAL: SA-106 GR. B

$S_h = 15000$ PSI $S_c = 15000$ PSI

$S_A = 1.25 S_c + 0.25 S_h = 22500$ PSI

Checking Method # [illegible]

Gibbs & Hill, Inc. Job No 11-2323-035 Client [illegible]

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER [illegible]

Calculation Number PROB: AB-2-63B Sheet No 26

Revision	1	Date	Re.	Date	Re.	Date	Re.	Date	Re.	Date
Prepared	KG	1/6/83								
Checked	EKG	3/25/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-700 DATED 12/29/82 NODE NO.: 1809

MARK NO.: CC-2-158-407-A43K Y SNUBBER

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 834 PSI

2). MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 173 PSI

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1)
8	11	0		1785	0		1785	1.0Sh = 15000
9(1/2SSE)	11+31	4387	4.387	2663	759		3422	1.5Sh = 22500
9(1/2SSE)	11+31	4387	4.387	2663		3658	6321	1.8Sh = 27000
11	61 62	4387 -4387	4.387	3426		3658	7084	(Sa+Sh) = 37500
9(SSE)	11+131	5398	5.398	2922	934		3856	2.16Sh = 32400

REF (1): G&H ANALYTICAL ENGINEERING MANUAL AEG-511.

NOTE: MATERIAL: SA-106 GR.B

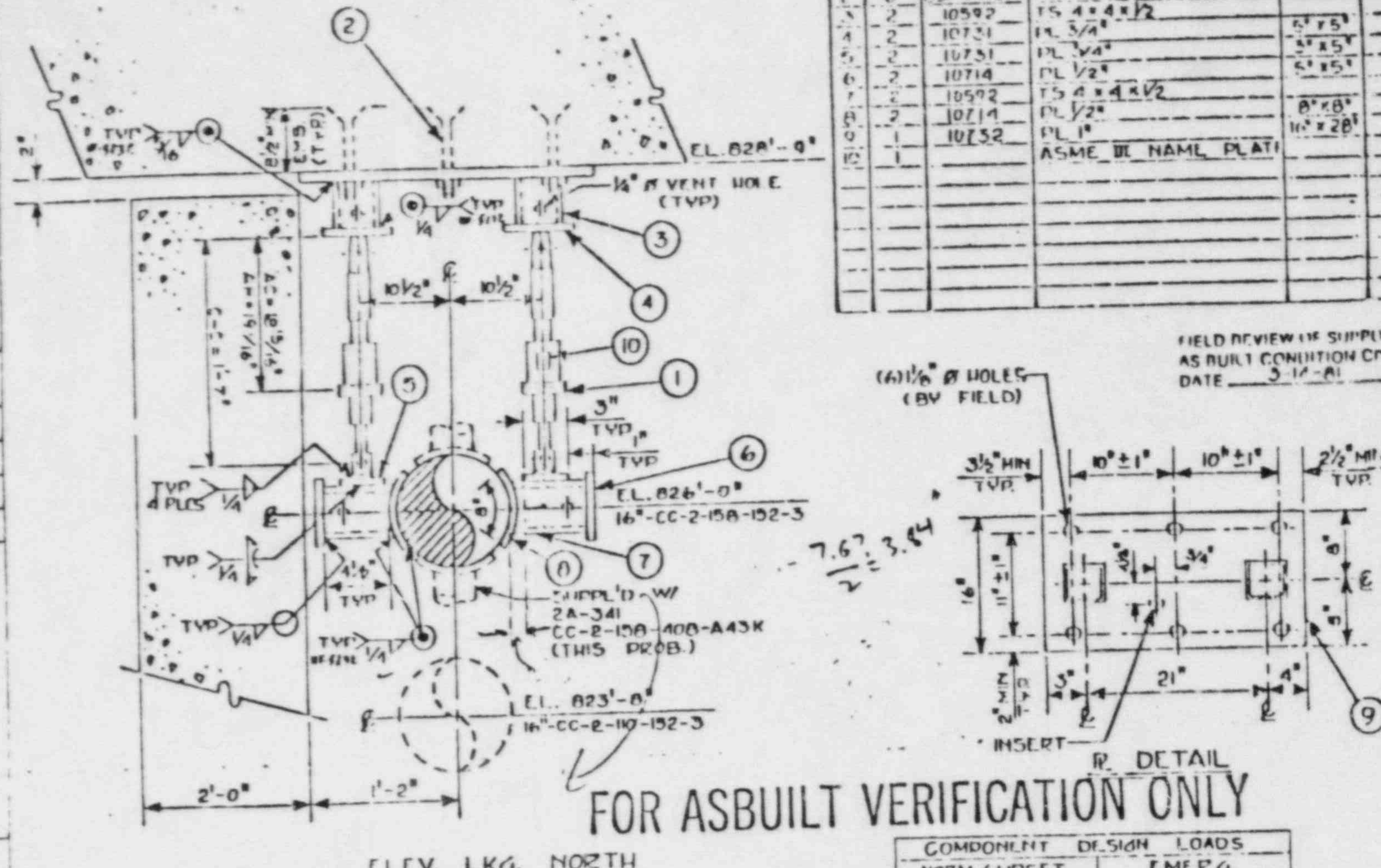
S_h = 15000 PSI S_c = 15000 PSI

$S_A = 1.25 S_c + 0.25 S_h$ = 22500 PSI

F-155

Checking Method #

ITEM NO	NO REQ'D.	PART NO	DESCRIPTION		WT.	MAT'L OR ASTM
1	2	SMF-3-BA	SHOCK SUPPRESSOR ASSY. FIELD [illegible]			
2	6	USA-1-12	INSERT [illegible] (BY FIELD)			A-[illegible]
3	2	10592	TS 4 x 4 x 1/2			A-500/1
4	2	10731	PL 3/4"	5" x 5"		SA-36
5	2	10731	PL 3/4"	5" x 5"		SA-36
6	2	10714	PL 1/2"	5" x 5"		SA-36
7	2	10592	TS 4 x 4 x 1/2			A-500/B
8	2	10714	PL 1/2"	8" x 8"		SA-36
9	1	10732	PL 1"	10" x 28"		SA-36
10	1		ASME III NAME PLATE			



FIELD REVIEW OF SUPPORT DESIGN
AS BUILT CONDITION CPPA-3211
DATE 3-14-81 REVIEWED BY S. JOSEPH

RECEIVED
SEP 29 1982
GIBBS & HILL, Inc.

LOCATION PLAN
9A
JA
6'-3"

FOR ASBUILT VERIFICATION ONLY

COMPONENT DESIGN LOADS	
NORM / UPSET	EMERG.
6802 # x 125 = 8502 #	13604 # x 1.14 = 15500 #

2A-16 SUPPORT ISSUE [illegible]-CC-2-AB-012

REFERENCE DRAWINGS	G & H ISOMETRIC	REV	PIPING	REV	ELECTRICAL	REV	CODE/CLASS
	2323-M2-3231-02	15	2323-MI-0703	13	2323-EI-0701-01	5	[illegible]
	FAB. ISOMETRIC	REV	2323-S-0710	5	2323-MI-0753	7	ZONE
	HEP-CC-2-AB-012	1					

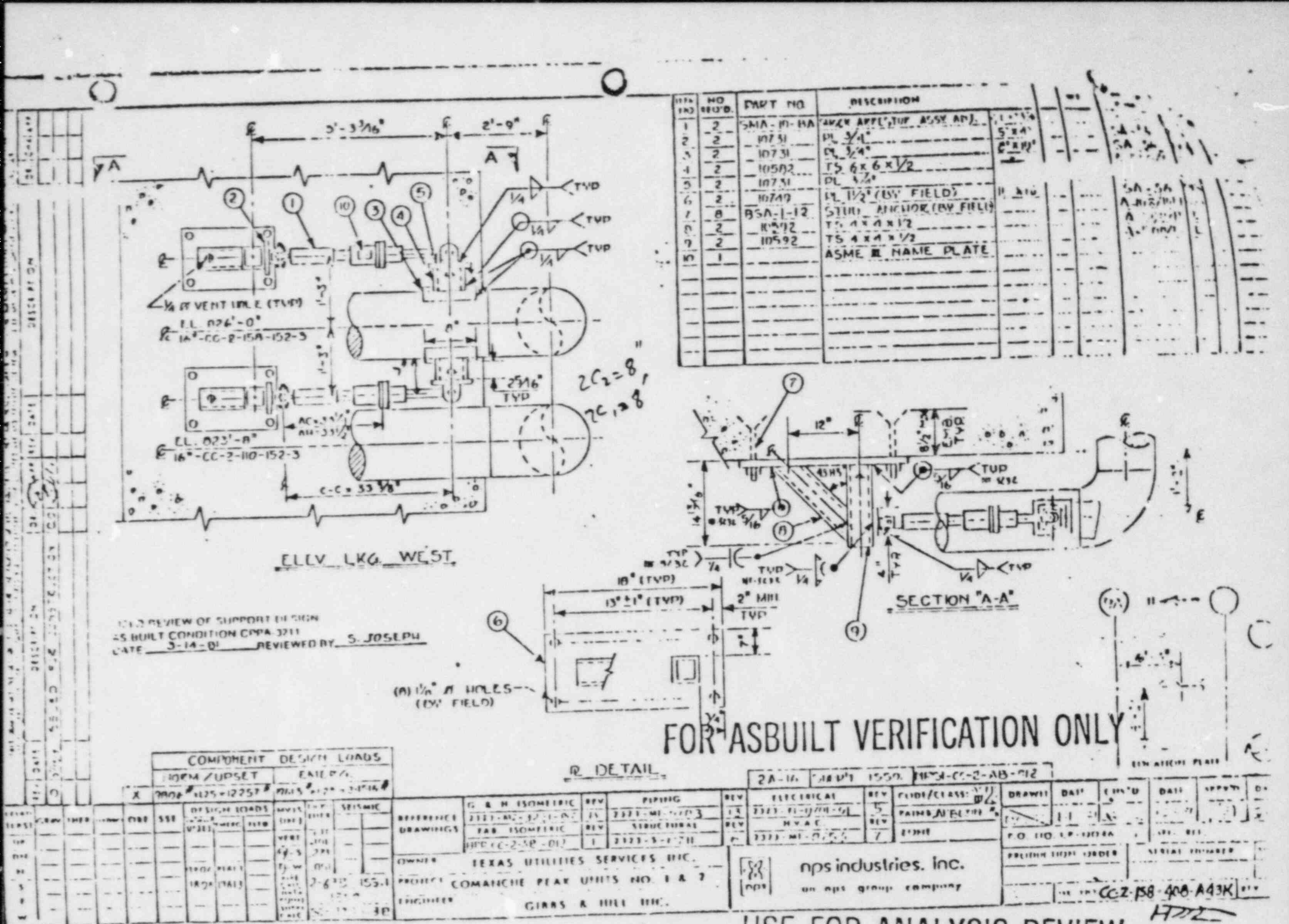
OWNER TEXAS UTILITIES SERVICES INC.
PROJECT COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER GIBBS & HILL INC.

nps industries, inc.
an nps group company

DRAWN	DATE	CHK'D.	DATE	APPV'D	DATE
		[illegible]	2/8/81	[illegible]	[illegible]

P.O. NO. CP-0048 A-1
PRODUCTION ORDER
SERIAL NUMBER
2A-340 MK. NO CC-2-158-407-A43K REV. 0

USE FOR ANALYSIS REVIEW
PROBLEM 2-063 B



FOR ASBUILT VERIFICATION ONLY

USE FOR ANALYSIS REVIEW
PROBLEM 2-063B

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUSI - CPSES

Subject AS-BUILT STRESS VERIFICATION-ANALYSIS RESULTS

Calculation Number AB-1-35A Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Drawing Revised										
Preparer	VIB	1-5-84								
Checker										

LOCAL STRESS DUE TO WELDED ATTACMENTS

REF. NO AM-WA-477

SUP. MARK NO. CT-1-013-406-C82R NODE NOS 120
CT-1-013-420-C82R 20

BOTH SUPPORTS ARE INSTALLED AT THE SAME CROSS SECTION

FOR UNIT LOAD - 1000#

MAX. COMBINED STRESS INTENSITY (S') = 1107 psi

MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 665 p

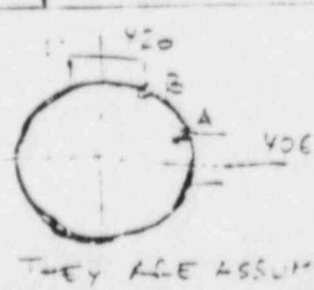
ACTUAL AND ALLOWABLE STRESS **

EQ	FILE COMB.	LOAD(k) UP: SUPPT-406 / DOWN: SUPPT-420	FACTOR	(PSI) GENERAL STRESS AVERAGE	CYL NOZ PSI MEMBRANE STRESS	CYL NOZ PSI TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE
8	11	93 1	0.093 0.001	3591	62 1		3654	$1.0 S_h = 16600$
9 (1/2 SSE)	11 + 31 + S.H.	3217 6667	3.217 6.667	9252	2139 4434		15825	$1.5 S_h = 24900$
9 (1/2 SSE)	11 + 31 + SH	3217 6667	3.217 6.667	9252		4526 9380	23158	$1.8 S_h = 29880$
11	51 or 52 + 11 + 40	18493 3727	18.493 3.727	16176		26020 5244	47440	$(S_A + S_h) = 44250$ *
9 (SSE)	11 + 131 + SH + 70	3206 6853	3.206 6.853	9342	2132 4557		16031	$2.16 S_h = 35856$

NOTE: MATERIAL SA-312 OR SA-358 TYPE 304 OR 316

$S_h = 16600$ psi $S_c = 18600$ psi

$S_A = 1.25 S_c + 0.25 S_h = 27650$ psi



* ALLOWABLE EXCEEDED BY $\frac{47440 - 44250}{44250} = 0.072 \rightarrow 7.2\%$

POINTS OF PEAK STRESS ARE AWAY BY ~3" EACH OTHER. THEY ARE ASSUMED IDENTICAL IN THE ABOVE STRESS COMBINATION

** [illegible]

Gibbs & Hill, Inc. Job No 11-2323-032 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS -OTHER CALCULATIONS Sheet No 36

Calculation Number AB-1-35A

Revision	1	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
	1									
Prepared	DJO	1/7/82								
Checked	[illegible]	1/11/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

NODE NO.: 20

REF. NO.: AM-WA-477

MARK NO.: CT-1-013-420-C82R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 1407 psi

2). MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 665 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1) psi
8	11	1	.001	3591	1	X	3592	1.0Sh = 16,600
9(UPSET)	11+31	6667	6.667	9253	4434	X	13,687	1.5Sh = 24,900
9(UPSET)	11+31	6667	6.667	9253	X	9380	18,633	1.8Sh = 29,880
11	11+40 + RANGE	3727	3.727	16,176	X	5244	21,420	(Sc+Sh) = 44,250
9(SSE)	11+131	6853	6.853	9343	4557	X	13,900	2.16Sh = 35,856

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

NOTE: MATERIAL: SA-312 + SA-358 TYPE 304 or 316

S_h = 16,600 psi S_c = 18,800 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 psi

F-155.4-

Checking Method #

Gibbs & Hill, Inc. Job No 11-2323-035 Client TUGI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number AB-1-35A Sheet No 35

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
	1									
Prepare	DJO	1/7/83								
Checker		1/18/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-477 NODE NO.: 120

MARK NO.: CT-1-013-406-C82R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 1407 psi

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 665 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYLNOZ MEMBRANE STRESS	CYLNOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1) psi
8	11	93	.093	3591	62		3653	1.0Sh = 16,600
9 (1/2 SSE)	11+31	3217	3.217	9252	2139		11,391	1.5Sh = 24,900
9 (1/2 SSE)	11+31	3217	3.217	9252		4526	13,778	1.8Sh = 29,880
11	11 + 40 + RANGE	18,493	18.493	16,177		26,020	42,197	(Sa+Sh) = 44,250
9 (SSE)	11+131	3206	3.206	9342	2132		11,474	2.16Sh = 35,856

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

NOTE: MATERIAL: SA-312 + SA-358 TYPE 304 or 316

S_h = 16,600 psi S_c = 18,800 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 psi

Checking Method #

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUSI-CASES

Subject AS-BUILT STRESS VERIFICATION-ANALYSIS RESULTS

Calculation Number AB-1-35A Sheet No.

Revision	Orig'l Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Drawing Revised										
Preparer	VIB	7-5-84								
Checker										

LOCAL STRESS DUE TO WELDED ATTACMENTS

REF. NO AM-WA-477

SUP. MARK NO. CT-1-013-406-C82R NODE NOS 120
CT-1-013-420-C82R 20

BOTH SUPPORTS ARE INSTALLED AT THE SAME CROSS SECTION

FOR UNIT LOAD 1000*

MAX. COMBINED STRESS INTENSITY (S') = 1407

MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 6

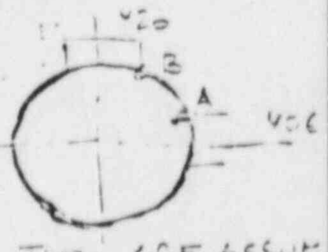
ACTUAL AND ALLOWABLE STRESS **

EQ	FILE COMB.	LOAD (#) UP: SUPPT-406 / DOWN: SUPPT-420	FACTOR	(PSI) GENERAL STRESS AVERAGE	CYL NOZ PSI MEMBRANE STRESS	CYL NOZ PSI TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE
8	11	93 1	0.093 0.001	3591	62 1		3654	$1.0 S_h = 16600$
9 (1/2 SSE)	11+31 + S.H.	3217 6667	3.217 6.667	9252	2139 4434		15825	$1.5 S_h = 24900$
9 (1/2 SSE)	11+31 + SH	3217 6667	3.217 6.667	9252		4526 9380	23158	$1.8 S_h = 29880$
11	51 or 52 + 11+40	18493 3727	18.493 3.727	16176		26020 5244	47440	$(S_A + S_h) = 4425$
9 (SSE)	11+131+ SH+70	3206 6853	3.206 6.853	9342	2132 4557		16031	$2.16 S_h = 3585$

NOTE: MATERIAL SA-312 OR SA-358 TYPE 304 OR 316

$S_h = 16600$ psi $S_c = 18800$ psi

$S_A = 1.25 S_c + 0.25 S_h = 27650$ psi



* ALLOWABLE EXCEEDED BY $\frac{47440 - 44250}{44250} = 0.072 \rightarrow 7.2\%$

POINTS OF PEAK STRESS ARE AWAY BY ~3" EACH OTHER. THEY ARE ASSUM IDENTICAL IN THE ABOVE STRESS COMBINATION

Gibbs & Hill, Inc. Job No 11-2323-020 Client [illegible]

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number AB-1-35A Sheet No 36

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
[illegible]	1									
Prepared	DJO	1/5/83								
Checked	[illegible]	1/11/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-477 NODE NO.: 20

MARK NO.: CT-1-013-420-C82R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 1407 psi

2). MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 665 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE psi (1)
8	11	1	.001	3591	1		3592	1.0Sh = 16,600
9(UPSET)	11+31	6667	6.667	9253	4434		13,687	1.5Sh = 24,900
9(UPSET)	11+31	6667	6.667	9253		9380	18,633	1.8Sh = 29,880
11	11+40 + POUSE	3727	3.727	16,176		5244	21,420	(Sc+Sh) = 44,250
9(SSE)	11+131	6853	6.853	9343	4557		13,900	2.16Sh = 35,856

NOTE: MATERIAL: SA-312 + SA-358 TYPE 304 & 316

REF (1): G+H ANALYTICAL ENGINEERS MANUAL AEG-511.

S_h = 16,600 psi S_c = 18,800 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 psi

F-155

Checking Method #

Gibbs & Hill, Inc. Job No 11-2323-035 Client TUGCO-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number AB-1-35A Sheet No 35

Revision	1	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Prepare	DJO	1/7/83								
Checker	TFill.	1/19/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-477 NODE NO.: 120

MARK NO.: CT-1-013-406-C82R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 1407 psi

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 665 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1) psi
8	11	93	.093	3591	62	X	3653	1.0Sh = 16,600
9(1/2SSE)	11+31	3217	3.217	9252	2139	X	11,391	1.5Sh = 24,900
9(1/2SSE)	11+31	3217	3.217	9252	X	4526	13,778	1.8Sh = 29,880
11	11+40 + RENSE	18,493	18.493	16,177	X	26,020	42,197	(SA+Sh) = 44,250
9(SSE)	11+131	3206	3.206	9342	2132	X	11,474	2.16Sh = 35,856

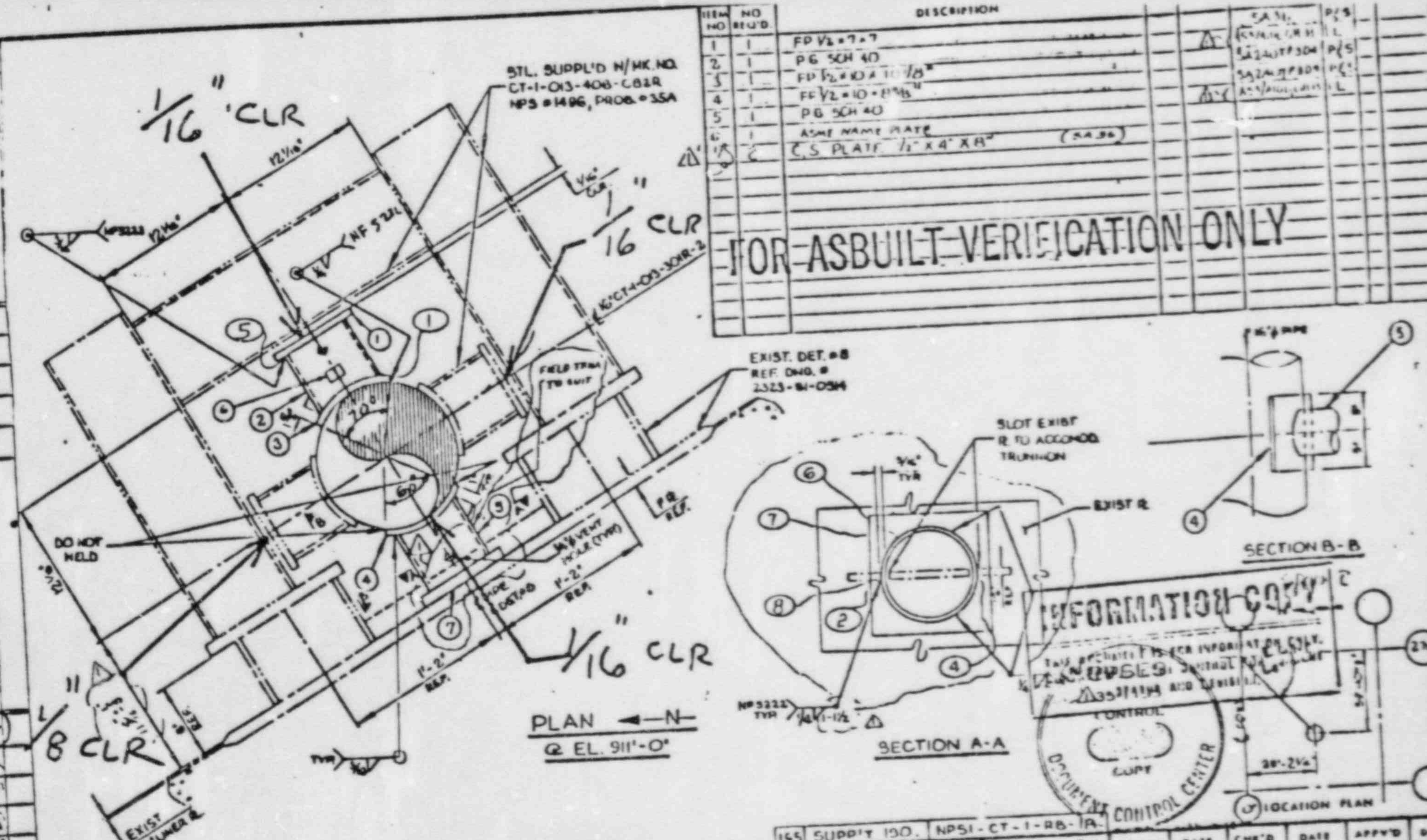
NOTE: MATERIAL: TYPE 304 or 316 SA-312 & SA-358 REF (1): G&H ANALYTICAL ENGINEERS MANUAL AEG-511.

S_h = 16,600 psi S_c = 18,900 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 psi

Checking Method #

F-155.4



ITEM NO	NO REQ'D	DESCRIPTION		MAT'L	P/S
1	1	FP 1/2 x 7 x 7		[illegible]	L
2	1	PG SCH 40		[illegible]	P/S
3	1	FP 1/2 x 10 x 10 7/8"		[illegible]	P/S
4	1	FP 1/2 x 10 x 8 3/16"		[illegible]	L
5	1	PG SCH 40			
6	1	ASME NAME PLATE			
7	2	C.S. PLATE 1/2" x 4" x 8" (SA 36)			

FOR ASBUILT VERIFICATION ONLY

INFORMATION COPY

DOCUMENT CONTROL CENTER
CONTROL COPY

REV	DESCRIPTION
[illegible]	ISSUE FOR CONST. P.W. '8' 1-5
[illegible]	REV. AS NOTED, PER NPSI R.1, [illegible]

LOAD (LBS)	GRAV	THER	HYDRO	OBE	SSE	DESIGN LOADS NORMAL	EMERG	FLTD	MVTS (IN.)	THER	SEISMIC
UP									VERT		
DN									N-S		
H		306A		3338	6676	8376	1796		E-W		
S	10	[illegible]		3338	6676	5634	8972			35A	40
E	2	1726		4655	3010	6383	11036			20	
W		9951		4655	9310	14634	19353			SC-"3-35A	

REFERENCE DRAWINGS		REV		REV		REV		
G & H ISOMETRIC	2323-MI-3252-02	F	PIPING 2323-MI-0534-[illegible]	4	ELECTRICAL 2323-EI-0504	3	CODE/CLASS II B/2	
FAB. ISOMETRIC	CT-1-RB-18	7	STRUCTURAL 2323-SI-0511	13	H.V.A.C. 2323-MI-0553	4	PAINT/CARBOZINC #[illegible]	ZONE —

ICS SUPP'T 190. NPSI-CT-1-RB-1A

OWNER TEXAS UTILITIES SERVICES INC.
PROJECT COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER GIBBS & HILL INC.

Brown & Root, Inc.
HOUSTON, TEXAS

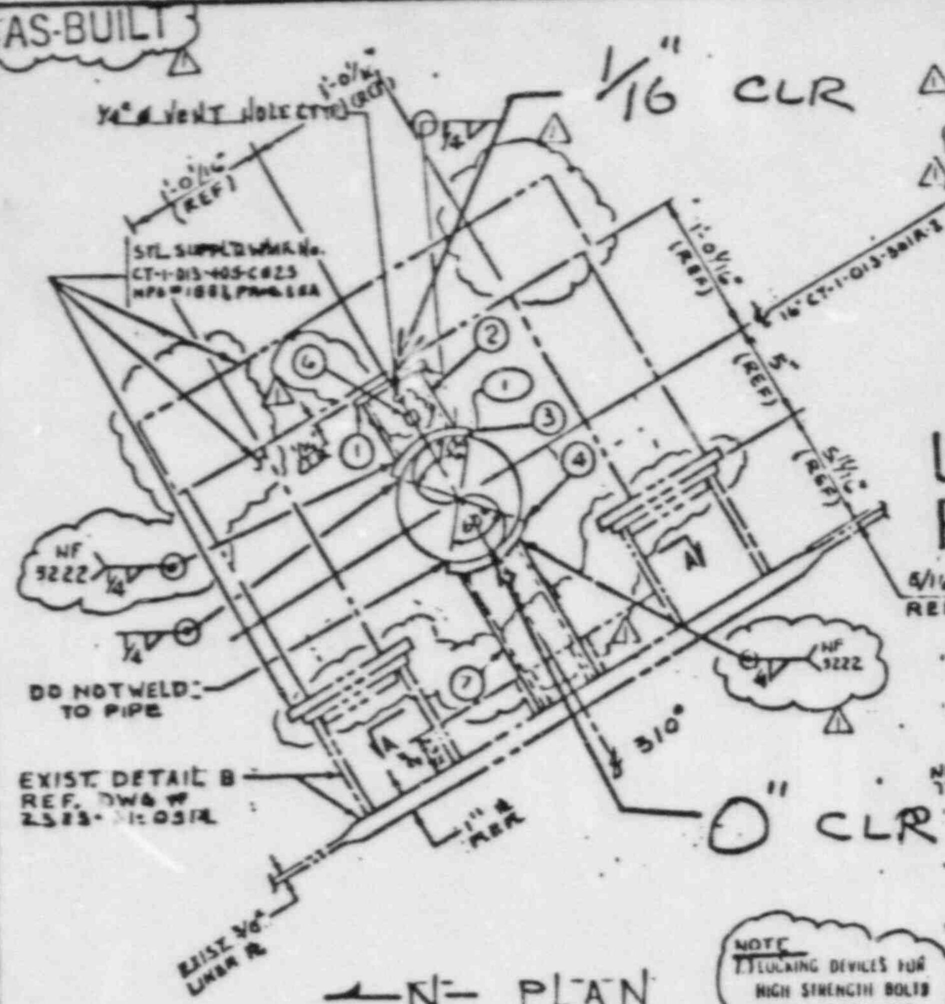
DRAWN	DATE	CHK'D	DATE	APPV'D	DATE
[illegible] SFR	9.13.79	[illegible]	7/1/7[illegible]	[illegible]	[illegible]

P.O. NO. CP-0046 A.1 — MFG. REF. TC-25[illegible]
PRODUCTION ORDER — SERIAL NUMBER
2774 — MK. NO CT-1-013-420-C82R

NPS 1044 M1 1/78

USE FOR ANALYSIS REVIEW
PROBLEM 1-035A

AS-BUILT



N — PLAN

@ EL 930'-0"

NOTE
1. LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 7607.

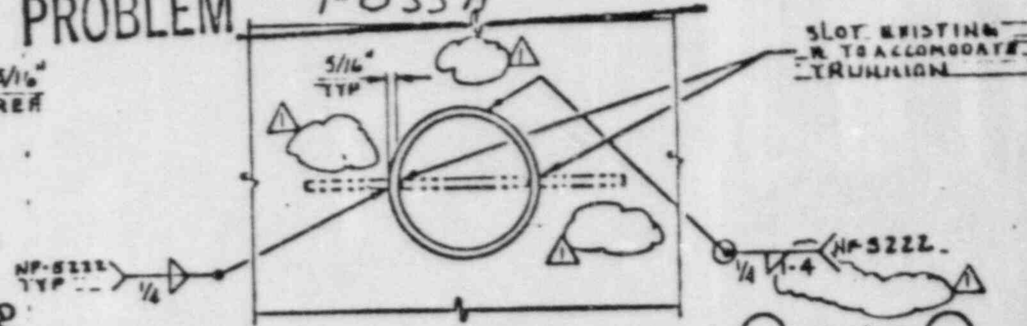
TO # 4802

ITEM NO	NO REQ'D	DESCRIPTION	WT.	ASME OR ASTM	
1	1	FP 1/2" x 7 1/2" x 7 1/2"		SA 36	PCS
2	1	P 6 SCH 40			
3	1	FP 1/2" x 10" x 10 1/2"			PCS
4	1	FP 3/4" x 8" x 8 3/4"		SA 36	PCS
5	1	P 6 SCH 40			
6	1	ASME NAME PLATE (OR ALTERNATE MARKING)			
7	1	P 6 SCH 40 4'-0" LG FIELD TRIM TO SUIT			

FOR ASBUILT VERIFICATION ONLY

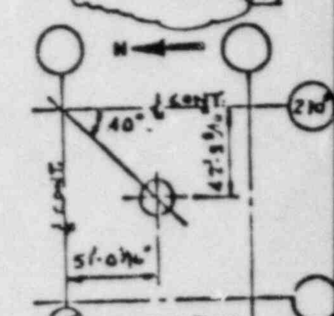
USE FOR ANALYSIS REVIEW
PROBLEM 1-035A

SLOT EXISTING R TO ACCOMODATE TRUNNION



SECTION A-A

CPSES
35-1195
CONTROL
COPY
DOCUMENT CONTROL CENTER



LOCATION PLAN

165 SUPP'T. ISO. NPSI-CT-1-RB-1B

REFERENCE DRAWINGS	G & H ISOMETRIC	REV	PIPING	REV	ELECTRICAL	REV
	2323-MI-3232-02	F	2323-MI-0504-01	G	2323-E1-0504	3
	FAB. ISOMETRIC	REV	STRUCTURAL	REV	H.V.A.C	REV
	CT-1-RB-1B	7	2323-S1-0511	8	2323-MI-0553	4

CODE/CLASS: III/2 · PAINT: CARBOZINC · ZONE

DRAWN	DATE	CHK'D	DATE	APPV'D	DATE
	9-12-79		9-14-79		9-1[illegible]

P.O. NO. CP-0046 81 · MFG. REL. TC-23C

OWNER: TEXAS UTILITIES SERVICES INC.

PROJECT: COMANCHE PEAK UNITS NO. 1 & 2

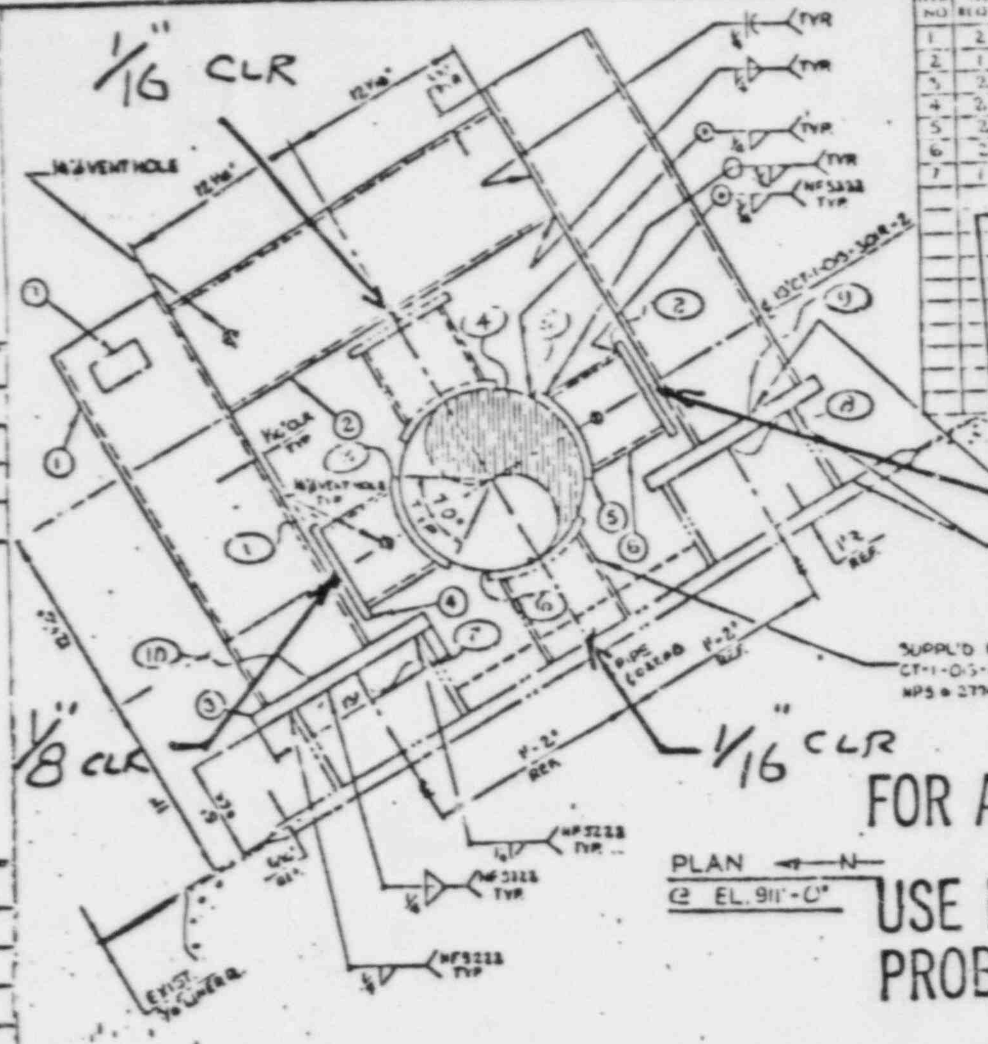
ENGINEER: GIBBS & HILL INC.

Brown & Root, Inc. HOUSTON, TEXAS

LOAD (LBS)	GRAV	THER	HYDRO	OBE	SSE	DESIGN LOADS		
UP								
DN								
N	108	2465		3308	6575	5060	9167	
S		4213		3308	6575	11303	20481	
E		1720		4012	8143	15433	18305	
W	158	2032		4072	8143	6262	16336	

E-W 0 · 35A/80 · 2601 · SC-73-35A

PRODUCTION ORDER 2615 · SERIAL NUMBER · MK. NO CT-1-013-421-C82R



PLAN
@ EL. 911'-0"

ITEM NO	NO. REQ'D.	DESCRIPTION
1	2	TS 8 × 8 × .375
2	1	TS 8 × 8 × .375
3	2	FP 1 × 11 × 13
4	2	FP ½ × 7 × 7
5	2	FP ½ × 11 × 10 7/8"
6	2	P6 SCH 40
7	1	ASME NAME PLATE

INFORMATION COPY
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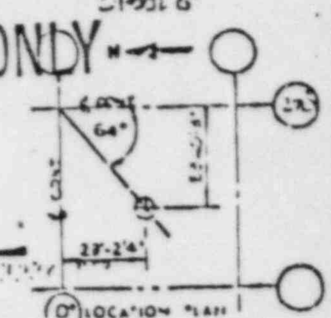
STATUS AND REVISION.

FOR ASBUILT VERIFICATION ONLY
USE FOR ANALYSIS REVIEW
PROBLEM 1-035A



SUPP'T NO. SPSI-CT-1-RB-1B

REFERENCE DRAWINGS		REV	PIPING	REV	ELECTRICAL	REV	CODE/CLASS
	G & H ISOMETRIC		2323-MI-CT-		2323-EI-	3	PAINT/CARZO/ZINC
	FAB. ISOMETRIC	REV	STRUCTURAL	REV	H.V.A.C.	REV	ZONE —
	CT-1-RB-1B		2323-SI-		2323-MI-0353		

OWNER: TEXAS UTILITIES SERVICES INC.
PROJECT: COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER: GIBBS & HILL INC.

CPSES
Brown & Root, Inc.
HOUSTON, TEXAS

DRAWN	DATE	CHK'D	DATE	APPR'D	DATE
	9.12.79		9.13.79		11.1.79

P.O. NO. CP-0048 A.1 — MFG. REL. IC-256
PRODUCTION ORDER — SERIAL NUMBER — SHEET
MK. NO CT-1-013-406-C88R 11-0

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. 16311

(1) APPLICATION: PIPE SUPPORT   WELD MOD ☒   Q ☒   NON-Q ☐   DESIGN CHANGE/~~DEVIATION~~ YES OR NO ☐

(2) DWG. NO. BRR2-0 NPS R-0 CT-1-013-406-C82R

(3) LINE NO./COMPONENT NO. N/A

(4) REASON FOR CHANGE: LOCATE ITEM 3

CT-1-RB-18

(7) REQUESTED/PREPARED BY: STARKEY
NAME

HANGERS
DEPT.

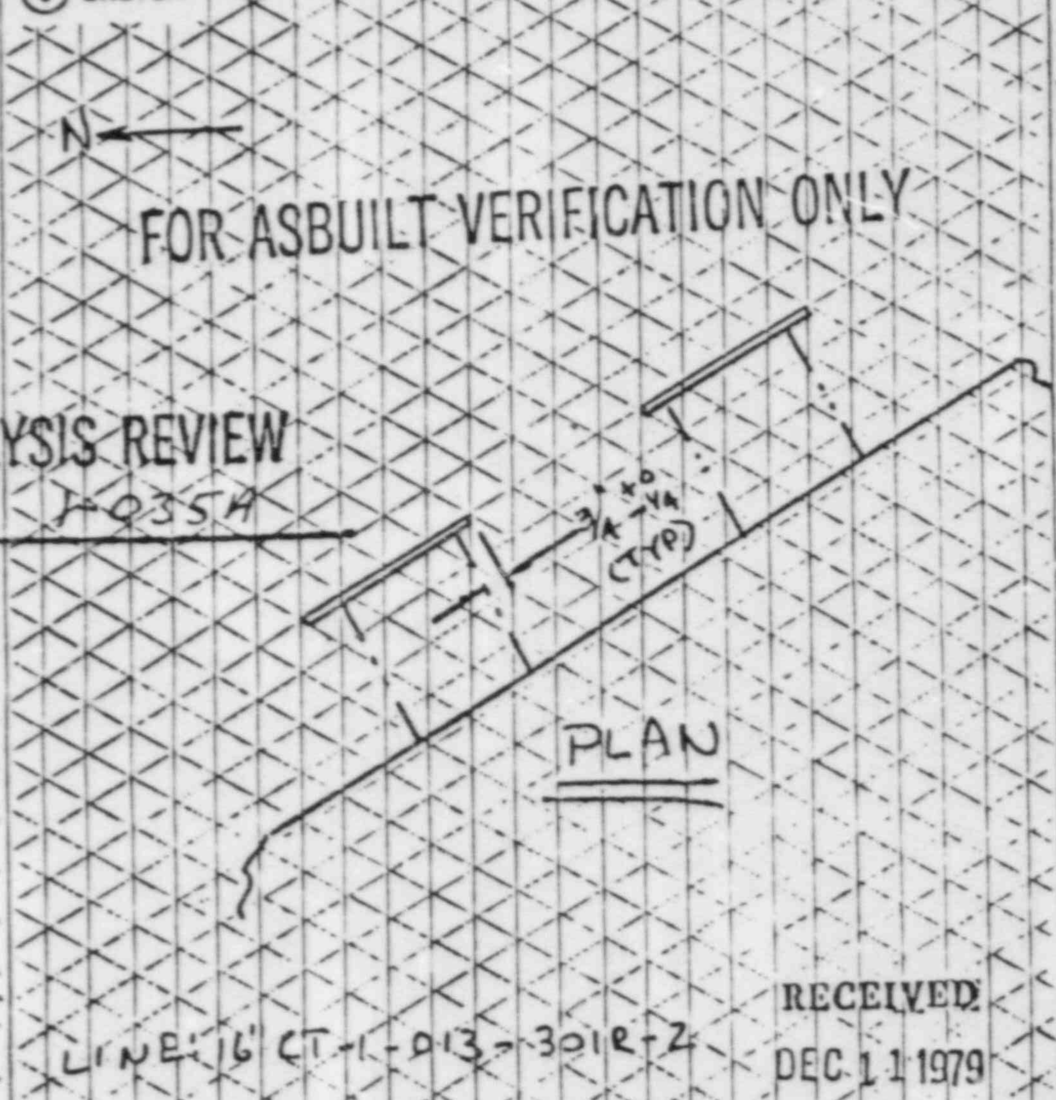
(5) INSTRUCTIONS:

REMOVE N/A

USE FOR ANALYSIS REVIEW
PROBLEM H035A

ADD. N/A

(6) SKETCH



RECEIVED
DEC 11 1979
PIPE DRAFTING

(8) APPROVED BY:

	DATE
Jeffrey W. Olivier	4-Dec-79
	DATE
	DATE
	DATE
	DATE
	DATE

(9) DISTRIBUTION	DCC CNTL NO.	QTY
NPSI	I.U.Fo	2

ISSUED BY DCC

CKR CRA

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. Nº 40343 REV. 3 (Int. 1082)

(1) APPLICATION: PIPE SUPPORT WELD MOD. [X] Q [X] NON-Q N/A DESIGN CHANGE/~~DEVIATION~~ [X]

(2) DWG. NO. BRH REV. 0
CT-1-013-406-C82R

(3) LINE NO./COMPONENT NO.
NA

(4) REASON FOR CHANGE △ Revise welds to meet AISC min. size.
INACCESSIBLE WELDS
△ VENDER PARTS TOO SHORT
△ Chg. spool number

(7) ORIGINATOR
J. KOPP / R. HEBERT
NAME

[X] CPPE

N/A ORIGINAL DESIGNER

(8) APPROVED BY:

J. L. Kopp	12-15-80 DATE
SYS △ [signature]	12/30/80 DATE
SYS △ [signature]	1/19/81 DATE
△ Tim Sullivan	5-11-82 DATE
	DATE
	DATE

(5) INSTRUCTIONS:

REMOVE [X]

DELETE IT.#s 1, 2

ADD [X]

IT.8(2) TS 8·8·3/8 × 2'-2 1/4" (ASOO ARA)

IT.9(1) TS 8·8·3/8 × 2'-2 1/4" (ADD KRB)

(6) SKETCH SO# CT-1-RB-18

△ Revise spool number to be spool 4 instead of #5

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PLAN — N

USE FOR ANALYSIS REVIEW
PROBLEM 1-035A

Notes: (1) TRANSFER IT.#7 (ASME NAMEPLATE) FROM IT.#1 TO IT.#8

(2) IT.#4 ON THE NORTHSIDE IS MISFABBED IS 8"×7 1/2"×7 1/2" SOUTHSIDE IS AS PER DWG.

(9) DISTRIBUTION

	DCC CNTL NO.	QTY
TECH SERVICES	INFO	2
SITE DAMAGE STUDY GROUP	INFO	
SYSTEMS PLANNING	INFO	1

AREA MANAGEMENT INFO. 1

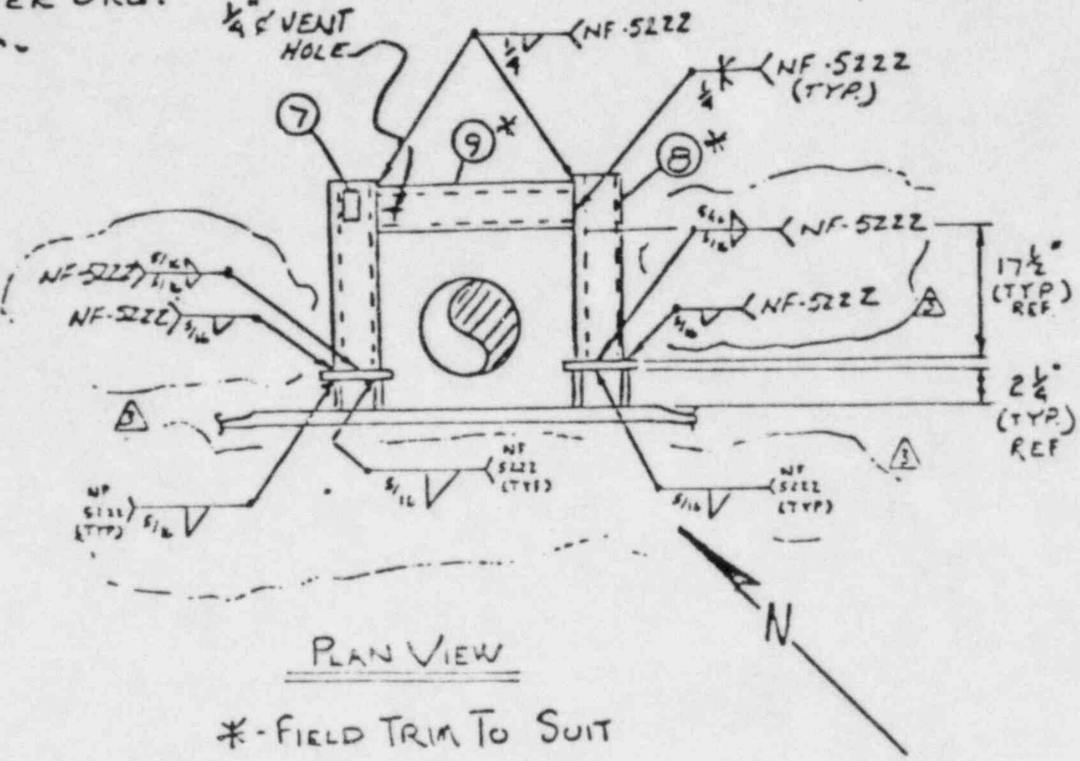
~~THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO.~~
CMC 40343 REV 2

BROWN & ROOT, INC.
ENGINEERING DIVISION

SHEET NO. 2 OF
CMC NO. 40343

CLIENT CPSES
SUBJECT CT-1-013-406-C82R
BASED ON
DRAWING NO.
COMPUTER
CHK'D. BY
APP'D. BY
DATE 19

NOTE: HOLD ALL CLR.
AS PER ORG.
DWG.



PLAN VIEW

* - FIELD TRIM TO SUIT

FOR ASBUILT VERIFICATION ONLY

USE FOR ANALYSIS REVIEW
PROBLEM 1-035A

OMANCHE PEAK STEAM
ECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. № 18005

1) APPLICATION: PIPE SUPPORT Q ☒ NON-Q ☐ DESIGN CHANGE/~~DEVIATION~~ N/A 11-26-79

2) DWG. NO. NPS REV0 BR REV 0
CT-1-013-406-C82R

3) LINE NO./COMPONENT NO.

4) REASON FOR CHANGE:
DRAFTING ERROR

7) REQUESTED/PREPARED BY:
TOM LISIEWSKI
NAME
PIPE SUPPORT
DEPT.

5) INSTRUCTIONS:

EMOVE FW 4, 6

DELETE FW
4 & 6 DUE
TO DUPLICATED
FW #'s SHOWN
ON ANOTHER
DWG

DD NA

6) SKETCH

FOR ASBUILT VERIFICATION ONLY

USE FOR ANALYSIS REVIEW
PROBLEM 1-035A

RECEIVED
NOV 28 1979
PIPE DRAFTING

8) APPROVED BY: R. McClung 11/19/79
DATE
Jeffrey W. Olwick 21-NOV-79
DATE

DATE

DATE

DATE

DATE

9) DISTRIBUTION	DCC CNTL NO.	QTY
NPSI	N/A	2

~~ISSUED BY DCC~~

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS

Calculation Number AB-1-35A Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Drawing Revised										
Preparer	VIB	7-5-84								
Checker										

LOCAL STRESS DUE TO WELDED ATTACMENTS

REF. NO: AM-WA-478

SUP. MARK NO. CT-1-013-411-C52R NODE NOS 1301
CT-1-013-422-C52R 4301

BOTH SUPPORTS ARE INSTALLED AT THE SAME CROSS SECTION

FOR UNIT LOAD 1000#

MAX. COMBINED STRESS INTENSITY (S') - 1463 psi

MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 684 psi

ACTUAL AND ALLOWABLE STRESS *

EQ	FILE COMB.	LOAD UP: SUPT-411- / DOWN: SUPT-422-	FACTOR	(PSI) GENERAL STRESS AVERAGE	CYL NOZ PSI MEMBRANE STRESS	CYL NOZ PSI TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE
8	11	59 / 0	0.059 / 0	3517	40 / 0		3557	$1.0S_h = 16600$
9 (1/2 SSE)	11+31 +S.H.	2393 / 847	2.393 / 0.847	4578	1637 / 579		6794	$1.5S_h = 24900$
9 (1/2 SSE)	11+31 +SH	2393 / 847	2.393 / 0.847	4578		3501 / 1239	9318	$1.8S_h = 29880$
11	51 OR 52+ +11+40	17527 / 970	17.527 / 0.97	10474		25642 / 1419	37535	$(S_A+S_h) = 44250$
9 (SSE)	11+131+ SH+70	3340 / 1254	3.34 / 1.254	5011	2285 / 858		8154	$2.16S_h = 35856$

NOTE: MATERIAL - SA 312 OR SA 358 TYPE 304 OR 316

$S_h = 16600$ psi $S_c = 18800$ psi

$S_A = 1.25S_c + 0.25S_h = 27650$ psi

* DATA USED FOR COMBINATION: QA BOOK AB-1-35A Rev 0, Sheets 3F4

Revision	No. 1	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Prepare	DJO	1/7/83								
Check	MW	1/11/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-478 NODE NO.: 1301

MARK NO.: CT-1-013-411-C52R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 1463 psi

2). MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 684 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1) psi
8	11	59	.059	3517	40	X	3557	1.0Sh = 16,600
9(1/2SSE)	11+31	2393	2.393	4578	1637	X	6215	1.5Sh = 24,900
9(1/2SSE)	11+31	2393	2.393	4578	X	3501	8079	1.8Sh = 29,880
11	11+40 + RANGE	17,527	17.527	10,475	X	25,642	36,117	(SA+Sh) = 44,250
9(SSE)	11+131	3340	3.340	5011	2285	X	7296	2.16Sh = 35,856

NOTE: MATERIAL: SA-312 + SA-358 TYPE 304 & 316

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

Sh = 16,600 psi Sc = 18,800 psi

$S_A = 1.25 S_c + 0.25 S_h = 27,650$ psi

Checking Method #

Gibbs & Hill, Inc. Job No 11-2323-032 Client TUGCO-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number AB-1-35A Sheet No 39

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
	1									
Prepare	DSD	1/7/83								
Checker		1/18/83								

CALCULATIONS / RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-478 NODE NO.: 4301

MARK NO.: CT-1-013-422-C52R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 1463 psi

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 684 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE psi	CYLNOZ MEMBRANE STRESS psi	CYLNOZ TOTAL STRESS psi	TOTAL = GEN. + LOCAL psi	ALLOWABLE (1) psi
8	1	0	0	3517	0		3517	1.0Sh = 16,600
9 (1/2SSE)	11+31	847	.847	4578	579		5157	1.5Sh = 24,900
9 (1/2SSE)	11+31	847	.847	4578		1239	5817	1.8Sh = 29,880
11	11+40 + RANGE	970	.970	10,474		1419	11,893	(SA+Sh) = 44,250
9 (SSE)	11+131	1254	1.254	5011	858		5869	2.16Sh = 35,856

NOTE: MATERIAL: SA-312 + SA-358 TYPE 304 or 316

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

S_h = 16,600 psi S_c = 18,800 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 psi

Checking Method #

F-165.4-8

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUSI - CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS

Sheet No.

Calculation Number AB-1-35A

	Orig. Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Revision										
Drawing Issued										
Preparer	VIB	7-5-84								
Checker										

LOCAL STRESS DUE TO WELDED ATTACMENTS

REF. NO: AM-1WA-478

SUP. MARK NO. CT-1-013-411-C52R   NODE NOS 1301
CT-1-013-422-C52R   4301

BOTH SUPPORTS ARE INSTALLED AT THE SAME CROSS SECTION

FOR UNIT LOAD 1000#

MAX. COMBINED STRESS INTENSITY (S') - 1463

MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') - 6.

ACTUAL AND ALLOWABLE STRESS *

EQ	FILE COMB.	LOAD UP: SUPT-411- DOWN: SUPT-422-	FACTOR	(PSI) GENERAL STRESS AVERAGE	CYL NOZ PSI MEMBRANE STRESS	CYL NOZ PSI TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE
8	11	59	0.059	3517	40		3557	$1.0S_h = 16600$
		0	0		0			
9 (1/2 SSE)	11+31 +S.H.	2393	2.393	4578	1637		6794	$1.5S_h = 24900$
		847	0.847		579			
9 (1/2 SSE)	11+31 +SH	2393	2.393	4578		3501	9318	$1.8S_h = 29880$
		847	0.847			1239		
11	51 or 52+ +11+40	17527	17.527	10474		25642	37535	$(S_A+S_h) = 4425$
		970	0.97			1419		
9 (SSE)	11+131+ SH+70	3340	3.34	5011	2285		8154	$2.16S_h = 358$
		1254	1.254		858			

NOTE: MATERIAL SA 312 OR SA 358 TYPE 304 OR 316

$S_h = 16600$ psi $S_c = 18800$ psi

$S_A = 1.25S_c + 0.25S_h = 27650$ psi

* DATA USED FOR COMBINATION: SA ... AB-1-35A Rev 0, Sheet ...

Gibbs & Hill, Inc. Job No 11-2323-[illegible] Client [illegible]

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - [illegible]

Calculation Number AB-1-35A Sheet No 38

Revision	[illegible]	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
[illegible]	1									
Prepare	DJO	1/7/83								
Check	[illegible]	1/11/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

NODE NO.: 1301

REF. NO.: AM-WA-478

MARK NO.: CT-1-013-411-C52R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 1463 psi

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 684 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1) psi
8	11	59	.059	3517	40		3557	1.0Sh = 16,600
9 (Y2SSE)	11+31	2393	2.393	4578	1637		6215	1.5Sh = 24,900
9 (Y3SSE)	11+31	2393	2.393	4578		3501	8079	1.8Sh = 29,880
11	11+40 + RANGE	17,527	17.527	10,475		25,642	36,117	(SA+Sh) = 44,25
9 (SSE)	11+131	3340	3.340	5011	2285		7296	2.16Sh = 35,85

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

NOTE: MATERIAL: SA-312 + SA-358 TYPE 304 & 316

S_h = 16,600 psi S_c = 18,500 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,150 psi

F-155

Checking Method #

Revision	1	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Prepare	DSO	1/7/83								
Checker		1/12/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-478 NODE NO.: 4301

MARK NO.: CT-1-013-422-C52R

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 1463 psi

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 684 psi

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYLNOZ MEMBRANE STRESS	CYLNOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1) psi
8	1	0	0	3517	0		3517	1.0Sh = 16,600
9 (1/2SSE)	11+31	847	.847	4578	579		5157	1.5Sh = 24,900
9 (1/2SSE)	11+31	847	.847	4578		1239	5817	1.8Sh = 29,880
11	11+40 + RANGE	970	.970	10,474		1419	11,893	(SA+Sh) = 44,250
9 (SSE)	11+131	1254	1.254	5011	858		5869	2.16Sh = 35,856

NOTE: MATERIAL: SA-312 + SA-358 TYPE 304 or 316

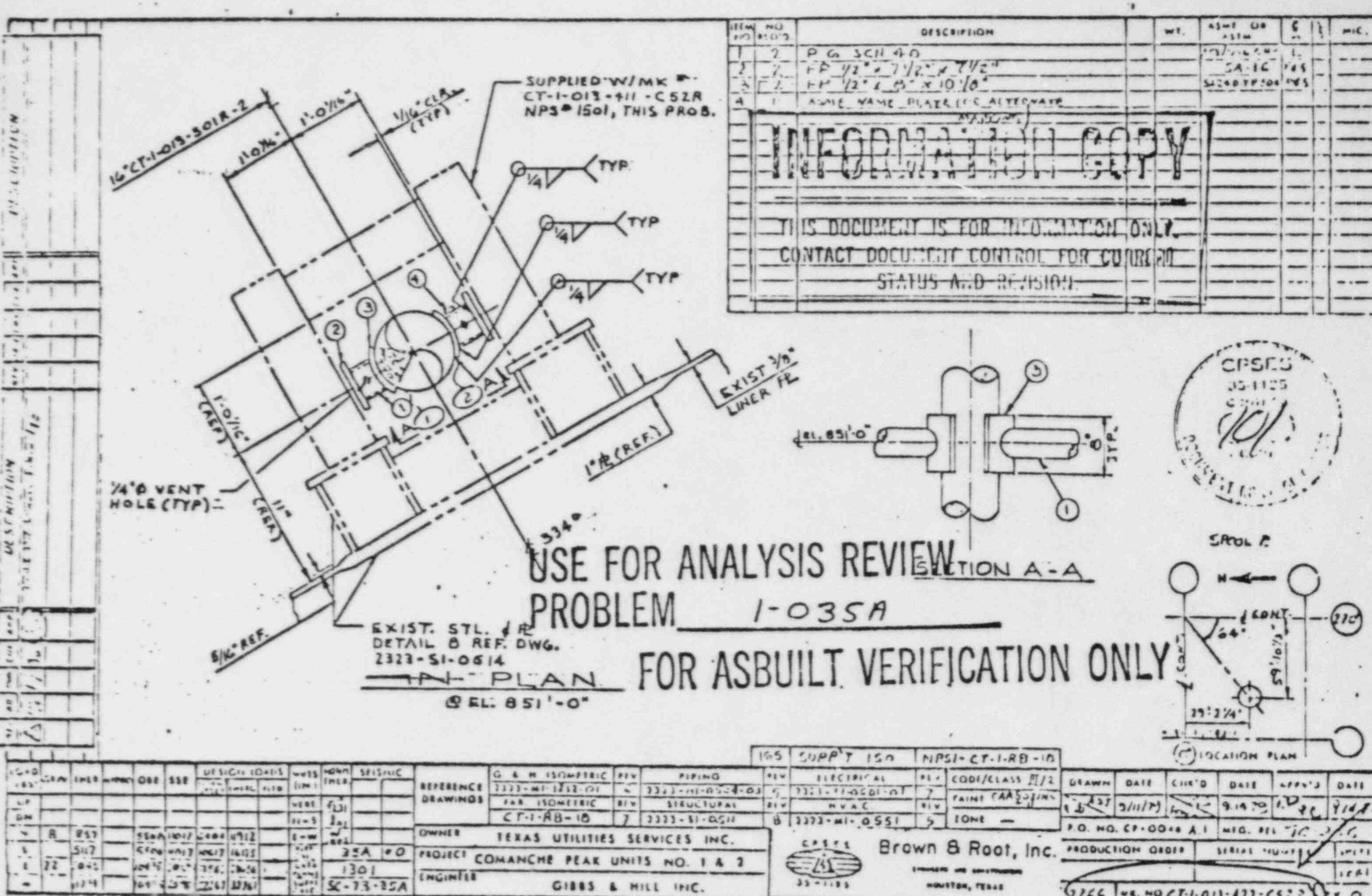
REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

S_h = 16,600 psi S_c = 18,800 psi

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 psi

Checking Method #

F-155.4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USE FOR ANALYSIS REVIEW
PROBLEM 1-035A
FOR ASBUILT VERIFICATION ONLY
SUPPLIED W/MK CT-1-013-411-C52R
NPS 1501, THIS PROB.
16"CT-1-013-501R-2
TYP
1/4 VENT HOLE (TYP)
EXIST 3/8" LINER PL
1"PL (REF.)
EXIST. STL. PL
DETAIL B REF. DWG.
2323-SI-0614
PLAN
@ EL. 851'-0"
EL. 851'-0"
SECTION A-A
LOCATION PLAN
CPSES
P G SCH 40
ASME NAME PLATE
DESCRIPTION
REFERENCE DRAWINGS
G & H ISOMETRIC
FAB. ISOMETRIC
CT-1-RB-18
PIPING
ELECTRICAL
STRUCTURAL
H V A C
CODE/CLASS
ZONE
SUPP'T
NPSI-CT-1-RB-18
DRAWN
DATE
CHK'D
APPR'D
P.O. NO.
PRODUCTION ORDER
SERIAL NUMBER
MK. NO CT-1-013-4??-C52R
OWNER TEXAS UTILITIES SERVICES INC.
PROJECT COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER GIBBS & HILL INC.
Brown & Root, Inc.
HOUSTON, TEXAS
35A
1301
SC-73-35A

OCT 20 ...

COMANCHE PEAK STEAM
ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. № 42943

(1) APPLICATION: PIPE SUPPORT WELD MOD. [X] Q [X] NON-Q [ ] DESIGN CHANGE/~~DEVIATION~~ [X]

(7) ORIGINATOR
J. KOPP/R. HEBERT
NAME
[X] CPPE
[ ] ORIGINAL DESIGNER

(2) DWG. NO. BRH REV. 0
CT-1-013-422-C52R #2766

(4) REASON FOR CHANGE:
INACCESSIBLE WELD

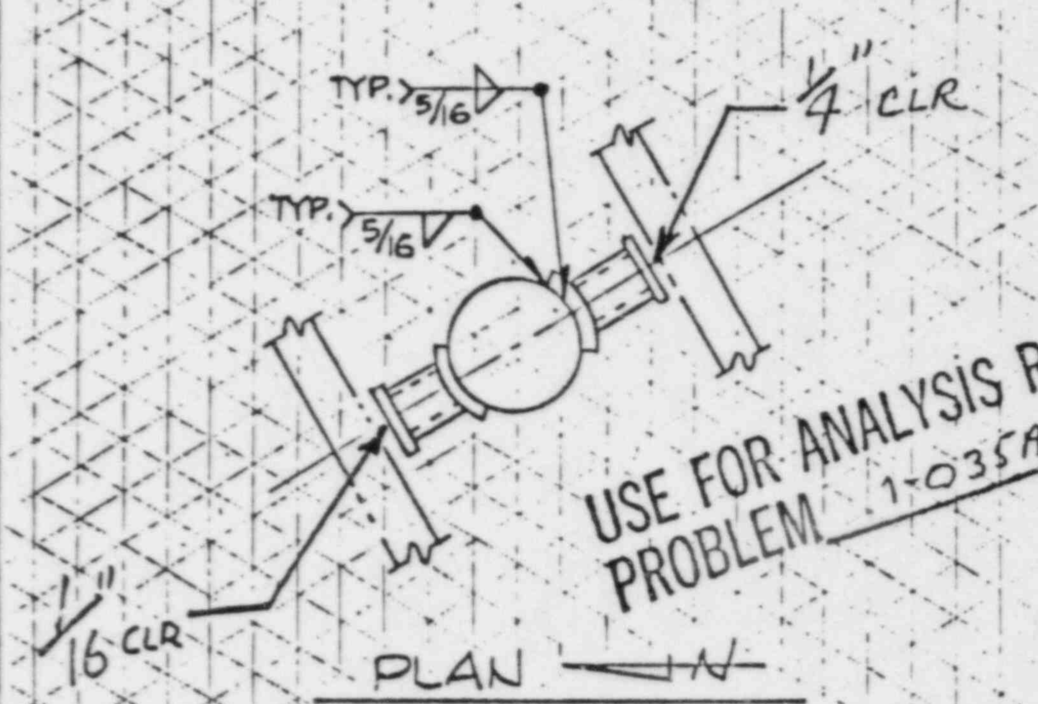
(3) LINE NO./COMPONENT NO.
NA

(5) INSTRUCTIONS:

REMOVE NA

ADD NA

(6) SKETCH ISO# CT-1-RB-18
LINE # 16" CT-1-13-301R-2



USE FOR ANALYSIS REVIEW
PROBLEM 1-035A

FOR ASBUILT VERIFICATION ONLY

(8) APPROVED BY: JJ
J. F. Kopp 10-22-80
DATE

DATE

DATE

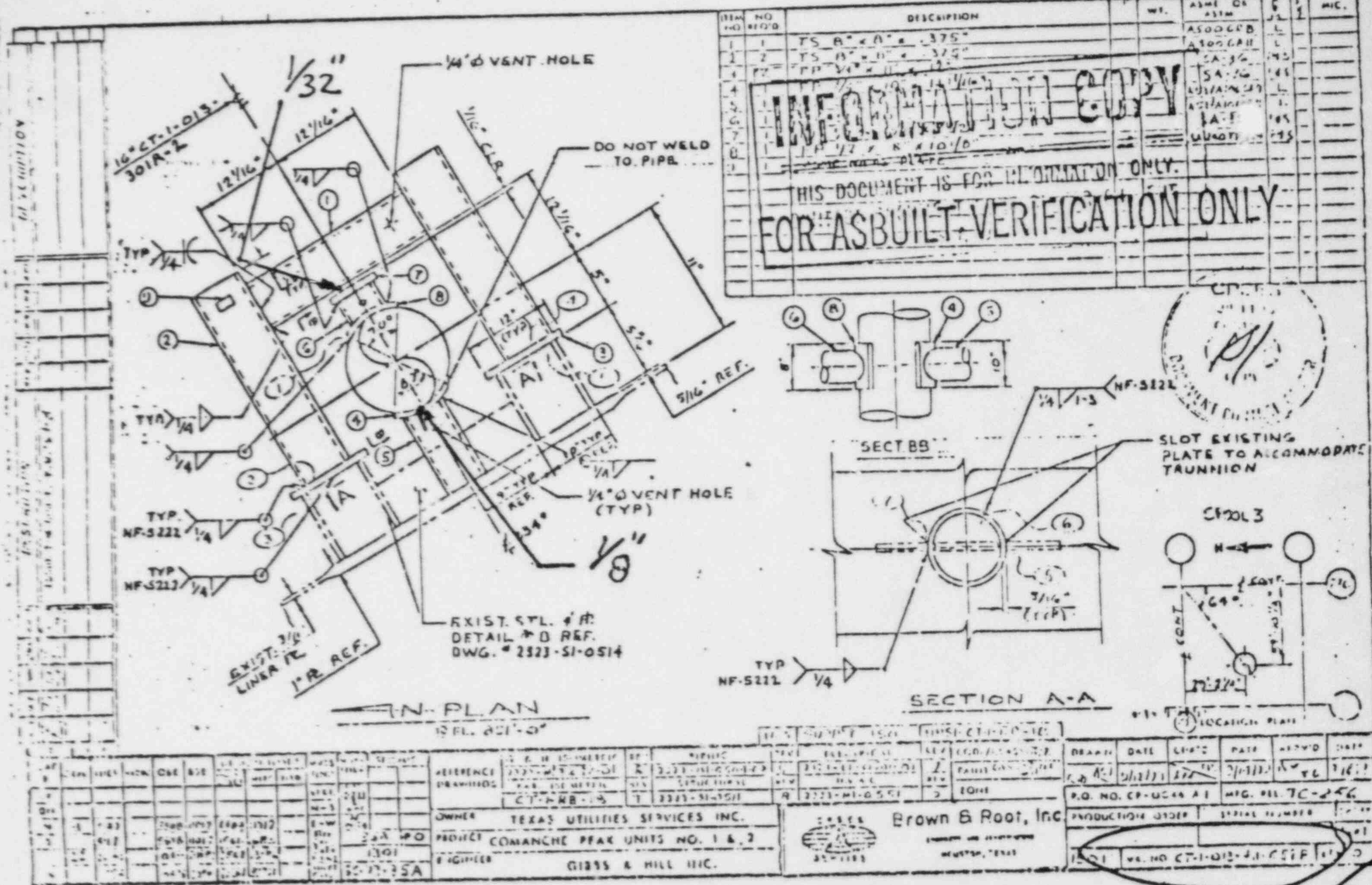
DATE

DATE

DATE

(9) DISTRIBUTION	DCC CNTL NO.	QTY
NPSI	INFO	2

ENTERED IN
TRACKING SYSTEM
10-27-80
DATE
OPER



USE FOR ANALYSIS REVIEW

PROBLEM

Gibbs & Hill, Inc. Job No 11-2323-035 Client TUGCO-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS -OTHER CALCULATIONS

Calculation Number PROB: AB-1-37 W Sheet No 04

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Sheet Rev.	1									
Prepared	M.SESTRADA	1/27/83								
Checked										

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-706 NODE NO.: 1801

MARK NO.: CT-1-014-415-C72R
CT-1-014-416-C72R

FOR UNIT LOAD OF 1000#:

MAX COMBINED STRESS INTENSITY ('S') = 2211 PSI

2). MAX COMBINED MEMBRANE STRESS INTENSITY ('S_M') = 833 PSI

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	105	.105	3492	87		3579	1.0Sh = 16,600
9(1/2SSE)	11 & 31	4041	4.041	4382	3366		7748	1.5Sh = 24,900
9(1/2SSE)	11 & 31	4041	4.041	4382		8935	13,317	1.8Sh = 29,880
11	11,40,& 20,21,22	2162	2.162	4081		4780	8861	(SA+Sh) = 44,250
9(SSE)	11 & 131	5456	5.456	4669	4545		9214	2.16 Sh = 35,856

NOTE: MATERIAL: SA 312 TP 304/316

S_h = 16,600 PSI S_c = 18,800 PSI

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 PSI

F-105.4-81

Checking Method #

Gibbs & Hill, Inc. Job No 11-2323-031 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number PROB: AB-1-37 W Sheet No 64

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
	1										
Preparer	MSESTRADA	1/27/83									
Checker											

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-706 NODE NO.: 1801

MARK NO.: CT-1-014-415-C72R
CT-1-014-416-C72R

FOR UNIT LOAD OF 1000#:

MAX COMBINED STRESS INTENSITY ('S') = 2211 PSI

2) MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 833 PSI

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYLNOZ MEMBRANE STRESS	CYLNOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	105	.105	3492	87		3579	1.0 Sh = 16,600
9 (1/2 SSE)	11 & 31	4041	4.041	4382	3366		7748	1.5 Sh = 24,900
9 (1/2 SSE)	11 & 31	4041	4.041	4382		8935	13,317	1.8 Sh = 29,880
11	11, 40, 41 (20, 21, 22)	2162	2.162	4081		4780	8861	(SA + Sh) = 44,250
9 (SSE)	11 & 131	5456	5.456	4669	4545		9214	2.16 Sh = 35,856

NOTE: MATERIAL: SA 312 TP 304/316

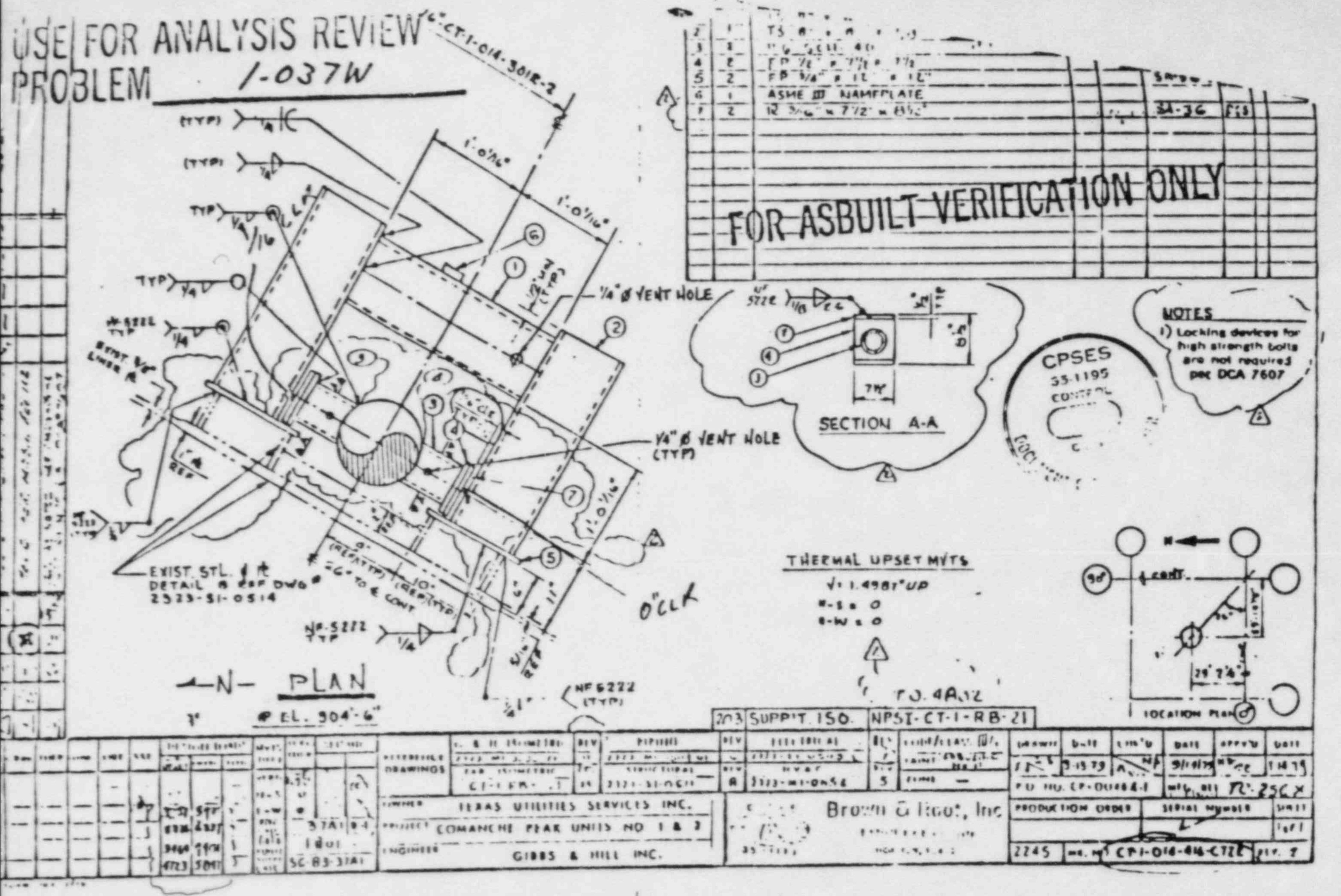
S_h = 16,600 PSI S_c = 18,800 PSI

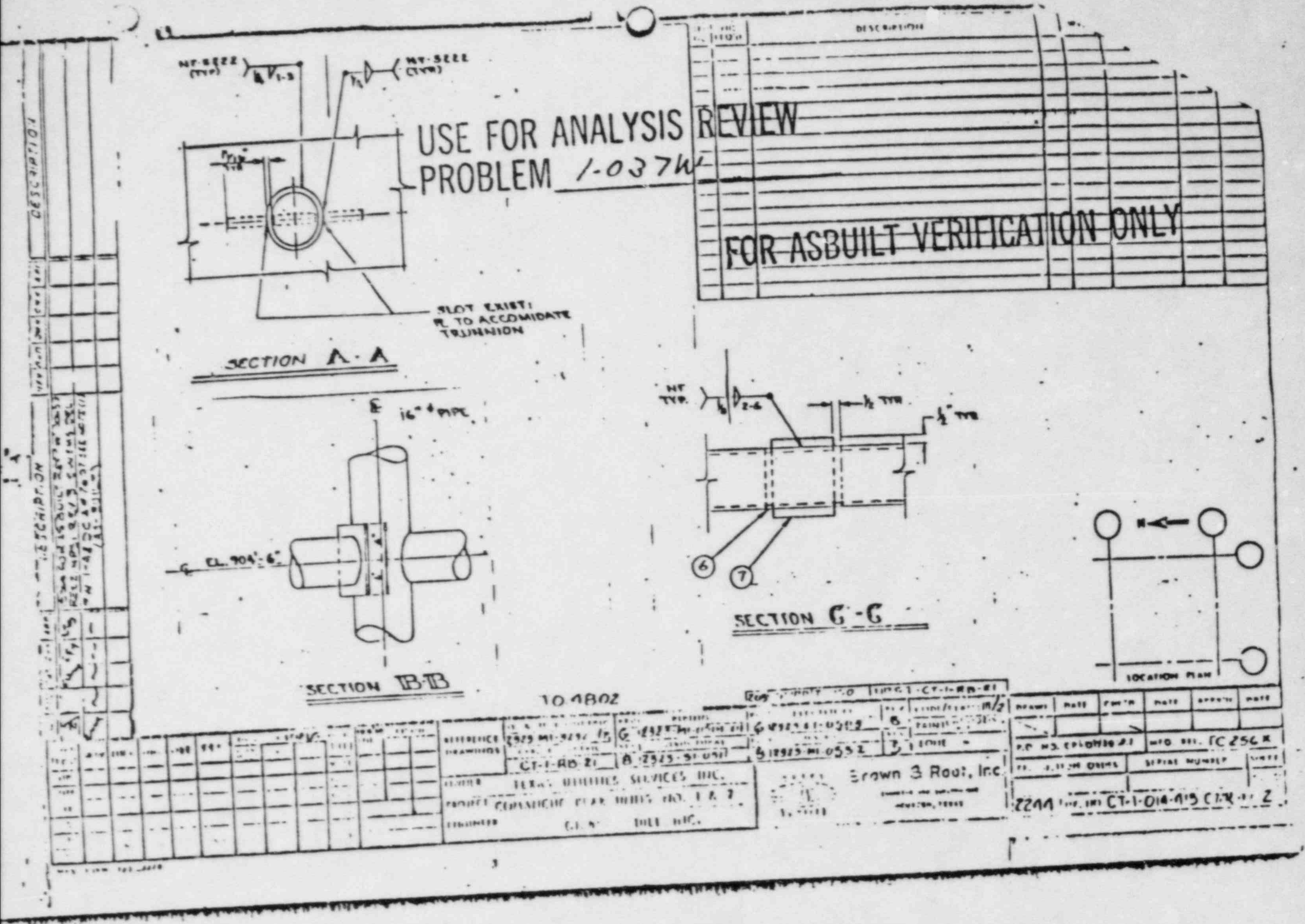
$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 PSI

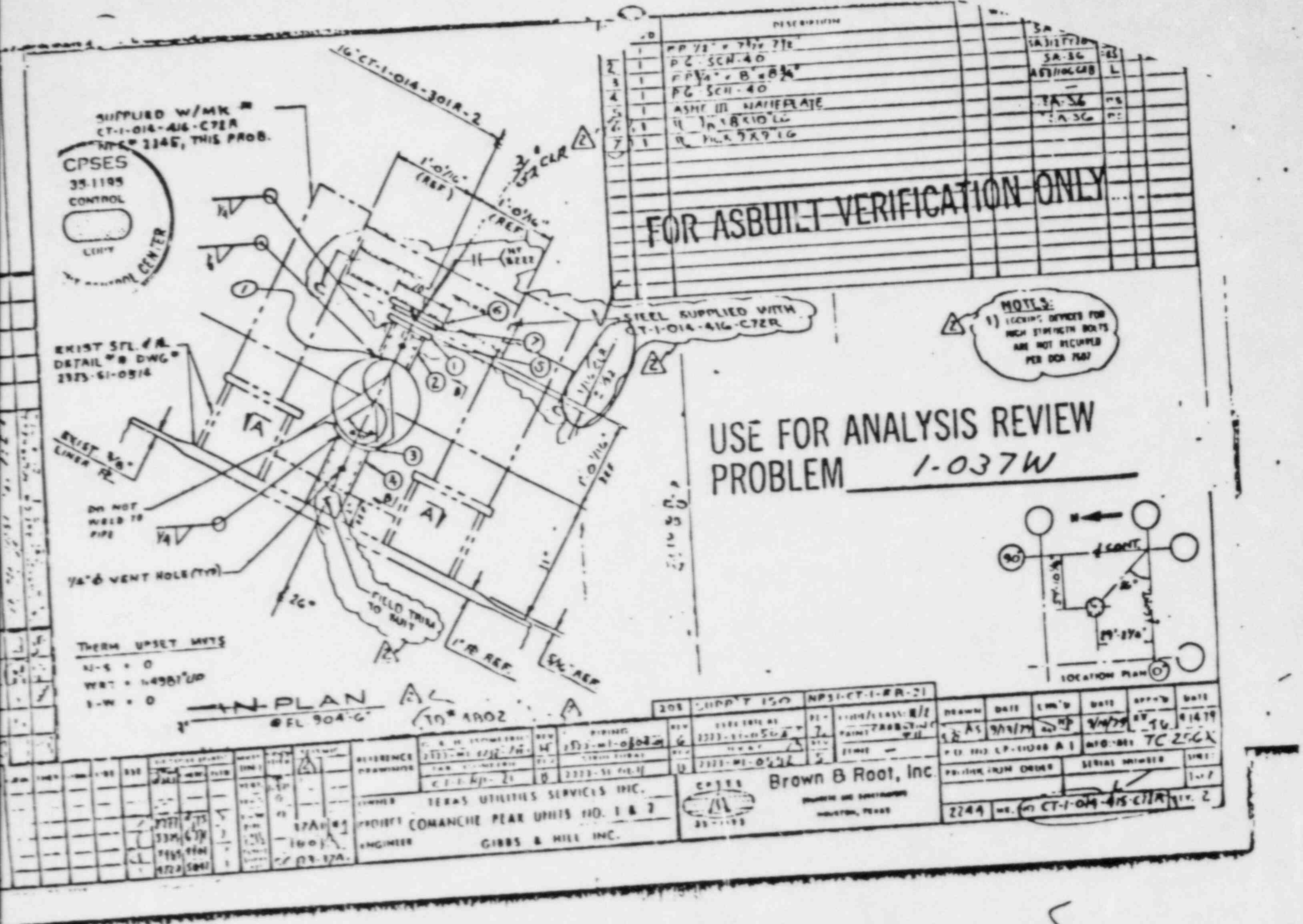
F-155.4

Checking Method #

USE FOR ANALYSIS REVIEW PROBLEM 1-037W




USE FOR ANALYSIS REVIEW
PROBLEM 1-037W
FOR ASBUILT VERIFICATION ONLY
DESCRIPTION
SLOT EXIST;
TO ACCOMIDATE
TRUNNION
SECTION A-A
16" PIPE
SECTION B-B
SECTION G-G
LOCATION PLAN
Brown & Root, Inc.
TEXAS UTILITIES SERVICES INC.
COMANCHE PEAK
CT-1-014-415


FOR ASBUILT VERIFICATION ONLY
USE FOR ANALYSIS REVIEW
PROBLEM 1-037W
CPSES
CONTROL
16" CT-1-014-301R-2
SUPPLIED W/MK
CT-1-014-416-C72R
STEEL SUPPLIED WITH
CT-1-014-416-C72R
NOTES:
1) LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 7587
EXIST STL. & PL.
DETAIL "B" DWG
EXIST 1/4" LINER PL
DO NOT WELD TO PIPE
1/4" Ø VENT HOLE (TYP)
FIELD TRIM TO SUIT
THERM UPSET MVTS
N-S = 0
VRT = .4981" UP
E-W = 0
PLAN
EL 904'-6"
LOCATION PLAN
PG SCH-40
ASME III NAMEPLATE
TEXAS UTILITIES SERVICES INC.
COMANCHE PEAK UNITS NO. 1 & 2
GIBBS & HILL INC.
Brown & Root, Inc.
HOUSTON, TEXAS
CT-1-014-415-C72R

Gibbs & Hill, Inc. Job No. 11-2323-030 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION-ANALYTICAL DATA-SPECIAL CALCULATIONS

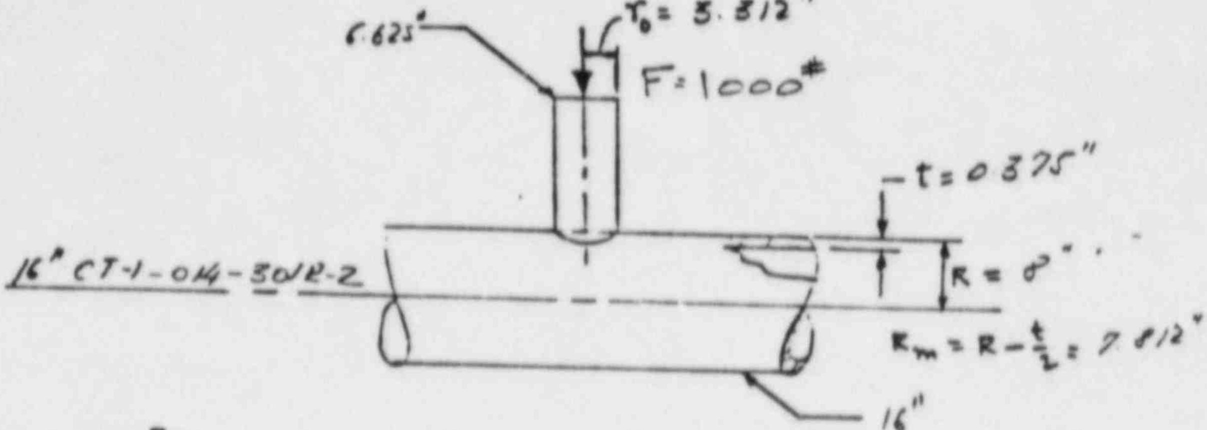
Calculation Number PROBLEM AB-1-37W Sheet No. 33

Revision	7	Date	Rev	Date	Rev	Date	Rev	Date	Rev	Date	
Preparer	VMC	12-29-82									
Checker	[illegible]	1-3-83									

SPECIAL CALCULATIONS

Hanger Mark # CT-1-014-415-C72R
CT-1-014-416-C72R

NODE # 1801



$\gamma = \frac{R_m}{t} = 20.83$

ARTIFICIALLY INCREASE RAD = . . .

$\beta = \frac{0.875\, r_0}{R_m} = 0.37$

LOADS IN TERMS OF CYLNDR PARAMETERS:

P = 1000#

VC = 0

VL = 0

MC = FM1 = 0

ML = FM2 = 0

MT = FMR = 0

COMPUTER RUN # VMC & CYL - J. 976 #21 DATE: 12-29-82
(CYLNDR)

FROM ABOVE COMPUTER RUN —

MAX. COMBINED MEMBRANE STRESS INTENSITY 'SM' 833 psi

MAX. COMBINED STRESS INTENSITY 'S' 2211 psi

Gibbs & Hill, Inc. Job No 11-2323-035 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number PROB: AB-1-37 W Sheet No 26

Revision	No.	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
	1									
Prepared	MSESTRADA	1/27/83								
Checker										

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-707 NODE NO.: 1901

MARK NO.: CT-1-014-413-C82R
CT-1-014-414-C82R

FOR UNIT LOAD OF 1000#:

MAX COMBINED STRESS INTENSITY ('S') = 1454 PSI

2). MAX COMBINED MEMBRANE STRESS INTENSITY (SM') = 670 PSI

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYLNOZ MEMBRANE STRESS	CYLNOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	176	.176	3569	118		3687	1.0Sh = 16,600
9(Y2ESE)	11+31	8212	8.212	7378	5502		12,880	1.5Sh = 24,900
9(Y2ESE)	11+31	8212	8.212	7378		11,940	19,318	1.8Sh = 29,880
11	11,40,+(20,21,22)	444	.444	5849		646	6494	(Sa+Sh) = 44,250
9(SSE)	11+131	11,215	11.215	8588	7514		16,102	2.16Sh = 35,856

NOTE: MATERIAL: SA 312 TP 304/316

S_h = 16,600 PSI S_c = 18,800 PSI

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 PSI

Checking Method #

F-105.4-81

obs E Hill, Inc. Job No. 11-2323-030 Client TUSI-CPSES

Project AS-BUILT STRESS VERIFICATION-ANALYTICAL DATA-SPECIAL CALCULATIONS

Calculation Number PROBLEM AB-1-37W Sheet No. 25

Revision	Orig. Issue	Date	Rev	Date	Rev.	Date	Rev	Date	Rev	Date
Design Review		X		X		X		X		X
Preparer	VMC	12-29-82								
Checker	[illegible]	1-3-83								

SPECIAL CALCULATIONS

Pipe Suppt Mark # CT-1-014-413-C82R / CT-1-014-414-C82R

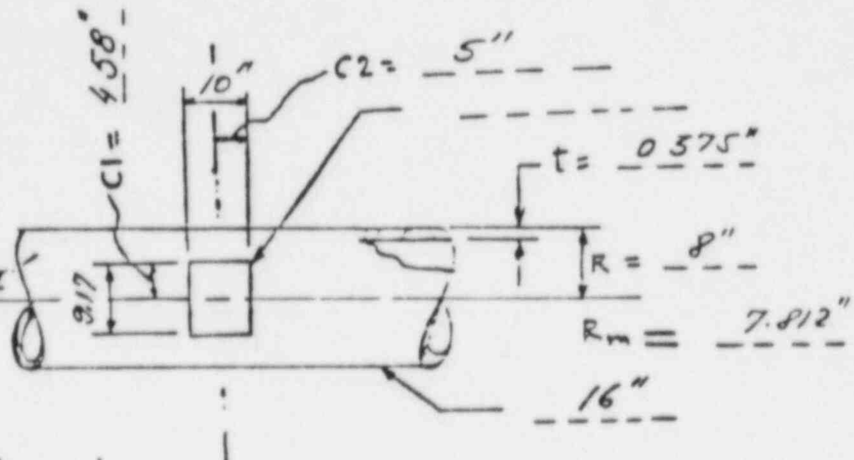
NODE # 1901

Actual:

$\gamma = \frac{R_m}{t} = 20.83$

$\beta_1 = \frac{C_1}{R_m} = 0.58$ NC

$\beta_2 = \frac{C_2}{R_m} = 0.64$ NC



Fictitious R_m used for present analysis = 12"

ARTIFICIALLY INCREASED RAD = YES

LOADS IN TERMS OF CYLNOZ PARAMETERS:		ATTACHMENT
P = 1000 Lbs	$C_1 = 4.58"$	SQUARE ☐
VC = 0	C2 = 5"	RECT ☑
VL = 0		
MC = FM1 = 0		
ML = FM2 = 0		
MT = FMR = 0		

COMPUTER RUN # VMC & CYL J 974 D20 DATE 12-29-82
(CYLNOZ)

MAX. COMBINED MEMBRANE STRESS INTENSITY 'SM' — 670 psi

MAX. COMBINED STRESS INTENSITY 'S' — 1454 psi

Gibbs & Hill, Inc. Job No 11-2323-035 Client TUGCO-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number PROB: AB-1-37 W Sheet No 2½

Revision	1	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Prepared	W.ESTRADA	1/27/83								
Checker										

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-707 NODE NO.: 1901

MARK NO.: CT-1-014-413-C82R
CT-1-014-414-C82R

FOR UNIT LOAD OF 1000#:

MAX COMBINED STRESS INTENSITY ('S') = 1454 PSI

2). MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 670 PSI

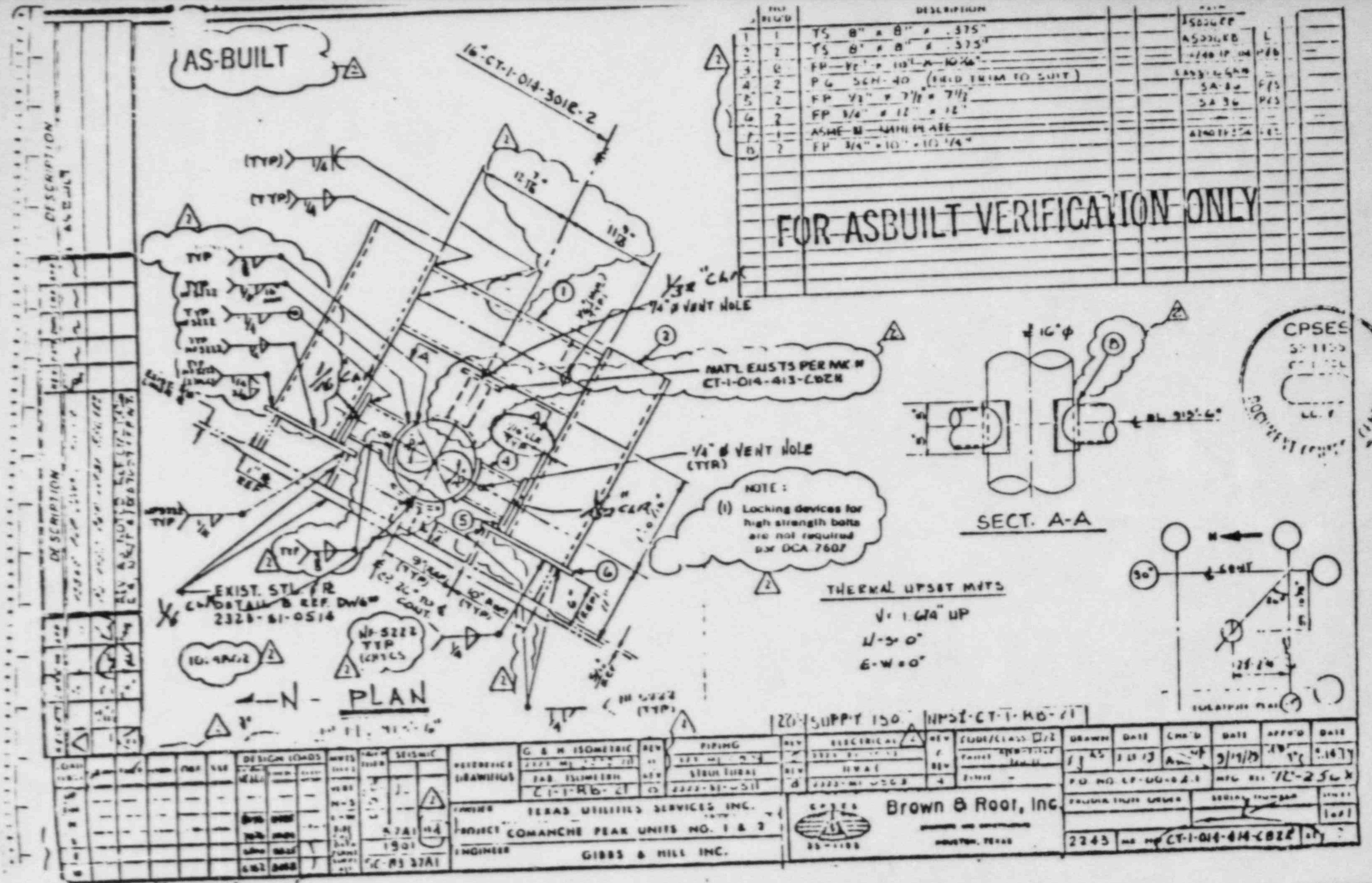
ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYLNOZ MEMBRANE STRESS	CYLNOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	176	.176	3569	118		3687	1.0Sh = 16,600
9(1/2SSE)	11 & 31	8212	8.212	7378	5502		12,880	1.5Sh = 24,900
9(1/2SSE)	11 & 31	8212	8.212	7378		11,940	19,318	1.8Sh = 29,880
11	11, 40, & 20, 21, 22	444	.444	5849		646	6494	(SA+Sh) = 44,250
9(SSE)	11 & 131	11,215	11.215	8588	7514		16,102	2.16Sh = 35,856

NOTE: MATERIAL: SA 312 TP 304/316

S_h = 16,600 PSI S_c = 18,800 PSI

$S_A = 1.25 S_c + 0.25 S_h$ = 27,650 PSI



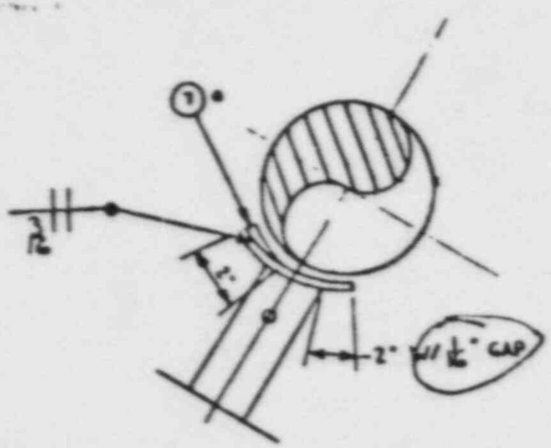
USE FOR ANALYSIS REVIEW

PROBLEM ___ 1-037W

AS-BUILT

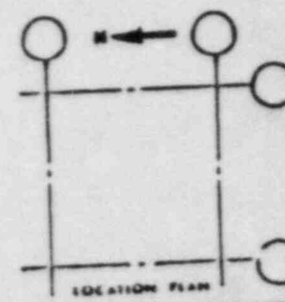
USE FOR ANALYSIS REVIEW
PROBLEM 1-037W

FOR ASBUILT VERIFICATION ONLY



TD: 4802

DETAIL "C"



* FIELD TRIM TO MAINTAIN 2" OF 1/16" GAP.

REFERENCE DRAWINGS	G & H ISOMETRIC	PIPING	ELECTRICAL
OWNER	TEXAS UTILITIES SERVICES INC.	
PROJECT	COMANCHE PEAK UNITS NO. 1 & 2	
ENGINEER	GIBBS & HILL INC.	

Brown & Root, Inc.

HOUSTON, TEXAS

ZONE	—
P.O. NO	CP-0046 A.1
MFG. REF.	TC-256R
SHEET	2 of 2
DWG. NO	CT-1-CH-413-C&LR
REV	2

2242

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS

Calculation Number AB-1-167F Sheet No.

Revision	Grid line	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method										
Preparer	'IB	7-5-84								
Checker										

LOCAL STRESS DUE TO WELDED ATTACMENTS

REF. NOS AM-WA-73
AM-WA-69

SUP. MARK NOS DO-1-090-001-S65K (SNUBBER) NODE NO. 6184
DO-1-090-002-S65S (CONST SUPPT)

FOR UNIT LOAD 1000#

MAX COMBINED STRESS INTENSITY SNUB (S') = 962 psi
SUPPT (S') = 1323 psi

MAX COMBINED MEMBRANE STRESS INTENSITY SNUB ('SM') = 247 psi
SUPPT ('SM') = 642 psi

ACTUAL AND ALLOWABLE STRESS *

EQ	FILE COMB.	LOAD(S) UP: SNUB DWN: SUPPT	FACTOR	(PSI) GENERAL STRESS AVERAGE	CYL NOZ PSI MEMBRANE STRESS	TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE.
8	11	0 3922	0 3.922	319	0 2518		2837	$1.0S_h = 7800$
9 (1/2 SSE)	11+31 +S.H.	2568 3922	2.568 3.922	156	634 2518		3308	$1.5S_h = 11700$
9 (1/2 SSE)	11+31 +SH	2568 3922	2.568 3.922	156		2470 5189	7815	$1.8S_h = 14040$
11 **	51 or 52 + +11+40	3922	3.922	525		5189	5714	$(S_A+S_h) = 28500$
9 (SSE)	11+131+ SH+70	3650 3922	3.65 3.922	209	902 2518		3629	$2.16S_h = 16848$

NOTE: MATERIAL

$S_h = 7800$ psi $S_c = 15000$ psi

$S_A = 1.25\ S_c + 0.25\ S_h = 20700$ psi

* DATA USED FOR COMBINATION: QA BOOK AB-1-167F, Rev 0, Sheets 23 & 27

** AS PER SHEETS 23 & 27 NO ANCHOR MOVEMENT AND S.H. ARE SHOWN

Gibbs & Hill, Inc. Job No [illegible] Client [illegible]

Subject [illegible] STRESS VERIFICATION - ANALYSIS RESULTS - [illegible]

Calculation Number [illegible] AB-167F Sheet No 23

Revision	1	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
[illegible]	1									
Prepared	JJP	3/29/83								
Checked	GVC	4/13/83								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-73

NODE NO.: 86184 66184 6184

MARK NO.: DO-1-090-001-S65K

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY ('S') = 962

2) MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 247

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	–	–	319	–		319	1.5Sh = 7800
9(U/E)	11+31 +56	2568	2.568	156	634		790	1.5Sh = 11700
9(U/E)	11+21 +56	2568	2.568	156		2470	2626	1.8Sh = 14040
11	11+20 or 21	–	–	525		–	525	(Sh+SA) = 28500
9(SSE)	11+131	3650	3.65	209	902		1111	2.16Sh = 16848

NOTE: MATERIAL:

$S_h = 7800$ $S_c = 15000$

$S_A = 1.25 S_c + 0.25 S_h = 20700$

Checking Method # [illegible]

F-155.4

Gibbs & Hill, Inc. Job No 11-2323-031 Client [illegible]

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - [illegible]

Calculation Number [illegible] AB-167F Sheet No 27

Revision	1	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
[illegible]	1									
Prepared	JJ?	3/29/82								
Checked	[illegible]	4/13/82								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AH-WA-69 NODE NO.: 6184

MARK NO.: DO-1-090-002-S65S

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY ('S') = 1323

2). MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 642

ACTUAL VS ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE
8	11	3922	3.922	319	2518		2837	1.0Sh = 7800
9(U/E)(OBE)	11+31+51	3922	3.922	156	2518		2674	1.5Sh = 11700
9(U/E)(SSE)	11+31+56	3922	3.922	156		5189	5345	1.8Sh = 14040
11	11+20 or 21	3922	3.922	525		5189	5714	(Sa+Sh) = 28500
9(SSE)	11+131	3922	3.922	209	2518		2,727	2.16Sh = 16848

NOTE: MATERIAL:

$S_h = 7800$ $S_c = 15,000$

$S_A = 1.25 S_c + 0.25 S_h = 20700$

Checking Method # [illegible]

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. № 58161 REV. 3

(1) APPLICATION: Pipe Support — WELD MOD. ☒ Q N/A NON Q ☒ DESIGN CHANGE ☒

(2) DWG. NO. SCH ???? Sheet 1 & 2 DD-1-090-001-S65K

(3) LINE NO./COMPONENT NO. N/A

(4) REASON FOR CHANGE: Add QTY To Item (11). Revise Item #8 & ADD WELD'S. Revise BASEPLATE'S Dimen. & ADD Sheet 2 of 2. Remove ITEMS 5,6,7,9 & 11 AND ADD ITEMS 12 & 13

(1) ORIGINATOR: PATRICK — NAME

☒ CPPE

N/A ORIGINAL DESIGNER

(1) APPROVED BY: — 9-14-8? DATE; — 9-17-8? DATE; — DATE; S.W. — 2-23 DATE; DATE; DATE; DATE

(5) INSTRUCTIONS:

REMOVE ☑

Change ITEM #8 - QTY. to READ: 2

Remove ITEM # 5, 6, 7 & 9

Change ITEM # 11 - QTY. to READ 2

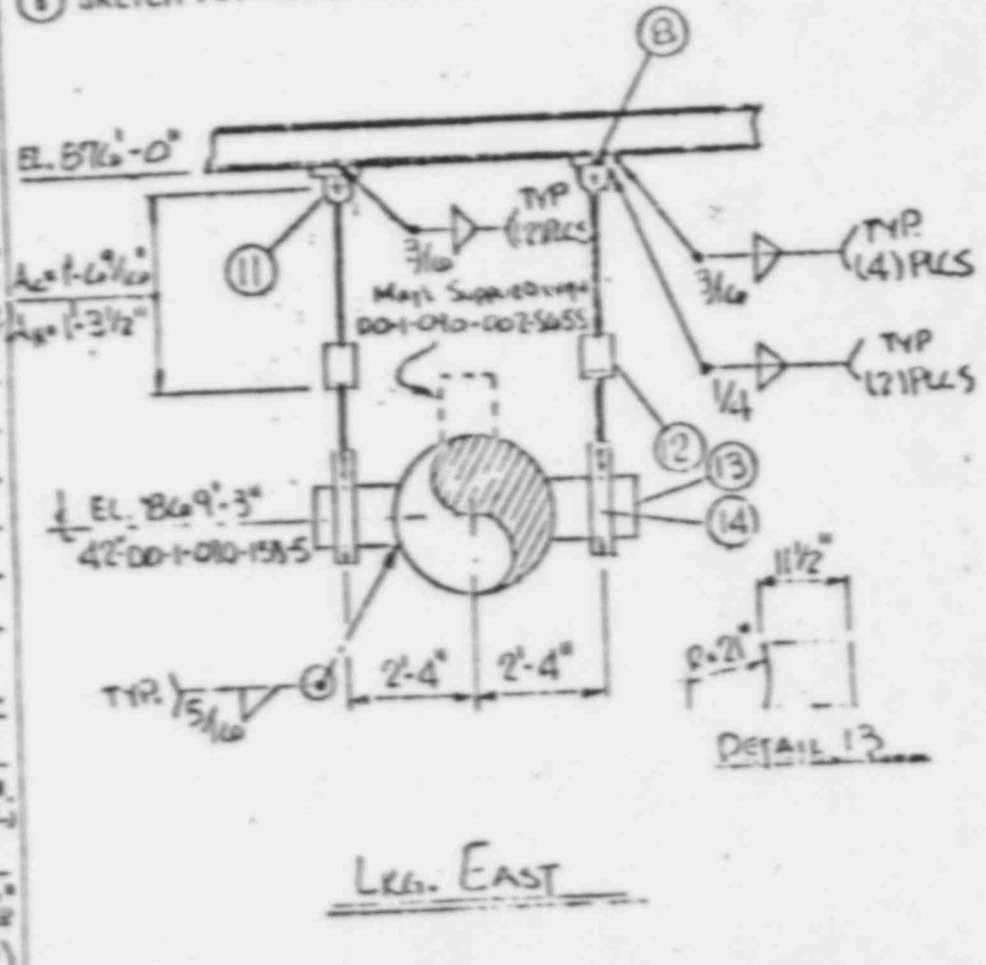
ADD ☑

Item #12: SHA-3-50; Total Travel = 3/16" (UP); Load = 2464#; C-C = 5'-4" (1) & 3'-9 ?/16"

Item #13: SA335 P22 Pipe 1/2" sch. 80 per Detail 13 (2)

Item #14: SA36 Pipe Clamp SPC-10-160 (2) Req'D

(6) SKETCH 1S1-DG1-DG-51



USE FOR ANALYSIS REVIEW PROBLEM 1-167F

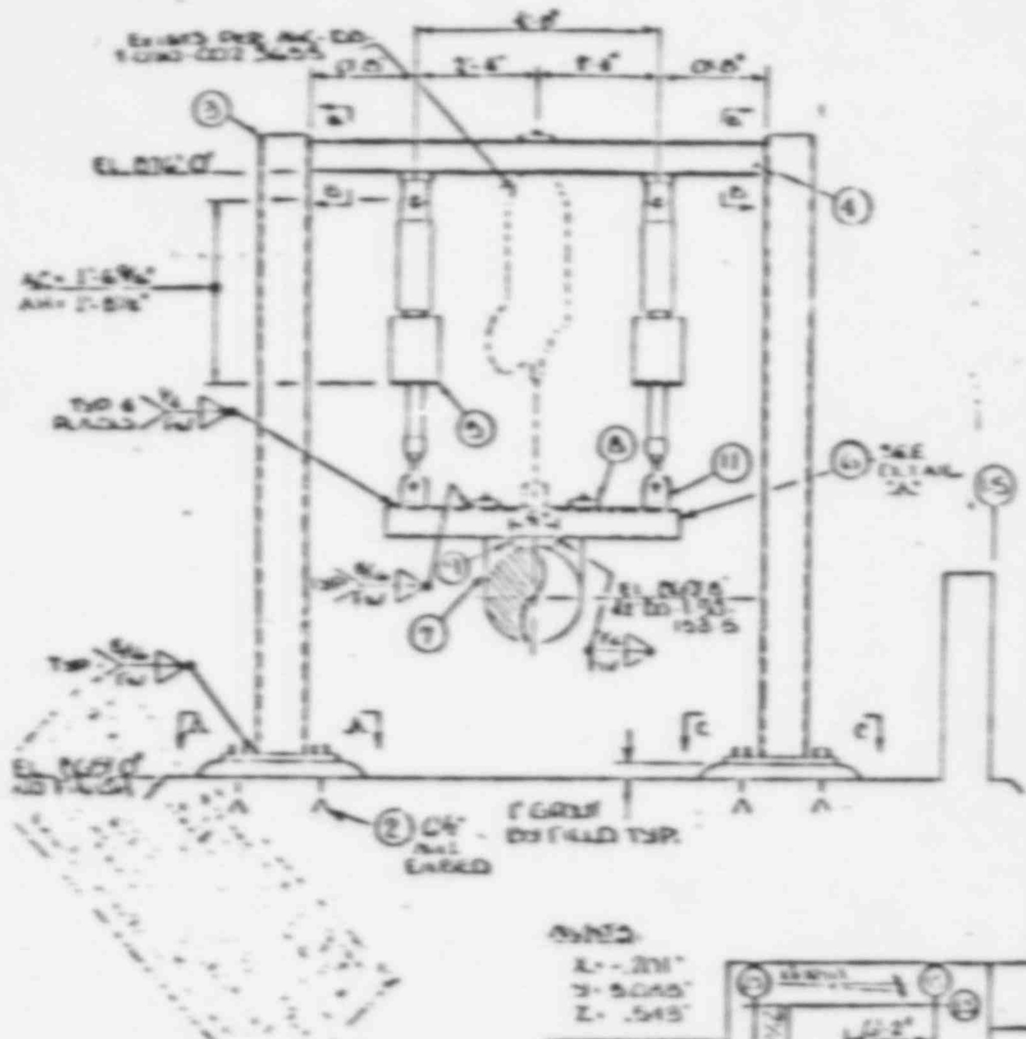
(9) DISTRIBUTION — DCC CNTL NO.

TECH SERVICES	INFO
SITE DAMAGE STUDY GROUP	INFO
SYSTEMS PLANNING	INFO
PRODUCTION CONTROL	INFO

THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO. 58161 REV

AREA-MANAGEMENT-INF

BLUELINE 6-18-81



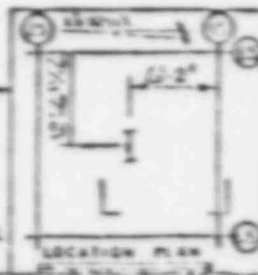
ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
	SEISMIC MECHANICAL SHOCK SUPPRESSOR ASSEMBLY	ONE	
1	[illegible] PER SECTION A-A (A36)	1	
2	1" x 12" Super [illegible]	[illegible]	
3	1/2" x 8" x 8" Structural Tubing [illegible]	2	
4	[illegible]	2	
5	[illegible]	2	
6	1/4" x [illegible] x 6" Structural Tubing [illegible]	1	
7	[illegible]	[illegible]	
8	[illegible]	2	
9	[illegible]	1	
10	[illegible] PER SECT. C-C (A36)	1	
11	[illegible] BRACKET [illegible]	4	

FOR ASBUILT VERIFICATION ONLY

HK 800-1-010-001-S65K

Approved By: DG

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET



BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS

PIPE:
STEEL:
ELECT: —
HVAC:

CONDITIONS	Fx	Fy	Fz	Mx	My
DESIGN	—	—	—	—	—
NORMAL & UPSET	—	[illegible]	—	—	—
EMERGENCY	—	[illegible]	—	—	—
FAULTED	—	—	—	—	—

DESCRIPTION

CUSTOMER
ORDER OR CONT. NO.
JOB NAME
SKETCH NO.
SHEET
REV.

THIRD PARTY INSPECTION
CODE CLASS:

TO 2434

USE FOR ANALYSIS REVIEW
1-167F

BEFCMG

PIPE HANGER ENGINEERING D

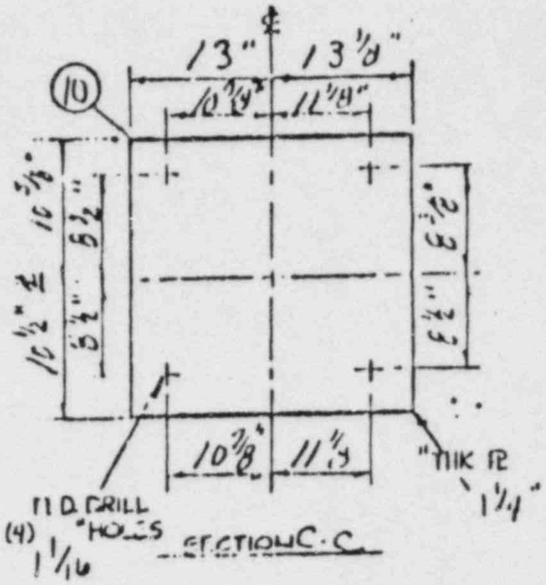
SUBJECT .... SHEET NO .... OF

CUSTOMER .... SYSTEM ....

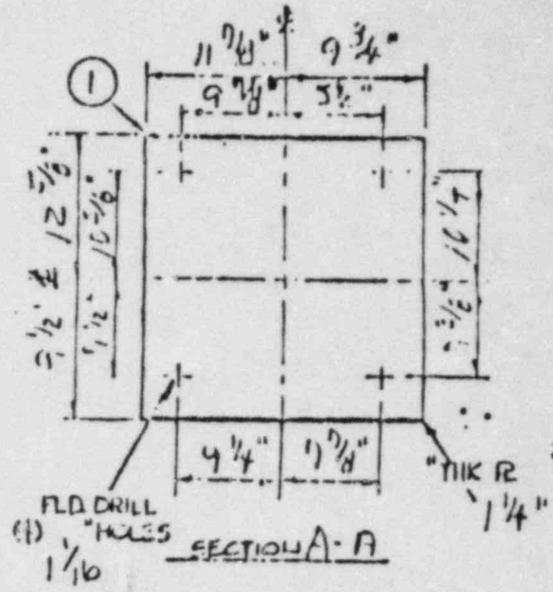
PROJECT .... PROJECT NO ....

BY .... DATE ....

CHK'D BY .... DATE ....



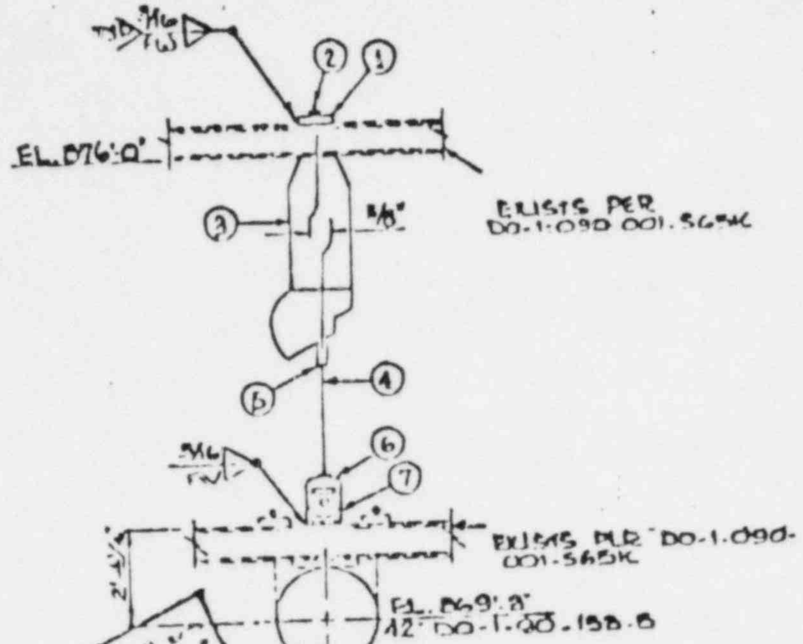
SECTION C-C



SECTION A-A

USE FOR ANALYSIS REVIEW
PROBLEM 1-167F

LINE 6-17-81



GPSES
CONTROL
COPY
DOCUMENT CONTROL CENTER

MVMTS.
X: -.201'
Y: 8.090'
Z: .513'

O.H.I. Iso. ME-3215-15 R.A
I.P.D. Iso. DO-1-DG-51 R.4
Data Point 6184-P00B-J167E
Pipe Mat'l. SA-155 2 1/4 CRCL 1
Insul. 4 1/2" Hidn. DG

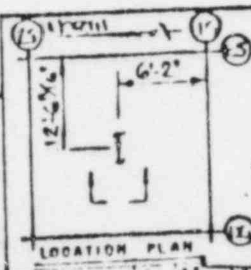
ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
	HANGER ASSEMBLY CONSISTING OF:	ONE	
1	ANC. #09 WASHER PLATE (A 36)	1	
2	RIT. #09, 0'-11" long, ROD W/RH. HAND THREAD	1	
3	NIJ. Fig. 80V, "A" or Equivalent w/Travel Stops. Load = 4121#. Total Travel = 4 1/2". Actual Travel = 3/16" UP	1	
4	RIT. #09, 1'- ROD W/RH. HAND THREAD	1	
5	EXN. 1 1/20" HEX NUT	2	
6	PEN. #09 WELDLESS EYE NUT	1	
7	BOD. #09 WELDLESS BEAM ATTACH. W/ BOLT (NUT) (A 36)	1	
	Apply one coat of Carbo Zinc 11 to ...		
	FOR ASBUILT VERIFICATION ONLY		
	HANGER ASSEMBLY SKETCH & ENGINEERING	1	
	MK. NO. DO-1-090-002-S655		
	DG 10/20/80	QUAN	SHIP

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: ML-0633 R.1 ELECT: —
STEEL: 1-0655 R.2 HV.A.C.: NL-OE-003

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—	4121	—	—	—	—
NORMAL & UPSET	—	—	—	—	—	—
EMERGENCY	—	—	—	—	—	—
FAULTED	—	—	—	—	—	—



REV	DATE	DRN	CHK	APP	DESCRIPTION
0					ISSUE FOR CONST. ~ REF. F.M.H.S.

THIRD PARTY INSPECTION
CODE CLASS: B31.1.5

CUSTOMER Texas Utilities Services Inc.
ORDER OR CONT. NO.
JOB NAME
MARK NO. DO-1-090-002-S655
SKETCH NO.
SHEET 1 OF 1 REV. 0

SEE CMC

2901

USE FOR ANALYSIS REVIEW
PROBLEM 1-167E

COMANCHE PEAK STEAM
ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. № 58203 △3

WELD MOD N/A Q N/A NON-Q ☒ DESIGN CHANGE/DEVIATION ☒

(1) ORIGINATOR
Patrick McVey
NAME

☒ CPPE

N/A ORIGINAL DESIGNER

(2) APPLICATION Pipe Support

(3) DWG NO BRH Rev. 0
DO-1-070-002-S65S

(4) REASON FOR CHANGE:
Revise Item #4
△2 Add Items 8 & 9
△3 Revise Item # 8 - Mat'l Spec.

(5) LINE NO./COMPONENT NO
N/A

(8) APPROVED BY
[signature] 9-16-81
DATE
△1 [signature] 9-17-81
DATE
△2 PSH [signature] 1/21/82
DATE
△3 [signature] 2-10-82
DATE

DATE

DATE

(6) INSTRUCTIONS

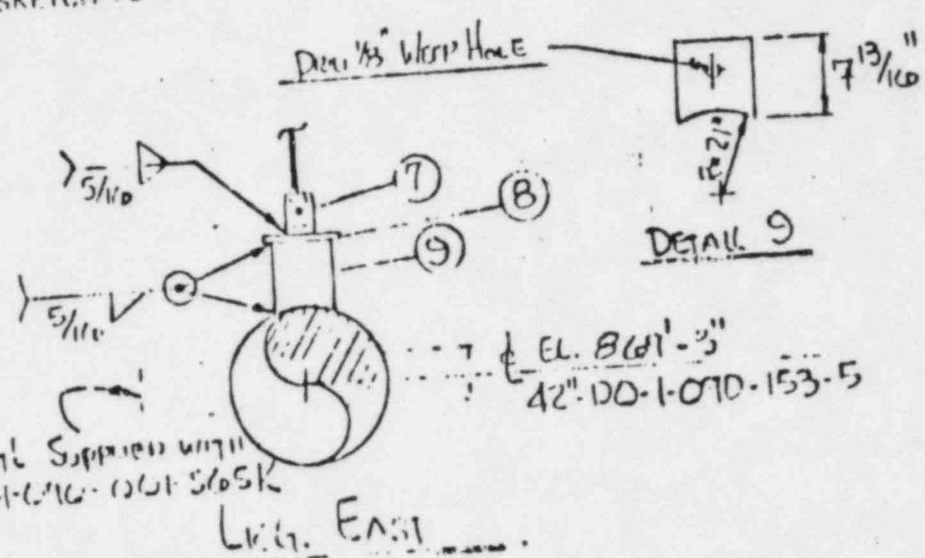
REMOVE N/A

Change Item #5 (QTY) to Read 4
Change Item #4 - Item length 1'-2 7/16" cut to suit

ADD ✓ △3

Item # 8 : (SA515 GR.65) 1" x 1'-1" x 1'-7" (QTY. 1)
Item # 2 : SA335 P22 ... Item 9

(6) SKETCH ISO-DO-1-DG-31



USE FOR ANALYSIS REVIEW
PROBLEM 1-167F

(9) DISTRIBUTION	DCC CNTL NOT	QTY INFO
AREA MANAGEMENT		
TECH SERVICES	INFO	2
SITE DAMAGE STUDY GROUP	INFO	
SYSTEMS PLANNING	INFO	1
PRODUCTION CONTROL	INFO	1

THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO. 58203 REV 2

Gibbs & Hill, Inc. Job No 11-2323-035 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS -OTHER CALCULATIO

Calculation Number PENS: AB-1-167C Sheet No 22

Revision		Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Status										
Preparer			JJP	3/28/83						
Checker			DJG	4/1/83						

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-432 NODE NO.: 240

MARK NO. : DO-1-089-003-S65S (Spring)

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY ('S') = 1975

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM') = 780

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	4092	4.092	362	3196		3558	1.0Sh = 9900
9 (UPSET)	11+31 +56	4092	4.092	669	3196		3865	1.5Sh = 14850
9 (UPSET)	11+31 +56	4092	4.092	669		8092	8761	1.8Sh = 17820
11	11+20 or 21+56	4092	4.092	552		8092	8644	(Sa+Sh) = 31125
9(SSE)	11+131	4092	4.092	769	3196		3965	2.16Sh = 21384

NOTE: MATERIAL:

$S_{h\,(650°F)} = 9900$ $S_c = 15000$

$S_A = 1.25 S_c + 0.25 S_h = 21225$

Checking Method #

F-165.4

1

Gibbs & Hill, Inc. Job No 11-2323-035 Client [illegible]

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIO

Calculation Number PROB: AB-1-167C Sheet No 23

Revision	[illegible]	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date	
[illegible]			1								
Preparer			JJP	3/19/83							
Checker			[illegible]	4/1/83							

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-432 NODE NO.: 140

MARK NO.: DO-1-089-003-S65S (Snubber)

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY ('S') = 1975

2). MAX COMBINED MEMBRANE STRESS INTENSITY (SM') = 780

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	0.0	0.0	362	0.0		362	1.0Sh = 9900
9(Y2SSE)	11+31 +56	712	.712	669	555		1224	1.5Sh = 14850
9(Y2SSE)	11+31 +56	712	.712	669		1406	2075	1.8Sh = 17820
11	11+20 or 21+56	0.0	0.0	552		0.0	552	(Sa+Sh) = 31125
9(SSE)	11+131	1043	1.043	769	814		1583	2.16Sh = 21384

NOTE: MATERIAL:

$S_{h\,(x'F)} = 9900$ $S_c = 15000$

$S_A = 1.25 S_c + 0.25 S_h = 21225$

Checking Method # [illegible]

F-155.4

Gibbs & Hill, Inc. Job No 11-2323-031 Client TUGCO

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATI

Calculation Number PROB: AB-1-167C Sheet No 24

Revision		Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
			1							
Preparer			JJH	4/11/83						
Checker			ACA	4/14/83						

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-433 NODE NO.: 27140 & 47140

MARK NO.: DO-1-089-004-S65K

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY ('S') = 936

2) MAX COMBINED MEMBRANE STRESS INTENSITY ('SM') = 375

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	0.0	0.0	337	0.0		337	1.0Sh = 9900
9(UPSET)	11+31 +56	8168	8.168	2004	3063		5067	1.5Sh = 14850
9(UPSET)	11+31 -56	8168	8.168	2004		7645	9649	1.8Sh = 1782[illegible]
11	11+20 or 21-56	0.0	0.0	2208		0.0	2208	(Sc+Sh) = 3112[illegible]
9(SSE)	11-131	11444	11.444	2559	4292		6851	2.16Sh = 2138[illegible]

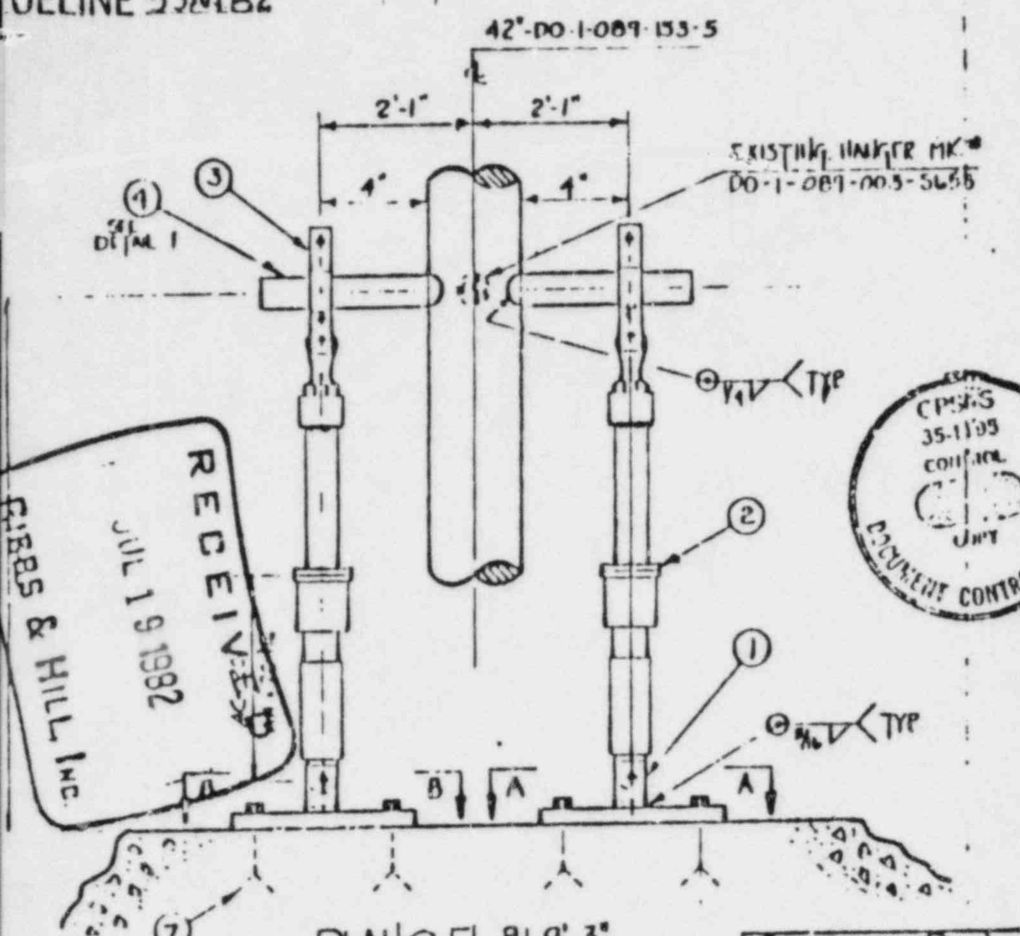
NOTE: MATERIAL:

$S_h = 9900$ (350°F) $S_c = 15000$

$S_A = 1.25 S_c + 0.25 S_h = 21225$

Checking Method #

UELINE 5JAN82



PLAN @ EL. 869'-3"

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
1	XRB-14 STR BRACKET (A14-DD/A36)	2	
2	SHA-10-50 SNUBBER C-C 8'-5 1/4"	2	
3	SPC-14-120 PIPE CLAMP (SA-36)	2	
4	STANCHION, BTG. (SA-335-P22)	2	
5	C-C (SA-515-GR 65/A36)		
6	A-A (SA-515-GR 65/A36)		
7	3/4" x 10" HILTI KWIK BOLTS (1144)	8	
	1/2" HILTI EMBED		

MARK # DO-1-089-004-S63R
PAINT: CARBO ZINC # 11

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FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS

PIPE: M1-0632-R4 ELECT: 1-0128-R1
STEEL: SL-0655-R2 HV.A.C.: 1-0450-R3

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—	—	—	—		
NORMAL & UPSET	—	—	1734			
EMERGENCY	—	—	1M628			
FAULTED	—	—	—	—		

REV	DATE	DWN	CHK	APP	DESCRIPTION
A					ISSUE FOR CONST. ~ REF:
					...

CUSTOMER Texas Utilities Services, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1&2
MARK NO. DO-1-089-004-S63R
SKETCH NO.
SHEET 1 OF 2 REV 0

LOCATION PLAN

THIRD PARTY INSPECTION
CODE CLASS: ASME III-3

MOVEMENTS
X -.100"
Y 3.086"
Z +.1675"

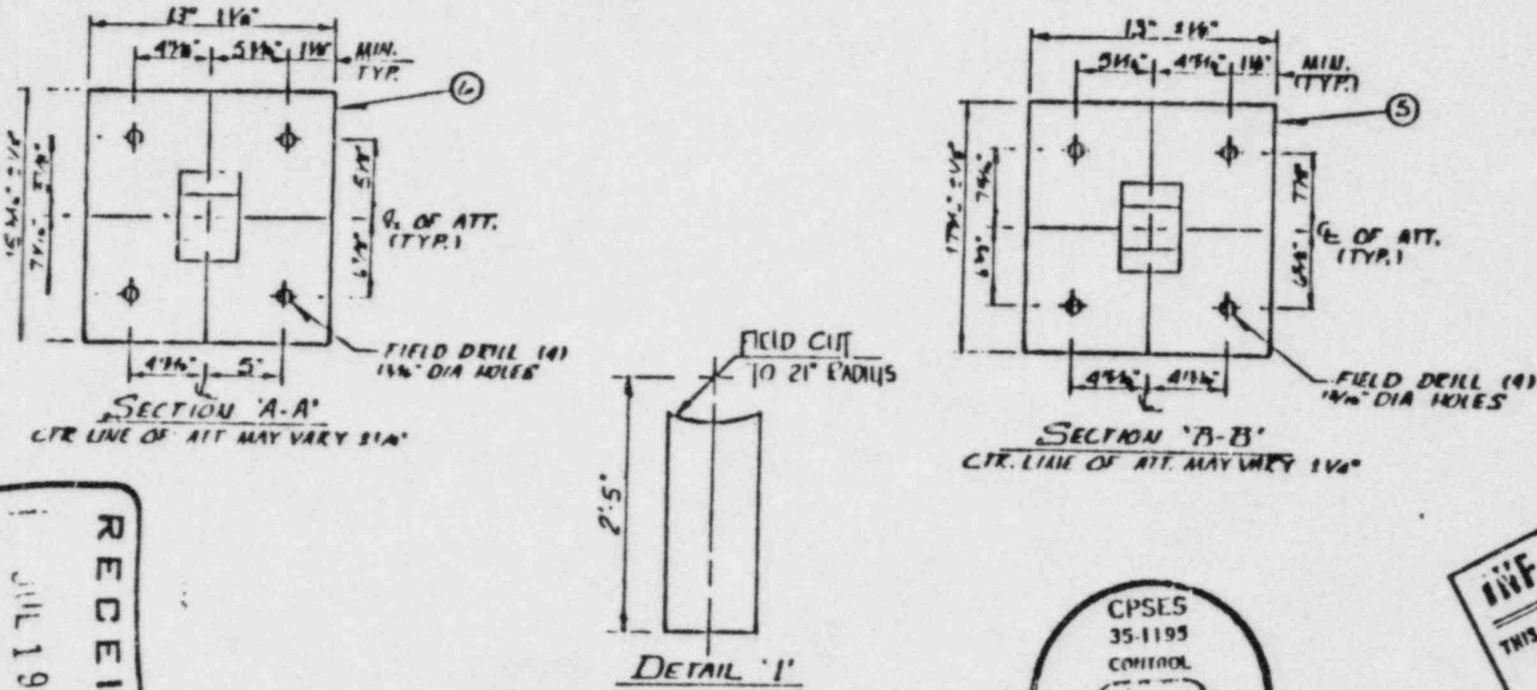
G.H.I. Iso. M-3815-11-RA
I.P.D. Iso. DO-1-DG-25-R4
Data Point 140/1108 # 116/C
Pipe Mat'l. SA-231-HC-22
Insul. 4 1/2" Bldg. 1XL

T.O. 2904

USE FOR ANALYSIS REVIEW

PROBLEM 1-167C -see CMC.

BLUELINE 5 JAN 82



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CPSES 35-1195 CONTROL COPY DOCUMENT CONTROL CENTER

RECEIVED
JUL 19 1982
GIBBS & HILL, INC.

FOR-ASBUILT VERIFICATION ONLY
USE FOR ANALYSIS REVIEW
PROBLEM 1-167C

T/O* 2934

THIRD PARTY INSPECTION	
CODE CLASS:	D,II,I/G

REV	DATE	DWN	CHK	APP	DESCRIPTION
A					ISSUED FOR CONST., REF. EM ...

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS	
PIPE:	ELECT:
STEEL:	HVAC:

CUSTOMER	Texas Utilities Service, Inc.
ORDER OR CONT. NO.	CP-0046
JOB NAME	Comanche Peak 1 & 2
MARK NO.	[illegible]
SKETCH NO.	
SHEET 2 OF 2	REV. 0

2233

Δ SJA

COMANCHE PEAK STEAM
ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC) Δ JS

№ 65293 Δ

SERIAL NO.

(1) APPLICATION: Pipe Support WELD MOD. [N/A] Q [N/A] NON-Q [X] DESIGN CHANGE/[redacted] [X]	(7) ORIGINATOR Patrick McGvey NAME
(2) DWG. NO. BRH Rev.0 SHT 1+2 DO-1-089-004-S6SK	[X] CPPE
(4) REASON FOR CHANGE: Revise Base Plate Dimin's; Δ Sup't Loc. Interferes W/Pipe Weld; Δ Rev. C-C of snubber due to distance off wall	[N/A] ORIGINAL DESIGNER
(3) LINE NO./COMPONENT NO. N/A	

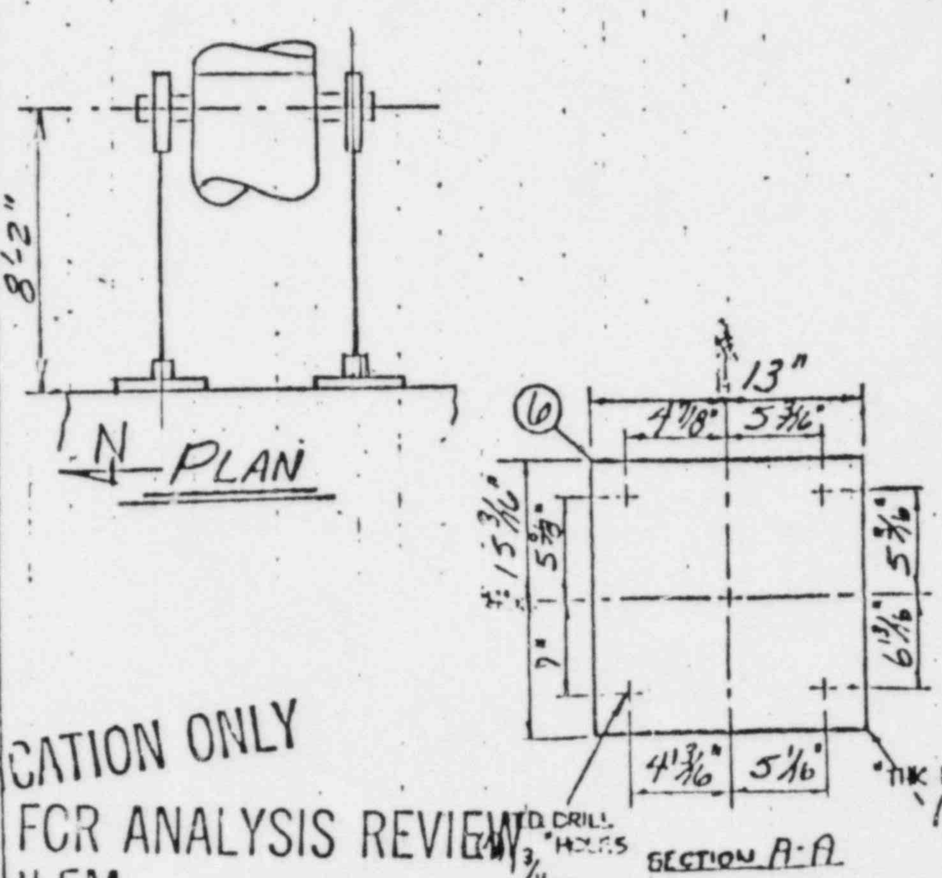
(5) INSTRUCTIONS: Δ

REMOVE ✓

REVISE #2 C-C = 6'-8"
L = 5'-0"

ADD [N/A]

(6) SKETCH / 30. DO-1-DG-25. R-4



(8) APPROVED BY:

CPPM [signature]	4-13-82 DATE
Δ SJA [signature]	4/23/82 DATE
Δ JS [signature]	2-19-82 DATE
	DATE
	DATE
	DATE

(9) DISTRIBUTION	DCC CNTL NO.	QTY
TECH SERVICES	INFO	2
SITE DAMAGE STUDY GROUP	INFO	
SYSTEMS PLANNING	INFO	1
PRODUCTION CONTROL	INFO	1

AREA MANAGEMENT INFO.

THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO. CMC 65293 Rev 1

RECEIVED JUL 19 1982 GIBBS & HILL, INC.

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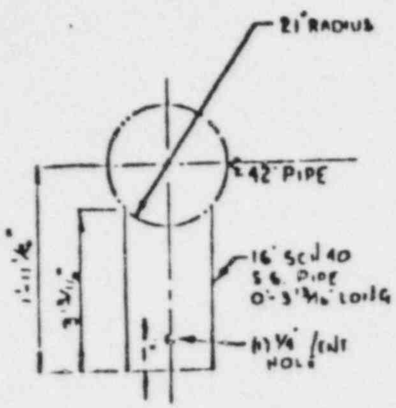
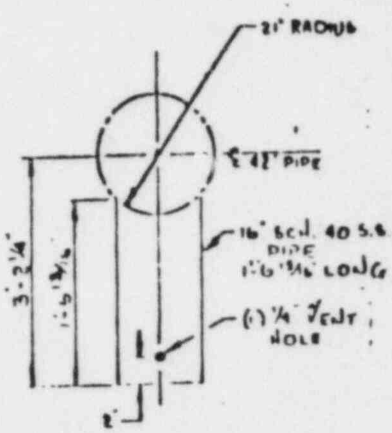
USE FOR ANALYSIS REVIEW

PROBLEM 1-167C

BLUELINE 3-10-81



DETAIL "A"



DETAIL "B"

NOTE: FIELD SURVEY BY STH 5-19-80

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
	HANGER ASSEMBLY CONSISTING OF:	1	
1	B36, Fig. 80V, "G" or Equivalent, w/Travel Stops, Total Load = 57145, Load/Spring = 26378, C-C = 5'-0", Total Travel = 4 1/2" Actual Travel = 1 1/8" UP, J = 1/8"	1	
2	16" Sch. 40 Stainless Steel (SA 312 GR.22) Pipe, 0'-3 13/16" long, TW = 20#	1	
3	16" Sch. 40 Stainless Steel (SA 312 GR.22) Pipe, 1'-6 13/16" long, TW = 110#	1	
4	3/4" x 1'-6" Carbon Steel Plate, 1'-6" TW = 136#	2	
5	SW, #10, BA, C-C = 2'-0 9/16", INT. 3 1/4" IN, Load = 71734	1	
6	1/2" x 8" x 8" Structural Tubing, 7'-9" TW = 3675	1	
7	1/2" x 8" x 8" Structural Tubing, 10'-4 1/2" TW = 9016	2	
8	~~Carbon Steel Plate per SKETCH A-A~~		
9	3/4" x 10" HILTI Kwik Conc. Anchors (1143)	8	
10	BBD-07 BRACKET	[illegible]	
11	HLS-07 EYE NUT	[illegible]	
12	EXT-7/8" HEX NUT	[illegible]	
13	RFP-07, 6'-4" long, TW = 10# ROD	[illegible]	
D	C.S.P. 1 1/4" x 21 3/16" x 1'-9 3/16" PER SECT. A-A	[illegible]	
14	C.S.P. 1 1/4" x 24 1/2" x 1'-10 3/16" PER SECT. D-D	[illegible]	
	Apply Carbo-Zinc 11 to above mat'l except threads which shall be treated with a rust preventative		
	HANGER ASSEMBLY SKETCH & [illegible]	1	
	MK 800-1-009-003-S65R		
	DG. 11/5/81	QUAN	SHIP

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3.063
.543

USE FOR ANALYSIS REVIEW
PROBLEM 1-167

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

Brown & Root, Inc.

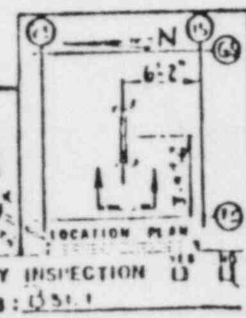
CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	--	-4781	--	--		--
NORMAL & UPSET		13607				
EMERGENCY		7174				
FAULTED	--	--				

REF. DRAWING NUMBERS

PIPE [illegible] ELECT [illegible]
STEEL [illegible] HVAC [illegible]

REV	DATE	DRN	CHK	APP	DESCRIPTION
A	[illegible]	[illegible]	[illegible]		ISSUE FOR CONSTRUCTION [illegible]

CUSTOMER [illegible]
ORDER OR CONT NO [illegible]
JOB NAME [illegible]
MARK NO. 00-1-009-003-S65R
SKETCH NO.
SHEET 1 OF 1 REV



THIRD PARTY INSPECTION
CODE CLASS: [illegible]

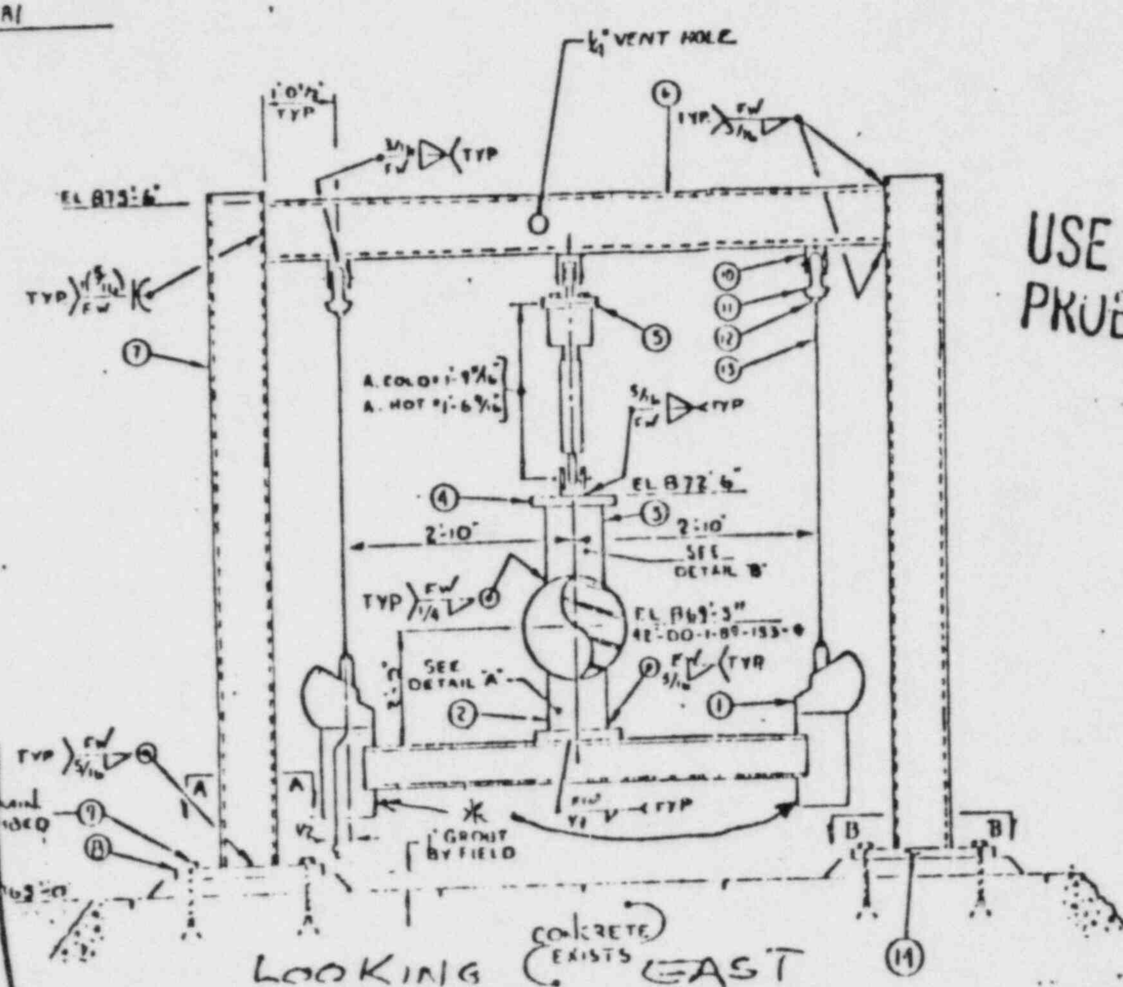
TQ 2904
MI-3215-11 REV A
00-1-06-25 Rev 4
SA234 GR 22

TAG #03

RECEIVED
JUL 19 1983
HILL

see C.M.C.

BLUELINE 3-10-81



USE FOR ANALYSIS REVIEW PROBLEM 1-167C

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T.O. 2904

THIRD PARTY INSPECTION
CODE CLASS: B31.1

REV	DATE	DWN	CHK	APP	DESCRIPTION
A	[illegible]	JW	[illegible]	[illegible]	ISSUE FOR CONSTRUCTION REF FIELD MODIFIED HANGER SKETCH

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: STEEL: ELECT: HVAC:

CUSTOMER
ORDER OR CONT. NO.
JOB NAME
MARK NO. 003-089-003-S455
SKETCH NO
SHEET 2 OF REV.

PAG #05

Page 1 of 3

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SIA / FAURIA / JS

№ 63277 P 4

SERIAL NO.

(1) APPLICATION: Pipe Support WELD MOD [N/A] Q [N/A] NON-Q [✓] ~~DESIGN CHANGE~~/DEVIATION [✓]

(2) DWG. NO. DO-1-087-003-S65S

(3) LINE NO./COMPONENT NO. 42" DO-1-089-153-G

(4) REASON FOR CHANGE: REVISE LOCATION PLAN, SHORTEN ITEM #6, SHOW ATTACHMENT OF DO-1-087-004-S65K, & REVISE PLATE DIMS.
REVISE STANCHION SIZE & MAT'L; SHOW CORRECT PIPE MATERIAL
ADD MAT'L TYPE TO PLATE
Revised Item #5 & Item #1 & Item 13, Detail P. Lengths & Detail A. Show Correct Hilti Size

(5) INSTRUCTIONS:

REMOVE [✓]

REV. IT. (2) TO: 12"Ø SCH 40 PIPE FIELD CUT TO SUIT (SA-335 P22)

REV IT. (3) TO: 12"Ø SCH 40, PIPE, 1'-6 13/16" (SA-335 P22)

REVISE (4) MAT'L = A-36 / A-36

REVISED ITEM #5 PER PAGE 3 OF CMC

REVISED ITEM #1 - CVG. #36 ... 3/8 UP, R: 7/8

TOTAL LOAD ... = 2386# AT

ITEM #13 7'-10 1/4 TL 18"

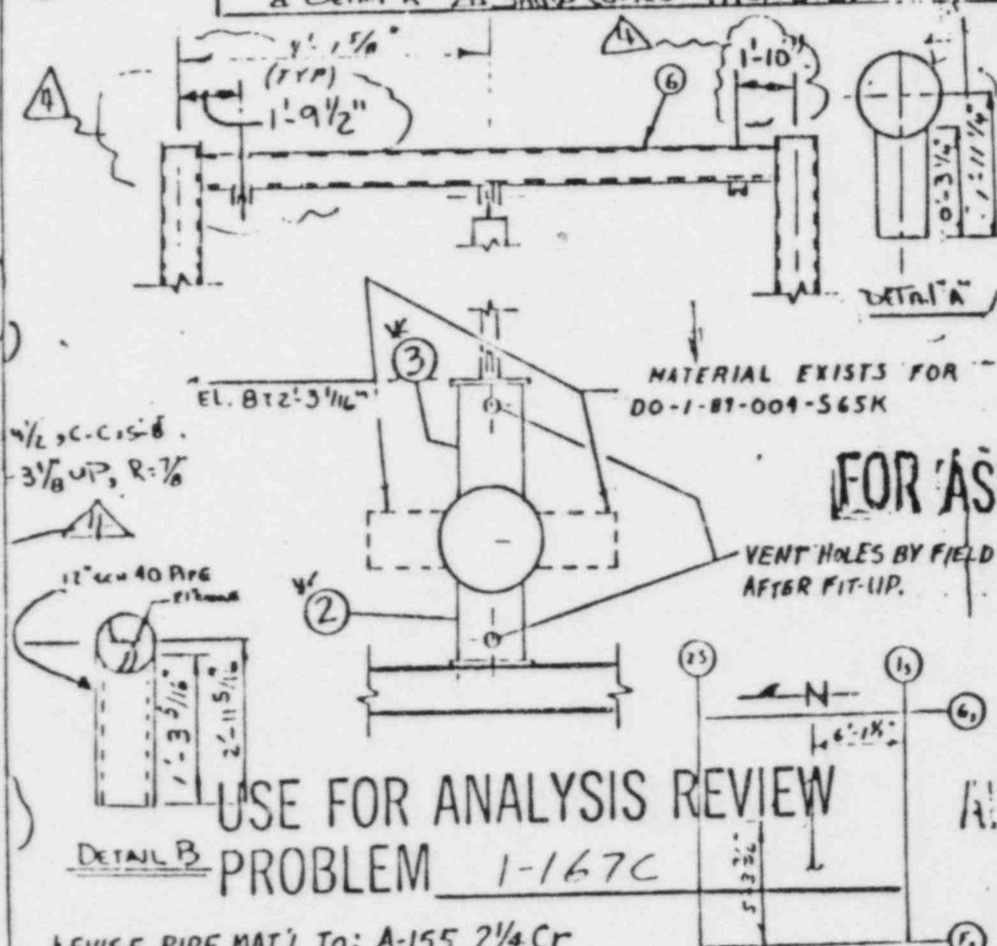
DELETE (1) ITEM (9)

ADD [✓]

6 1/2 x 8 x 8 T.S. (A500 Gr B) 1'-2 1/4" Long

(15) (1) 1" x 12" Lg Hilti Kwik Bolt

(6) SKETCH



USE FOR ANALYSIS REVIEW
PROBLEM 1-167C

REVISE PIPE MAT'L TO: A-155 2 1/4 Cr

ANY ITEMS, WELDS, OR DIMENSIONS NOT SHOWN REMAIN THE SAME

* Field cut to suit

(7) ORIGINATOR
Charles S Siva
NAME
[X] CPPE
[N/A] ORIGINAL DESIGNER

(8) APPROVED BY:
	DATE
(signature)	12/21/81
SJA / JF (signature)	12/31/81
SJA / JS (signature)	1-4-82
JHA (signature)	1-12-82
SIA (signature)	3/4/82

FOR ASBUILT VERIFICATION ONLY

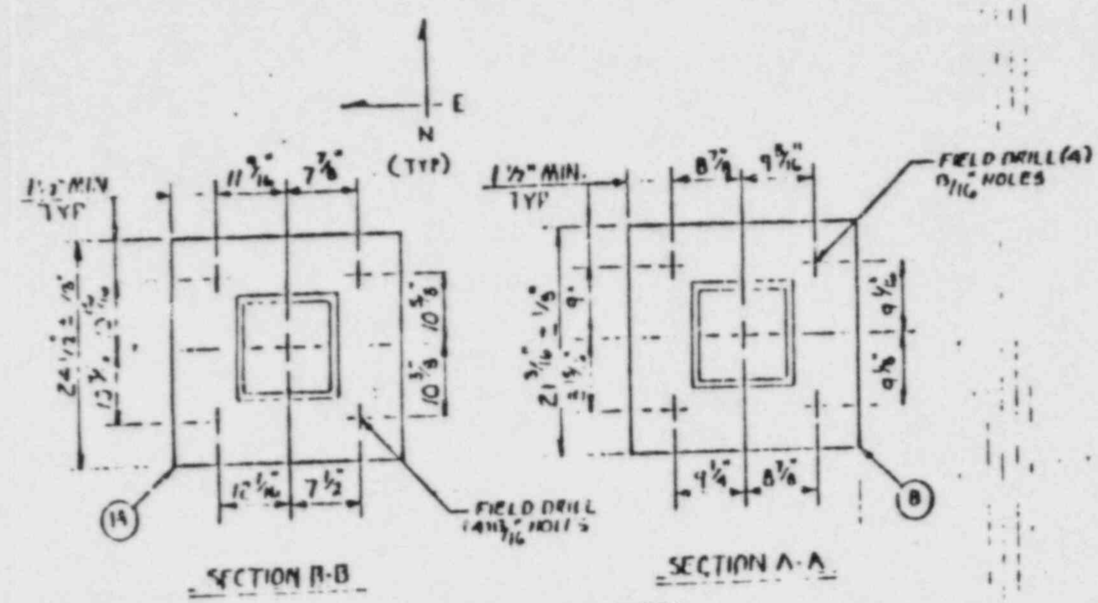
(9) DISTRIBUTION

		DOC. COPY NO.
~~TECH SERVICES~~	INFO	2
~~SITE DAMAGE STUDY GROUP~~	INFO	
~~SYSTEMS PLANNING~~	INFO	1
~~PRODUCTION CONTROL~~	INFO	1

~~THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO.~~ CMC 63277 REV. 3

RECEIVED FEB 1 9 1982 GIBBS & HILL

BLUELINE 3-10-81



ALL ℄ DIMS. ± 1/4" UNLESS NOTED

USE FOR ANALYSIS REVIEW
PROBLEM 1-167C

FOR ASBUILT VERIFICATION ONLY

T.O. 2904

THIRD PARTY INSPECTION
CODE CLASS: B31.1

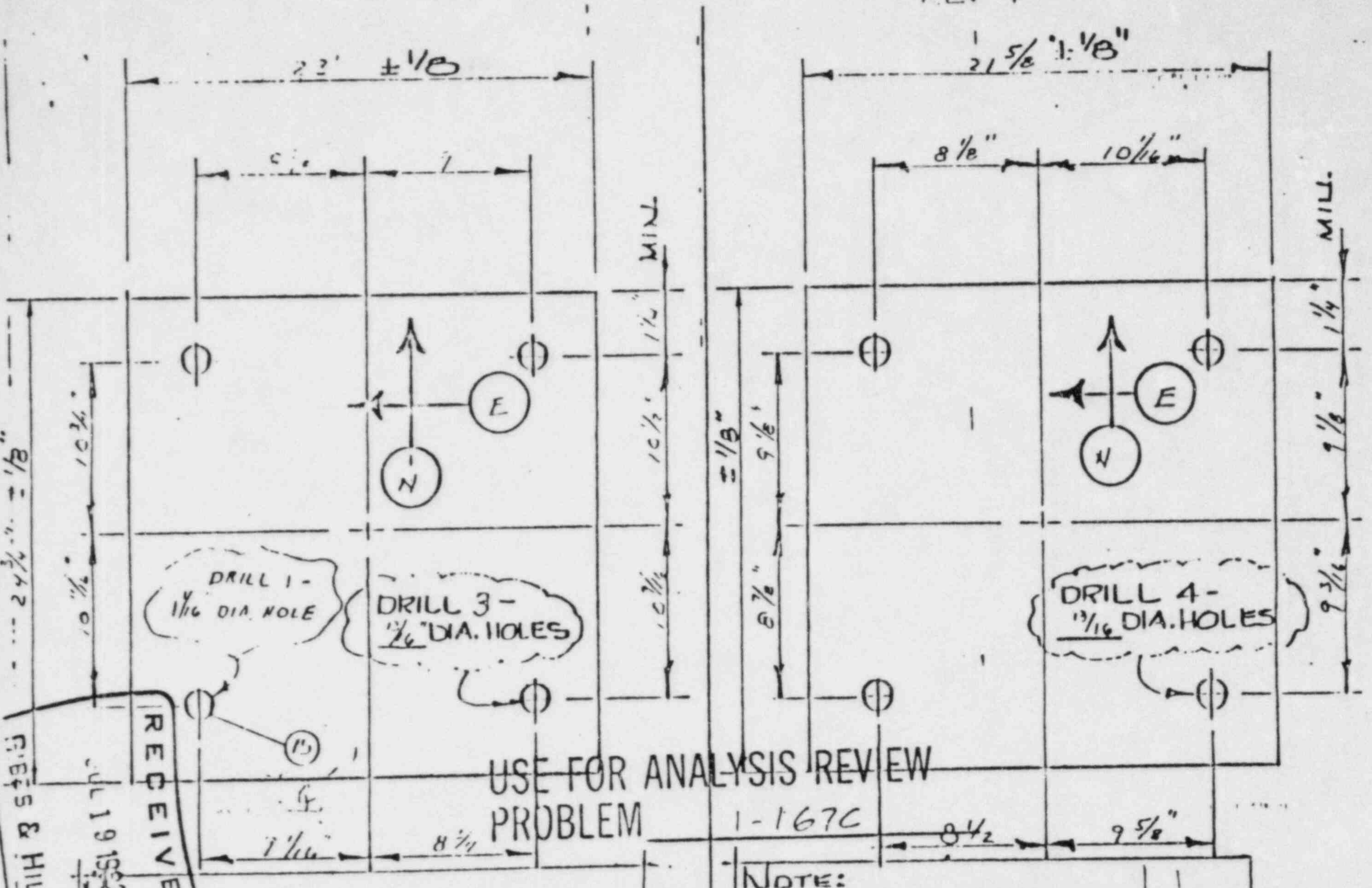
REV	DATE	DWN	CHK	APP	DESCRIPTION
0	81				ISSUED FOR CONSTRUCTION: REF. FIELD MODIFIED HANGER SKETCH

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: ~ ELECT: ~
STEEL: ~ HVAC: ~

CUSTOMER
ORDER OR CONT. NO.
JOB NAME
MARK NO. DO-1-089-003-S655
SKETCH NO.
SHEET 3 OF 3 REV. 0

REV 4



USE FOR ANALYSIS REVIEW
PROBLEM 1-1676

NOTE:
CTR. LINE OF ATTACHMENT MAY VARY ± 1/4 INCH

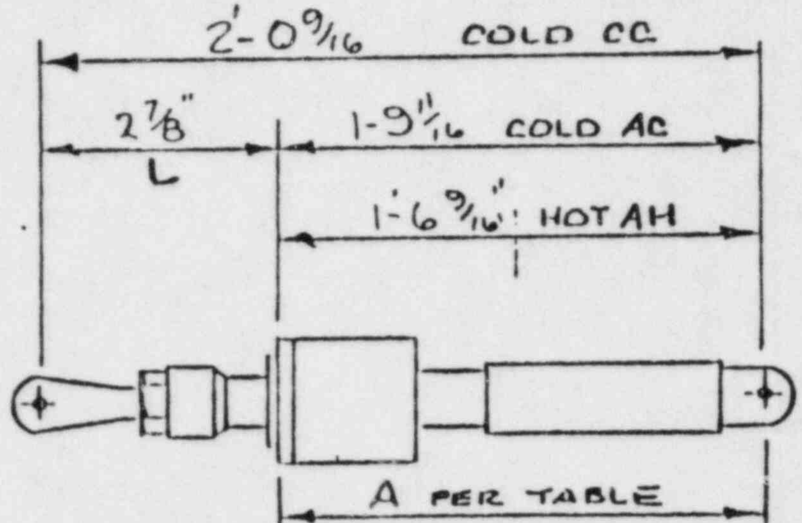
SECTION B-B SPEC. SA 36 OR SA 515
PL 1 1/4 THK X 22" WIDE X 24 3/4 LONG

NOTE:
CTR. LINE OF ATTACHMENT MAY VARY ± 1/4 INCH

SECTION A-A SPEC. SA 36 OR SA 515 Gr 65
PL 1 1/4 THK. X ____ WIDE X ____ LONG

FOR ASBUILT VERIFICATION ONLY

DRAWING NO. DO-1.089-003-S655
CMC NO. 63277 R4
SHEET 3 OF 3



TYPE & SIZE SMF-10-BA
QUANTITY 1

USE FOR ANALYSIS REVIEW
PROBLEM 1-1676

(KETTETS) $A_C = \frac{1}{2}(\overset{6}{\text{STROKE}} + \overset{3.125}{\text{MOVEMENT}}) + (\overset{17.1}{\text{A RETRACTED}}) = 21.6875$

$A_H = A_C - \overset{3.125}{\text{MOVEMENT}} = 18.5625$

SNUBBERS
(USE NPSI SNUBBER DESIGN GUIDE)

FOR ASBUILT VERIFICATION ONLY

Gibbs & Hill, Inc. Job No 11-2323-032 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number PROB. AB-1-167C Sheet No 28

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
[illegible]			1							
Preparer			JJP	3/29/83						
Checker			JCA	4/19/83						

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-437 ✓ NODE NO.: 22231 & 42231

MARK NO.: DO-1-029-001-S53K ✓

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY ('S') = 681 ✓

2) MAX COMBINED MEMBRANE STRESS INTENSITY (S_M') = 213 ✓

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYLNOZ MEMBRANE STRESS	CYLNOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE
8	11	0.0	0.0	314	0.0	X	314	$1.0S_h$ = 9900
9(1/2SSE)	11+31+56	3254	3.254	531	693	X	1224	$1.5S_h$ = 14850
9(1/2SSE)	11+31+56	3254	3.254	531	X	2216	2747	$1.8S_h$ = 17820
11	11+20 or 21+56	0.0	0.0	687	X	0.0	687	(S_A+S_h) = 31125
9(SSE)	11+121	4510	4.51	566	961	X	1527	$2.16S_h$ = 21384

NOTE: MATERIAL:

$S_h = 9900$ $S_c = 15000$

$S_A = 1.25S_c + 0.25S_h = 21225$

Checking Method #: [illegible]

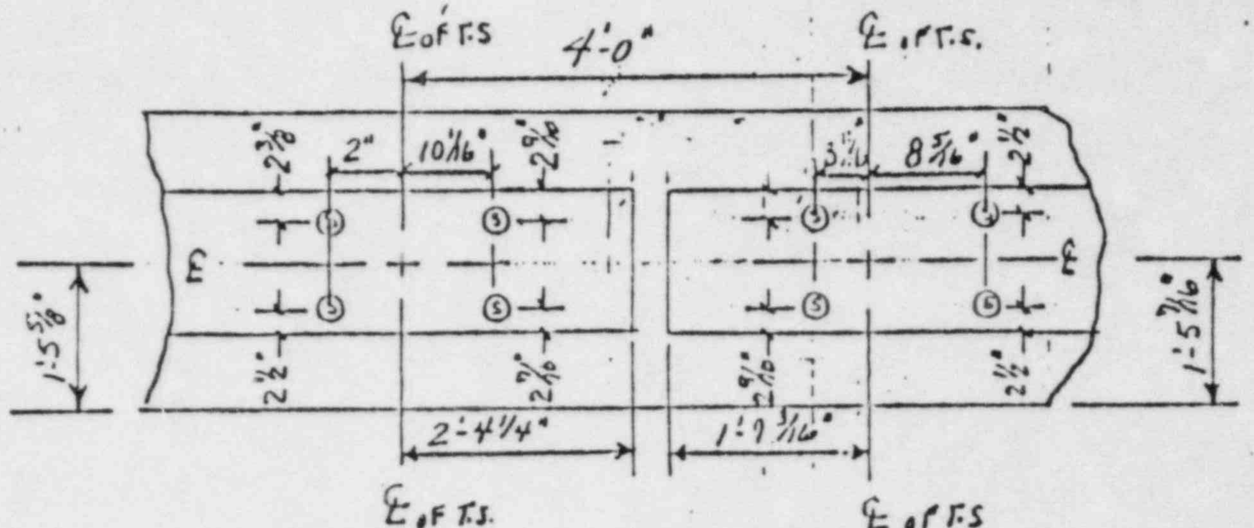
Sheet 2 of 5

CMC # 66091 Rev. 4

BY .... DATE .... SUBJECT .... SHEET NO. .... OF ....

CHKD BY .... DATE .... CUSTOMER .... SUPPORT I.D. ....

PROJECT .... OTHER I.D. ....



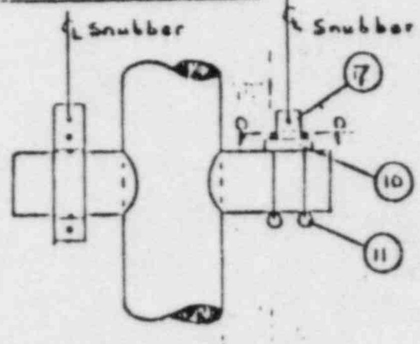
(5) - NELSON STUD

USE FOR ANALYSIS REVIEW

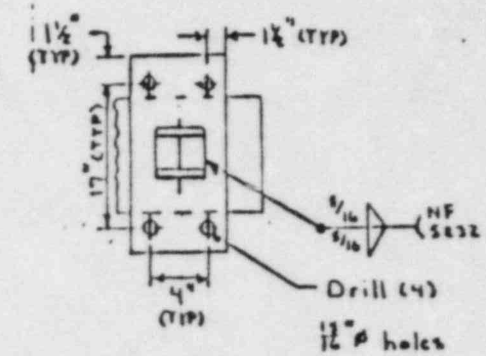
PROBLEM 1-167C

ELEV. LKG. WEST

Note: For snubber on South side of pipe "c-c" = 2'-11 1/2", "L" = 2 7/8", "AC" = 2'-8 5/8", "AH" = 2'-7 3/8". For snubber on North side of pipe "c-c" = 3'-2", "L" = 2 7/8", "AC" = 2'-11 1/8", "AH" = 2'-9 7/8"



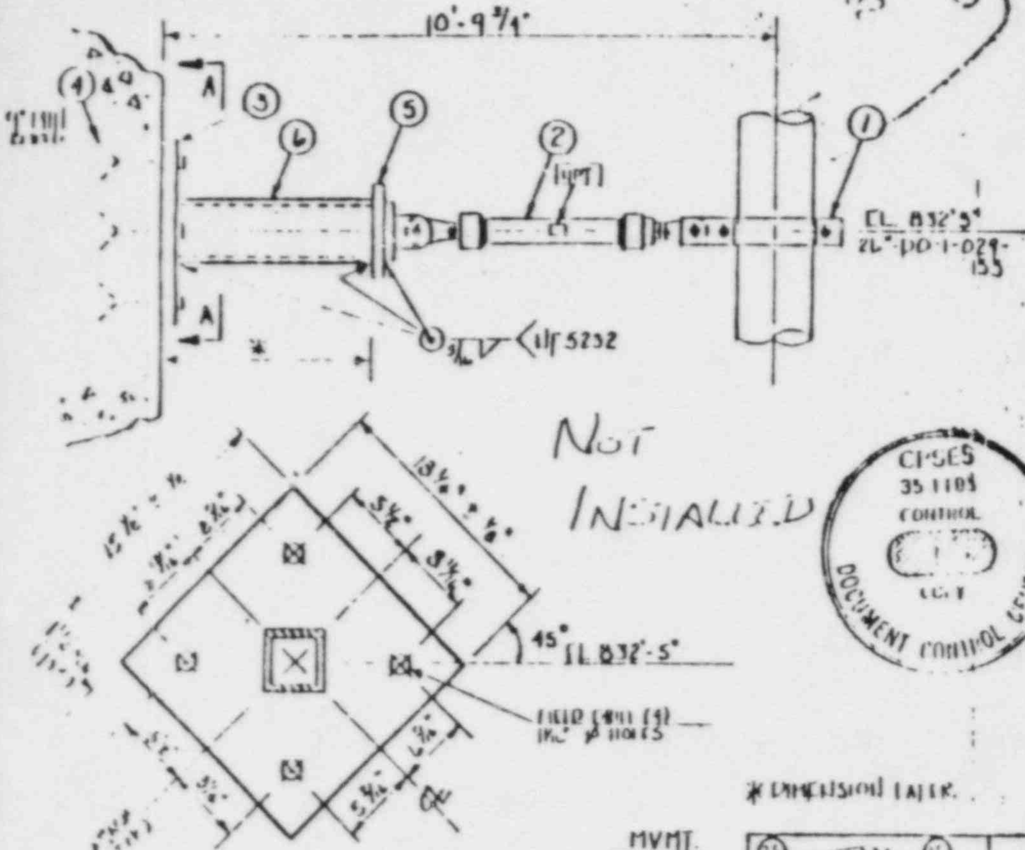
Section "A-A" (Partial)



Section "D-D"

FOR ASBUILT VERIFICATION ONLY.

BLUELINE 1-4-82



ITEM NO	MATERIALS & OPERATIONS	QUAN	SHIP
1	SPECIAL CLAMP BY NPSI (DIMENSION LATER)	1	
2	SRS-80-PO SWAY STRUT C-C: 7'-0"	1	
3	1 1/4" C.S. IP PER SECT. A-A (SA 36 / SA-515-GR 65)	1	
4	1" x 12" SUPER HILTI-KWIK BOLTS (1144)	4	
5	3/4" C.S. IP x 7" x 7" (SA 36 / SA 515-GR 65)	1	
6	T.S. 6" x 6" x 1/2" x 1'-0" LG (A 500-GR B)	1	
	FIELD TRIM TO SUIT		

FOR ASBUILT VERIFICATION ONLY

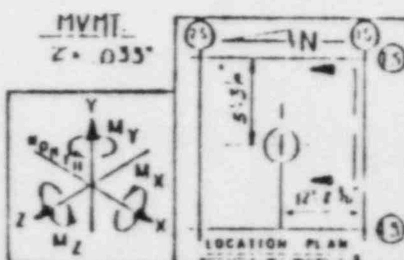
USE FOR ANALYSIS REVIEW

PROBLEM 1-167C

MARK NO. 1-024-002-S33R
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS

MVMT.
Z = .035"



THIRD PARTY INSPECTION
CODE CLASS: ASME III 3

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: M1-0250-P4 ELECT: E1-0787 P5
STEEL: SE-0105-P4 HVAC: M1-0581 P5

SPEC SKETCH NO.	Fx	Fy	Fz	Mx	My	Mz
CONDITIONS						
DESIGN						
NORMAL & UPSET	—	—	11847	—	—	—
EMERGENCY	—	—	11892	—	—	—
FAULTED						

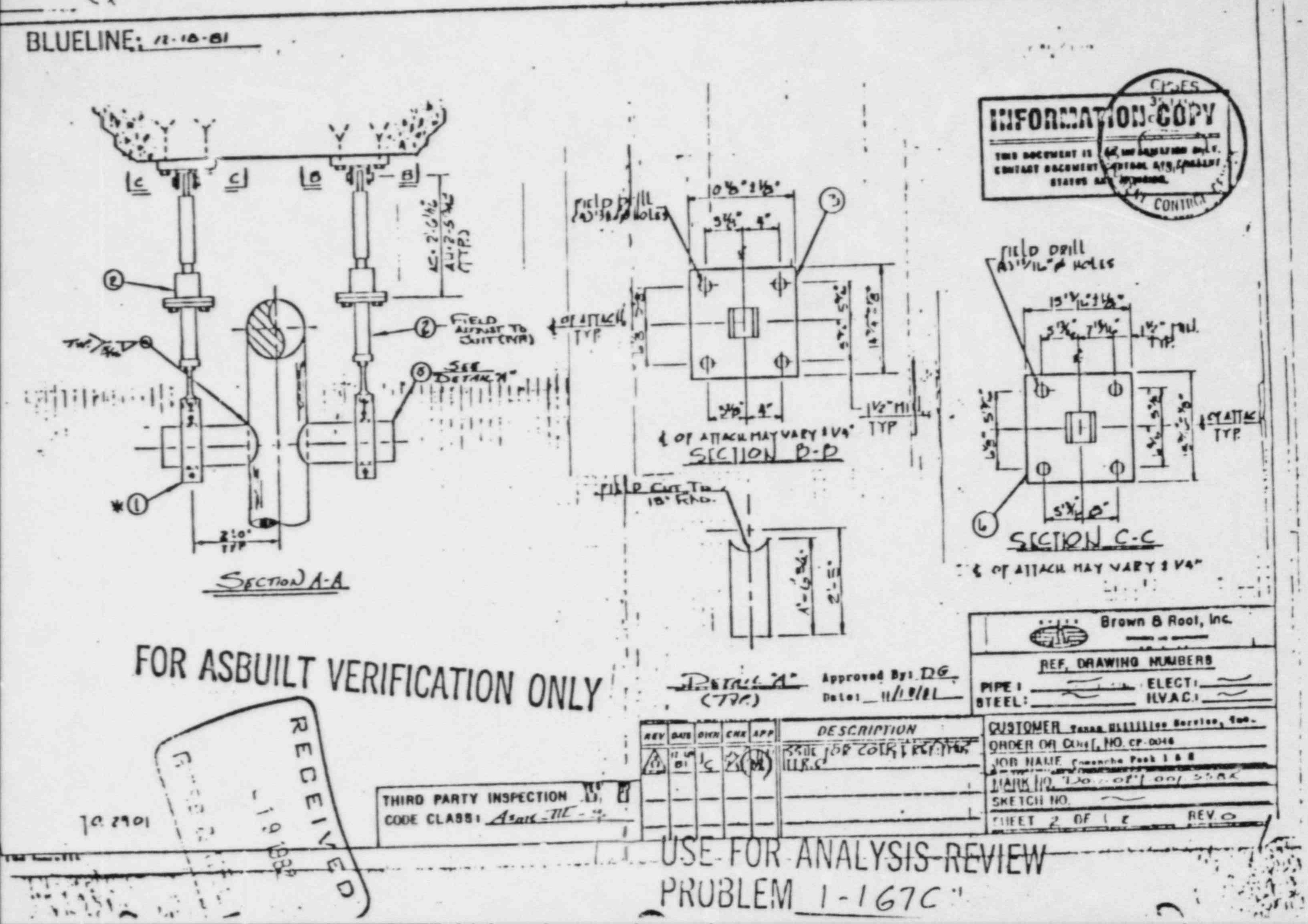
SHEET OF

DESCRIPTION
ISSUE FOR CONSTRUCTION / UPDATED FIELD

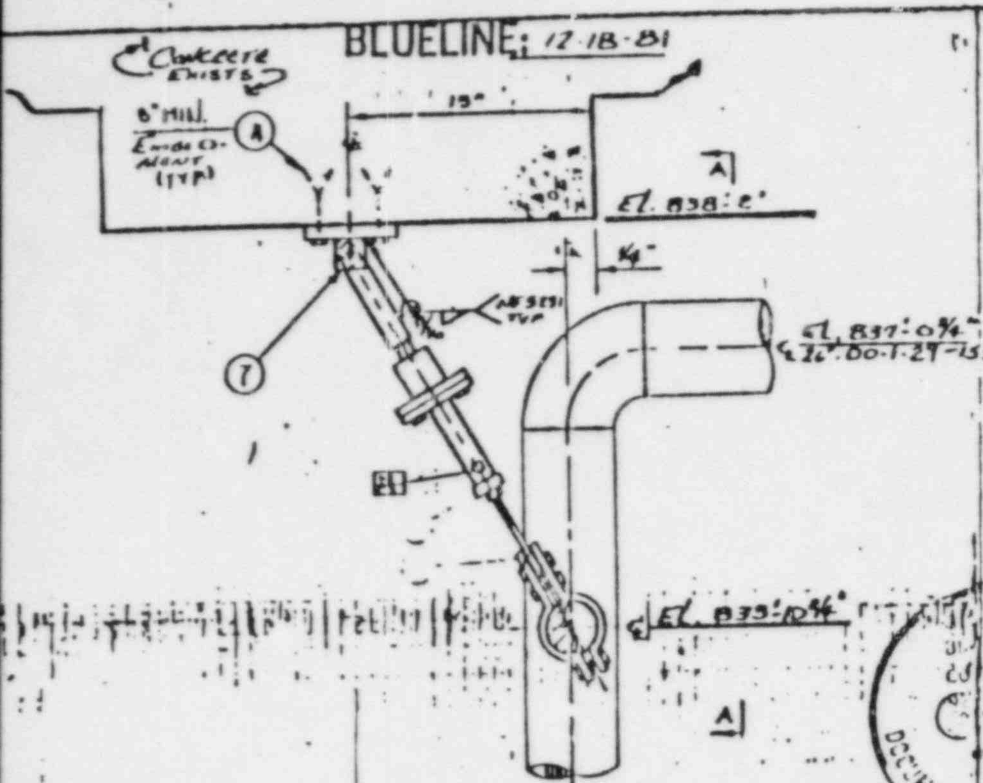
CUSTOMER Texas Utilities Service, Inc
ORDER OR CONT NO CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. DO-1-024-002-S33R
SKETCH NO.
SHEET 1 OF 1 REV 0

GHI Iso. M1-3215-12-R A
FPD. Iso. DO-1-PG-25-R 4
Data Point 2232 / PROB 1167C
Pipe Mat'l. SA 387 GR 22
Insul. 5" Bldg. S

TO 2104



BLUELINE: 12-10-81
INFORMATION COPY
SECTION A-A
FIELD ADJUST TO SUIT (TYP)
SEE DETAIL "A"
SECTION B-B
FIELD DRILL HOLES
℄ OF ATTACH MAY VARY ± 1/4"
SECTION C-C
FIELD DRILL HOLES
℄ OF ATTACH MAY VARY ± 1/4"
FIELD CUT TO 18" RAD.
DETAIL "A" (TYP)
Approved By: DG
Date: 11/18/81
FOR ASBUILT VERIFICATION ONLY
RECEIVED
THIRD PARTY INSPECTION
CODE CLASS:
REV
DATE
DRN
CHK
APP
DESCRIPTION
Brown & Root, Inc.
REF. DRAWING NUMBERS
PIPE:
STEEL:
ELECT:
HVAC:
CUSTOMER Texas Utilities Services, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO.
SKETCH NO.
SHEET 2 OF 2
REV. 0
USE FOR ANALYSIS REVIEW
PROBLEM 1-167C



ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
1	SPECIAL PIPE CLAMP PER NPSI	1	
2		1	
3		1	
4		2	
5		1	
6		2	

FOR ASBUILT VERIFICATION ONLY

INFORMATION COPY
THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR CURRENT STATUS AND REVISION.

DOCUMENT CONTROL

MARK # DO-1-024-001-S33K
PAINT: CARBO ZINC II

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

MOVEMENTS	
X	—
Y	.263"
Z	-.160"

Brown & Root, Inc.

REF. DRAWING NUMBERS
PIPE: ...
STEEL: ...
ELECT: ...
H.V.A.C.: ...

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET						
EMERGENCY						
FAULTED						

REV	DATE	DRWN	CHK	APP	DESCRIPTION
0					ISSUE FOR CONST. REF: MHS

CUSTOMER Texas Utilities Services, Inc.
ORDER OR CONT. NO. CP-0016
JOB NAME Comanche Peak S.E.S.
MARK NO. DO-1-024-001-S33K
SKETCH NO.
SHEET 1 OF 2 REV. 0

LOCATION PLAN
NORTH

THIRD PARTY INSPECTION
CODE CLASS: ASME III-3

G.H.I. Iso. 5713-12 Rev A
I.P.D. Iso. DO-1-DG-83 Rev 4
Data Point E231/PK03 1-14 7C
Pipe Mat'l. SA-333 Gr. 6
Insul. 4½" Bldg. S

TC 2901

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USE FOR ANALYSIS REVIEW
PROBLEM

see CMC

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

№ 66071 Rev. 4

SHEET 1 OF 2

SERIAL NO. ___

APPLICATION: PIPE SUPT. WELD MOD. ☒ Q ☑ NON-Q NA DESIGN CHANGE ☑

(2) DWG. NO. DO-1-029-001-S53K
BRH REV 0 SH 1 of 2

(3) LINE NO./COMPONENT NO.
26" DO-1-29-153

(4) REASON FOR CHANGE: ℄ ATT. CHG'D.
Inaccessible weld & add snubber dim.
Redesign & ADD SHEET 2 of 2
Interference with other equipment.
Correct deletion of item (5) to item (1)

(7) ORIGINATOR
SJ Allen
NAME
☑ CPPE
NA ORIGINAL DESIGNER

(8) APPROVED BY:

SJA J. Schaefer	1/20/82 DATE
(GDH) J. Gladsden	2-17-82 DATE
Joe Parker	2/20/82 DATE
SJA J. Schaefer	2/23/82 DATE
Joe Parker	2/25/82 DATE
	DATE

(5) INSTRUCTIONS:

REMOVE ☑

REVISE (5) TO READ 1'-7 9/16" LG (FIELD TRIM TO SUIT)

Delete 1 of item 1

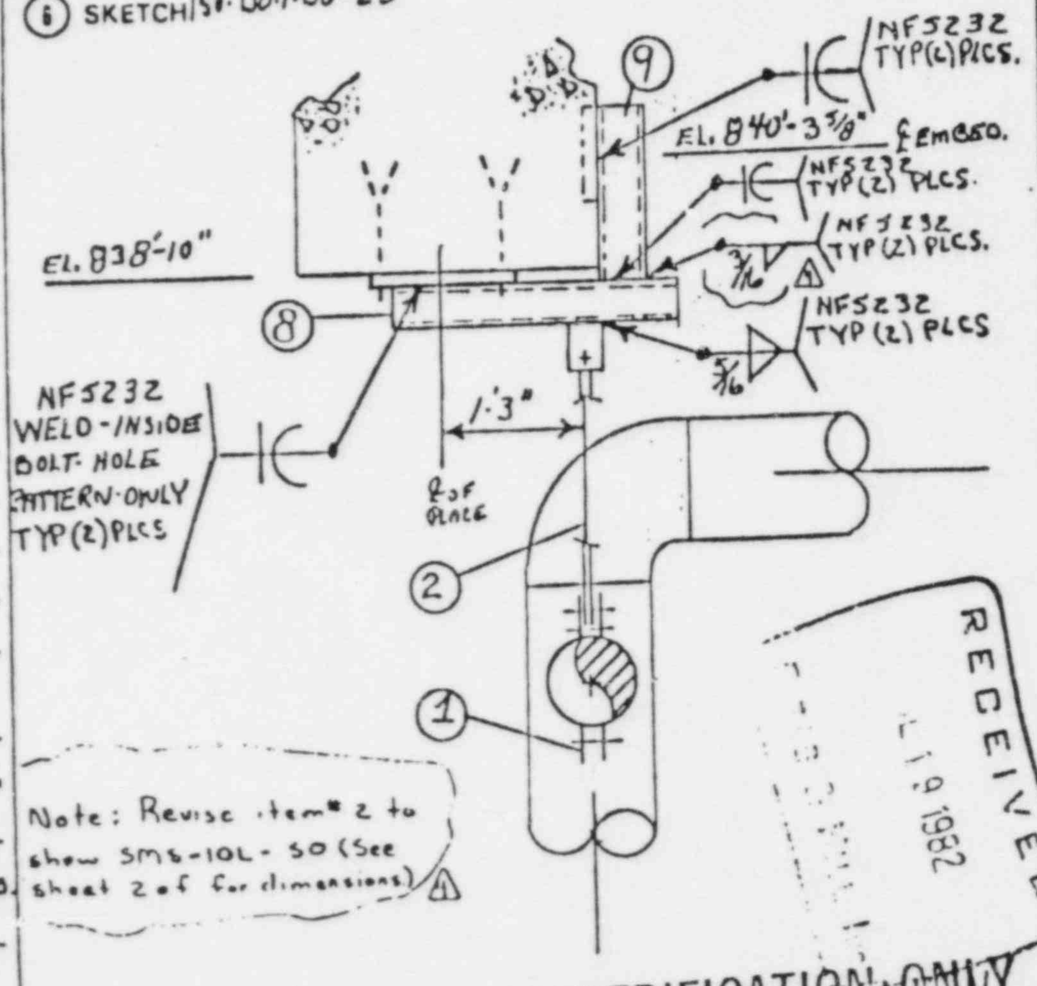
ADD ☒

8) (2) T.S. 1/2"x4"x4"x2'-3 1/2" LG (A500 GR.B) FIELD CUT TO SUIT

9) (2) T.S. 1/2"x4"x4"x2'-2 1/2" LG (A500 GR.B) FIELD CUT TO SUIT

[illegible]

(6) SKETCH (SI-DO-1-06-25)



Note: Revise item 2 to show SMS-10L-50 (See sheet 2 of for dimensions)

(9) DISTRIBUTION

	DCC CNTL NO.	QTY
TECH SERVICES	INFO	2
SITE DAMAGE STUDY GROUP	INFO	
SYSTEMS PLANNING	INFO	1
PRODUCTION CONTROL	INFO	1

THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO.
CMC # 66071 REV 3

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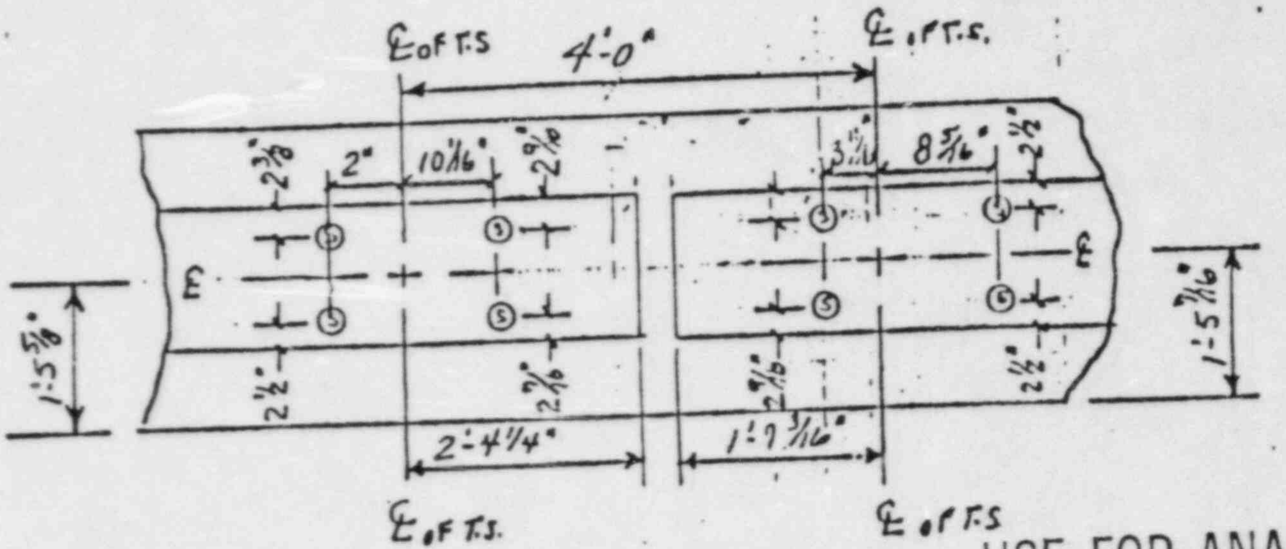
FOR ASBUILT VERIFICATION ONLY

USE FOR ANALYSIS REVIEW

1-167C

Cmc # 66071 Rev. 4



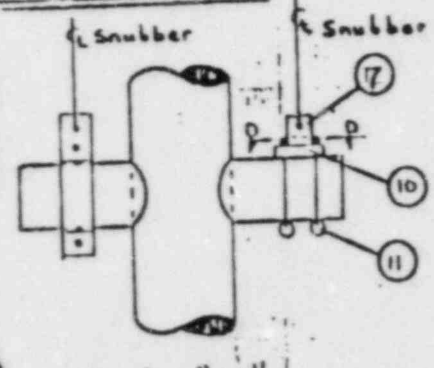
(S) - NELSON STUD

USE FOR ANALYSIS REVIEW

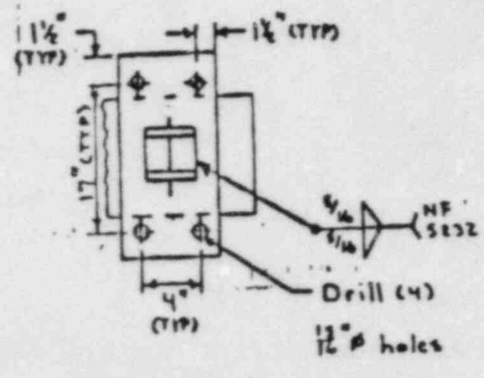
PROBLEM 1-167C

ELEV. LKG. WEST

Note: For snubber on South side of pipe "c-c" = 2'-11 1/2", "L" = 2 7/8", "AC" = 2'-8 3/8", "AH" = 2'-7 3/8". For snubber on North side of pipe "c-c" = 3'-2", "L" = 2 7/8", "AC" = 2'-11 1/8", "AH" = 2'-9 7/8"



Section "A-A"
(Partial)



Section "D-D"

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1982

FOR ASBUILT VERIFICATION ONLY.

SHEET NO. ... OF ...
SUPPORT I.D. ...
OTHER I.D. ...
SUBJECT ...
CUSTOMER ...
PROJECT ...
DATE ...
DATE ...
BY

Gibbs & Hill, Inc. Job No. 00-2323-030 Client TUSI - CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS

Calculation Number AB-1-167C Sheet No.

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Drawing Revised										
Preparer:	VIB	7-5-84								
Checker:										
:										

LOCAL STRESS DUE TO WELDED ATTACMENTS

REF NOS: AM-WA-393
AM-WA-395

SUP. MARK NOS FW-1-097-019-C62R NODE NO. 1346
FW-1-097-020-C62R

FOR UNIT LOAD 1000 # SUPT-019- (S') = 4642 psi

MAX COMBINED STRESS INTENSITY SUPT-020- (S') = 714 psi

MAX COMBINED MEMBRANE STRESS INTENSITY SUPT-019- ('SM') = 894 psi
SUPT-020 ('SM') = 269 psi

ACTUAL AND ALLOWABLE STRESS *

EQ	FILE COMB.	LOAD (#) UP: SUPPT / DOWN: SUPPT	FACTOR -019- / -020-	(PSI) GENERAL STRESS AVERAGE	CYL NOZ PSI MEMBRANE STRESS	CYL NOZ PSI TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE
8	11	78 / 34	0.018 / 0.034	5400.	16 / 9		5425	$1.0 S_h = 15000$
9 (1/2 SSE)	11+31 +S.H.	177 / 326	0.177 / 0.326	5861	158 / 88		6107	$1.5 S_h = 22500$
9 (1/2 SSE)	11+31 +SH	177 / 326	0.177 / 0.326	5861		822 / 233	6915.	$1.8 S_h = 27000$
11	51 or 52 + +11+40	118 / 162	0.118 / 0.162	6175		548 / 116	6838	$(S_A + S_h) = 37500$
9 (SSE)	11+131+ SH+70	1980 / 37206	1.98 / 37.206	11040	1770 / 10008		22819	$2.16 S_h = 36000$

NOTE: MATERIAL SA 333 Gr. 6

$S_h = 15000$ psi $S_c = 15000$ psi

$S_A = 1.25 S_c + 0.25 S_h = 22500$ psi

* DATA USED FOR STRESS COMBINATION: QA BOOK AB-1-167C Rev. 2
Sheets 74 & 81

Gibbs & Hill, Inc. Job No. 11-2323-030 Client TUSI - CPSES

Subject AS BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCS.

Calculation Number AC 1-154 Sheet No. 74

Revision	Orig. Issue	Date	Rev. 1	Date	Rev. 2	Date	Rev.	Date	Rev.	Date
Checking Method #		X	1	X	1	X		X		X
Preparer			[illegible]	[illegible]	CGJ	10/21/87				
Checker			[illegible]	[illegible]	[illegible]	[illegible]				

CALCULATIONS / RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REFERENCE NO : AM-WA-393

MATERIAL : SA 333 GR.6

S_h = 15,000 #/in² S_c = 15,000 #/in²

S_A = 1.25 S_c + .25 S_h = 22,500

MARK NO : FW-1-097-019-C62R

NODE 1346 X-RIGID

FOR A UNIT LOAD OF 1000 LBS

1 MAXIMUM COMBINED STRESS INTENSITY S = 4642

2 MAXIMUM COMBINED MEMBRANE STRESS INTENSITY S_M = 89[illegible]

ACTUAL & ALLOWABLE STRESS

EQ.	FILE COMB.	LOAD (lbs)	FACTOR (LOAD/1000)	GENERAL AVERAGE STRESS (PSI)	CYLNOZ MEMB. S_M	CYLNOZ MAX. S	TOTAL = GEN. + LOCAL	ALLOW. STRESS
8	11	18	.018	5400	16	X	5416	1.0 S_h 15,000
9 ½SSE	11+31	177	.177	5861	158	X	6019	1.5 S_h 22,500
9 ½SSE	11+31	177	.177	5861	X	822	6683	1.8 S_h 27,000
11	51-32 +11+40	118	.118	6175	X	548	6723	S_A + S_h 37,500
9 SSE	11+131 +70	257	.257	6092	230	X	6322	2.4 S_h 36,000
9 SSE	11+131 +WH	1980	1.980	11040	1770	X	12810	2.4 S_h 36,000

REF 1 G&H ANALYTICAL ENGINEERING MANUAL AEG-511

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Identical Calculation Results compared

Gibbs & Hill, Inc. Job No. 11-2323-030 Client TUSI - CPSES

Subject AS BUILT STRESS VERIFICATION · ANALYSIS RESULTS · OTHER CALCS.

Calculation Number AB 1-154 Sheet No. 81

Revision	Original Issue	Date	Rev. 1	Date	Rev. 2	Date	Rev.	Date	Rev.	Date
Checking Method #			1		1					
Preparer			[illegible]	[illegible]	C4J	10/31/84				
Checker			[illegible]	[illegible]	[illegible]	[illegible]				

CALCULATIONS / RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REFERENCE NO : AM-WA-395

MATERIAL : SA 333 GR.6
$S_h = 15{,}000$ #/in² $S_c = 15{,}000$ #,
$S_A = 1.25\, S_c + .25\, S_h = 22{,}50$..

MARK NO : FW-1-097-020-C62R
NODE 1346

Z RIGID

FOR A UNIT LOAD OF 1000 LBS

1 MAXIMUM COMBINED STRESS INTENSITY S = 714

2 MAXIMUM COMBINED MEMBRANE STRESS INTENSITY S_M = 2(

ACTUAL & ALLOWABLE STRESS

EQ.	FILE COMB.	LOAD (lbs)	FACTOR (LOAD/1000)	GENERAL AVERAGE STRESS (PSI)	CYLNOZ MEMB. S_M	CYLNOZ MAX. S	TOTAL = GEN. + LOCAL	ALLOW. STRESS
8	11	34	.036	5400	10		5410	1.0 S_h 15,000
$9_{½SSE}$	11-31	326	.326	5861	88		5949	1.5 S_h 22,500
$9_{½SSE}$	11-31	326	.326	5861		233	6094	1.8 S_h 27,000
11	51-52 +11-40	162	.162	6175		116	6291	$S_A + S_h$ 37,500
9_{SSE}	11+131 +70	467	.467	6092	126		6218	2.4 S_h 36,000
9_{SSE}	11+131 + WH	37206	37.206	11040	10008		21048	2.4 S_h 36,000

REF 1 G&H ANALYTICAL ENGINEERING MANUAL AEG-511

Checking Method #
1 Line-by-line checking
2 Alternative Calculation Results compared
3 Similar Calculation Results compared
4 Compare inputs and results of computer with corresponding inputs and results of similar codes

F-166, 7-1

Gibbs & Hill, Inc. Job No. 11-2323-030 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION-ANALYTICAL DATA-SPECIAL CALCULATIONS

Calculation Number PROBLEM AB-1-154 Sheet No. 72

Revision	Orig.	Date	Rev	Date	Rev	Date	Rev	Date	Rev	Date	
Revision	1	X		X		X		X		X	
Preparer	SG	10-6-82									
Checker	[illegible]	10-7-82									

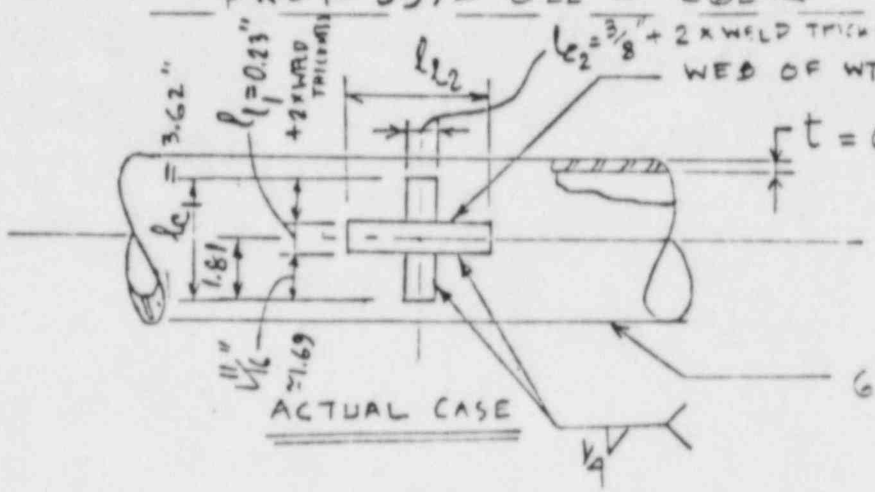
SPECIAL CALCULATIONS

Hanger Mark # FW-1-097-023-C62R NODE [illegible]

FW-1-097-025-C62R NODE 1333

FW-1-097-019-C62R NODE [illegible]

FW-1-097-022-C62R NODE [illegible]

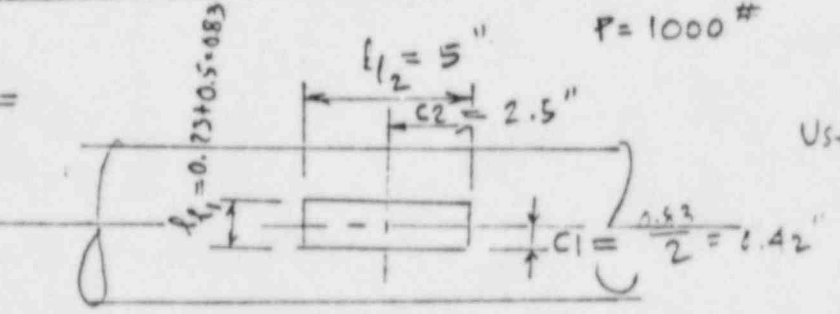


ACTUAL CASE

$R_m = \frac{O.D - t}{2} = 3.1"$

FOR CONSERVATIVENESS USE* HIGHER RESULTS FROM FOLLOWING 2 RUNS

RUN 1



P = 1000#

C1 = 0.42

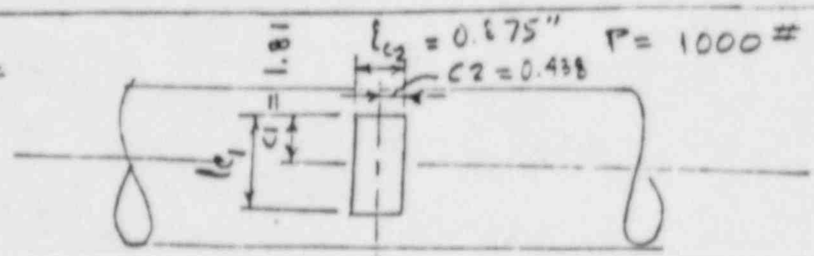
C_2 = 2.5" ← Use 1.6

Use R_m = 3.4 to work

t = 0.432"

[illegible]

RUN 2



P = 1000#

C1 = 1.81 ← [illegible]

C2 = 0.438

Use R_m = 2.0 to work

t = 0.432"

MAX SM = [illegible]

MAX S = [illegible]

FROM COMPUTER RUN # SHG $ CYL 27682 DATE: 10-7-82

$*\begin{cases} \text{MAX "SM"} = \text{[illegible] psi} \\ \text{MAX "S"} = \text{[illegible] psi} \end{cases}$

Checking Method #

F-156.4

Gibbs & Hill, Inc. Job No. 11-2323-030 Client TUSI-CPSES

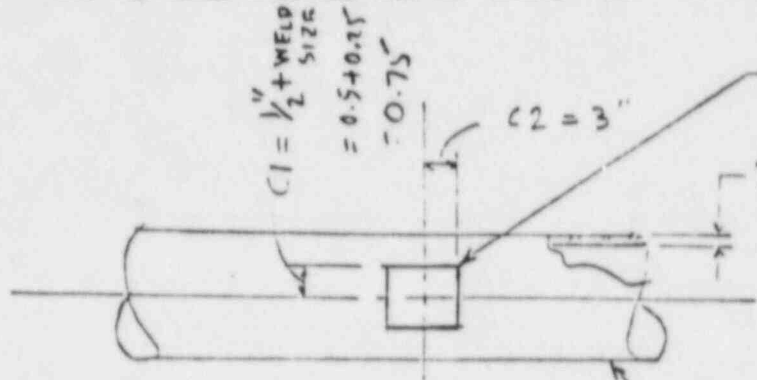
Subject AS-BUILT STRESS VERIFICATION-ANALYTICAL DATA-SPECIAL CALCULATIONS

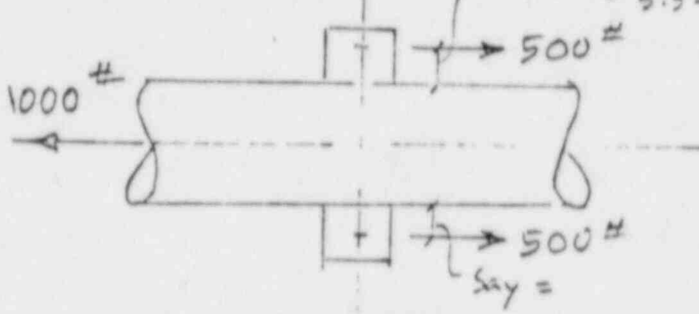
Calculation Number PROBLEM AB-1-154 Sheet No. 80

Revision	Drawing Issue	Date	Rev	Date	Rev	Date	Rev	Date	Rev	Date	
Drawing Issue	1										
Preparer	S G	10-7-82									
Checker	[illegible]	10-8-82									

SPECIAL CALCULATIONS

Hanger Mark # FW-1-097-020-C62R NODE 1340





LOADS IN TERMS OF CYLNOZ PARAMETER

P = 0
VC = 0
VL = 500#
MC = FM1 = 0
ML = FM2 = 1095 in-#
MT = FMR = 0

$C_1 = 0.75$
$C_2 = 3 \leftarrow$ Use 2.9
$U_{sc}R_m = 7$ to work
$t = 0.432$

ATTACHMENT - SQUARE ☐ RECT ☑

COMPUTER RUN # SYG 31 J 290A DATE: 1-8-82

FROM ABOVE COMPUTER RUN

MAX MEMBRANE STRESS INTENSITY 'SM' $\boxed{269}$ psi

" COMBINED " " 'S' $\boxed{714}$ psi

Checking Method #

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

JAN 12 1981

SERIAL NO. Nº 45558 Rev 1

(1) APPLICATION [illegible] WELD MOD [illegible] Q [X] NON Q [illegible] DESIGN CHANGE/DEVIATION [X]

(2) DWG. NO. [illegible] FW-1-097-020-C02K [illegible]

(3) LINE NO./~~COMPONENT NO.~~ [illegible]-1-97-1303-2

(4) REASON FOR CHANGE: CHANGED SHEET # [illegible] (DRAFTING ERROR) △ PARENT SUPPORT CHANGE

(7) ORIGINATOR

J. Schreiber / Ed Dean

NAME

[X] CPPE

[illegible] ORIGINAL DESIGNER

(5) INSTRUCTIONS

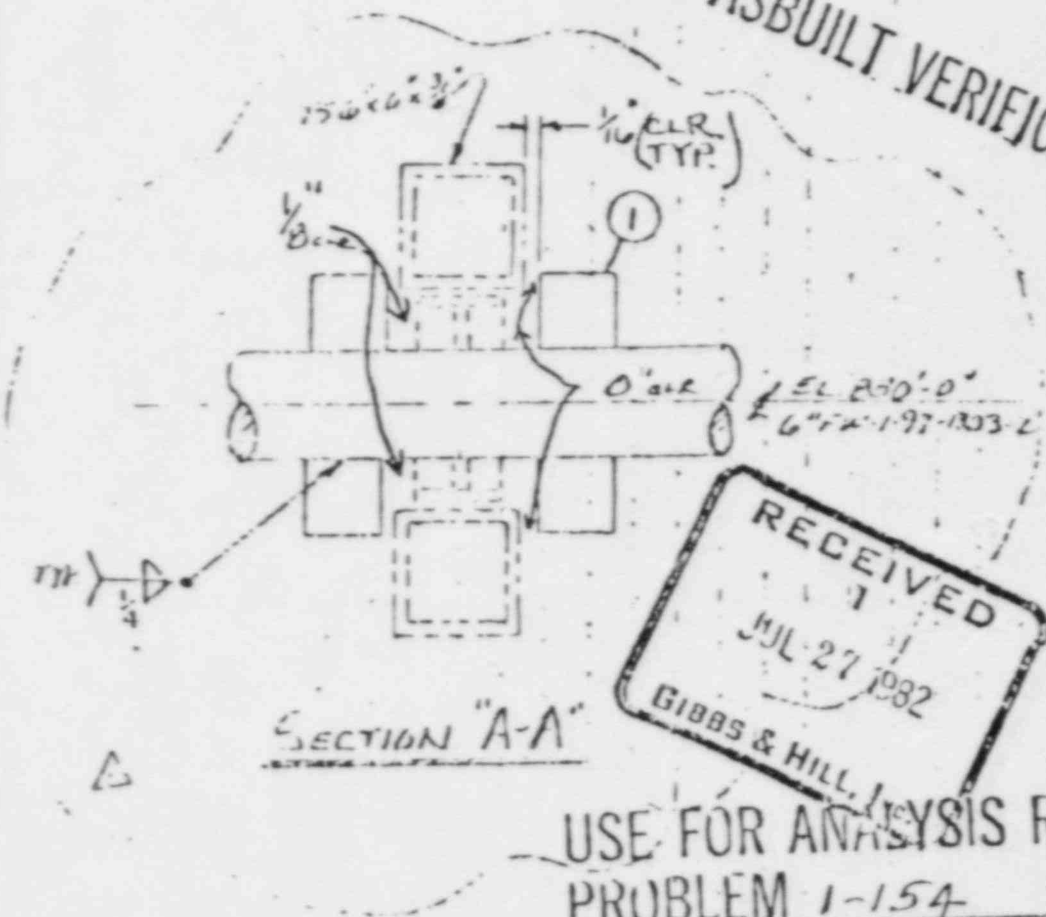
MOVE [N/A]

NOTE DRAFTING ERROR ON BCH DWG. THE [illegible] SHOULD READ [illegible] NOT [illegible] AS [illegible] DWG.

ADD [N/A]

(6) SKETCH

FOR ASBUILT VERIFICATION ONLY



RECEIVED

JUL 27 1982

GIBBS & HILL, INC.

USE FOR ANALYSIS REVIEW

PROBLEM 1-154

(8) APPROVED BY

[illegible] Schaefer [illegible] DATE [illegible]

[illegible] Schaefer DATE 1/6/81

DATE

DATE

DATE

DATE

DATE

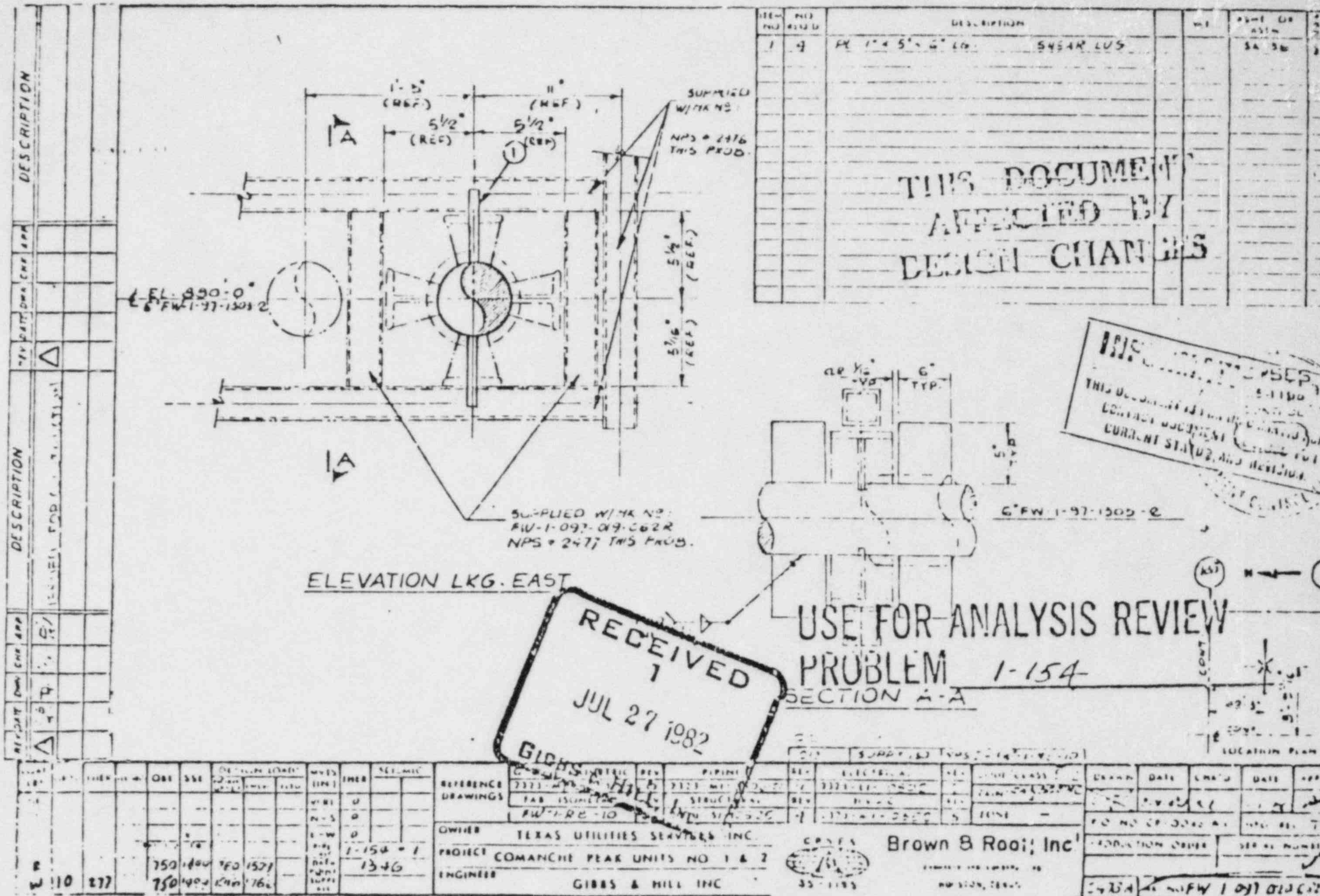
(9) DISTRIBUTION	DCC CNTL NO.	Q
NPSI	Eng.	

ENTERED IN TRACKING SYSTEM

JAN 8 1981

DATE

~~THIS DESIGN OR DESIGN CHANGE DOCUMENT~~ NO. 45558 REV. 0


1'-5" (REF)
11" (REF)
5 1/2" (REF)
5 1/2" (REF)
SUPPLIED WITH NO:
NPS # 2476 THIS PROB.
EL. 890'-0"
6" FW-1-97-1505-2
5 1/4" (REF)
5 7/16" (REF)
SUPPLIED WITH NO:
FW-1-097-019-C62R
NPS # 2477 THIS PROB.
ELEVATION LKG. EAST
6" TYP.
6" FW-1-97-1505-2
SECTION A-A
PL 1/2 x 5 1/2 x 6" LG.
SHEAR LUG
THIS DOCUMENT AFFECTED BY DESIGN CHANGES
THIS DOCUMENT ... CONTACT DOCUMENT ... CURRENT STATUS AND REVISION.
USE FOR ANALYSIS REVIEW
PROBLEM 1-154
RECEIVED
1
JUL 27 1982
GIBBS & HILL, INC.
DESCRIPTION
DESCRIPTION
REFERENCE DRAWINGS
OWNER TEXAS UTILITIES SERVICES INC.
PROJECT COMANCHE PEAK UNITS NO 1 & 2
ENGINEER GIBBS & HILL INC
Brown & Root, Inc
1-154-1
1346
LOCATION PLAN

As Per CMC

Gibbs & Hill, Inc. Job No. 11-2323-030 Client TUSI - CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCS.

Calculation Number AB-1-153 Sheet No. 68

Revision	Original Issue	Date	Rev. 1	Date	Rev.	Date	Rev.	Date	Rev.	Date	
Checking Method	1		1								
Preparer	CSU	11-10-82	DHF	6/27/83							
Checker	[illegible]	11/17/82	[illegible]	6/27/83							

CALCULATIONS / RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REFERENCE NO : AH-WA-502

MATERIAL : SA 333 GR. 6

$S_h = 15,000 \#/in^2$ $S_c = 15,000 \#/in^2$

$S_A = 1.25 S_c + .25 S_h = 22,500 \#$

MARK NO : FW-1-096-020-C62R

(115) Y-ES

FOR A UNIT LOAD OF 1000 LBS

1 MAXIMUM COMBINED STRESS INTENSITY S = 4809 #/in²

2 MAXIMUM COMBINED MEMBRANE STRESS INTENSITY S_M = 907 #

ACTUAL & ALLOWABLE STRESS

EQ.	FILE COMB.	LOAD (lbs)	FACTOR (LOAD/1000)	GENERAL AVERAGE STRESS (PSI)	CYLNOZ MEMB. S_M	CYLNOZ MAX. S	TOTAL = GEN. + LOCAL	ALLOW. STRESS
8	11	684	.684	5435	620		6055	1.0 S_h 15,000
9 ½SSE	11 + 31	1023	1.023	6059	928		6987	1.5 S_h 22,500
9 ½SSE	11 + 31	1023	1.023	6059		4920	10979	1.8 S_h 27,000
11	RANGE OF 31 & 32 11 + 40	770	.77	6761		3703	10464	$S_A + S_h$ 37,500
9 SSE	11 + 131 + 70	1225	1.225	6447	1111		7558	2.16 S_h 32,400
9 SSE	11 + 131 + W.H.	1865	1.865	7563	1692		9255	2.16 S_h 32,400

REF 1 G&H ANALYTICAL ENGINEERING MANUAL AEG-511

Gibbs & Hill, Inc. Job No. 11-2323-030 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION-ANALYTICAL DATA-SPECIAL CALCULATIONS

Calculation Number PROBLEM AB-1-153 Sheet No. 67

Revision	Orig. Issue	Date	Rev	Date	Rev	Date	Rev	Date	Rev	Date	
Drawing Issue	1										
Prepare	ASAN	11-2-82									
Checker	SG.	11-5-82									

SPECIAL CALCULATIONS for

Hanger Mark # FW-1-096-019-CG2R
FW-1-096-020-CG2R
FW-1-100-002-CG2R
FW-1-096-021-CG2R

These supports are identical to support # FW-1-096-018-CG2 of prob AB-1-153, and the results as shown below are obtained from that analysis. Refer to the welded attachment analysis in the QA book for AB-1-153 for details.

Max combined membrane stress intensity ('SM') psi	Max. combined stress intensity ('S') psi
907 psi	4807 psi

Checking Method #

F-166,4-8

Revision	Orig. Issue	Date	Rev. 1	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method #	1		1							
Preparer	CSV	11-10-82	DHF	6/27/83						
Checker	[illegible]	NOV 17/82	[illegible]	6/27/83						

CALCULATIONS / RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REFERENCE NO : AM-WA-503

MATERIAL : SA 333 GR. 6

$S_h = 15,000$ #/in² $S_c = 15,000$ #/

$S_A = 1.25 S_c + .25 S_h = 22,500$

MARK NO : FW-1-096-021-C62R (115) X-RS

FOR A UNIT LOAD OF 1000 LBS

1 MAXIMUM COMBINED STRESS INTENSITY S = 4509 [illegible]

2 MAXIMUM COMBINED MEMBRANE STRESS INTENSITY S_M = [illegible]

ACTUAL & ALLOWABLE STRESS

EQ.	FILE COMB.	LOAD (lbs)	FACTOR (LOAD/1000)	GENERAL AVERAGE STRESS (PSI)	CYLNOZ MEMB. S_M	CYLNOZ MAX. S	TOTAL = GEN. + LOCAL	ALLOW. STRESS
8	11	24	.024	5435	22		5457	1.0 S_h 15,000
9 ½SSE	11 + 31	232	0.232	6059	210		6269	1.5 S_h 22,500
9 ½SSE	11 + 31	232	0.232	6059		1116	7175	1.8 S_h 27,000
11	RANGE OF 31 & 32 11 + 40	545	.545	6761		2621	9352	$S_A + S_h$ 37,500
9 SSE	11 + 131 + 70	381	0.381	6447	346		6793	2.16 S_h 32,400
9 SSE	11 + 131 + W.H.	1141	1.141	7563	1035		8598	2.16 S_h 32,400

REF 1 G&H ANALYTICAL ENGINEERING MANUAL AEG-511

Gibbs & Hill, Inc. Job No 11-2323-030 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION-ANALYTICAL DATA-SPECIAL CALCULATIONS

Calculation Number PROBLEM A3-1-153 Sheet No. 63

Revision	Original Issue	Date	Rev	Date	Rev	Date	Rev	Date	Rev	Date
Outstanding Issue	1									
Preparer	ASAN	11-2-82								
Checker	SG.	11-5-82								

SPECIAL CALCULATIONS for

Hanger Mark # FW-1-096-019-CG2R
FW-1-096-020-CG2R
FW-1-100-002-CG2R
FW-1-096-021-CG2R

These supports are identical to support # FW-1-096-018-CG2R of prob AB-1-153, and the results as shown below are obtained from that analysis. Refer to the welded attachment analysis in the QA book for AB-1-153 for details.

Max combined membrane stress intensity ('SM') psi	Max. combined stress intensity ('S') psi
907 psi	4809 psi

Checking Method #

F-166, 4-8

Gibbs & Hill, Inc. Job No. 11-2323-030 Client TUSI - CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCS.

Calculation Number AB-1-153 Sheet No. 64

Revision	Original Issue	Date	Rev. 1	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method	1		1							
Preparer	CSV	11-10-82	DHF	6/27/83						
Checker	[illegible]	Nov 17 '82	[illegible]	6/27/83						

CALCULATIONS / RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REFERENCE NO : AH-WA-496

MATERIAL : SA 333 GR. 6

$S_h = 15{,}000$ #/in² $S_c = 15{,}000$ #

$S_A = 1.25 S_c + .25 S_h = 22{,}500$

MARK NO : FW-1-096-022-C62R

(115) E-R

FOR A UNIT LOAD OF 1000 LBS

1 MAXIMUM COMBINED STRESS INTENSITY $S = 1782$ #/in

2 MAXIMUM COMBINED MEMBRANE STRESS INTENSITY S_M = 6[illegible]

ACTUAL & ALLOWABLE STRESS

EQ.	FILE COMB.	LOAD (lbs)	FACTOR $\left(\frac{LOAD}{1000}\right)$	GENERAL AVERAGE STRESS (PSI)	CYLNOZ MEMB. S_M	CYLNOZ MAX. S	TOTAL = GEN. + LOCAL	ALLOW. STRESS
8	11	69	0.069	5435	46		5481	1.0 S_h 15,000
$9_{1/2 SSE}$	11 + 31	426	0.426	6059	282		6341	1.5 S_h 22,500
$9_{1/2 SSE}$	11 + 31	426	0.426	6059		759	5300	1.8 S_h 27,000
11	RANGE OF 31 & 32 11 & 40	1694	1.694	6761		3019	9780	$S_A + S_h$ 37,500
9_{SSE}	11 + 131 + 70	628	0.628	6447	4151		6862	2.16 S_h 32,400
9_{SSE}	11 + 131 + Vl.H.	36381	36.381	7563	24,048		31,611	2.16 S_h 32,400

REF 1 G&H ANALYTICAL ENGINEERING MANUAL AEG-511

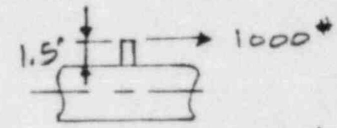
Gibbs & Hill, Inc. Job No. 11-2323-030 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION-ANALYTICAL DATA-SPECIAL CALCULATIONS

Calculation Number PROBLEM AB-1-153 Sheet No. 63

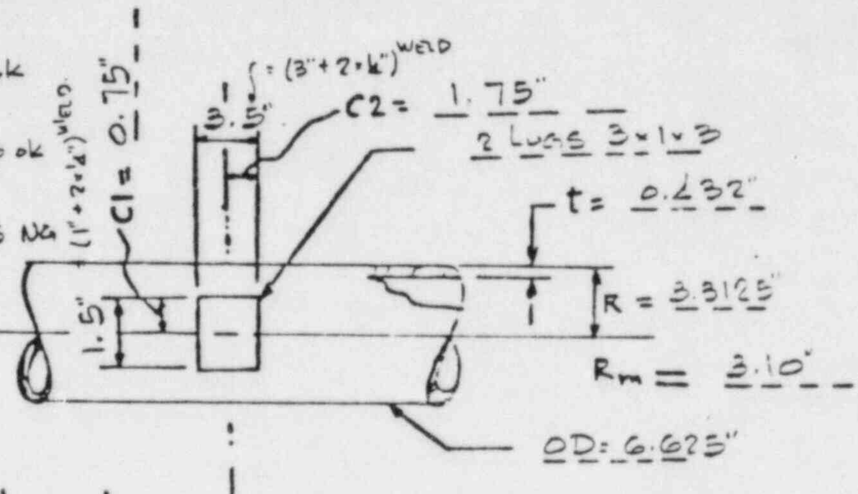
Revision	Orig. Issue	Date	Rev.	Date	Rev.	Date	Rev	Date	Rev	Date	
Drawing revision	1										
Preparer	ASAN	11-3-82									
Checker	S.G.	11-4-82									

SPECIAL CALCULATIONS



Pipe Suppt Mark# FW-1-096-022-C62R

Actual
$$\gamma = \frac{R_m}{t} = \frac{3.10}{0.232} = 7.2 > 5 \text{ ok}$$
$$\beta_1 = \frac{C_1}{R_m} = \frac{0.75}{3.10} = 0.24 < .5 \text{ ok}$$
$$\beta_2 = \frac{C_2}{R_m} = \frac{1.75}{3.10} = 0.56 > .5 \text{ NG}$$



6"FW-1-096-1303-2

Fictitious R_m used for present analysis = 3.60"

ARTIFICIALLY INCREASED RAD. = YES

LOADS IN TERMS OF CYLNOZ PARAMETERS:

P = 0
VC = 0
VL = 1000#
MC = FM1 = 0
ML = FM2 = 1500'# (1000 × 1.5)
MT = FMR = 0

C_1 = 0.75
C2 = 1.75

RM = 3.6 (FICTITIOUS)
T = 0.232

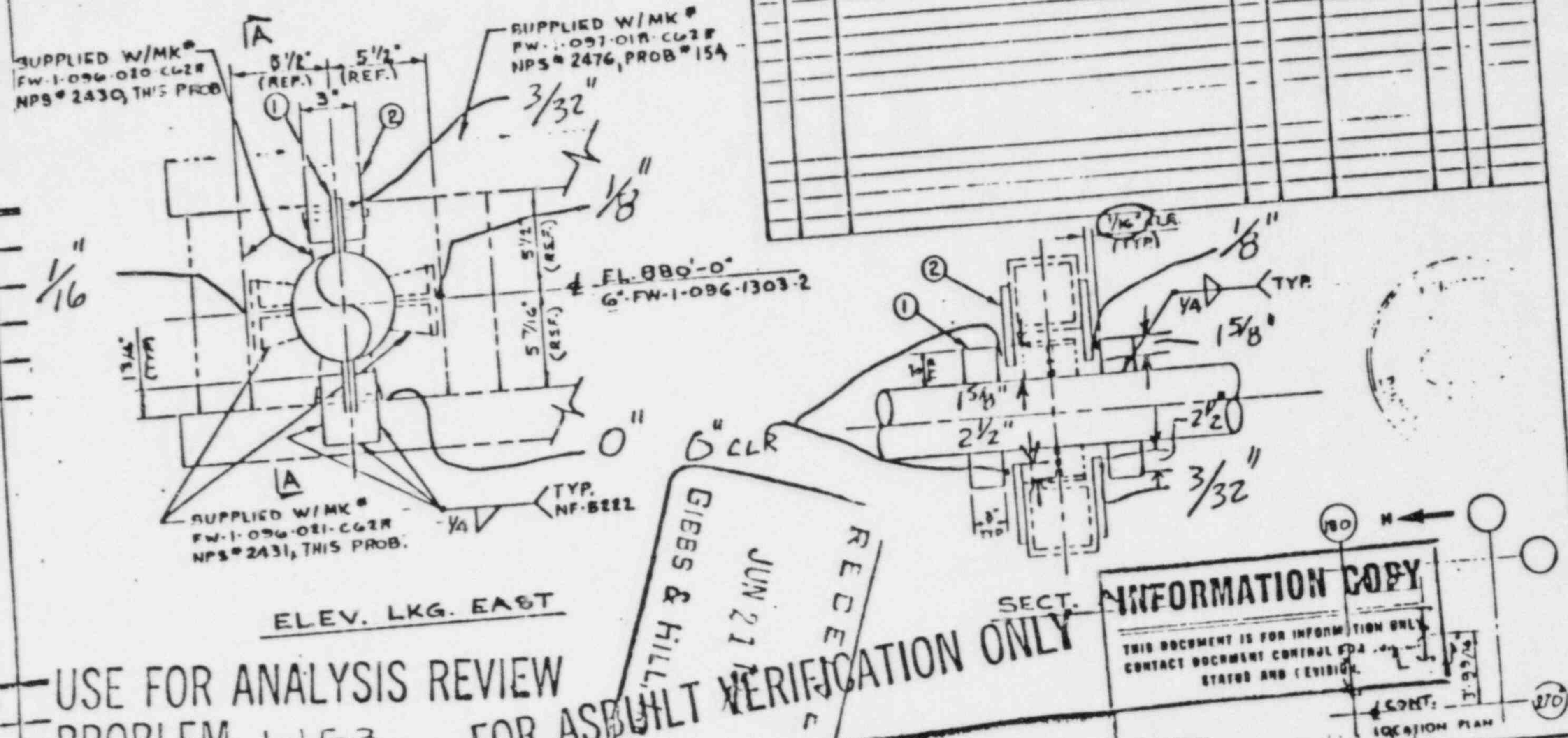
ATTACHMENT
SQUARE [ ]
RECT [ ]

COMPUTER RUN# ASAN $ CYL .. J 1182 DATE: 11-1-82
(CYLNOZ)

MAX. COMBINED MEMBRANE STRESS INTENSITY 'SM' = 661

MAX. COMBINED STRESS INTENSITY 'S' = 1782

ITEM NO	NO REQ'D	DESCRIPTION		WT.	ASME OR ASTM			MIC.
1	4	FB 3" x 1" x 3"			SA-36	PCS		
2	4	FB 3" x 3/4" x 5"			SA-36	PCS		



INFORMATION COPY

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USE FOR ANALYSIS REVIEW
PROBLEM 1-153

FOR ASBUILT VERIFICATION ONLY

RECEIVED
JUN 21
GIBBS & HILL, INC.

ISSUED FOR CONST

REFERENCE DRAWINGS	G & H ISOMETRIC 2323-MI-3203-51	REV 8	PIPING 2323-MI-0506-01
	FAB ISOMETRIC FW-1-RB-03	REV 0	STRUCTURAL 2323-S1-0530
	REV 11	ELECTRICAL 2323-E1-0502	REV 7
	REV 2	HVAC 2323-MI-0552	REV 5

HOT 150 · H.S. FW-1-RB-08

CODE/CLASS: III/2
PAINT CARBOZINC
ZONE

OWNER TEXAS UTILITIES SERVICES INC.
PROJECT COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER GIBBS & HILL INC.

CPSES
Brown & Root, Inc
HOUSTON, TEXAS

DRAWN	DATE	CHK'D	DATE	APPV'D	DATE
SFA RCL	2-5-80		2/6/80		

P.O. NO. CP-0046 A.1 · MFG. REL.
PRODUCTION ORDER · SERIAL NUMBER · SHEET 1 of 1

2432 MK NO FW-1-096-022-C62R REV 0

SEISMIC: FIS8/P1 115 SC-80-153

DESIGN LOADS: 647 / 202; 188 / 188; 1877 / 1577; 1433 / 1033; 2221 / 1821; 43

JAN 28 1981

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. № 47239 Rev 0

(1) APPLICATION: Pipe Support WELD MOD [✓] Q [✓] NON Q [N/A] DESIGN CHANGE/~~DEVIATION~~ [✓]

(7) ORIGINATOR

Joe Parker / Ed Dean

NAME

[✓] CPPE

[N/A] ORIGINAL DESIGNER

(2) DWG. NO. BRH Rev. 0

FW-1-096-021-C62R

(4) REASON FOR CHANGE: Delete weld (as request by field)

(3) LINE NO./COMPONENT NO.

6" FW-1-096-1303-2

(8) APPROVED BY: [signature] 1/22/81

DATE

DATE

DATE

DATE

DATE

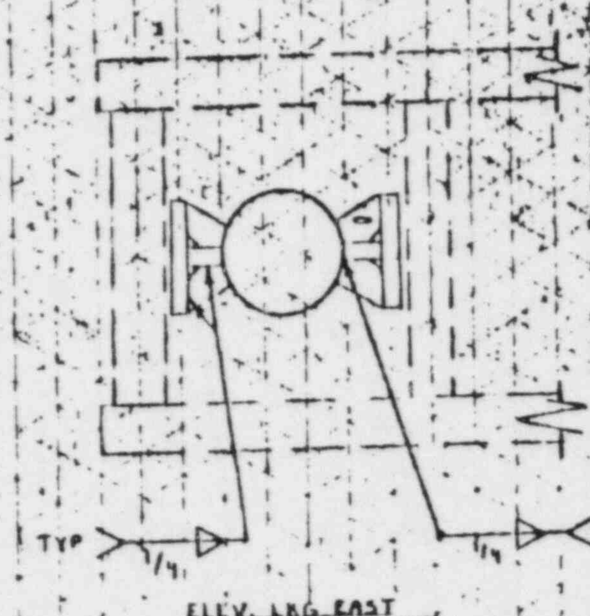
DATE

(5) INSTRUCTIONS:

REMOVE [N/A]

ADD [N/A]

(6) SKETCH



(9) DISTRIBUTION

DCC CNTL NO.	QTY

ENTERED IN TRACKING SYSTEM JAN 28 1981

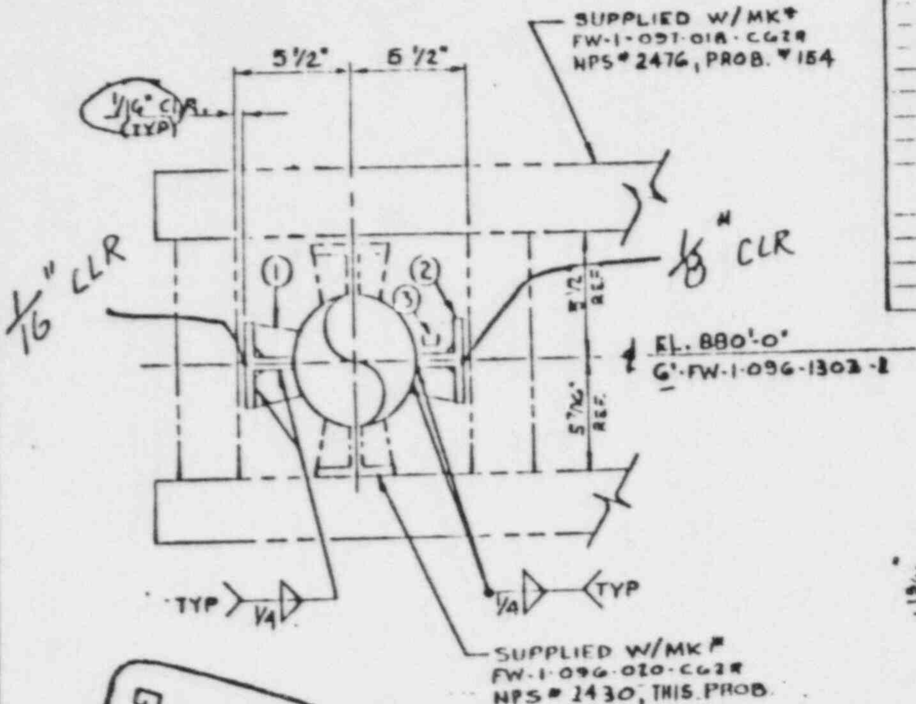
DATE OPER.

RECEIVED JUN 21 1982 GIBBS & HILL, INC.

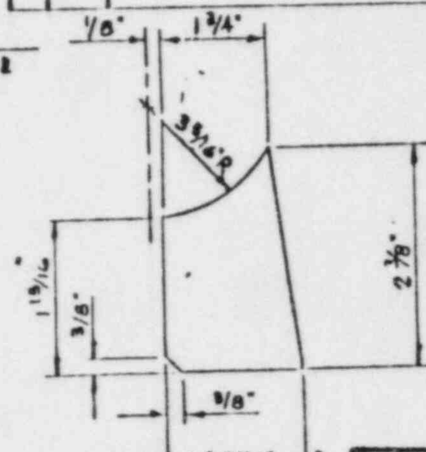
FOR ASBUILT VERIFICATION ONLY

USE FOR ANALYSIS REVIEW

PROBLEM 7-153

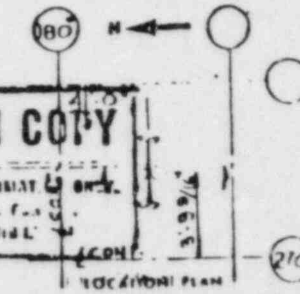


ELEV. LKG. EAST



DETAIL - 1

ITEM NO	NO REQ'D	DESCRIPTION		WT.	ASME OR ASTM			MIC.
1	1	FB 2 1/4" x 3/8" x 2 7/8" (SEE DETAIL - 1)			SA-36	PRS		
2	2	WT 4 x 8.5 x 5' LG.			SA-36	L		
3	1	ASME III NAME PLATE			—			



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DOCUMENT CONTROL

RECEIVE
JUN 21 1982
GIBBS & HILL, INC

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208	SUPP'T 130	NPS1-FW-RB-09

DESIGN LOAD							SEISMIC
20			476	953	436	373	1-153/#1
	303		476	353	960	436	116
							SC-80-153

REFERENCE DRAWINGS	G & H ISOMETRIC	REV	PIPING	REV	ELECTRICAL	REV	CODE/CLASS III/2
	2323-MI-3203 51	15	2323-MI-0506-01	11	2323-EI-0502	7	PAINT CARBO ZINC 11
	FAB ISOMETRIC	REV	STRUCTURAL	REV	HVAC	REV	ZONE
	FW-1-RB-09	0	2323-SI-0530	2	2323-MI-0552	5	

OWNER TEXAS UTILITIES SERVICES INC.
PROJECT COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER GIBBS & HILL, INC

CPSES
Brown & Root, Inc
HOUSTON, TEXAS

DRAWN	DATE	CHK'D	DATE	APPV'D	DATE
RO SER	2-5-80		4/6/80	HA	1/31/80

P O NO CP-0048 A.1 MFG. REL.
PRODUCTION ORDER | SERIAL NUMBER | SHEET 1 OF 1
2A31 | NO FW-1-096-021-C62R | REV 0

USE FOR ANALYSIS REVIEW
PROBLEM: 1-153

COMANCHE PEAK STEAM
ELECTRIC STATION (CPSES)

FEB 19 1981

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO № 47238 Δ4

(1) APPLICATION PIPE SUPPORT WELD MOD ☒ Q ☒ NON Q N/A DESIGN CHANGE/DEVIATION ☒

(2) DWG NO. 13 'A' R-0 FW-1-096-020-C62R

(3) LINE NO / ~~COMPONENT NO~~ 6" FW-1-96-1303-2

(4) REASON FOR CHANGE: Inaccessible weld / Added shim Δ2 Drafting Error
Δ1 Drafting error & need shim & change to achieve correct ... Δ3 Corrected weld symbol

(7) ORIGINATOR
J. Schauer / Ed. Dean
NAME
☒ CPPE
N/A ORIGINAL DESIGNER

(5) INSTRUCTIONS

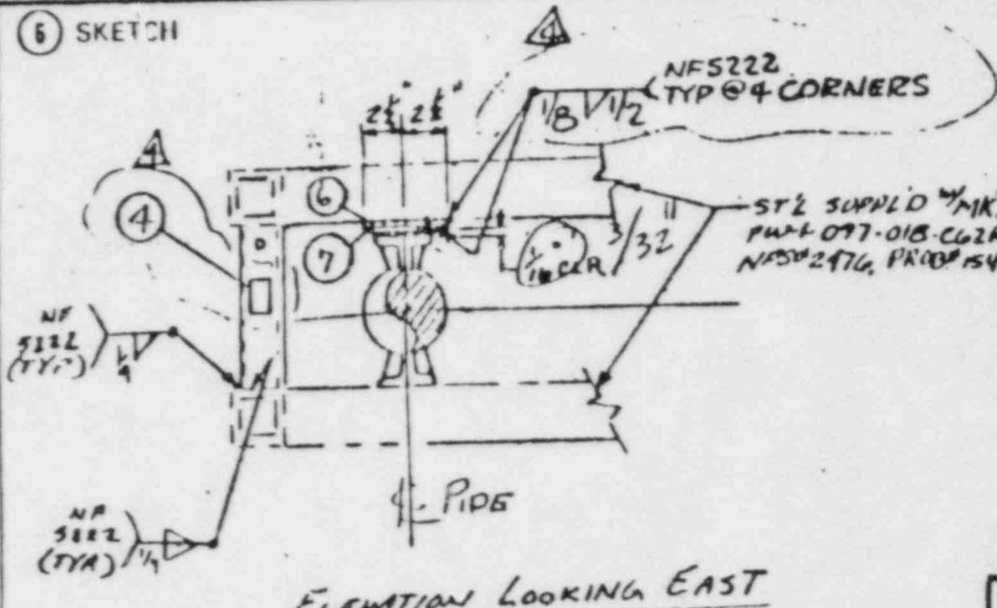
REMOVE N/A

Delete 1 PC (1) PL 3/8 x 5" x 2'-5 lg. (SA-36)

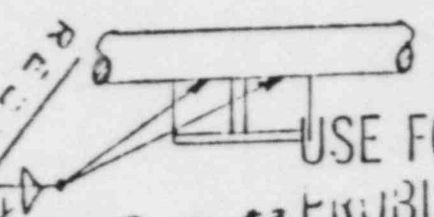
ADD ☒

PC 7 (1) PL 3/8" x 4" x 4" (SA-36 or A-570 GR. A)
PC 6 (1) PL 3/16 x 5" x 0'-5 lg. (SA-36)

(6) SKETCH



FOR ASBUILT VERIFICATION ONLY



USE FOR ANALYSIS REVIEW

PROBLEM 1-153

RECEIVED JUN 21 1982 GIBBS & HILL, INC.

(8) APPROVED BY:

	DATE
Δ1	1/26/81
Δ2	1/29/81
Δ3	2/10/81
Δ4	2-12-81

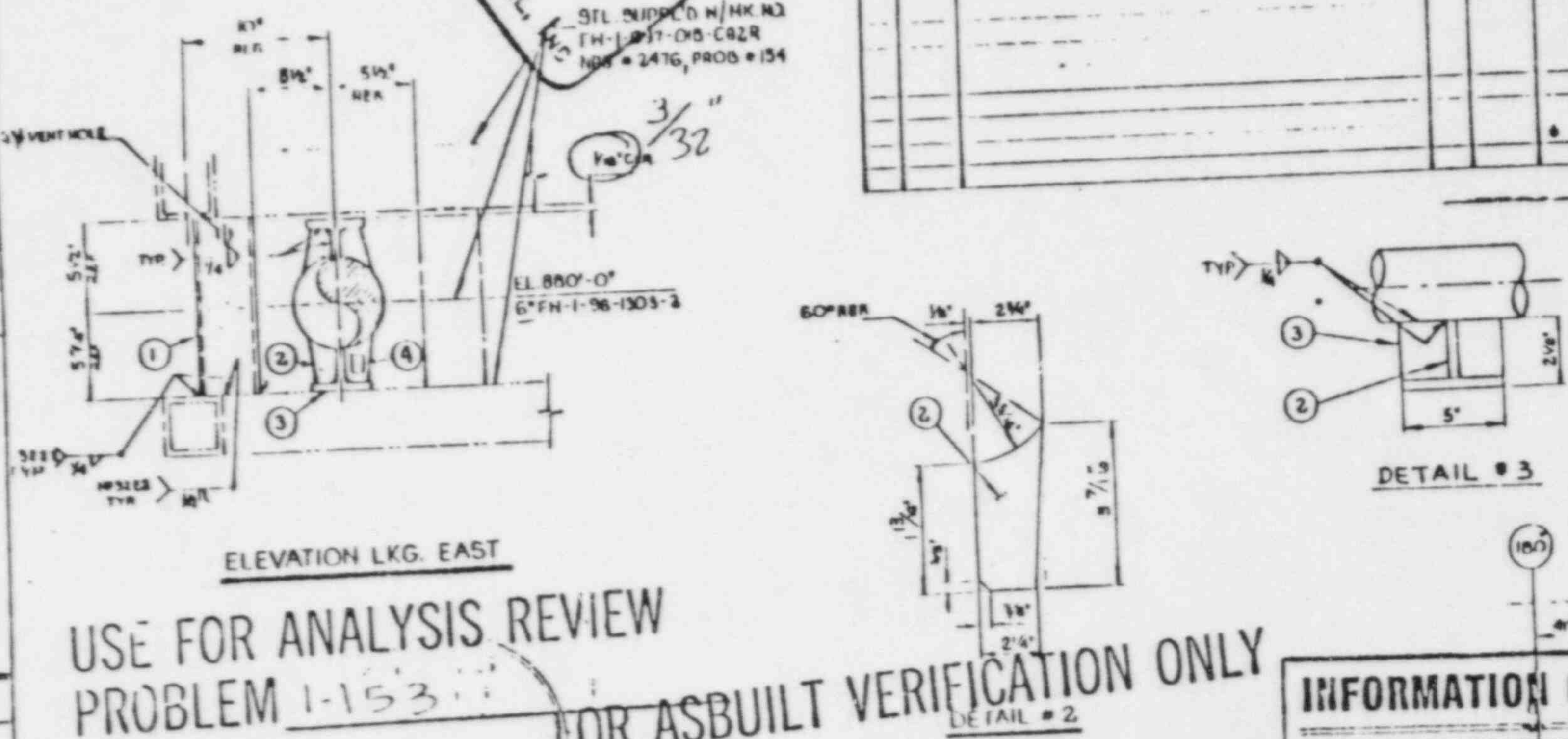
(9) DISTRIBUTION | QCC CNTL NO. | QTY

FOR ENGINEERING AND OFFICE USE ONLY

~~THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO.~~ # 47238

RECEIVED
JUN 21 1982
GIBBS & HILL, INC.

ITEM NO	NO REQ'D	DESCRIPTION		WT.	ASME OR ASTM			
1	1	TS 4 × 4 × .375			A500 GR B	L		
2	4	FB 2¼ × ⅜ × 5 9/16" (SEE DET. 2)			A36	P/S		
3	2	WT 4 × 8.5 × 5" LG (SEE DET. 3)			A36	L		
4	1	ASME III NAME PLATE						



USE FOR ANALYSIS REVIEW
PROBLEM 1-153

FOR ASBUILT VERIFICATION ONLY

INFORMATION COPY
THIS DOCUMENT IS FOR INFORMATION ONLY. CONTACT DOCUMENT CONTROL FOR STATUS AND APPLICATION

ISO NPSI-FH-1-RB-90

REFERENCE DRAWINGS	G & H ISOMETRIC	REV	PIPING	REV	ELECTRICAL	REV
	2323-MI-0506-01	13	2323-MI-0506-01	11	2323-EI-0502	7
	B&R ISOMETRIC	REV	STRUCTURAL	REV	HVAC	REV
	FH-1-RB-090	0	2323-SI-0550	2	2323-MI-0552	5

CODE/CLASS: III/2 — PAINT CARBOZINC — ZONE

DRAWN	DATE	CHK'D	DATE	APP'D	DATE
ES	1/28/80		1/28/80		

P.O. NO. CP-0044 A1 — MFG. REL.

OWNER: TEXAS UTILITIES SERVICES INC.
PROJECT: COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER: GIBBS & HILL INC.

Brown & Root, Inc

PRODUCTION ORDER 2450 — SERIAL NUMBER — MK NO FH-1-096-020-C63R — REV 0 — SHEET 1 OF 1

DESIGN LOADS: 758 / 1515 / 134 / 337 ; 758 / 1515 / 1424 / 2182 — GES 42

SEISMIC: 1-153/#1 — 115 — SC-BO-153

RW

Gibbs & Hill, Inc. Job No 11-2323-030 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number PROB: AB-1-76B Sheet No 26

Revision	1	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Prepared	RLM	7-28-82								
Checked		8/07/82								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-206 NODE NO.: 2270 RIGID

MARK NO.: MS-1-151-047-C52R.

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 3762 PSI ✓

2) MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 697 PSI ✓

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (PSI) (1)
8	11	13 ✓	.013 ✓	4334 ✓	10 ✓	X	4344	$1.0S_h$ = 15,000
$9_{(1/2SSE)}$	11+31	489 ✓	.489 ✓	6851 ✓	341 ✓	X	7192 ✓	$1.5S_h$ = 22,500
$9_{(1/2SSE)}$	11+31	489	.489	6851 ✓	X	1840	8691 ✓	$1.8S_h$ = 27,000
11	11, 20, 21 22, 40	500 ✓	.500 ✓	7424 ✓	X	1881 ✓	9305 ✓	(S_A+S_h) = 37,500
$9_{(SSE)}$	17+13	607 ✓	.607 ✓	7248 ✓	424 ✓	X	7672 ✓	$2.16S_h$ = 32,400

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

NOTE: MATERIAL: SA 333 GR.6.

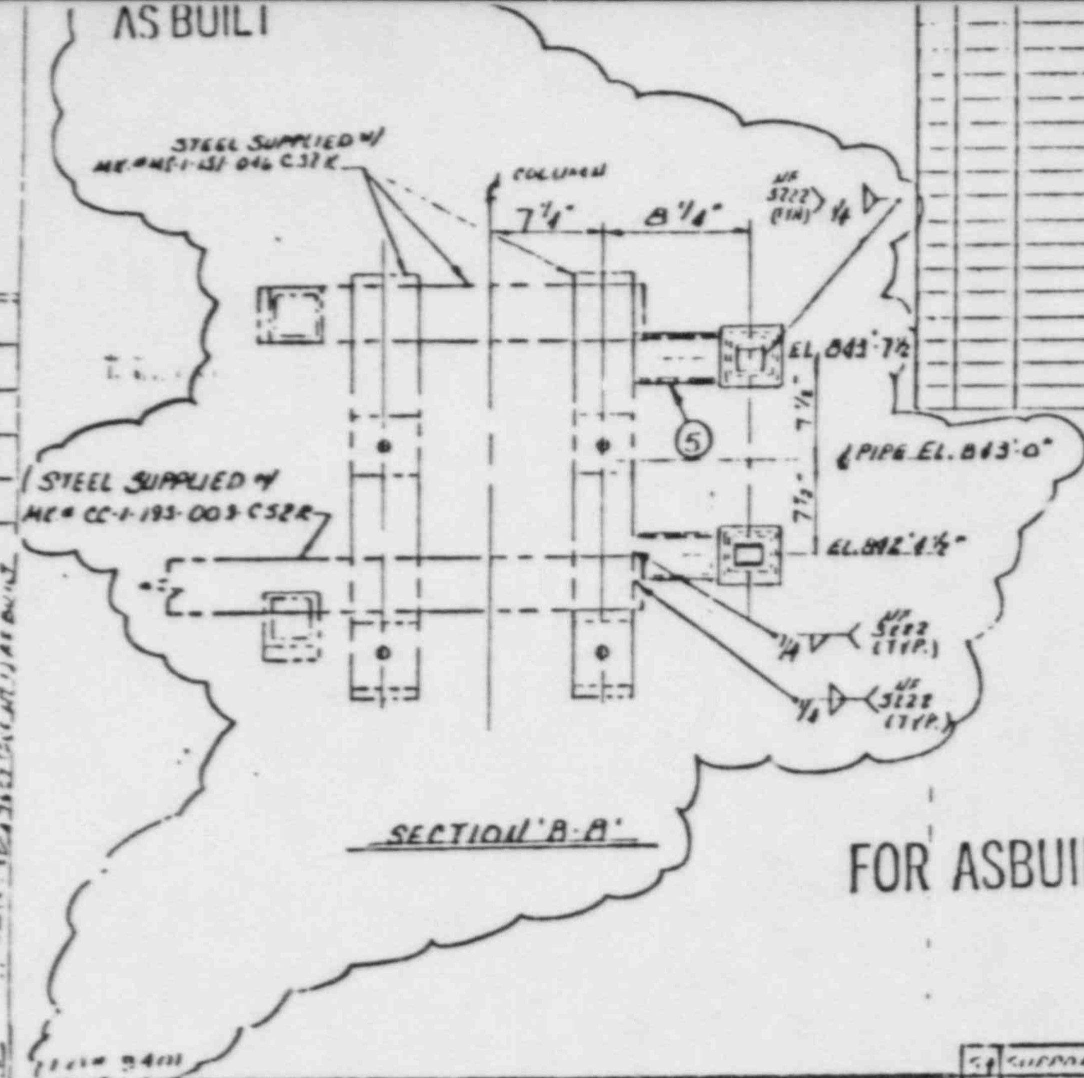
S_h = 15,000 PSI S_c = 15,000 PSI

$S_A = 1.25 S_c + 0.25 S_h$ = 22,500 PSI

F-155.4-B

Checking Method #

AS BUILT



FOR ASBUILT VERIFICATION ONLY

DESCRIPTION
ISSUE FOR CONST.

SUPPORT ISO

REFERENCE DRAWINGS

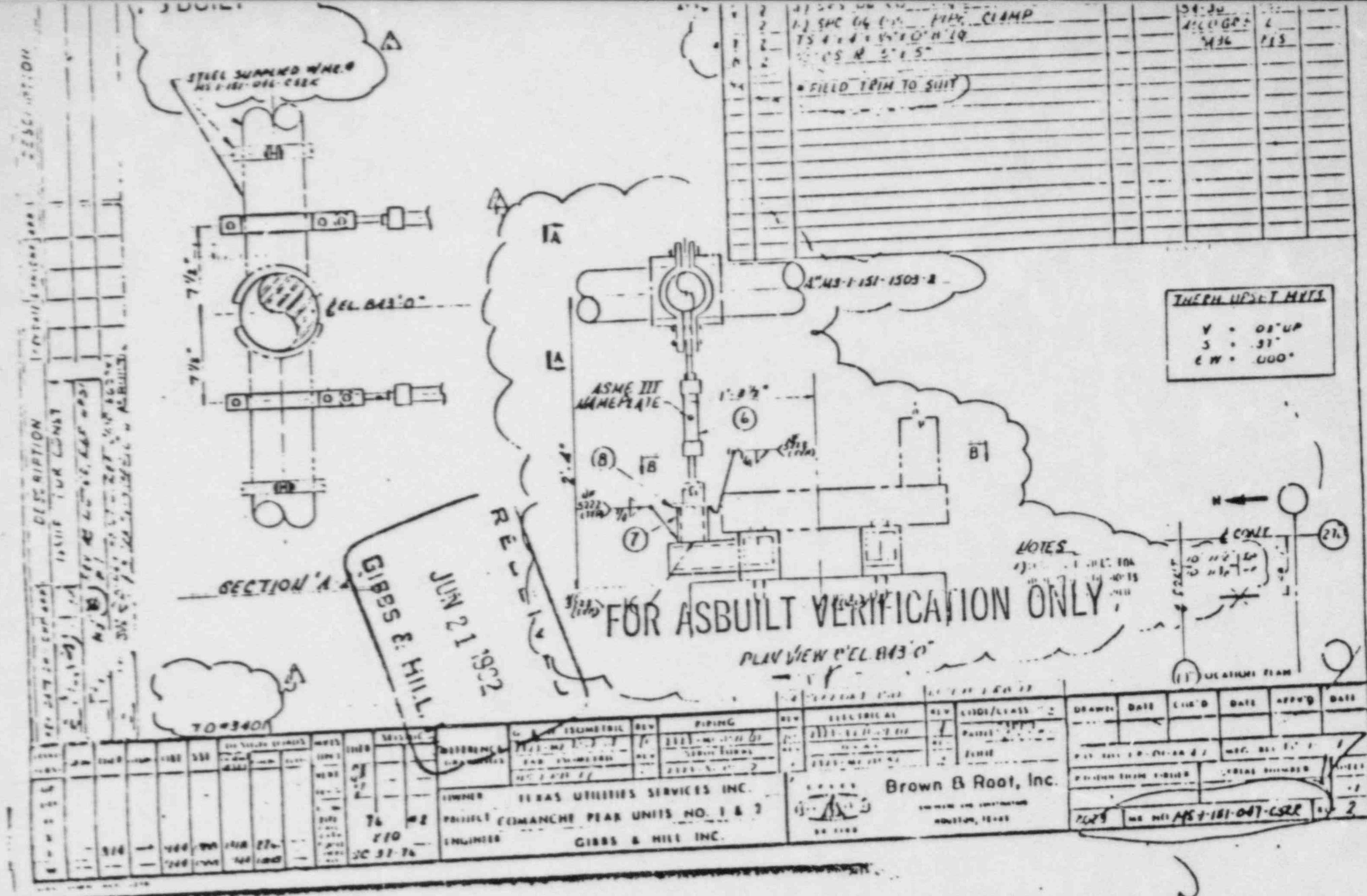
OWNER: TEXAS UTILITIES SERVICES INC.
PROJECT: COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER: GIBBS & HILL INC.

Brown & Root, Inc.

2023 MS-1-151-087-C52R REV 2

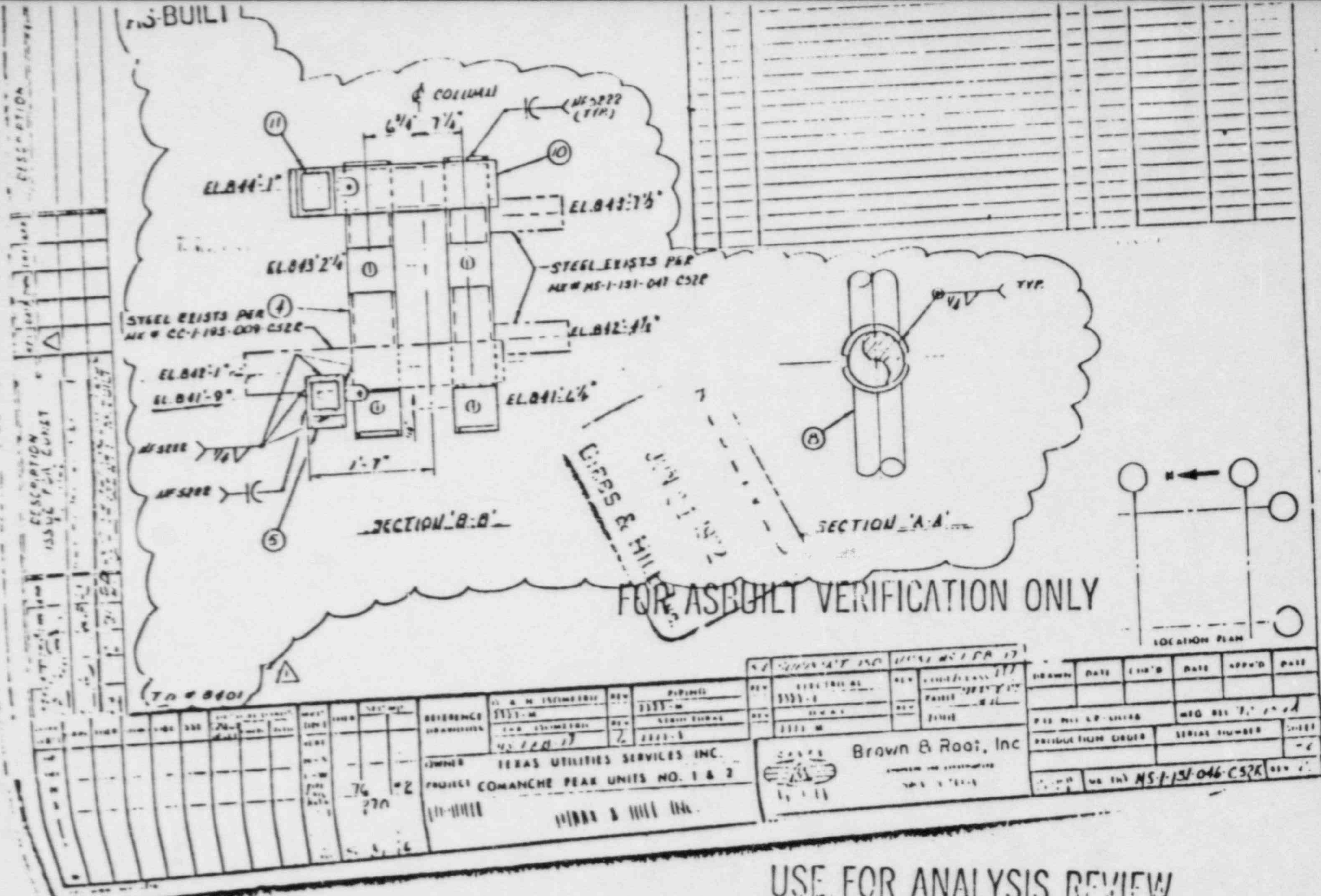
JUN 21 1982
GIBBS & HILL

USE FOR ANALYSIS REVIEW
PROBLEM 1-0763

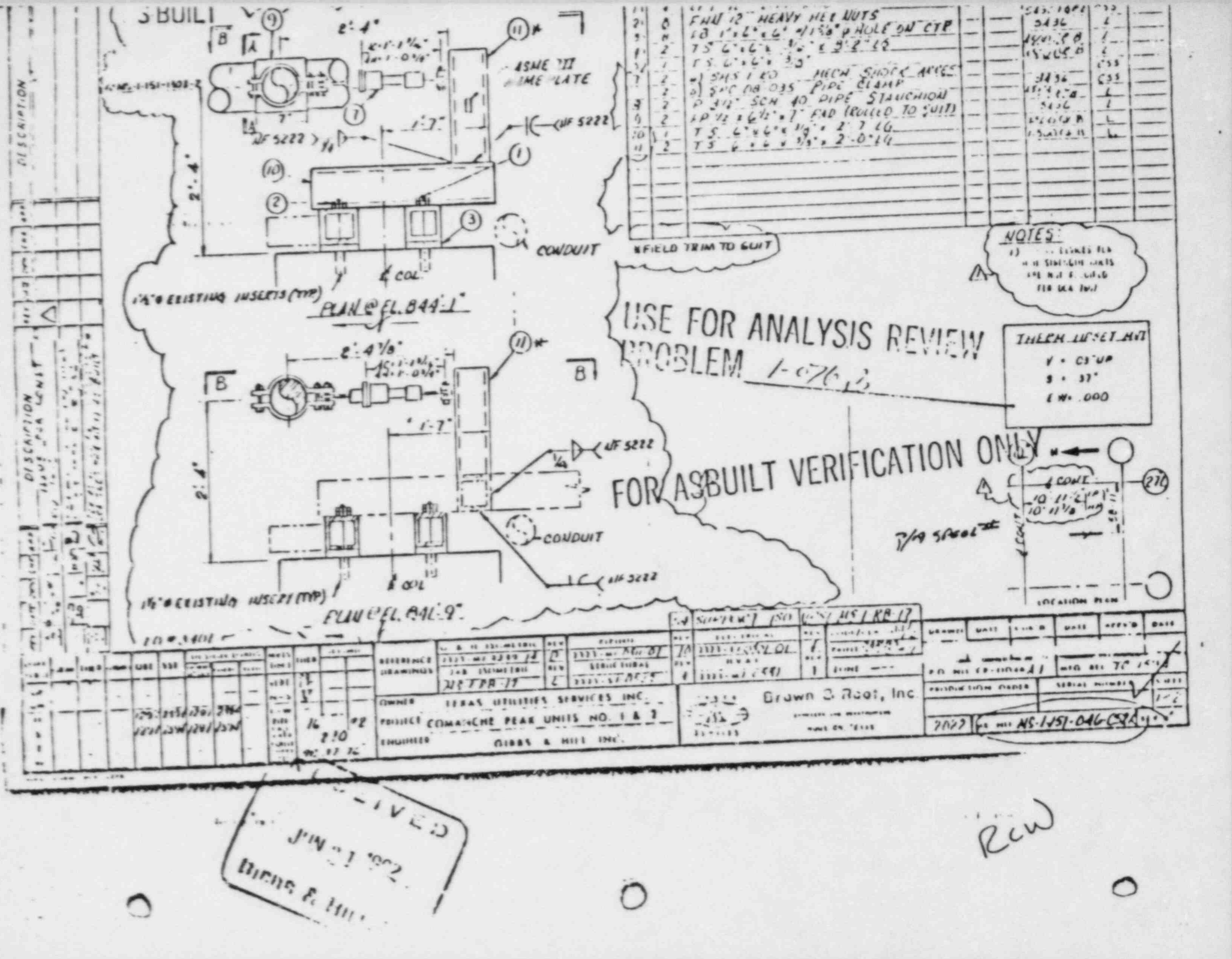


USE FOR ANALYSIS REVIEW
PROBLEM 1-076,3

RLW



USE FOR ANALYSIS REVIEW
PROBLEM 1-076.3



ASME III NAME PLATE
CONDUIT
PLAN @ EL. 844'-1"
PLAN @ EL. 841'-9"
FIELD TRIM TO SUIT
NOTES:
USE FOR ANALYSIS REVIEW
PROBLEM 1-076 B
FOR ASBUILT VERIFICATION ONLY
THERM. UPSET MVT
LOCATION PLAN
REFERENCE DRAWINGS
OWNER TEXAS UTILITIES SERVICES INC.
PROJECT COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER GIBBS & HILL INC.
Brown & Root, Inc.
NS-1-151-046-C52
RECEIVED
JUN 21 1982
GIBBS & HILL
RCW

Revision	Original Issue	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
Checking Method										
Preparer	VIB	7-5-84								
Checker										

LOCAL STRESS DUE TO WELDED ATTACMENTS

REF NCS: AM-WA-502
AM-WA-503
AM-WA-498

SUP. MARK NO. FW-1-096-020-C62R * NODE NO. 115
FW-1-096-021-C62R
FW-1-096-022-C62R

FOR UNIT LOAD 1000#

MAX. COMBINED STRESS INTENSITY SUPTS '-20-' & '-21-' (S') = 4209; SUPT '-22-' (S') = 1782

MAX COMBINED MEMBRANE STRESS INTENSITY SUPTS -20- & -21- ('SM') = 907; SUPT-22- ('SM') = 661

ACTUAL AND ALLOWABLE STRESS **

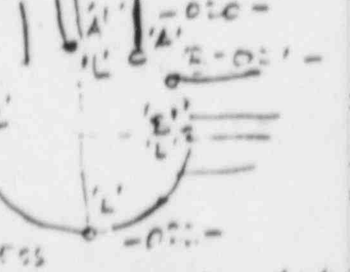
(*) Exceeded by 2.8%. Accept

EQ	FILE COMB.	LOAD 1st: SUPT -020- / 2nd: SUPT -021-	FACTOR	(PSI) GENERAL STRESS AVERAGE	CYL NOZ PSI MEMBRANE STRESS	CYL NOZ PSI TOTAL STRESS	TOTAL = GEN + LOCAL	ALLOWABLE
8	11	684 69	0.684 0.069	5435	620 46		6101	$1.0 S_h = 15000$
9 (1/2 SSE)	11+31 +S.H.	1023 426	1.023 0.476	6059	928 282		7268	$1.5 S_h = 22500$
9 (1/2 SSE)	11+31 +SH	1023 426	1.023 0.426	6059		4920 759	11738	$1.8 S_h = 27000$
11	51 or 52 + +11+40	770 1694	0.77 1.694	6761		3703 3019	13483	$(S_A + S_h) = 37500$
9 (SSE)	11+131+ SH+70	1865 36381	1.865 36.381	7563	1692 24048		33302	$2.16 S_h = 32400$ (*)

NOTE: MATERIAL SA 333 GR 6

$S_h = 15000$ psi $S_c = 15000$ psi

$S_A = 1.25 S_c + 0.25 S_h = 22500$ psi



** a) LOCAL STRESSES AT SUPPORTS '-020-' & '-021-' COMBINE AT 'A' & 'B'. LOADS AT '-20-' > THAN LOADS AT '-021-' AND STRESSES AT '-20-' (Sheet 68) LESS THAN 1/2 ALLOWABLE, HENCE NO [illegible] STRESS

b) THE TABLE ABOVE SHOWS STRESS COMBINATION AT 'A' & 'L' OF SUPPTS '-20-' & [illegible]

Gibbs & Hill, Inc. Job No 11-2323-035 Client TUGI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number PROB: AB-1-76B Sheet No 23

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
	1									
Prepare	RLM	7-29-82								
Checked	[illegible]	7-29-82								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-208 NODE NO.: 221 RIGID

MARK NO.: MS-1-151-034-C52R

FOR UNIT LOAD OF 1000#:

) MAX COMBINED STRESS INTENSITY (S) = 3706 PSI

). MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 1202 PSI

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYLNOZ MEMBRANE STRESS	CYLNOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1)
8	11	2	.002	4637	3	X	4640	1.0Sh = 15,000
9 (Press)	11+31	179	.179	6149	216	X	6365	1.5Sh = 22,500
9 (Press)	11+31	179	.179	6149	X	664	6813	1.8Sh = 27,000
11	11,20,21 22,40	389	.389	17264	X	1442	18706	(Sa+Sh) = 37,500
9 (SSE)	11+131	266	.266	6696	320	X	7016	2.16Sh = 32,400

NOTE: MATERIAL: SA333 GR.6

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

$S_h = 15{,}000$ PSI $S_c = 15{,}000$ PSI

$S_A = 1.25 S_c + 0.25 S_h = 22{,}500$ PSI

Checking Method #

F-155, 4-81

Gibbs & Hill, Inc. Job No 11-2323-031 Client TUSI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER CALCULATIONS

Calculation Number PROB: AB-1-76B Sheet No 24

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
	1									
Prepared	[illegible]	7-29-82								
Checked	[illegible]	8/02/82								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-205 NODE NO.: 2221 RIGID

MARK NO.: MS-1-151-035-C52R

FOR UNIT LOAD OF 1000#:

) MAX COMBINED STRESS INTENSITY (S) = 2644

). MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 1112

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (PSI) (1)
8	11	61	.61	4637	679	X	5316	1.0Sh = 15,000
9 (1/2 SSE)	11+31	392	.392	6150	436	X	6586	1.5Sh = 22,500
9 (1/2 SSE)	11+31	392	.392	6150	X	1037	7187	1.8Sh = 27,000
11	11,20,21 22,40	115	.115	17261	X	304	17565	(SA+Sh) = 37,500
9 (SSE)	11+(31)	543	.543	6696	604	X	7300	2.16Sh = 32,400

REF (1): G+H ANALYTICAL ENGINEERING MANUAL AEG-511.

NOTE: MATERIAL: SA 333 GR.6.

Sh = 15,000 PSI Sc = 15,000 PSI

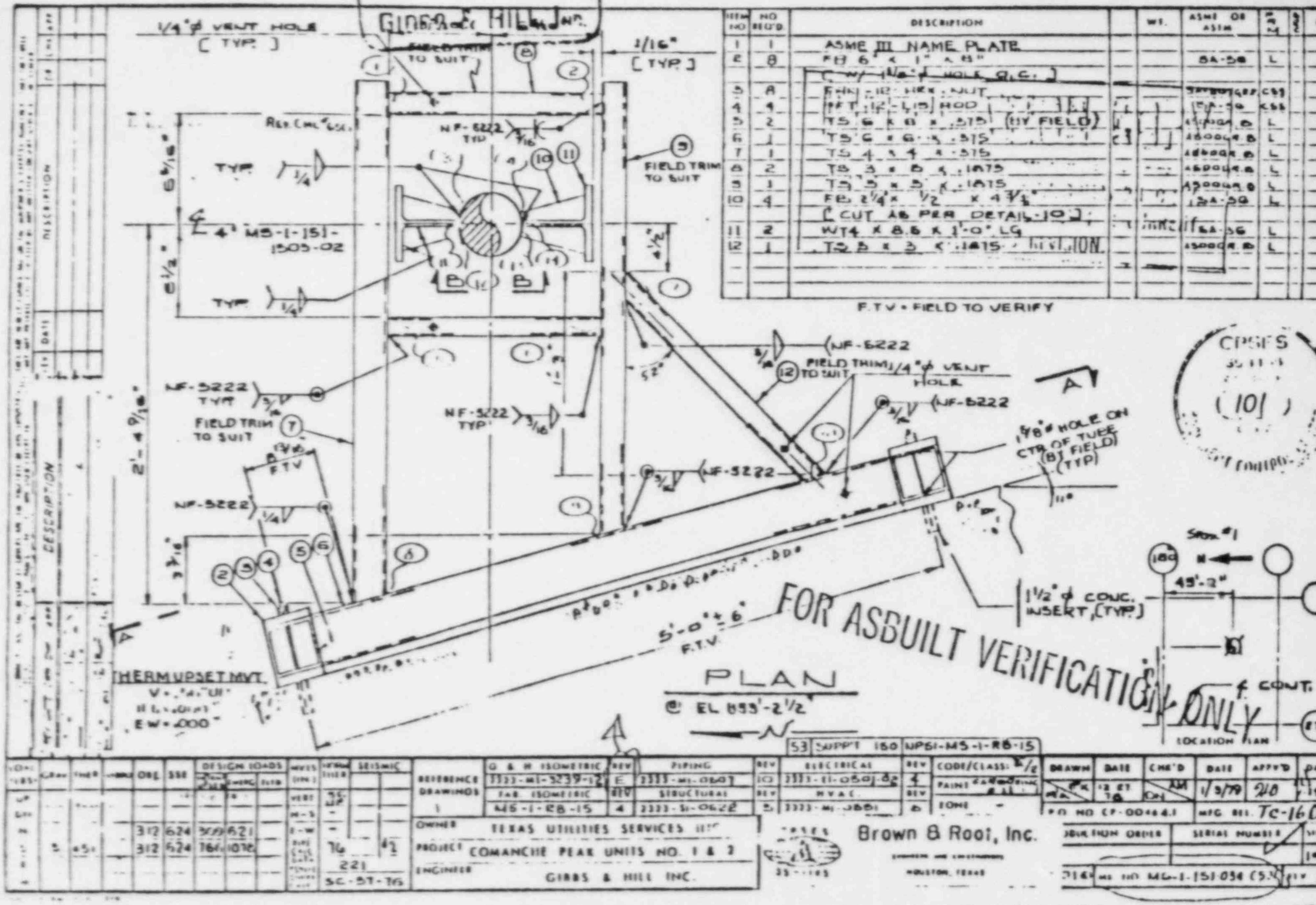
$S_A = 1.25 S_c + 0.25 S_h = 22,500$ PSI

F-155, 4-81

Checking Method #

RECEIVED
JUN 21 1982
GIBBS & HILL, INC.

USE FOR ANALYSIS REVIEW
PROBLEM 1-076 B



ITEM NO	NO REQ'D	DESCRIPTION	WT.	ASME OR ASTM	
1	1	ASME III NAME PLATE			
2	8	FB 6" x 1" x 8"		SA-36	L
		[W/ 1 1/8"⌀ HOLE Q.C.]			
3	8	HVY HEX NUT			
4	4	... ROD		SA-36	
5	2	TS 6 x 6 x .375 (BY FIELD)		A500 GR. B	L
6	1	TS 6 x 6 x .375		A500 GR. B	L
7	1	TS 4 x 4 x .375		A500 GR. B	L
8	2	TS 3 x 3 x .1875		A500 GR. B	L
9	1	TS 3 x 3 x .1875		A500 GR. B	L
10	4	FB 2 1/4" x 1/2 x 4 7/8"		SA-36	L
		[CUT AS PER DETAIL 10]			
11	2	WT4 x 8.5 x 1'-0" LG		SA-36	L
12	1	TS 3 x 3 x .1875		A500 GR. B	L

F.T.V. = FIELD TO VERIFY

DESIGN LOADS				
OBE	SSE			
312	624	509	621	
312	624	764	1076	

REFERENCE DRAWINGS	G & H ISOMETRIC	REV	PIPING	REV	ELECTRICAL	REV
	2323-MI-5239-12	E	2323-MI-0607	10	2323-EI-0501-02	4
	FAB. ISOMETRIC	REV	STRUCTURAL	REV	HVAC	REV
	MS-1-RB-15	4	2323-SI-0622	5	2323-MI-0881	6

OWNER: TEXAS UTILITIES SERVICES INC
PROJECT: COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER: GIBBS & HILL INC.

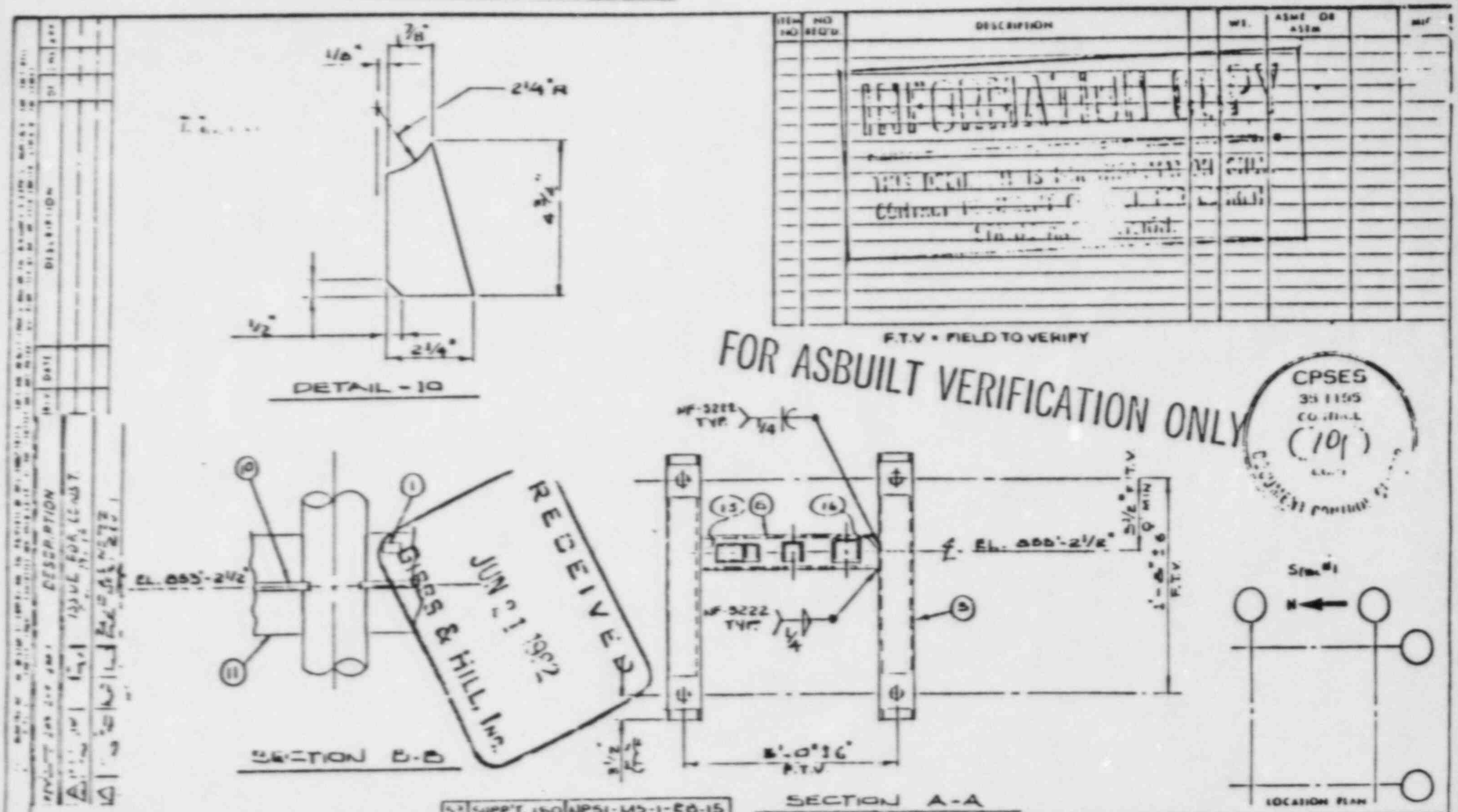
SEISMIC: 221 SC-5T-75

53 SUPPT 150 NPSI-MS-1-RB-15
CODE/CLASS: 2
DRAWN / CHK'D / DATE 1/3/79 / APP'D
P.O. NO CP-0046.1
MFG. DRL. TC-1602

Brown & Root, Inc.
HOUSTON, TEXAS

DWG NO MS-1-151-034 C53

USE FOR ANALYSIS REVIEW
PROBLEM 1-076, 2



SS SUPP'T. 160 | NPSI-MS-1-RB-15

REFERENCE DRAWINGS	G & H ISOMETRIC	REV	PIPING	REV	ELECTRICAL	REV
	2323-M		2323-M		2323-E	
	FAB. ISOMETRIC	REV	STRUCTURAL	REV	HVAC	REV
			2323-S		2323-M	

CODE/CLASS: III/2
PAINT: CARBOZINC NO. 11
ZONE: -

DRAWN	DATE	CHK'D	DATE	APPV'D	DATE
PC	11-27-78	AM	1/3/79	YD	1-15-79

P.O. NO CP-0046A1
MFG # TC-160X

OWNER: TEXAS UTILITIES SERVICES INC.
PROJECT: COMANCHE PEAK UNITS NO. 1 & 2
ENGINEER: GIBBS & HILL INC.

CPSES

Brown & Root, Inc.
HOUSTON, TEXAS

SHEET 2 OF 2
DWG. NO. MS-1-151-034-C92 REV. 1

USE FOR ANALYSIS REVIEW

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO. N° 36369 Rev. 4

(1) APPLICATION: PIPE SUPPORT WELD MOD. [x] Q [x] NON-Q [N/A] DESIGN CHANGE/DEVIATION [x]

(2) DWG. NO. SHT 1 BRH-REV-1 SHT 2 BRH REV 1
MS-1-151-034-C52R

(3) LINE NO./COMPONENT NO.

(4) REASON FOR CHANGE: Drafting error
INSERTS OFF LOCATION
Interference w/other pipe
Interference w/ other pipe

(7) ORIGINATOR
DR TOOMBS / R HEBERT
NAME
[x] CPPE
[N/A] ORIGINAL DESIGNER

(5) INSTRUCTIONS:

REMOVE [✓]

DELETE ITEM # 23
1 OF # 2
4 OF # 3
3 1 OF # 4
2 OF # 5
1 OF # 7
1 OF # 9
1 OF # 12
1 OF # 13
1 OF # 14

ADD [✓]

No.	Qty	
13	1	34-36
14	1	FB-1x6x6-SA-36
15	1	TS-3x3x.1875 x 3'-6" LG A500 GR.B
16	1	TS-3x3x.1875 x 4'-0" LG A500 GR.B
17	1	TS-4x4x.375 x 4'-0" LG A500 GR.B
18	1	FB-1x6x6 w/1 1/2" ø ... DRILLED ...
19	1	...
20	1	...

ENTERED IN TRACKING SYSTEM
JAN 11 1982
OPEN

(6) SKETCH

LINE NO: 4" MS-1-151-1303-02
ISO NO: MS-1-RB-15

Note: Field trim to suit items # 10 & # 11

ADDED PIPE SUPPORT 1-51-RB-4-048-006-2
PIPE SUPPORT MS-1-150-046-C52K AS BUILT.

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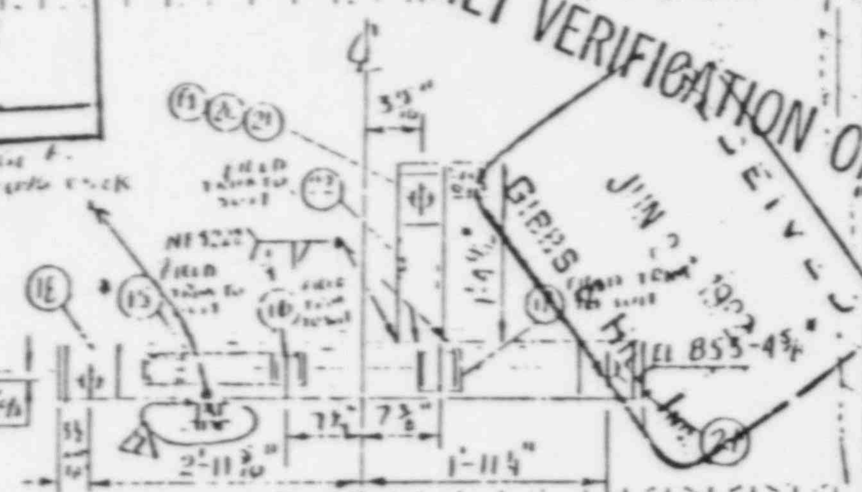


SECTION A-A

ITEM NO 22 - (2) TS 4x4x.375 x 1'-6" LG A500 GR.B
ITEM NO 21 - (2) ... HEX NUT SA307 GR.B

(8) APPROVED BY:
... 6/16/8
DATE 6/20/80
RMV ... DATE 5-29-81
DATE 6/19/81
DATE 6/25/81
DATE 7-24-81
DATE 6-27-81

(9) DISTRIBUTION

DISTRIBUTION	DCC CNTL NO.	QTY
NRSI	INFO	2
VARNELL	INFO	1
SITE DAMAGE STUDY GROUP	INFO	
SYSTEMS PLANNING	INFO	
PRODUCTION CONTROL	INFO	

THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO. 36369 REV.

CMC 11 MOMA CHA

COMANCHE PEAK STEAM ELECTRIC STATION (CPSES)

COMPONENT MODIFICATION CARD (CMC)

SERIAL NO Nº [redacted]

(1) ORIGINATOR

J. [illegible]

NAME

☑ CPPI

☒ ORIGINAL DESIGNER

APPLICATION WELD MOD ☒ Q ☑ NON Q ☐ DESIGN CHANGE/DEVIATION ☑

(3) DWG NO

BRHL-[illegible] Rev. 1

LINE NO./COMPONENT NO

[illegible]

(4) REASON FOR CHANGE

△ As-Built

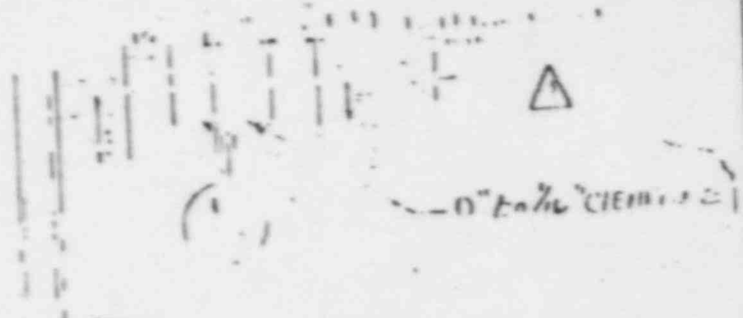
△ [illegible] As Shown

(5) INSTRUCTIONS

REMOVE ☒

ADD ☒

(6) SKETCH



RECEIVED

JUN 21 1982

GIBBS & HILL, Inc.

FOR ASBUILT VERIFICATION ONLY

USE FOR ANALYSIS REVIEW

PROBLEM 1076.2

(8) APPROVED BY

REV

[illegible] 5-[illegible]

DATE

△ [illegible] [illegible]

DATE

△ [illegible] 8-7-81

DATE

△ [illegible] 8-7-81

DATE

DATE

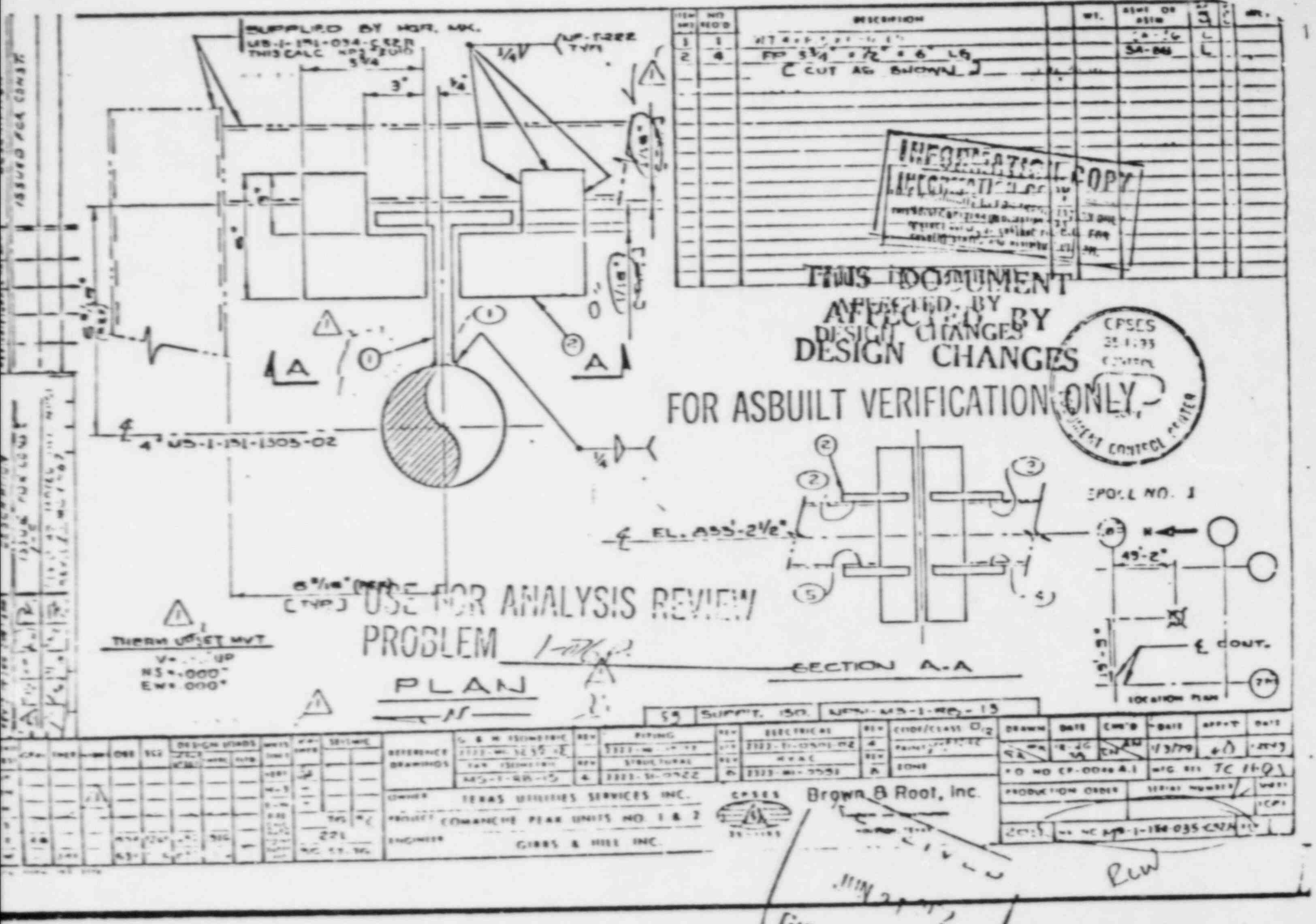
DATE

(9) DISTRIBUTION

	DOC CNTL NO	QTY
TECH SERVICES	INFO	2
SITE DAMAGE STUDY GROUP	INFO	—
SYSTEMS PLANNING	INFO	1
PRODUCTION CONTROL	INFO	1

THIS REVISION VOIDS AND SUPERSEDES DOCUMENT SERIAL NO.

CMC [illegible] REV. 2



SUPPLIED BY HGR. MK.
THIS CALC
1/4
3"
TYP
FP 3 3/4" x 1/2" x 6" LG
CUT AS SHOWN
INFORMATION COPY
THIS DOCUMENT AFFECTED BY DESIGN CHANGES
CPSES
FOR ASBUILT VERIFICATION ONLY
DOCUMENT CONTROL CENTER
4" MS-1-151-1305-02
EL. 855'-2 1/2"
SECTION A-A
USE FOR ANALYSIS REVIEW
PROBLEM
THERM UPSET MVT
NS=.000"
EW=.000"
PLAN
SUPPT. ISO.
LOCATION PLAN
TEXAS UTILITIES SERVICES INC.
COMANCHE PEAK UNITS NO. 1 & 2
GIBBS & HILL INC.
Brown & Root, Inc.
CPSES
REFERENCE DRAWINGS
PIPING
ELECTRICAL
STRUCTURAL
HVAC
DESIGN LOADS
SEISMIC
DRAWN
DATE
CHK'D
APPR'D
TC 11-03
PRODUCTION ORDER
SERIAL NUMBER
RLW
JUN
GIBBS

Gibbs & Hill, Inc. Job No 11-2323-031 Client TUGI-CPSES

Subject AS-BUILT STRESS VERIFICATION - ANALYSIS RESULTS - OTHER [illegible]

Calculation Number PROB: AB-1-76B Sheet No 25

Revision	0	Date	Rev.	Date	Rev.	Date	Rev.	Date	Rev.	Date
	1									
Prepared	[illegible]	7-29-82								
Checked	[illegible]	8/02/82								

CALCULATIONS/RESULTS

LOCAL STRESS DUE TO WELDED ATTACHMENTS

REF. NO.: AM-WA-203 NODE NO.: 270. SNUBBER

MARK NO.: MS-1-151-046-C52K.

FOR UNIT LOAD OF 1000#:

1) MAX COMBINED STRESS INTENSITY (S) = 3082 PSI

2). MAX COMBINED MEMBRANE STRESS INTENSITY (SM) = 1101 PSI

ACTUAL AND ALLOWABLE STRESS

EQUATION	FILE COMB.	LOAD (lb.)	FACTOR = LOAD/1000	GENERAL STRESS AVERAGE	CYL NOZ MEMBRANE STRESS	CYL NOZ TOTAL STRESS	TOTAL = GEN. + LOCAL	ALLOWABLE (1) (PSI)
8	11	0	0.0	4334	0		4334	1.0Sh = 15,000
9(1/2SSE)	11+31	1000	1.0	6852	1101		7953	1.5Sh = 22,500
9(1/2SSE)	11+31	1000	1.0	6852		3082	9934	1.8Sh = 27,000
11	11,20,21 22,40	395	.395	7424		1218	8642	(SA+Sh) = 37,500
9(SSE)	11+131	1112	1.112	7249	1225		8474	2.16Sh = 32,400

NOTE: MATERIAL: SA 333 GR 6.

REF (1): G&H ANALYTICAL ENGINEERING MANUAL AEG-511.

$S_h = 15{,}000$ PSI $S_c = 15{,}000$ PS

$S_A = 1.25 S_c + 0.25 S_h = 22{,}500$ PSI

Checking Method # 1

F-155, 4-81

187

TEXAS UTILITIES GENERATING COMPANY

July 4, 1984

OFFICE MEMORANDUM

To G. Grace Glen Rose, Texas

Subject AB-1-23B

As per request via letter, 3711-PSE a reduced set of Fx loads for support #MS-1-240-004-S72K at D.P. 307, based on revised analysis was transmitted to PSE lay out group.

These loads were:

Fx= ± 5000# in upset condition
Fx= ± 7000# in emergency condition

These loads can be shown in the analysis AB-1-23B Rev. 1 analyzed incorporating refined response spectra, refined seismic anchor movement and modified coding of the valve stem in consistance with 1-23A, C, and D.

The loads in AB-1-23B Rev. 1 for the subject supports are:

Max upset load Fx= ± 4375 <± 5000#
Max emergency load Fx= ± 6264 <± 7000#

Refined seismic anchor movement is based on attached memo SA-T502.

Very Truly Yours,

C. RAY

CR/jrf

CYGNA	
JOB NO:	84042
DATE LOGGED:	7/6/84
LOG NO.:	#187
FILE:	4.1.1 Tech. Files
CROSS REF. FILE	4.1 Tech. Files

186

TEXAS UTILITIES GENERATING COMPANY

OFFICE MEMORANDUM

July 4, 1984

To G. Grace Glen Rose, Texas

Subject CC-1-028-024-S33R

From the attached STRUDL analysis without the skewed bolt at joint 10, the bolt interaction for joint 12 is the following:

x-Force=96#
y-Force=4747#
z-Force=6471#

$$\left(\frac{4747}{12110}\right)^2 + \left(\frac{6567}{7850}\right)^2 = 0.853 \leq 1 \text{ (ok)}$$

The bolt interaction for joint 14 is the following:

x-Force=214#
y-Force=9740#
z-Force=6362#

$$\left(\frac{9740}{12110}\right)^2 + \left(\frac{6365}{7850}\right)^2 = 1.30^*$$

*In this case a 30% overstress of the bolt does not mean failure but only a reduced factor of safety. In this case it is an absolute worst case condition because we are assuming no forces are being resisted by the canted bolt. In actuality the tremendous ductibility of the A36 rod at joint 10 would resist some of the load and reduce the interaction at joint 14.

Very Truly Yours,

G.M. Chamberlain

G.M. Chamberlain

GMC/jrf

CYGNA
JOB NO: 84042
DATE LOGGED: 7/6/84
LOG NO.: #186
FILE: W.1 Desk Files
CROSS REF FILE: W.1 Desk Files Corr.

TEXAS UTILITIES GENERATING COMPANY

OFFICE MEMORANDUM

To Nancy Williams Glen Rose, Texas July 5, 1984

Subject CYGNA Energy Services-Phase 3

Attached for CYGNA's review are the following items:

1) STRUDL for hanger CC-1-028-024-S334 without considering the canted bolt at joint 10 and the bolt interaction for joints 12 and 14. (for J. Minichiello)

2) ADLPIPE analysis for stress problem AB-1-23B and an explanation of the corrected input. (for L. Weingart)

3) Response to telecon of July 2, between G. Grace (TUGCO) and L. Weingart (CYGNA). (for L. Weingart)

4) Memos confirming changes in AB-1-23B stress calculation between TSDRE and SSAG. (for L. Weingart)

Very Truly Yours,

G. E. Grace

GEG/jrf

CYGNA	
JOB NO:	84042
DATE LOGGED:	7/6/84
LOG NO.:	#51
FILE:	2.1.1 Enc. Cor. (w/o attach.)
CROSS REF. FILE	2.1 Enc. Cor. Log

bcc: N. Williams
L. Weingart
T. Austin / PE

189

To Gary Griswold

From N. Ahmed.
(TSDRE)

CYGNA
JOB NO.: 84042
DATE LOGGED: 7/16/84
LOG NO.: #189
FILE: H.T. [illegible]
CROSS REF. FILE: [illegible]

Subject MS-1-24c-ac4-S75k

Date 11-3 1983

MESSAGE

The following items fail:

2. SMA-3-50, Emerg. Allow 9000# < 17777#
N/U " 6000# < 12014#

10. 1¼"×13" Super Hilti —— Bolt Interaction = 1.37 (section B-B)

11. 1"×9" Super Hilti —— Bolt interaction = 1.5 (section A-A)

Please modify. Thank you.

031

Signed Nazeer Ahmed

REPLY Mr. Dave Rencher, Date November 03 1983

I was asked by P.S.E. to Upgrade certain bolts and items per this TSDR. I did some comparitive research on Problem #'s 1-23A, 1-23B, 1-23C and 1-23D. By doing a field review and by gathering all the as-built documentation I came to the conclusion that there was a very good chance that Prob. 1-23B had an error in it. I then asked Chandi Ray to re-check the Problem # for accuracy. Attached is Chandi Ray's Results which is the answer to P.S.E.'s Problem and your T.S.D.R. #5451. If you have any questions give me a call.

Thank You

Signed Michael Cockram 634

Wilson Jones Company

RECIPIENT—RETAIN WHITE COPY, RETURN PINK COPY

To CHANDI RAY · GARY KRISHNAN
SSAG

From MICHAEL [illegible] 634
P.S.E. · LAYOUT ENG.

Subject REDUCING AS-BUILT LOADS AT D.P. 307 / PROB. 1-23B

MESSAGE

Date NOV. 14 1983

PLEASE REVIEW DATA POINT 307 / PROB. 1-23B AS LOADS ARE TOO HIGH FOR THE USE OF A SMA-03 SNUBBER. A SIZE 10 WOULD BE REQUIRED RESULTING IN HARDWARE CHANGE ON THE FISHER ACTUATOR. THE CHANGE REQUIRED IS NOT POSSIBLE AT THIS LATE DATE.

MAX. LEVEL A/B IS 6000 #
MAX. LEVEL C IS 9000 #
MAX. LEVEL D IS 9400 #

Signed Michael D. [illegible]

REPLY

Date 11.23. 1983

SUPPORT # MS-1-240-004-S72K

PLEASE FIND BELOW THE REVISED LOADS OF SUBJECT SNUBBER AT D.P. 307 IN PROB # 1-23B [illegible]

~~NORMAL = [illegible] lb~~

UPSET = ± 5000 lb
EMERGENCY = ± 7000 lb
} Fx LOADS

THESE LOADS ARE GENERATED FROM OUTPUT TAPE:
= T08128/09

INPUT TAPE = T 12794/38

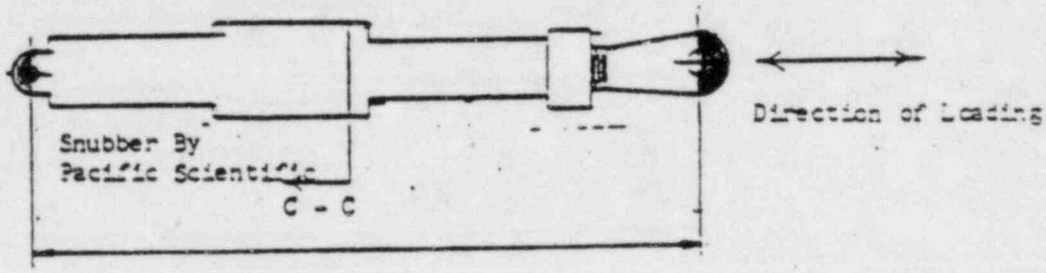
Signed [illegible] X391

Wilson Jones Company

RECIPIENT—RETAIN WHITE COPY, RETURN PINK COPY

nps industries. inc. an nps group company	NPS INDUSTRIES, INC. COMPONENT SUPPORT CERTIFIED DESIGN REPORT SUMMARY	CDRS NO. SMX PAGE 1 OF 7 REV. DATE

Products covered by this Certified Design Report Summary are included in S Section of NPS Industries' Catalog



(1) Materials for extension strut:
Pipe SA-53 Gr. B , SA-106 Gr. B
Plate SA-36, Rod SA-36
Forgings A-668 Gr. C, D (per Code Cases 1644-5, 1644-6, N-71-7, N-71-8, N-71-9) or F (per Code Cases 1644-5, 1644-6, N-71-7, N-71-8 N-71-9, N-249), SA-266 Class 1, 2, 3,
Bolts- SA-193 B7, SA-320 L7A (per Code Cases 1644-5, 1644-6, N-71-7 N-71-8, N-71-9, N-249) A-449 (N-71-7, N-71-8, N-71-9, N-249)
Bearings and locking wire steel (exempt per NF 2121 (b))

(2) This is a welded item.

(3) This CDRS is applicable for fixed length and adjustable length versions- part codes SMF and SMA.

FOR INFORMATION ONLY

STATE OF NEW YORK
LICENSED PROFESSIONAL ENGINEER

This Certified Design Report Summary has been prepared by NPS Industries, in accordance with ASME Section III, Subparagraph NCA-3551.1, Code Case N-247 and is applicable for Code Classes 1,2,3 and MC Component supports designed by analysis in compliance with Subsection NF, Article 3000, 1974 Edition and also all addenda thru 1980 Edition S'80 Addenda. The Applicable Design Specification (NPSS- 61876 and Design Report (NPS-CR- SMX are maintained on file in NPS Industries' Quality Assurance Records in Secaucus, New Jersey.

Signature: [signature] Registration No.
State of: New York Date:

nps industries. inc. an nps group company	NPS INDUSTRIES, INC. COMPONENT SUPPORT CERTIFIED DESIGN REPORT SUMMARY	CDRS NO. ____ PAGE 1 OF 1 REV. ____ DATE 07/22/81

Products covered by this Certified Design Report Summary are included in 5 Section of NPS Industries' Catalog

	Level A @ 1g Side Load - Snubber Size - Load in (lbs) @ 350°F						
Length C-C (inches)	1/4	1/2	1	3	10	35	100
Min. C-C	12-1/8	9-7/8	14-5/8	19	22	32-1/8	40-3/4
10	350	650	1,500	6,000			
20	350	650	1,500	6,000	15,000		
30	350	650	1,500	6,000	15,000	50,000	
40	350	650	1,500	6,000	15,000	50,000	120,000
50	350	650	1,500	6,000	15,000	50,000	120,000
60	350	650	1,500	6,000	15,000	50,000	120,000
66	350	650	1,500	6,000	15,000	50,000	120,000
70				6,000	15,000	50,000	120,000
80				5,120	13,530	50,000	120,000
86				4,340		50,000	120,000
90					11,010	50,000	120,000
100					9,780	50,000	120,000
110						50,000	120,000
120						50,000	120,000
Max. C-C length (in)	66	66	66	86	100	120	120

FOR INFORMATION ONLY

STATE OF NEW YORK
RAY P. DEUBLER
No. 53177
LICENSED PROFESSIONAL ENGINEER

This Certified Design Report Summary has been prepared by NPS Industries, in accordance with ASME Section III, Subparagraph NCA-3551.1, Code Case N-247 and is applicable for Code Classes 1,2,3 and MC Component supports designed by analysis in compliance with Subsection NF, Article 3000, 1974 Edition and also all addenda thru 1980 Edition S'80 Addenda. The Applicable Design Specification (NPSS- 61876 and Design Report NPS-DR- SMX are maintained on file in NPS Industries' Quality Assurance Records in Secaucus, New Jersey.

Signature: [signature] Registration No. ____

State of: New York Date: 07 22 81

nps industries, inc. — an nps group company	NPS INDUSTRIES, INC. COMPONENT SUPPORT CERTIFIED DESIGN REPORT SUMMARY	CDRS NO. [illegible] PAGE [illegible] OF [illegible] REV. [illegible] DATE [illegible]/22/8[illegible]

Products covered by this Certified Design Report Summary are included in [illegible] Section of NPS Industries' Catalog

	Level [illegible] @ 1g Side Load - Snubber Size - Load in (lbs) @ 350°F					
Length C-C (inches)	1/4	1/2	1	3	10	35	100
Min. C-C	12-1/8	9-7/8	14-5/8	19	[illegible]	32-1/8	40-3/4
10	512	865	2,100	9,000/ 9,400			
20	512	865	2,100	9,000/ 9,400	21,000/ 22,100		
30	512	865	2,100	9,000/ 9,400	21,000/ 22,100	67,500/ 72,450	
40	512	865	2,100	9,000/ 9,400	21,000/ 22,100	67,500/ 72,450	160,000
50	512	865	2,100	9,000/ 9,400	21,000/ 22,100	67,500/ 72,450	160,000
60	512	865	2,100	9,000/ 9,400	21,000/ 22,100	67,500/ 72,450	160,000
66	512	865	2,100		--	67,500/ 72,450	160,000
70				8,790	20,960	67,500/ 72,450	160,000
80				6,930	18,010	67,500/ 72,450	160,000
86				[illegible],900		67,500/ 72,450	160,000
90					14,880	67,500/ 72,450	160,000
100					12,460	67,500/ 72,450	160,000
110						67,500/ 71,280	160,000
120						67,500	160,000
Max. C-C length (in)	66	66	66	86	100	120	120

FOR INFORMATION ONLY

FOR INFORMATION ONLY

FOR VIEWING USE ONLY

STATE OF NEW YORK · LICENSED PROFESSIONAL ENGINEER

This Certified Design Report Summary has been prepared by NPS Industries, in accordance with ASME Section III, Subparagraph NCA-3551.1, Code Case N-247 and is applicable for Code Classes 1,2,3 and MC Component supports designed by analysis in compliance with Subsection NF, Article 3000, 1974 Edition and also all addenda thru 1980 Edition S'80 Addenda. The Applicable Design Specification (NPSS- S'876 and Design Report (NPS-DR- SMX are maintained on file in NPS Industries' Quality Assurance Records in Secaucus, New Jersey.

Signature: [illegible] Registration No. [illegible]

State of: New York Date [illegible]

188

TEXAS UTILITIES GENERATING COMPANY

P. O. BOX 1002 · GLEN ROSE, TEXAS 76043

CYGNA	
JOB NO.:	84-02
DATE LOGGED:	7/6/84
LOG NO.:	#188
FILE:	11.1.1 Tech. files
CROSS REF. FILE	11.1 Tech files log

July 3, 1984

CYGNA Energy Services
101 California Street
San Francisco, CA 94111

ATTENTION: Ms. Nancy Williams, Project Manager

COMANCHE PEAK STEAM ELECTRIC STATION
CYGNA REVIEW QUESTIONS

Reference: 1) July 2: Telecon between G. Grace (TUGCO) and L. Weingart (CYGNA)

Dear Ms. Williams:

Below is TUGCO's response to the above referenced telecon regarding seismic qualification of the main steam relief valves.

CYGNA Questions:

a) Were 'as-built' loads transferred to Fisher Controls Company for qualification of the valve/snubber assembly?

b) What are the 'as-built' loads?

c) Please provide documentation.

TUGCO Response:

a) The final "as-built' normal and upset or emergency loads were not provided to Fisher because the loads were within the limiting load allowable for the actual snubbers in the field (NPSI Type SMA-3). These snubbers are similar to the tested Pacific Scientific snubbers used in the actual qualification package of the valve/snubber assembly (Pacific Scientific Model PSA-3).

b) The final 'as-built' normal and upset loads are the following:

VALVE	Fx(#)	SNUBBER TYPE	SNUBBER CAPACITY(#)
1-PV-2325	4528	NPSI SMA-3	6000
1-PV-2326	5000	NPSI SMA-3	6000
1-PV-2327	4970	NPSI SMA-3	6000
1-PV-2328	5624	NPSI SMA-3	6000
	Fz(#)		
1-PV-2325	1893	NPSI SMA-3	6000
1-PV-2326	1642	NPSI SMA-3	6000
1-PV-2326	1877	NPSI SMA-3	6000
1-PV-2327	1973	NPSI SMA-3	6000

Similarly, emergency loads were within the snubber load capacity for emergency conditions.

July 3, 1984

c) Attached are the BRH drawings for the above valves and load capacity data sheet for the NPSI snubbers.

If there are any further questions or comments, please contact Mr. George Grace at extension 500.

Very Truly Yours,

TEXAS UTILITIES GENERATING COMPANY

L.M. POPPLEWELL
Engineering Manager

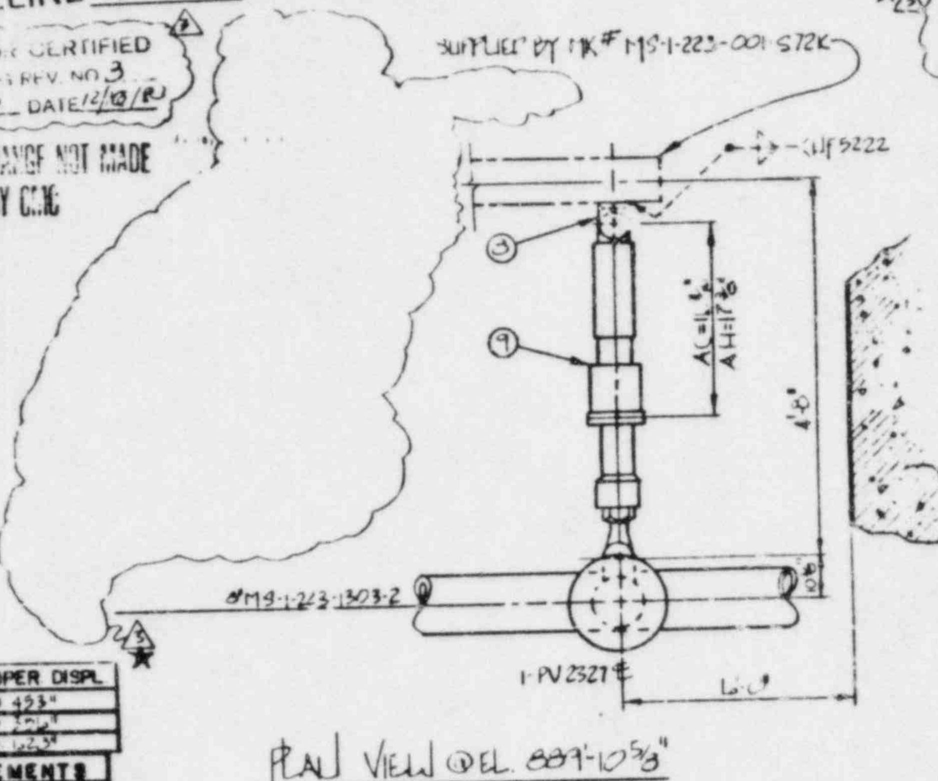
cc: John Burgess
Charles Wilson

GG/JB/CW/jrf

BLUELINE 5 Nov.'81

VENDOR CERTIFIED
DRAWINGS REV. NO. 3
BY [illegible] DATE 12/10/81

★ CHANGE NOT MADE BY C.N.G



PLAN VIEW @ EL. 889'-10 5/8"

N

NORM. OPER DISPL.	
DX	-2.453"
DY	-2.556"
DZ	-0.623"

MOVEMENTS	
X	-.503"
Y	+.367"
Z	-.694"

NOTE

3) LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER PCA [illegible]

BRHL Iso. MS-1-SB-44 R2
I.P.D. Iso. MS-1-SB-4 [illegible]
Data Point 1797/AB-1-2362D
Pipe Mat'l. SA-333 GR 6
Insul. ~ Bldg. SB

THIRD PARTY INSPECTION
CODE CLASS ANSI B31.1

ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP
8	12B-12 REAR BRACKET (SA 36/SA 660 GR D)	1	
9	3½-3-30 SNUBBER	1	

FOR OFFICE AND ENGINEERING USE ONLY

REV	DATE	DWN	CHK	APP	DESCRIPTION
0					ISSUED FOR CONST REF FMRS LTTR
1	10-3-83				VENDOR CERTIFICATION REF. CMC 65194 R.S. [illegible] 7407 SET N° 3 GTN 61163
2					
3	12-1-84				REV'D VENDOR CERT.

MARK # MS-1-223-003-S72K
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: [illegible] R5 ELECT: [illegible]
STEEL: [illegible] R3 HV.A.C.: [illegible]

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET			1877 / 1325			
EMERGENCY			1857 / 1187			
FAULTED						

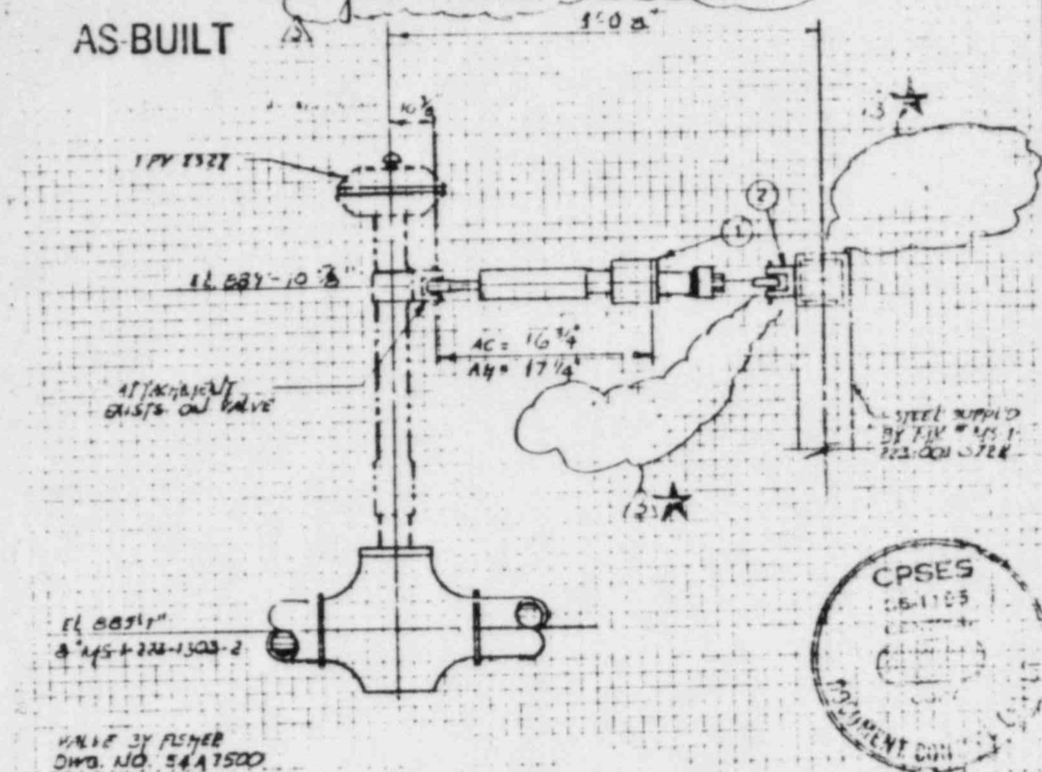
REV	DATE	DWN	CHK	APP	DESCRIPTION
A	11-6-83	RJ	RH	JL	[illegible] MS-1-223-003-S72K [illegible]

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. MS-1-223-003-S72K
SKETCH NO.
SHEET 1 OF 1 REV. 3

DUELINE: 4 NOV 81 VENDOR CERTIFIED DRAWING REV. NO. 2 BY ___ DATE ___

☆ CHANGE NOT MADE BY CMC

AS-BUILT



NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607

NORM. OPER DISPL.	
DX	-.453
DY	
DZ	-.628

B&R L Iso. MS-1-SB-034 R 2
Data Point ___
Pipe Mat'l. A233 ___
Insul. — Bldg. ___

MKT#: X = 0.0, Y = 0.0, Z = 0.0 -.679

THIRD PARTY INSPECTION ___
CODE CLASS: ANSI B31.5

SEE B&R L For Hgr. Loc.
LOCATION PLAN

ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP
1	SNUBBER	1	
2	REAR BRACKET	1	
3		1	

FOR OFFICE AND ENGINEERING USE ONLY

REV	DATE	DRN	CHK	APP	DESCRIPTION
3					REVISED PER ___

MARK # MS-1-223-004-S72K
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ___ SHEET ___ OF ___

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: ___ ELECT: ___
STEEL: ___ HVAC: ___

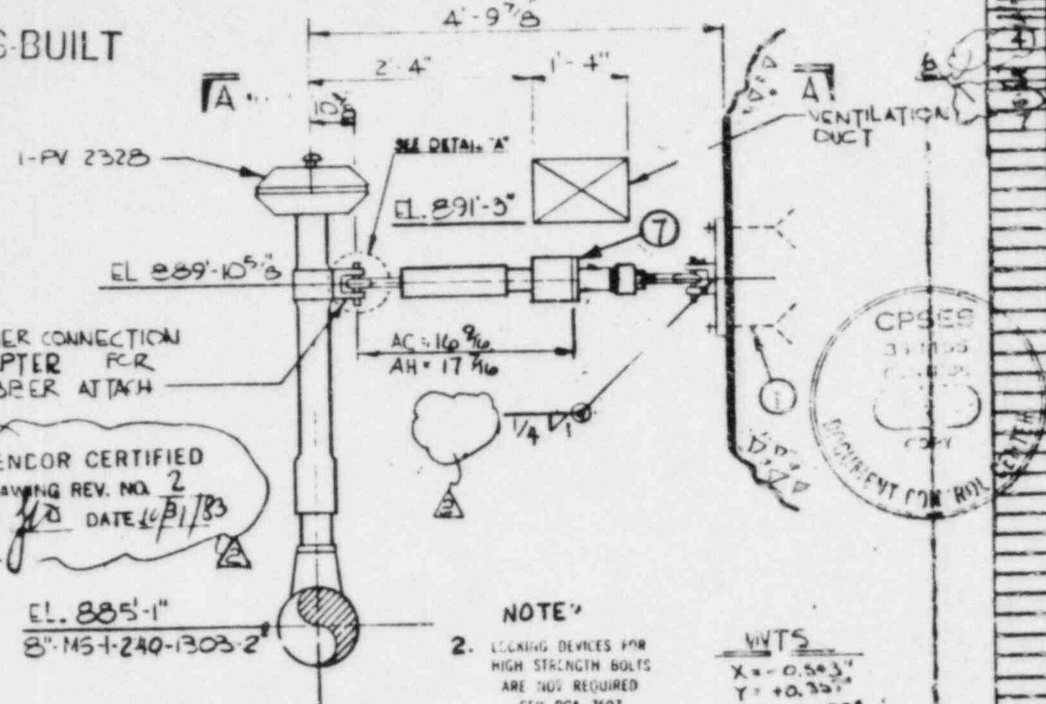
CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET						
EMERGENCY						
FAULTED						

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT NO. CP-0026
JOB NAME Comanche Peak 1 & 2
MARK NO. MS-1-223-004-S72K
SKETCH NO.
SHEET 1 OF 1 REV. 3

CPSES DOCUMENT CONTROL

BLUELINE — 30 OCT 81

AS-BUILT



NOTE:
2. LOCKING DEVICES FOR HIGH STRENGTH BOLTS ARE NOT REQUIRED PER DCA 7607

UNITS
X = -0.543"
Y = +0.357"
Z = -0.602"

NOTE:
VALUE ASSY FISHER DWG NO. S4AT500
ATTACHMENT TO CONT. BLDG.
PER PROB REF GTN 39831

TO/ 3401

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
1	1/2" x 4 1/2" HILTI KWIK BOLT (1/2" MAX. EMB.)	4	
~~2~~	~~[illegible]~~		
~~3~~	~~[illegible] SNUBBER~~		
4	3/4" S. P. PER SECTION B-B SA 515 GR 65 & A-36		
~~5~~	~~ASME III NAMEPLATE FOR ALT MARKING~~		
6	ROD 1" ⌀ x 11/16" LG. (FIELD CUT TO SUIT) A-36	2	
7	SMA-3-RO, SNUBBER		

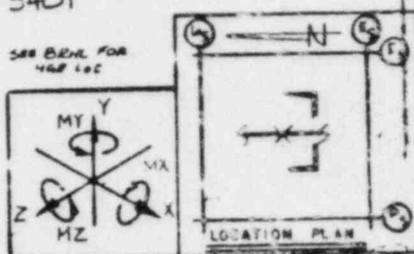
MARK: MS-1-240-003-S75K
PAINT: CARBO ZINC II

FOR OFFICE AND ENGINEERING USE ONLY

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ____ SHEET ____ OF ____

BRHL ISO MS-1-58-045 R2
T.R.D. ISO MS-1-58-45-REV 1
DATA POINT 307/PROB AB-1-2B/RO
PIPE MAT'L SA 333 GR 6
INSUL ____ BLDG 5

SEE BRHL FOR HGR LOC



THIRD PARTY INSPECTION
CODE CLASS ANSI B31.5

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

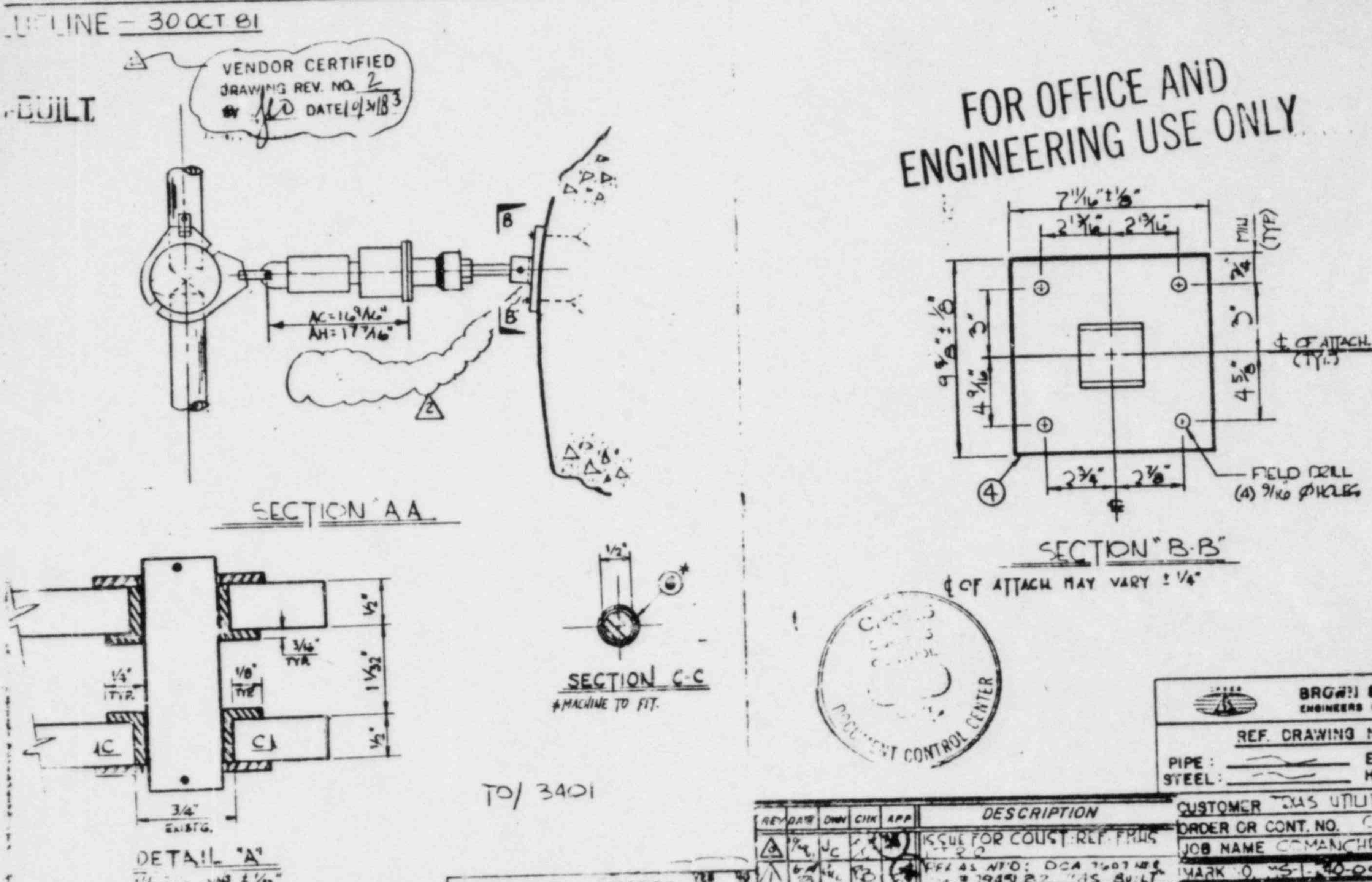
REF. DRAWING NUMBERS
PIPE: M1-0600 R5 ELECT: E1-0603-
STEEL: S1-0610 R3 H.V.A.C.: M1-0655 R6

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET			+1642 -1578			
EMERGENCY			±2716			
FAULTED						

REV	DATE	DWN	CHK	APP	DESCRIPTION
0		JC			ISSUE FOR CONST. REF. FMLS. TRP
1			RS		REV AS NTD. REF: DCA 7607 NCR, CMC # 73451 R2 AS BUILT VENDOR CERTIFIED, REF. SIN# 50330
	-	-	-	-	
2					RCVD VENDOR CERT. REF PPA 34136 WAS MS-1-240-203-S72R

CUSTOMER TEXAS UTILITIES SERVICE INC.
ORDER OR CONT NO. CP-0046
JOB NAME COMANCHE PEAK #2
MARK NO. MS-1-240-203-S75K
SKETCH NO
SHEET 1 OF 2 REV. 2

FOR OFFICE AND ENGINEERING USE ONLY



DOCUMENT CONTROL CENTER

THIRD PARTY INSPECTION
CODE CLASS ANSI B31.5

REV	DATE	DWN	CHK	APP	DESCRIPTION
1		JC			ISSUE FOR CONST. REF. FRMS
2					REV. AS NOTED: DCA 7607 NO. ... 19451 R2 "AS BUILT"
3	—	—	—	—	VENDOR CERTIFIED; REF. ...
					[illegible]

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

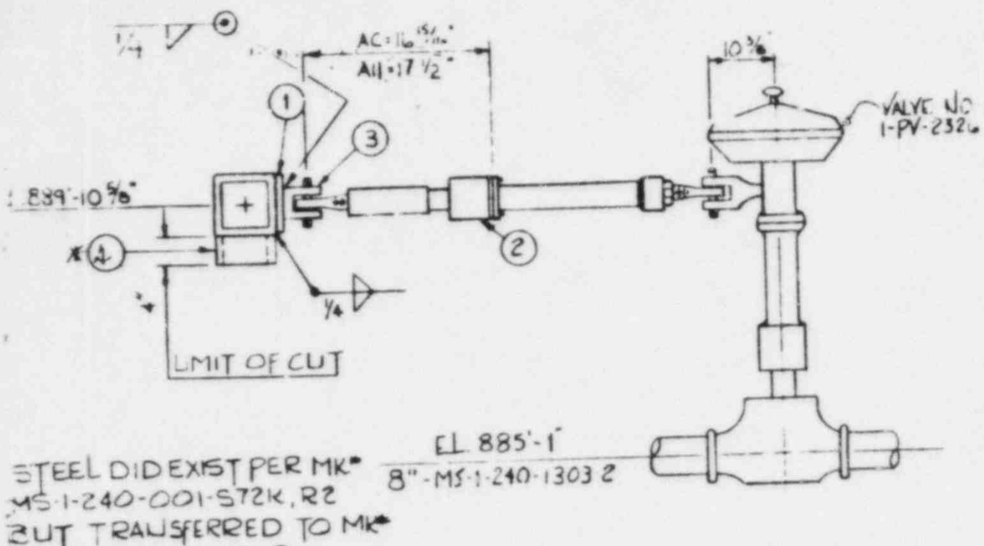
REF. DRAWING NUMBERS

PIPE: —— ELECT: ——
STEEL: —— H.V.A.C.: ——

CUSTOMER	TEXAS UTILITIES SERVICE INC
ORDER OR CONT. NO.	CP-0046
JOB NAME	COMANCHE PEAK 1+2
MARK NO.	...-SI-...-003-S75C
SKETCH NO.	
SHEET 2 OF 2	REV. 2

BLUELINE 18 JAN 82

VENDOR CERTIFIED DRAWING REV. NO. 2 BY [illegible] DATE 1/5/84



STEEL DID EXIST PER MK# MS-1-240-001-S72K, R2 BUT TRANSFERRED TO MK# MS-1-240-004-S75K, R1

SECTION "C-C"

NOTES:
1) Locking devices for high strength bolts are not required per DCA 7607

ITEM NO.	MATERIALS & OPERATIONS	QUAN	SHIP
1	1/2" C.S. PL 3" x 5" (SA-515 GR 65/ A 36)	1	
2	SMA-3-50 MECH SNUBBER, T = 13" CUT	1	
3	XRB-10 REAR BRACKET	1	
4	TS 3"X3"X1/2"X6" FIELD CUT TO SUIT (A500 GR B)	1	
5	TS 3"X3"X1/2"X4'-10" LG (A500 GR B)	1	
6	TS 3"X3"X1/2"X5" LG (A500 GR B)	1	
7	1/2" C.S. PL 1/2" X 15" LG (A36/SA515 GR 65)	1	
8	1 1/4" C.S. PL PER SECTION "A-A" (A36/SA515 GR 65)	1	
9	1 1/4" C.S. PL PER SECTION "B-B" (A36/SA515 GR 65)	1	
10	1 1/4" X 12" SUPER HILTI KWIK BOLT 8 1/2" MIN EMB.	6	
11	1" X 9" SUPER HILTI KWIK BOLT 6 1/2" MIN EMB.	6	

FOR OFFICE AND ENGINEERING USE ONLY

MARK # MS-1-240-004-S75K
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

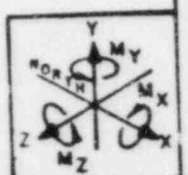
BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: M1-0608-R5 ELECT: E1-0603-02-R7
STEEL: S1-0614-R3 H.V.A.C.: M1-0655-R6

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—	—	—	—	—	—
NORMAL & UPSET	±5300	—	—	—	—	—
EMERGENCY	±7000	—	—	—	—	—
FAULTED	—	—	—	—	—	—

See B.R.H.L. For Hor. Loc.

LOCATION PLAN



REV	DATE	DWN	CHK	[illegible]	DESCRIPTION
0	[illegible]	[illegible]	[illegible]	[illegible]	ISSUE FOR CONST. ~ REF: FMHS & IT-RO
1	[illegible]	Q	[illegible]	[illegible]	ISSUED FOR CERT REF CMC 6013 & CA 7607. SEE NT 1. ADDED SHT. 2. MK # WAS MS-1-240-004-S72K REF. CPPA 14,156, GTN 60830
—	—	—	—	—	
2	[illegible]	[illegible]	[illegible]	[illegible]	REV'D VENDOR CERT.

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO. MS-1-240-004-S75K
SKETCH NO. —
SHEET 1 OF 2 REV. 2

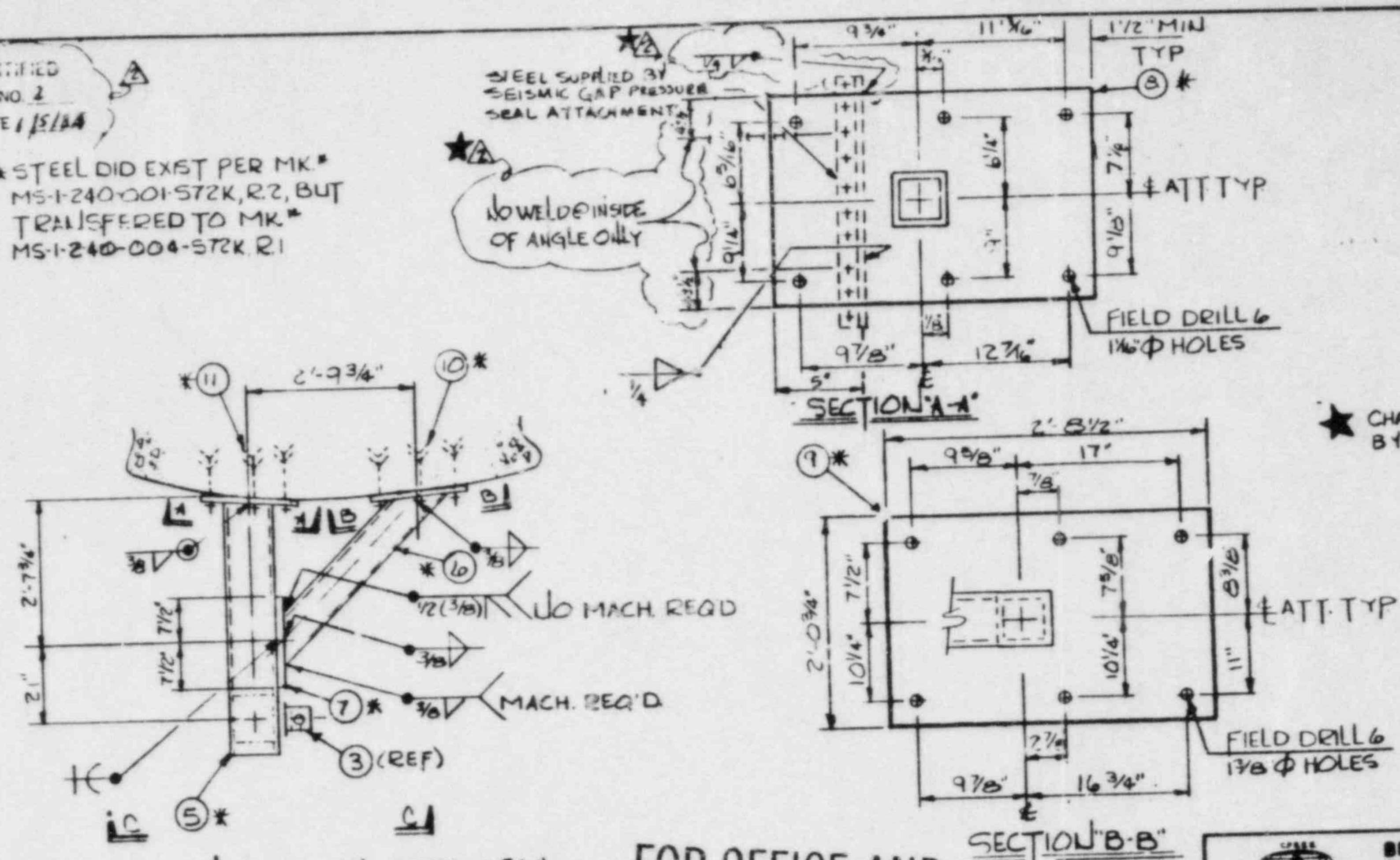
THIRD PARTY INSPECTION
CODE CLASS: ASI 1

Iso. MS-1-SB-045 Rev 3
Iso. MS-1-SB-45-R1
Data Point 307/PECB/AE/73B/0
Pipe Mat'l. SA-333 GR. 6
Insul. — Bldg. SB

I.G. 3401

VENDOR CERTIFIED
DRAWING REV. NO. 2
BY J.D. DATE 1/5/84

* STEEL DID EXIST PER MK.#
MS-1-240-001-S72K, R2, BUT
TRANSFERED TO MK.#
MS-1-240-004-S72K, R1



★ CHANGE NOT MADE BY CMC

FOR OFFICE AND
ENGINEERING USE ONLY

TC# 3401

THIRD PARTY INSPECTION
CODE CLASS: B31.1

REV	DATE	DWN	CHK	APP	DESCRIPTION
1	7-2-81	Q	B		ISSUED FOR VENDOR CERT. REF. MC 9013.22 DXAT407 (SEE NT 1) MK # WAS MS-1-240-004-S75K, REF CPPA 54136, TSDR# 5451 & GTN# 64850
~	~	~	~	~	
~	~	~	~	~	
2	1-3-84	RH	BH		REV'D VENDOR CERT.

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

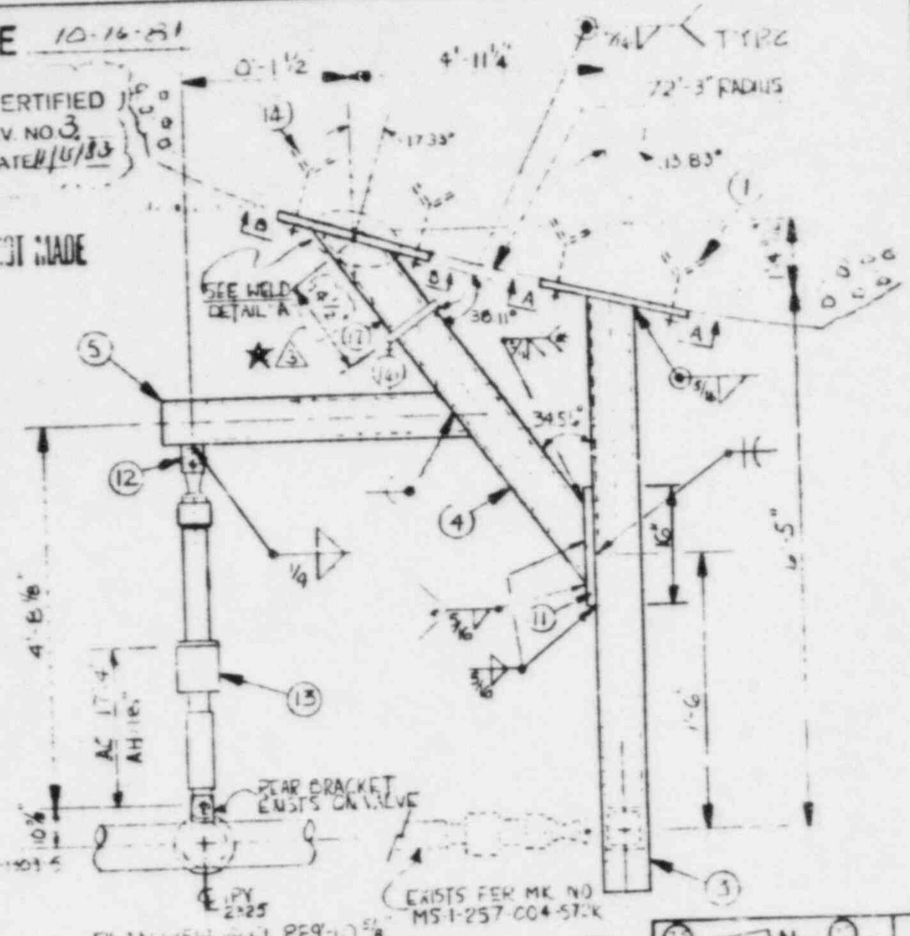
REF. DRAWING NUMBERS
PIPE: ______ ELECT: ______
STEEL: ______ H.V.A.C.: ______

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Pea. 1 & 2
MARK NO. MS-1-240-004-S75K
SKETCH NO.
SHEET 2 OF 2 REV. 2

UELINE 10-16-81

VENDOR CERTIFIED
DRAWING REV. NO. 3
DATE 11/15/83

CHANGE NOT MADE
BY CMC



ITEM NO	MATERIALS & OPERATIONS	QUAN	SHIP
1	[illegible] HILTI KWIK BOLTS (1 ½ MIN EMBED)	4	
2	[illegible]	4	
3	[illegible] (FIELD TRIM TO SUIT)		
4	A 500 GR B [illegible] 4'-10" LG (FIELD TRIM TO SUIT)	1	
5	[illegible] 2'-6" LG (FIELD TRIM TO SUIT)	1	
6	[illegible] PER SECT A-A [illegible]		
7	[illegible] PER SECT B-B [illegible]		
8	[illegible] REAR BRACKET [illegible]		
9	SMA-3-50 SNUBBER [illegible]		
10	ASME NAME PLATE [illegible]		
11	[illegible]		
12	[illegible] REAR BRACKET		
13	SMA-3-50 SNUBBER		
14	[illegible] HILTI KWIK BOLT	4	
15	[illegible]		
16	[illegible]		

FOR OFFICE AND ENGINEERING USE ONLY

REV	DATE	DWN	CHK	APP	DESCRIPTION
3	11-15-83				REC'D VENDOR CERT

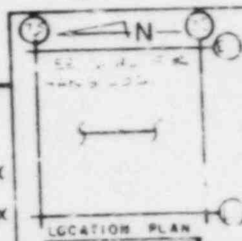
MARK # MS-1-257-003-572K
PAINT: CARBO ZINC # 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ____ SHEET ____ OF ____

NOTE
[illegible] per DCA 7507

Data Point 2500/AB-1-33A
Bldg. SG

NORM. OPER DISPL.	
DX	
DY	
DZ	



THIRD PARTY INSPECTION
CODE CLASS

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

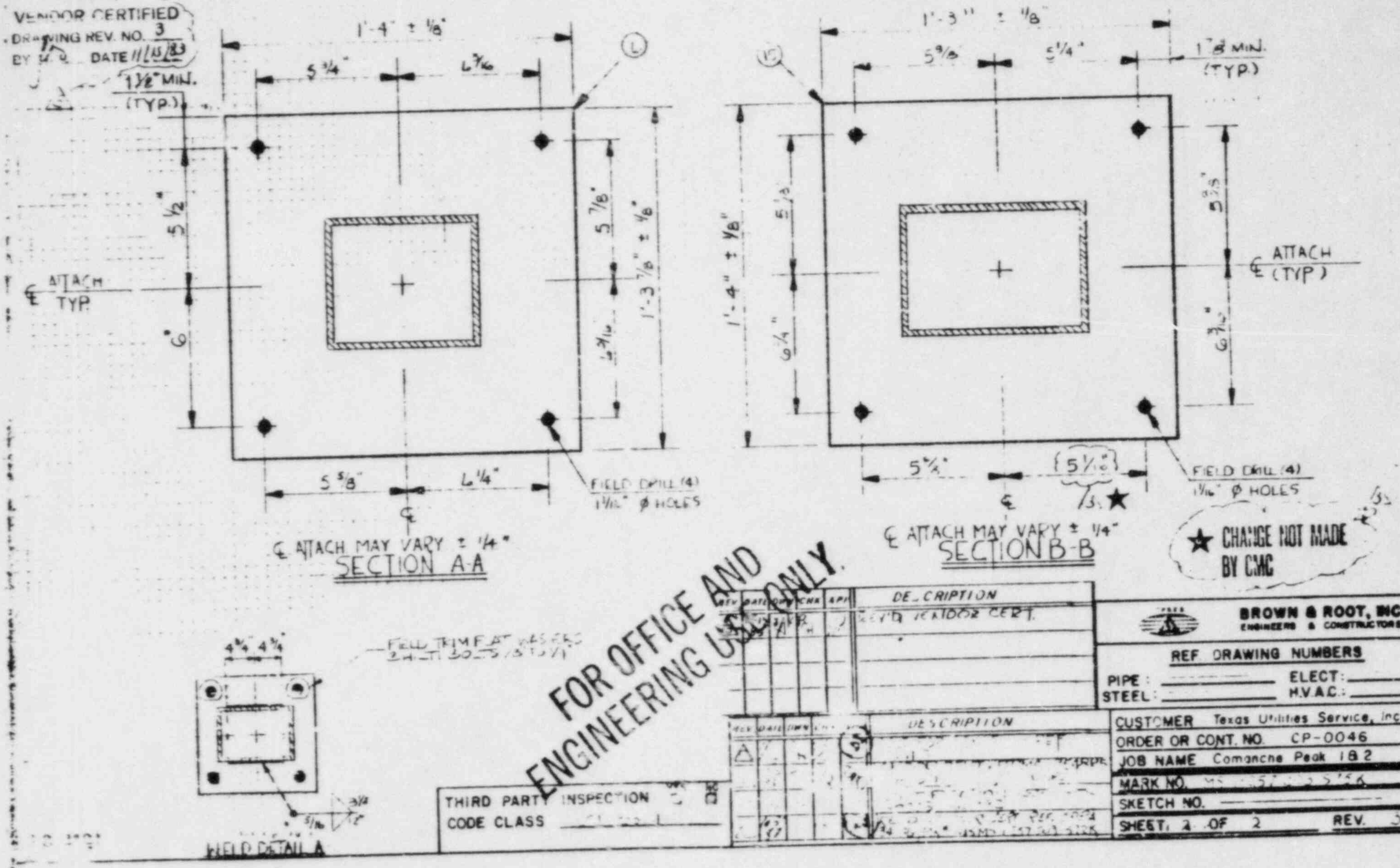
REF DRAWING NUMBERS
PIPE:
STEEL:
ELECT:
HVAC:

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET						
EMERGENCY						
FAULTED						

CUSTOMER Texas Utilities Service, Inc
ORDER OR CONT NO CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO MS-1-257-003-572K
SKETCH NO
SHEET 1 OF 2 REV 3

BLUELINE 10-16-84

VENDOR CERTIFIED
DRAWING REV. NO. 3
BY H.R. DATE 11/15/83



FOR OFFICE AND ENGINEERING USE ONLY.

REV	DATE	DWN	CHK	APP	DESCRIPTION
3					REV'D VENDOR CERT.

THIRD PARTY INSPECTION
CODE CLASS

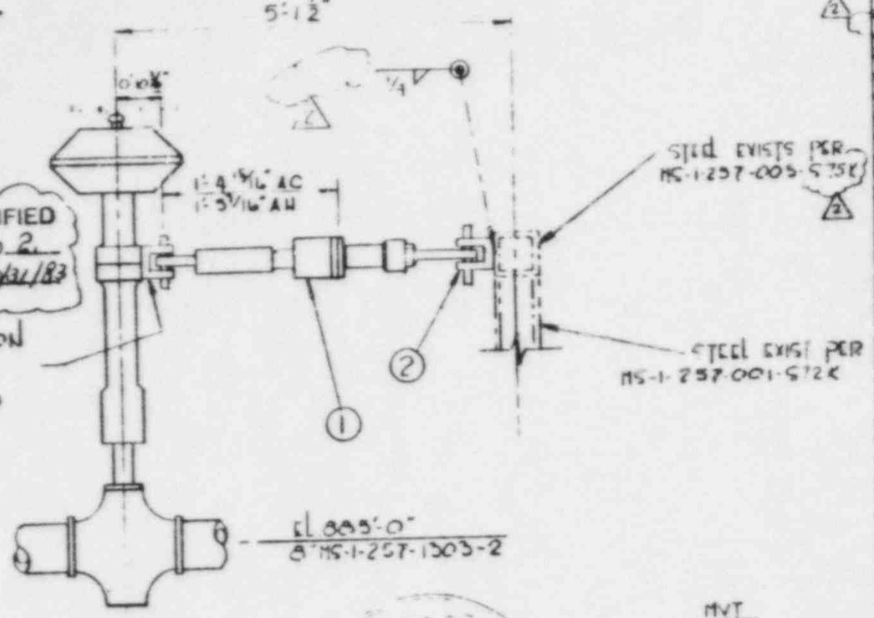
BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: ELECT:
STEEL: H.V.A.C.:

CUSTOMER Texas Utilities Service, Inc.
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 & 2
MARK NO.
SKETCH NO.
SHEET: 2 OF 2 REV. 3

BLUELINE: 13 OCT 81

AS-BUILT



ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP
1	SHA-5-50		
2	RBB-10 REAR BRACKET		
3	ASME III NAMEPLATE		
	MARK # MS-1-257-004-S75K		
	CARBOZINC #11		

FOR OFFICE AND ENGINEERING USE ONLY

MVT
X = .506
Y = .363
Z = -.714

NOTE:
1) VALVE ASSY. FISHER DWG. NO. 5447500 ATTACH. PER REF. GTN 59831.

NOTE
2) Locking devices for ... per DCA 7607

NORM. OPER. DISPL.	
DX	-.453
DY	-.357
DZ	

Data Point: 2500
Insul. ~ Bldg. SB

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET OF

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: M1-0500 REV. 5 ELECT: ...
STEEL: S1-0614 ... H.V.A.C.: ...

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN						
NORMAL & UPSET						
EMERGENCY						
FAULTED						

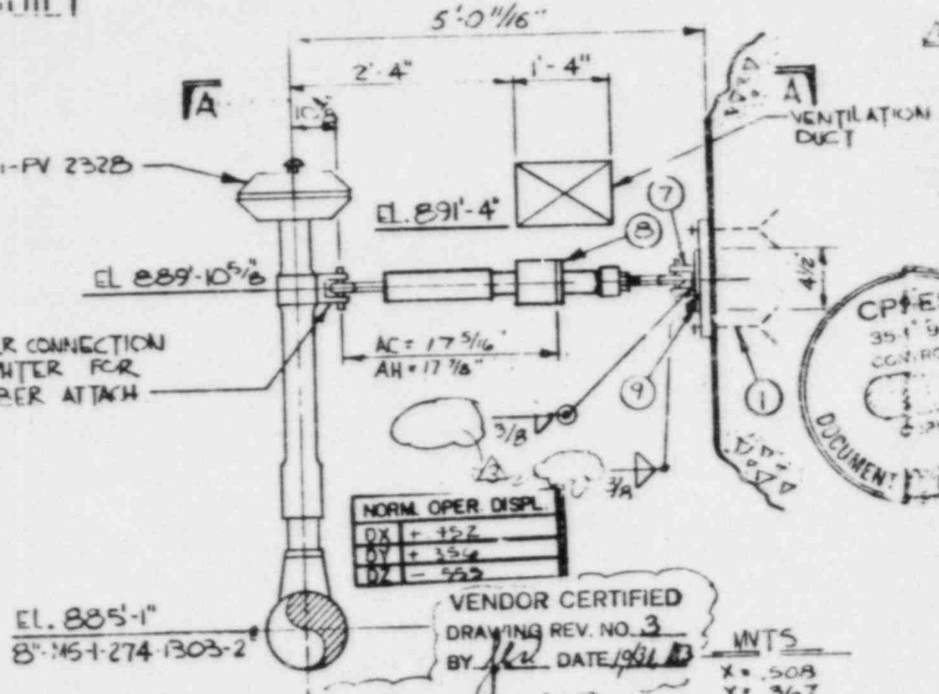
THIRD PARTY INSPECTION
CODE CLASS

REV	DATE	DWN	CHK	APP	DESCRIPTION
0					ISSUE FOR CONST. REF. ... SEE NOTE 1
1	83				REF CMC 63523 ... (SEE NOTE 2) AS BUILT
2					VENDOR CERTIFIED ...

CUSTOMER TEXAS UTILITIES SERVICE, INC.
ORDER OR CONT. NO. CP-0046
JOB NAME COMANCHE PEAK S.E.S.
MARK NO. MS-1-257-004-S75K
SKETCH NO.
SHEET 1 OF 1 REV. 2

BLUELINE — 18 SEPT -1

AS-BUILT



NORM. OPER. DISPL.	
DX	+ .452
DY	+ .356
DZ	− .555

VENDOR CERTIFIED
DRAWING REV. NO. 3
BY jkr DATE 1981

MNTS
X = .508
Y = .367
Z = -.601

CPSES
CONTROL
DOCUMENT

NOTE
ASSY FISHER
DWG NO. 2-A1509
ATTACHMENT TO CONT. BLDG.
PER PROB REF GTN 39831
devices for ... bolts ... required ... 7607.

TO/3401

ORIG. ISO.	MS-1-SB-46-R.2
P.D. ISO	MS-1-SB-46 REV 1
...	5797/A3-1-230 R.0
MAT'L	SA 333 GR 6
...	BLDG SB

ITEM NO.	MATERIALS & OPERATIONS	QUAN.
	1/2" x ... HILTI KWIK BOLT (4 1/2" MIN EMB) ...	4
1	... REAR BRACKET ...	1
2	SMA-1-50 SNUBBER ...	1
3	1" C.S. PL PER SECTION "B-B" (SA-515 GR 65/	1
4	(SA-36)	
5	ASME III NAMEPLATE	1
6	C.S. PL 2" x 2 1/2" x 2'-4" LG. (SA-...	1
7	... 10 REAR BRACKET	1
8	SMA 3 ... SNUBBER	1
9	C.S. PL 2" x 4" x ... (SA-36)	1

FOR OFFICE AND ENGINEERING USE ONLY

REV	DATE	DWN	CHK	APP	DESCRIPTION
3					REV'D VENDOR CERT. REF CMA-34136 MK# WAS MS-1-274-003-S72K

MARK: MS-1-274-003-S75K
PAINT: CARBO ZINC 11

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. ___ SHEET ___ OF ___

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS
PIPE: M1-0600 R3 ELECT: E1-0603-...
STEEL: S1-0619 R3 H.V.A.C.: M1-0655 R...

CONDITIONS	Fx	Fy	Fz	Mx	My	Mz
DESIGN	—	—	—	—	—	—
NORMAL & UPSET	—	—	+.973 -.1915	—	—	—
EMERGENCY	—	—	+3290	—	—	—
FAULTED	—	—	—	—	—	—

REV	DATE	DWN	CHK	APP	DESCRIPTION
0					ISSUED FOR CONST. REF ITT REV 0 FMHS GTN 39831
1					REV AS NT'D REF ...
2					... REF CMC# 20... 37R
3	~	~	~	~	VENDOR CERTIFICATION REF. GTN# 61005

CUSTOMER TEXAS UTILITIES SERVICE INC

ORDER OR CONT. NO. CP 0046

JOB NAME COMANCHE PEAK 1+2

MARK NO. MS-1-274-003-S75K

SKETCH NO.

SHEET 1 OF 2 REV. 3

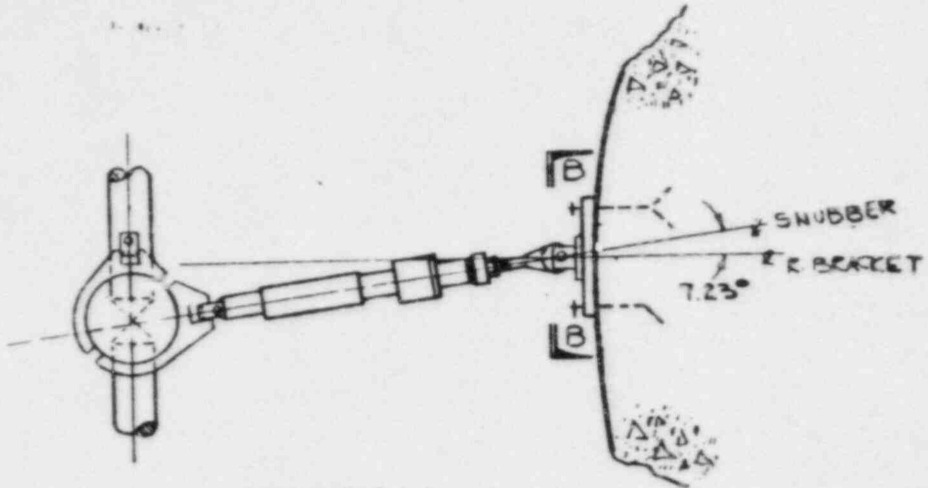
THIRD PARTY INSPECTION

CODE CLASS: ANSI B31.1

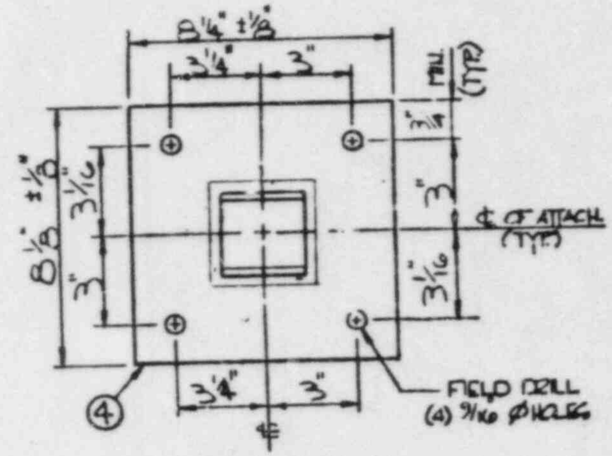
BLUELINE — 18 SEPT 81

AS-BUILT

FOR OFFICE AND ENGINEERING USE ONLY



SECTION "A-A"



SECTION "B-B"

VENDOR CERTIFIED
DRAWING REV. NO. 5
BY [illegible] DATE 10/31/83

CPSES 35-1195 CONTROL COPY DOCUMENT CONTROL CENTER

TO/ 3401

THIRD PARTY INSPECTION
CODE CLASS ANSI B31.1

BROWN & ROOT, INC.
ENGINEERS & CONSTRUCTORS

REF. DRAWING NUMBERS

PIPE: — ELECT: —
STEEL: — H.V.A.C.: —

REV	DATE	DWN	CHK	APP	DESCRIPTION
0	[illegible]	[illegible]	[illegible]	[illegible]	ISSUED FOR CONST. REF. ITT REV 0, FMHS GTN 30831
1	[illegible] 32	[illegible]	[illegible]	[illegible]	REV. AS NT'D REF CMC 56031 R1 & DCA 7607 SEE NT2 AS-BUILT
2	9-24-83	RD	[illegible]	[illegible]	[illegible] VENDOR CERTIFICATION GTN 61005
3	[illegible]	[illegible]	[illegible]	[illegible]	REV'D VENDOR CERT., REF CMR [illegible] MK# was MS-1-274-009-S72K

CUSTOMER TEXAS UTILITIES SERVICE INC.
ORDER OR CONT. NO. CP-0046
JOB NAME COMANCHE PEAK 1+2
MARK NO. MS-1-274-009-S75K
SKETCH NO.
SHEET 2 OF 2 REV. 3

CC: C.M. SAN, C. CORBAN

Gibbs & Hill, Inc.

Interoffice Memorandum

TO:	H. MENTEL / S. LIM	DATE:	6/14/84
FROM:	J.C. PEIR / W. THONGUTHAI	JOB NO:	2323-046
SUBJECT:	REFINED SEISMIC ANCHOR MOVEMENTS FOR MAIN STEAM LINES OUTSIDE CONT. PROB. AB-1-23A, 23B, 23C, 23D	REF. NO:	SA-T 502 YOUR MEMO DATED 6/4/84 BY H. MENTEL/S. LIM

PER YOUR REQUEST IN THE ABOVE REFERENCED MEMO, WE HAVE CALCULATED THE REFINED SEISMIC ANCHOR MOVEMENTS FOR MAIN STEAM LINES (AS-BUILT PIPING PROBLEM AB-1-23A, 23B, 23C AND 23D) CONSIDERING THE ACTUAL LOCATION OF SUPPORTS ON THE FLOOR. THE VERTICAL SEISMIC ANCHOR MOVEMENT AT THE PENETRATION ELEV. 877'-6" IS 0.35" FOR SSE AND 0.21" FOR $\frac{1}{2}$ SSE. THERE IS NO REDUCTION AT THE SNUBBERS AND PENETRATION IN THE HORIZONTAL DIRECTIONS.

REF: DHI-11C, SET 10, REV. 0

TEXAS UTILITIES GENERATING COMPANY

OFFICE MEMORANDUM

To Nancy Williams/Lee Weingart Glen Rose, Texas July 6, 1984

Subject CYGNA Energy Services-Phase 3 - Main Steam Relief Valves

Reference: July 3 letter to N. Williams (CYGNA) from L. Popplewell (TUGCO)

Per the referenced letter, TUGCO stated that the snubbers on the main steam relief valves were capable of resisting the 'as-built' normal and upset and emergency loads. However, the valve has not been evaluated to determine if it is able to transfer loads from the piping system to the snubbers. TUGCO will pursue this issue with Fisher Controls Company and any required corrective actions will be resolved.

If there are any further questions in this regard, please contact me at extension 500 at the site.

Very Truly Yours,

George Grace

GG/jrf

Distribution
NHW, LJW
84042 File

CYGNA
JOB NO.: 84042
DATE LOGGED: 7/6/84
LOG NO.: #52
FILE: 2.1.1 Inc. Cor
CROSS REF. FILE: 2.1 Inc. Cor Log

Distribution:
N. Williams
J. Minichiello
L. Weingart
84042/IPF

TUSI - SITE
(TELECOPY)

GTT- 10424

ATTENTION: J.T. MERRITT/D.H. WADE/M.R. McBAY

JULY 11, 1984

SUBJECT: FOLLOW-UP INFORMATION FROM G&H

REFERENCE: GTN-69218 DATED JULY 5, 1984

CYGNA	
JOB NO:	84042
DATE LOGGED:	7/11/84
LOG NO.:	#53
FILE:	21 ...
CROSS REF FILE	21 ...

BY COPY OF THIS TELEX TO NANCY WILLIAMS OF CYGNA, ATTACHED ARE THE FOLLOWING INTENDED G&H PLAN OF ACTIONS ON THE FOLLOWING ITEMS:

A) PLAN OF ACTION ADDRESSING THE SUPPORT LOAD INCREASES IDENTIFIED BY CYGNA IN THEIR REVIEW OF THE REVISED ANALYSIS RESULTS OF AB-1-61A ATTACHED TO GTN-69218 DATED JULY 5, 1984

B) PLAN OF ACTION ADDRESSING EQUIPMENT NOZZLE CONNECTIONS AND THE CONSIDERATION OF A STRESS INTENSIFICATION FACTOR FOR A TAPERED TRANSITION JOINT.

UPON REVIEW OF THESE INTENDED PLANS SHOULD ANY QUESTIONS ARISE, PLEASE CONTACT HENRY W. MENTEL.

R.E. BALLARD/H.W. MENTEL R. E. Ballard

TO: NANCY WILLIAMS (CYGNA CALIF.)

G&H PLAN OF ACTION

AB-1-61A G&H LUMPED MASS MODEL AND SUPPORT LOAD INCREASE IDENTIFIED BY CYGNA

IN THEIR REVIEW OF THE G&H RESPONSE REGARDING AB-1-61A AND THE INCLUSION OF INSULATION AND WATER WEIGHTS, CYGNA QUESTIONED SUPPORT LOAD INCREASES IDENTIFIED IN THE G&H SUPPLIED LOAD TABLES. TO RESOLVE CYGNA'S CONCERN, G&H INTENDS TO DO THE FOLLOWING:

A) REVIEW THE APPROACH TAKEN REGARDING THE ADDITION OF LUMPED MASS POINTS IN OUR RESPONSE IN GTN-69218 ON THIS ITEM, AND PROVIDE AN EXPLANATION. IN ADDITION A REVIEW WILL BE MADE OF SUPPORT LOAD CHANGES AND THE IMPACT ON SUPPORT DESIGN.

B) A REVIEW BY RANDOM SAMPLE OF ADDITIONAL STRESS PROBLEMS TO CHECK ADHERENCE BY THE G&H ANALYSTS TO THE AS-BUILT CHECKLIST CRITERIA WITH REGARDS TO LUMPED MASS POINT SPACING THE RANDOM SAMPLE WILL BE OF 10% OF THE LARGE BORE PIPING ANALYSIS (i.e.; 27 OF 272 STRESS PROBLEMS)

G&H PLAN OF ACTION

EQUIPMENT NOZZLE CONNECTIONS AND THE CONSIDERATION OF A STRESS INTENSIFICATION FACTOR FOR A TAPERED TRANSITION JOINT TTJ

G&H'S RESPONSE TO THIS ITEM WAS AN EXPLANATION AS TO THE PROCEDURE FOLLOWED REGARDING EQUIPMENT NOZZLES BEING TREATED AS TAPERED TRANSITION JOINTS. SINCE IN THEIR SAMPLE CYGNA IDENTIFIED THAT 1/3 OF THE NOZZLES REVIEWED DID NOT CONSIDER A STRESS INTENSIFICATION FACTOR FOR A TAPERED TRANSITION JOINT, A MORE QUANTITATIVE RESPONSE IS REQUIRED. G&H INTENDS TO DO THE FOLLOWING

A) REVIEW OF CYGNA'S SAMPLE AND FOR EACH CASE EITHER PROVIDE JUSTIFICATION FOR NOT USING SIF OR VERIFY THAT STRESSES ARE STILL WITHIN ALLOWABLES SHOULD AN SIF FOR A TAPERED TRANSITION JOINT BE REQUIRED.

B) BASED UPON A) ABOVE PERFORM AN EXPLANDED REVIEW ON ALL LARGE BORE EQUIPMENT NOZZLES AND ASSESS WHETHER AN SIF WAS USED OR NOT AND EVALUATE THE IMPACT.

NOTE: CYGNA'S SAMPLE

PROBLEM	NODE
AB-1-61C	378, 420, 439
AB-1-151D	1
AB-1-40	34
AB-1-57	76, 116
AB-1-167B	204
AB-1-50G	1, 17

PROJECT FILE

Distributed
84042 PF
D. Minichiello
N. Williams
C. Wong

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760-4438
Telex
Domestic 127636 958606
International 428813 / 234475

A Dravo Company

CYGNA
JOB NO.: 84042
DATE LOGGED: 7/12/84
LOG NO.: #57
FILE: 2.1.1 Inc. CR
CROSS REF. FILE: 2.1 Inc. CR log

GTN- 69233

July 10, 1984

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Mgr.

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
FOLLOWUP INFORMATION FROM G&H
REF: CYGNA COMMUNICATIONS REPORT DTD 7/2/84

By copy of this letter to Nancy Williams of CYGNA, attached please find a response to question 1 of the referenced CYGNA communications report.

Should you have any questions, please contact either S. Lim or H. Mentel.

Very truly yours,

GIBBS & HILL, Inc.

S M Marano

Robert E. Ballard, Jr.
Director of Projects

HWM

REBa-HWMe:lc
1 Letter
~~cc:~~ N. Williams (CYGNA, Calif.) 1L 1A
G. Grace (TUSI Site) 1L 1A
D. Wade (TUSI Site) 1L
L. Weingart (CYGNA, Calif.) 1L 1A
ARMS (B&R Site) OL + 1A

Dravo

G&H RESPONSE TO CYGNA COMMUNICATIONS REPORT DATED JULY 2, 1984
1:30 pm -- QUESTION 1

In performing the as-built stress analyses for the main steam loops, inside containment, the effect of trapeze supports was not included in the original analyses (rev. 0). However, the support weights were included in the original analyses. Then a judgment was made to incorporate the effect of trapeze supports for the inside containment main steam loops.

Since the entire system consisted of snubbers and deadweight spring hangers, it was deemed that the effect of modeling trapezed snubber supports into the analyses would have insignificant impact on deadweight loads and also would have no impact on design. Hence no revision was made to the deadweight loads.

In the instance where CYGNA has noted an upset load of 51.3 kips as opposed to the 49.6 kips reported in the as-built calculation, the differences are minor. However, this 51.3 kip load exceeds the components 50 kip prescribed upset allowable. It should be noted that the emergency and faulted loads meet the prescribed emergency and faulted component allowables. This 1.3 kip exceedence of the components 50 kips allowable is minor and would not have any design impact because of the inherent conservatism in the analyses. One such conservatism is in the generation of the hydraulic forcing functions for use in the steamhammer analysis. A second source of conservatism is in the absolute addition of seismic inertia loads, seismic anchor loads and steamhammer loads. All three of the above mentioned events generate time dependent loads and as such, the possibility of all three instantaneous maximums occurring simultaneously are remote.

PROJECT FILE

Distribution
JC Finneran
J. Wiesquest
N. Williams
84042 PF

CPPA-39,734

TEXAS UTILITIES GENERATING COMPANY
P. O. BOX 1002 · GLEN ROSE, TEXAS 76043

July 9, 1984

CYGNA Energy Services
101 California Street
San Francisco, CA 94111

ATTENTION: Ms. Nancy Williams, Project Manager

COMANCHE PEAK STEAM ELECTRIC STATION
CYGNA REVIEW QUESTIONS
(FISHER VALVES)

Reference: July 3 letter to N. Williams (CYGNA) from L. Popplewell (TUGCO)

Dear Ms. Williams:

Per the referenced letter, TUGCO determined the 'as-built' normal/upset and emergency loads were within the allowables of the NPSI type SMA-3 snubbers supporting the main steam relief valves, (1-PV-2325, 1-PV-2326, 1-PV-2327, 1-PV-2328). However, a further evaluation is required to determine if the main steam relief valves are capable of transferring the enveloping loads of the snubber attachments. TUGCO will evaluate this in concurrence with Fisher Control Company. If any corrective actions are required as a result of this evaluation, TUGCO will take the necessary corrective steps. Furthermore, in addition to these four valves, all other Fisher Controls Company supplied valves with similar support configurations will be reviewed for potential impact.

If there are any further questions in this regard, please contact Mr. George Grace at extension 500 at the site.

Very Truly Yours,

TEXAS UTILITIES GENERATING COMPANY

CYGNA
JOB NO.: 84042
DATE LOGGED: 7/12/84
LOG NO.: 255
FILE: 2.1 / m.c. 02
CROSS REF. FILE: 2.1 / m.c. 03, 1cc

L.M. Popplewell
Engineering Manager

GG/jf

cc: ARMS

PROJECT FILE

Rec. 7-12-84

TEXAS UTILITIES GENERATING COMPANY

P. O. BOX 1002 · GLEN ROSE, TEXAS 76043

84042 Telecopy File

CYGNA	
JOB NO:	84042
DATE LOGGED:	7/12/84
LOC NO.:	#56
FILE:	2.1.1 Doc. CR
CROSS REF. FILE	2.1 Doc. CR Log

To: J. Minichiello, C. Wong, N. Williams, G. Bjorkman

July 12, 1984

CYGNA Energy Services
101 California Street
San Francisco, California 94111

Attention: Ms. Nancy Williams
Project Manager

COMANCHE PEAK STEAM ELECTRIC STATION
CPSES CYGNA REVIEW
(PIPE SUPPORTS)

REF: 1) April 19, 1984 letter to N. Williams (CYGNA) from L. Popplewell (TUGCO)
2) July 11, 1984 Telecon between J. Minichiello (CYGNA) and J. C. Finneran (TUGCO)

Dear Ms. Williams:

This letter responds to CYGNA's concerns regarding "bumpers" on supports on the main steam line and on weld calculations for composite sections.

As previously discussed in Reference 1 above (Page 8, Question 3), TUGCO believes that these support configurations are acceptable and we do not agree with CYGNA's assessment of these supports. However, in order to satisfy CYGNA's concerns, we have re-analyzed the stress problems for the pipes with these supports completely removed from the analysis. This evaluation results in no over-stressed piping or supports. Therefore, in the event these supports would behave in an unstable manner (which TUGCO does not believe will happen) and in the event that the bumpers would not perform their intended function, there would be no detrimental effects on these piping systems.

Per Reference 2 regarding the main steam supports with composite sections, the calculation packages for these supports did not consistently include a calculation of the appropriate stresses in the welds between structural members and cover plates for composite sections. However, all the subject welds were acceptable for all stresses. In order to satisfy CYGNA's concerns in this regard, we have reviewed all supports on the 18" feedwater lines and 30" service water lines to determine if composite sections were utilized. We only found one other support on a feedwater line where a composite section was used. The weld stresses in this support were acceptable.

If there are any further questions regarding the above issues, please contact Mr. J. C. Finneran at the site at Extension 521.

Very truly yours,

TEXAS UTILITIES GENERATING COMPANY
ENGINEERING DIVISION

L. M. Popplewell
Project Engineering Manager

LMP/JCF/GG/cp

cc: D. H. Wade
J. C. Finneran

PROJECT FILE

MAVivirito, JLEichler/CMJan, ELBezkor/AMKenkre, HWMentel, PTHuang, SMMarano/, REBallard, TDHawkins/HMLapinig, OUTGOING

CYGNA	
JOB NO.:	84042
DATE LOGGED:	7/13/84
LOG NO.:	#58
FILE:	21.1 Inc. OR
CROSS REF. FILE	2.1 Inc. OR Log

Domestic 127636/968894
International 428813/234475
A Dravo Company

July 13, 1984

GTN-69250

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Mgr.

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
FOLLOWUP INFORMATION FROM G&H
REF 1: CYGNA COMMUNICATIONS REPORT DTD 7/2/84
REF 2: GTN-69233 DTD 7/10/84

By copy of this letter to Nancy Williams of CYGNA, attached please find a response (to supplement that given in ref. 2) to question 1 of the referenced CYGNA Communications Report.

Should you have any questions, please contact either Steve Lim or Henry Mentel.

Very truly yours,

GIBBS & HILL, Inc.

R. E. Ballard

Robert E. Ballard, Jr.
Director of Projects

REBa-HWMe:lc
1 Letter + 1 Attachment
CC: ARMS (B&R Site) OL + 1A
N. Williams (CYGNA, Calif.) 1L 1A (telecopied)
G. Grace (TUSI Site) 1L 1A
D. Wade (TUSI Site) 1L
L. Weingart (CYGNA, Calif.) 1L 1A

Dravo

SUPPLEMENTARY RESPONSE TO ITEM 1 OF CYGNA TELECOPIED QUESTIONS ON JULY 2, 1984

In reference to the minor differences in snubber loads reported in the computer printouts and the calculation book, the analyst in his or her judgment deemed the load changes to be small and as such would have no impact on the support designs. As a consequence, the calculation book was not updated to reflect these new loads and these minor load changes were not reported in the pipe support vendor certification.

PROJECT FILE Distribution

S. Bibo
D. Smedley
P. DiDonato
N. Williams
84042 PF

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760-4438
Telex
Domestic 127636/968694
International 428813/234475

A Dravo Company

July 3, 1984

CYGNA	100
JOB NO.:	84042
DATE LOGGED:	7/16/84
LOG NO.:	#59
FILE:	2.1.1 Misc. CR
CROSS REF. FILE	2.1 Misc. CR Log

GTN- 69212

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project ~~Gen. Manager~~

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
REF: 1) CYGNA LETTER 84042.007 DTD. 6-23-84
2) GTN-69190 DTD. 6-29-84

Please be advised that G&H would like to modify GTN-69190 (Ref. 2) para. C as follows:

Para. C - Gibbs & Hill, Inc. response: Please delete a reference to ad-hoc committee since that committee's function was based on technical evaluation rather than that of QA management review.

Our efforts to locate records substantiating management reviews prior to 1976 was unsuccessful. We therefore conclude that this function was not performed prior to 1976.

Should you have any questions, please contact B. Czarnogorski at (212) 760-8343.

Very truly yours,

GIBBS & HILL, INC.

S M Marano

Robert E. Ballard, Jr.
Project Manager

REBa-BCz:sce
84
1 Letter

cc: ARMS (B&R Site) OL
N. Williams (CYGNA Ca.) 1L
~~S. Bibo (CYGNA Boston)~~ 1L
D. Wade (TUSI Site) 1L
G. Grace (TUSI Site) 1L

Dravo

84042 Telecopy File
N. Williams
S. Bibo
D. Smedley

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760- 4438
Telex:
Domestic: 127636/968694
International: 428813/234475

A Dravo Company

CYGNA
JOB NO. 84042
DATE LOGGED: 7/16/84
LOG NO. #60
FILE 2.1.1 Inc. CR
CROSS REF. FILE 2.1 Inc. CR log

July 12, 1984

GTN- 69245

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Mgr.

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
ADDITIONAL RESPONSE TO CYGNA LTR 84042.007 DTD 6/23/84
REF: GTN-69190 DATED JUNE 29, 1984

In Gibbs & Hill's response to CYGNA Energy Services letter of June 23, 1984, via the referenced letter, we indicated that we were continuing to search files for documentation supporting Concern No. 2b of their letter. We are providing the following additional response concerning Management Review Evaluation Reports.

CYGNA's Finding

2b. Management Review Evaluation Reports could not be found for the time period from 1974 through 1976.(1) This requirement has been established since September 1974 in G&H Procedure QA-4...it appears that these activities form an integral part of the G&H corrective action system.(2)

Please determine if documentation exists for.., Management Review Evaluations from 1974 through 1977(1) as required by G&H Procedure QA-4. (Emphasis Added)

Gibbs & Hill, Inc.

Gibbs & Hill's Response - Statements (1) and (2) above are somewhat misleading, since they give the impression that:

1. No management review was performed during the period 1974 through 1977. There is also inconsistency between the dates mentioned under Statement (1), as reported by CYGNA.

2. The Management Review function forms an integral part of Gibbs & Hill's corrective action system. This implied that the corrective action system was not duly performed or completed.

In response to item (1), it is to be noted that the requirement to perform the management review function was included in G&H Procedure QA-4, Rev. 3 dated September 1974. Accordingly, the first round of management reviews was expected to take place in 1975 (i.e., within a year of issuing the procedure). This was done in August 1975. Although we have been unsuccessful, so far, in retrieving this 1975 Report, we can demonstrate that the 1975 management review was indeed performed. By examining the cover sheets and part of the check lists of the 1976 management review reports (see attached copies), it is stated: "Date of previous management review: August 1975. This demonstrates that the 1975 review was indeed performed.

Also, it is to be noted that the checklist used for the management review included a provision to check and verify corrective actions of previous reviews. This was done, as evidenced in the 1976 Report. In other words, any action which was recommended as a result of the 1975 review was verified in the 1976 review. This completes the action and demonstrates that this function was done as required by the G&H Program.

Further, management reviews of successive years (i.e., 1976 and later) were performed and the reports are on file and were presented to CYGNA's representative.

In response to item (2), the statement that "those activities form an integral part of G&H corrective action system", this statement misrepresents the intent of the management review function and discredits G&H's corrective action system. It further implies that G&H did not correct those activities. Since this is not the case, we would point out that correction of deficiencies identified by audits, surveillance or any other means, were dealt with, corrected and verified as part of G&H's audit/surveillance program which was already in place. The management review objective was to assess part performance to improve future operation, under the QA program, and strengthen the preventive action measures.

With this response we believe that we have addressed to our satisfaction all concerns raised by CYNGA's letter 84042.007.

If we can provide additional information in this regard, please advise.

Very truly yours,

GIBBS & HILL, Inc.

R. E. Ballard

Robert E. Ballard, Jr.
Director of Projects

REBa-MSM:lc
1 Letter + 1 Attachment
CC: ARMS (B&R Site) OL + 1A
N. Williams (CYGNA, Calif.) 1L+1A (telecopied)
S. Bibo (CYGNA, MA) 1L+1A
D. Wade (TUSI Site) 1L+1A

DEPARTMENT MECHANICAL ENGINEERING

AUDIT NO. 76-1 DATE JULY 26, 1976

OCT. 29, 1976 REV.

DEPARTMENTAL MANAGEMENT AUDIT

DATE OF PREVIOUS AUDIT: AUGUST 27, 1975

NEXT AUDIT SCHEDULED FOR: MAY 1977

PERSONNEL AUDITED AND TITLE: E. HOROVITZ - SUPV. MECH. ENGINEERING

M. FITTER - SR. I&C ENGINEER

A. SCARIMBOLO - LEAD MECH. DESIGN ENGR.

REFERENCE AUTHORITY: GIBBS & HILL QUALITY ASSURANCE MANUAL PROCEDURE QAI-G

C. NEW ITEMS OR SUGGESTED IMPROVEMENTS (SEE PAGE 3A FOR ADDITIONAL ITEMS)

1- QAII-E should include specific instructions to file the original of the Tech. Description sign-off record forms with the Tech. Description. (audit check list item 3.2 C)

2- Exhibit 3 of QAII-B3.1 (form F777, 2-75) should be revised to include space for inserting the issue date of the index. (audit check list item 3.2 D).

D. PREVIOUS AUDIT STATUS:

	YES	NO
1. WERE DEFICIENCIES OF THE PREVIOUS AUDIT SATISFACTORILY RESOLVED?	✓	

REMARKS:

	YES	NO
2. WAS NECESSARY CORRECTIVE ACTION TAKEN TO PREVENT REPORTED DEFICIENCIES?	✓	

REMARKS:

	YES	NO
3. IS ADDITIONAL CORRECTIVE ACTION REQUIRED?	✓	

REMARKS: See item F, page 4.

DEPARTMENT Electrical

AUDIT NO. 2 DATE 10/12/76

DEPARTMENTAL MANAGEMENT AUDIT

DATE OF PREVIOUS AUDIT: 1975

NEXT AUDIT SCHEDULED FOR: 1977

PERSONNEL AUDITED AND TITLE: L.E. O'Brien - Senior Electrical Engineer

J.A. Walsh - Lead Design Engineer

Engineers & Designers (Electrical)

OPPD - Fort Calhoun 2
Job No. 564

REFERENCE AUTHORITY: GIBBS & HILL QUALITY ASSURANCE MANUAL PROCEDURE QAI-G

C. NEW ITEMS OR SUGGESTED IMPROVEMENTS:

1. (3.0B) Procedure QAII-B.7 should be amended to ensure that a copy of the SAR sign-off record is given to the job engineer.

2. (3.5D) QAII-B.6 para. 6.4(d) should be clarified to resolve the difference in interpretations between QA and engineering.

3. QAII-E provides for distribution of specs and addenda to all but the

(cont'd on back)

D. PREVIOUS AUDIT STATUS:

	YES	NO
1. WERE DEFICIENCIES OF THE PREVIOUS AUDIT SATISFACTORILY RESOLVED?	N/A	

REMARKS: There were no deficiencies in Audit No. 1.

	YES	NO
2. WAS NECESSARY CORRECTIVE ACTION TAKEN TO PREVENT REPORTED DEFICIENCIES?	N/A	

REMARKS: There were no Corrective Action Requests in Audit No. 1.

	YES	NO
3. IS ADDITIONAL CORRECTIVE ACTION REQUIRED?	X	

REMARKS: Yes, as a result of new deficiencies found and noted hereafter.

DEPARTMENT Structural

AUDIT NO. 2 DATE June 1976

DEPARTMENTAL MANAGEMENT AUDIT

DATE OF PREVIOUS AUDIT: August 7, 1975

NEXT AUDIT SCHEDULED FOR: January 10, 1977

PERSONNEL AUDITED AND TITLE: I.K. Shah, Senior Engineer - Job Engineer Valdecaballeros

J.G. Ortiz, Senior Engineer - Job Engineer Ft. Calhoun 2

C.S. Chen, Senior Engineer - Squad Leader Ft. Calhoun 2

A. M. Kenkre, Senior Engineer - Squad Leader Comanche Peak

REFERENCE AUTHORITY: GIBBS & HILL QUALITY ASSURANCE MANUAL PROCEDURE QAI-G

MANAGEMENT AUDIT REPORT

A. SUMMARY OF THE AUDIT ANALYSIS:

Valdecaballeros and Ft. Calhoun were fully audited. Comanche Peak was audited as a review of the previous management audit of August 7, 1975. A. M. Kenkre for Comanche Peak, I. K. Shah for Valdecaballeros and J. G. Ortiz and C. S. Chen for Ft. Calhoun 2 were interviewed. Conformance within the Department to the QA Manual was found satisfactory as regards procedures and understanding. Valdecaballeros and Ft. Calhoun 2 are in a stage where all procedures are not yet auditable.

B. QA PROGRAM REVIEW:

IN VIEW OF THIS AUDIT AND REVIEW OF THE QA PROGRAM AND CORPORATE PROCEDURES:

	YES	NO
A. IS THE QA PROGRAM ADEQUATE TO MEET THE G&H'S MANAGEMENT POLICIES, GOALS AND OBJECTIVES?	X	

REMARKS:

	YES	NO
B. ARE THE EXISTING PROCEDURES ADEQUATE AND IN SUFFICIENT DETAIL TO MEET THE REQUIREMENTS OF APPLICABLE REGULATORY GUIDES, CODES AND STANDARDS FOR NUCLEAR SAFETY-RELATED SYSTEMS STRUCTURES AND COMPONENTS	X	

REMARKS:

Gibbs & Hill, Inc.

11 Penn Plaza
New York, New York 10001
212 760- 4438
Telex
Domestic 127536/968694
International 428813/234475

A Dravo Company

July 20, 1984

GTN-69279

Texas Utilities Generating Company
Post Office Box 1002
Glen Rose, Texas 76043

Attention: Mr. J. B. George
Vice President/Project Gen. Mgr.

Gentlemen:

TEXAS UTILITIES GENERATING COMPANY
COMANCHE PEAK STEAM ELECTRIC STATION
G&H PROJECT NO. 2323
G&H FOLLOWUP ACTIVITIES FOR CYGNA (PHASE 3)

Attached please find G&H status report for the following activities:

1. Mass Participation Fraction Sensitivity Study
2. Equipment Nozzle Connections and the Consideration of a Stress Intensification Factor for a Tapered Transition Joint (TTJ)
3. AB-1-61A, G&H Lumped Mass Model and Support Load Increase.

Should you have any comments contact Henry W. Mentel (x6302).

Very truly yours,

GIBBS & HILL, Inc.

S M Marano

Robert E. Ballard, Jr.
Director of Projects

HWMe

REBa-HWMe:lc
1 Letter + 1 Attachment
CC: ARMS (B&R Site) OL + 1A
N. Williams (CYGNA Calif.) 1L 1A
D. Wade (TUSI Site) 1L 1A (Telecopied)
C. Grace (TUSI Site) 1L 1A

TRANSMITTED BY TELECOPIER
7-20-84

Dravo

PLAN OF ACTION - MASS PARTICIPATION FRACTION SENSITIVITY STUDY
REF: GTN-69162 DATED JUNE 26, 1984

The above referenced GTN established a three (3) point plan of action. To date, via GTN-69176 dated June 29, 1984 Item 1 (expanded explanation of survey) and Item 2a (problem selection) have been completed. Item 2b has now been completed by the creation of a magnetic input tape. This tape has already been transferred to CYGNA (Boston) via GTN-69249 dated July 13, 1984. Based upon verbal communications with Mr. Leo Colborne of CYGNA (Boston) (July 18, 1984), the tape is in their office, has been mounted onto their system, and the five (5) input files are readible. Additional communications took place on July 18, 1984 with both Nancy Williams and Dr. Gordon Bjorkman at G&H, New York, regarding G&H personnel traveling to CYGNA's Boston office. Both parties agreed that the trip should take place Monday, July 23, 1984. Henry Mentel and Steve Lim will be in CYGNA's office on Monday and Tuesday; during that time the five (5) selected problems will be run and load comparison tables (1/2 SSE inertia) for supports will be developed. The input tape and all computer runs will be brought to the G&H, New York office. A preliminary report of findings will be prepared for Friday, July 27, 1984. Any number of continued followup actions may result:

a. Need for an expanded review (more problems)

b. Further re-analysis of the five (5) selected problems (with refinements to reduce loads)

c. Submittal of revised loads to PSE to check support adequacy.

PLAN OF ACTION - EQUIPMENT NOZZLE CONNECTIONS AND THE CONSIDERATION OF A STRESS INTENSIFICATION FACTOR FOR A TAPERED TRANSITION JOINT (TTJ)
REF: GTT-10424 DATED JULY 11, 1984

The referenced GTT established a possible two (2) part plan of action. To date, Part A is essentially completed. A report of findings will be prepared on Monday, July 23, 1984. Based upon preliminary findings it is presently felt that the expanded review alluded to in Part B will not be necessary. This will hinge upon CYGNA's acceptance of our findings issued on Part A.

PLAN OF ACTION - AB-1-61A G&H LUMPED MASS MODEL AND SUPPORT LOAD INCREASE
REF: GTT-10424 DATED JULY 11, 1984

The referenced GTT established a plan of action. The following activities are underway:

a. A review of existing 61A analyses

b. A re-analysis of 61A with additional mass points to define their effect

c. The selection of the 27 problem samples for review.

It is anticipated that a response on both parts will be prepared on August 3, 1984.

TEXAS UTILITIES GENERATING COMPANY
P. O. BOX 1002 · GLEN ROSE, TEXAS 76043

May 17, 1984

CYGNA
JOB NO: 84042
DATE LOGGED: 5/21/84
LOG NO.: #13
FILE: 2.1 Inc. CR
CROSS REF. FILE 2.1 Inc. CR Log

CYGNA Energy Services
101 California Street
Suite 1000
San Francisco, CA 94111

Attention: Ms. Nancy Williams, Project Manager

SUBJECT: COMANCHE PEAK STEAM ELECTRIC STATION
CYGNA REVIEW QUESTIONS

Reference: Williams (CYGNA) to Grace (TUGCO) Telecon Dated May 15, 1984

Dear Ms. Williams:

Per your request of the referenced telecon, enclosed is the following:

1. Calculation packages for supports MS-1-001-004-S72R and MS-1-003-004-S72R.
2. The index of Gibbs & Hill's Analytical Engineering Guides and Procedures (AEG's and AEP's).
3. The seismic qualification package FQP-5A-1.
4. Memorandum SAT-426.
5. Testimony of the ASLB hearings for June 1983 (Sections of possible interest marked in yellow) and June 1982.
6. TUGCO response regarding seismic acceleration question.

In addition, per your letter 83090.007 dated April 24, 1984, enclosed is a list of all stress problems with hangers in two or more buildings.

If you have any further questions or comments, please contact Mr. George Grace at CPSES site (Ext. 500).

Very truly yours,

TEXAS UTILITIES GENERATING COMPANY
ENGINEERING DIVISION

M. E. McKay
for L. M. Popplewell
Project Engineering Manager

RECEIVED
MAY 21 1984
CYGNA - SAN FRANCISCO

LMP/GG/lp
cc: D. Wade, File