UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	Docket Nos. 50-445 and 50-446
TEXAS UTILITIES ELECTRIC COMPANY, ET AL.	)	
	)	(Application for Operating Licenses)
(Comanche Peak Steam Electric Station, Units 1 and 2)	)	

AFFIDAVIT OF JOHN C. FINNERAN, JR. REGARDING CONSIDERATION OF FRICTION FORCES IN THE DESIGN OF PIPE SUPPORTS WITH SMALL THERMAL MOVEMENTS

I, John C. Finneran, Jr., being first duly sworn hereby depose and state, as follows: I am the Project Pipe Support Engineer for the Comanche Peak Steam Electric Station. In this position, I oversee the design work of all pipe support design organizations for Comanche Peak. I have previously provided testimony in this proceeding. A statement of my professional and educational qualifications was received into evidence as Applicant's Exhibit 142B.

Q. What is the purpose of your affidavit?

A. This affidavit addresses an allegation made by CASE regarding consideration of friction loads in pipe supports for which piping movements are 1/16" or less. This question concerns two of the three support design organizations (PSE and ITT-Grinnell) which do not require its designers to

consider such loads. All three organizations consider friction loads where piping movements are greater than 1/16".

Q. What is CASE's allegation on this topic?

A. CASE alleges in Chapter XVI of its Proposed Findings that this friction load must be calculated for all piping movements, arguing that the point at which friction forces may be most significant is at the point movement of the pipe begins (CASE Proposed Findings at XVI-4). At the request of the Board during the May 1983, hearings, Mr. Doyle performed a simple analysis to illustrate his position (CASE Exhibit 843; following Tr. 6824). In that exhibit, Mr. Doyle first addresses the support configuration which would, in his opinion, have the most dramatic effects, _i.e._, a relatively short stiff tube steel cantilever beam (Tr. 6759; CASE Exhibit 843 at 1-2).

Q. What were the results of Mr. Doyle's analysis?

A. Mr. Doyle concludes (CASE Exhibit 843 at 1) that to apply the procedure he thought should be applied would result in a "gross conservatism" and the condition his calculation indicated would result "could not exist." As Mr. Doyle apparently recognized (Tr. 6757, 6759; CASE Exhibit 843 at 1), the true friction load for movements less than 1/16" would be the lesser of:

1. The normal load on the support times the coefficient of friction, or

2. The amount of force needed to deflect the support a distance equal to the thermal movement of the pipe.

The procedure he applied in CASE Exhibit 843 was the latter, the results of which indicated that if one were to substitute the first method to achieve equivalent loads, a 10,000 pound normal load would have had to be placed on the beam from the pipe with a resulting stress of 60,000 psi. Because a 10,000 pound normal load could not be placed on the beam from the pipe (the actual normal load would be on the order of 1,000 pounds), Mr. Doyle recognized his simple calculation resulted in "outlandish" numbers. In fact, Mr. Doyle eventually concluded his concern "really doesn't exist, except on a theoretical level" (Tr. 6825) and "dwindles into insignificance" (Tr. 6829).

Q. Why did Mr. Doyle's calculation produce "outlandish" numbers?

A. Mr. Doyle assumed that the cantilever beam would deflect the full 1/16". He then simply calculated the friction force needed to cause this deflection in the beam. This would obviously have given the hypothetical maximum stress in the beam if the friction between the pipe and the beam were maintained through the entire 1/16" movement. However, this calculation has no relation to the physical phenomena present when friction is used to transmit a force. As Mr. Doyle recognized, for the friction to be maintained between

the support beam and the pipe in order to transmit the load calculated for the full 1/16" movement, an extraordinary normal force would have to be placed on the beam by the pipe. In reality, a significantly smaller normal force would exist such that the maximum friction force which could be transmitted into the beam by the movement of the pipe before the friction was broken (and the friction force instantly reduced) would be much less than he had calculated.

Q. After recognizing this calculation technique was not an accurate representation of actual conditions, what did Mr. Doyle conclude?

A. Mr. Doyle concluded that a more rational approach would be to establish some guideline based on stress ratios (actual/allowable loads) for normal and upset conditions such that if the ratio were, for example .900, then friction should be included in the calculation (CASE Exhibit 843 at 2).

Q. Do you believe it is necessary to adopt this recommendation of Mr. Doyle's?

A. No. What Mr. Doyle apparently did not recognize was that the allowables Applicants use for normal and upset conditions are the stress limits established by the ASME Code for primary, mechanical loads. If friction conditions resulting from the thermal growth of the pipe, *i.e.*, effects which result from the restraint of free-end displacements,

were to be combined with those mechanical loads, the ASME Code permits the allowables to be increased by a factor of three (ASME Code Section NF-3231.1). Thus, given that, as Mr. Doyle recognizes, the friction loads are a small contribution to the total support loads there would not be any condition where a combination of those loads would exceed the increased allowable even if the stress ratios were 1.0 before consideration of the friction loads. In addition, with respect to Hilti bolts, because Applicants use a factor of safety of 5:1, rather than the 4:1 value authorized by I&E Bulletin 79-02, when establishing Hilti allowables, the effects of friction for these small movements would not cause the actual allowables of the Hilti's to be exceeded even if the Hilti loads were right at the conservative allowable employed by Applicants.

Q. Have Applicants performed any further evaluation of Mr. Doyle's concern since the May 1983 hearings?

A. Yes. In order to provide added assurance of the adequacy of Applicants' design process in this regard, we have assessed a sample of actual supports in the field which are within the category of supports with which Mr. Doyle had his principal concern, namely short, stiff members with relatively large pipes. We first examined support SW-1-012-009-A33R, which is referenced on page XVI-1 of CASE's

Proposed Findings, and was discussed in Section 16 of CASE Exhibit 669B (Doyle Exhibits). Our analysis of this support (Attachment A) demonstrates that even including the friction load for this support in the Normal and Upset loading condition, in the manner shown in Section 16 of CASE Exhibit 669B, results in maximum member stresses, weld stresses, plate stresses, and Hilti interactions that are all within applicable allowables.

In addition, we randomly selected 5 other supports which fall into the area of Mr. Doyle's concern, and which all have a thermal movement less than 1/16". These supports were analyzed by including the friction forces in the level A and B loading conditions. See Table 1 (attached) for the results. As shown in Table 1, all stresses are within allowables. It should be noted that these are the regular normal and upset allowables and they have not been increased as allowed by the Code. All Hilti bolt interactions are less than 1.

In sum, these analyses demonstrate that the friction effects of concern to Mr. Doyle are indeed insignificant and Applicants' support designs provide more than adequate

capacities to accommodate these effects even if grossly conservative assumptions are employed. As Mr. Doyle stated, this concern truly "dwindles into insignificance."

John C. Finneran, Jr.

John C. Finneran, Jr.

Subscribed and sworn to before me this 16th day of May 1984.

My Commission Expires January 31, 1985

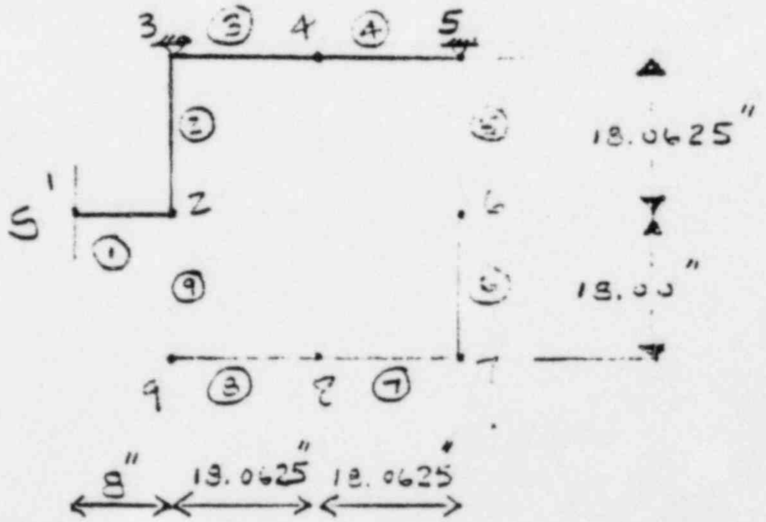
M. Pamela Blake

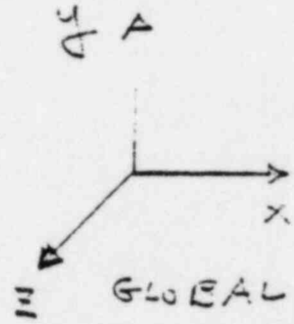
Notary Public

OBJECTIVE:

TO QUALIFY THE M4x13, 1"x16x16" C.S. PL, 1"x9" HILTI'S, AND 3/16" WELD ON MK. NO. SW-1-012-009-F33K REV. 1 USING D.W. + TH LOADS WITH FRICTION DERATED (IF NECESSARY) BASED UPON .0625" OF OUT OF PLANE THERMAL MOVEMENT. THE POINTS OF ATTACHMENT OF THE SWAY STRUTS TO THE FRAME WILL BE RESTRAINED IN THE Y-DIRECTION ONLY.

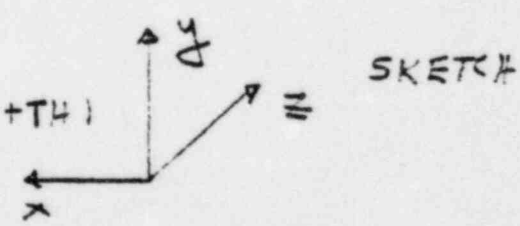
STRUDL MODEL





JOINTS 3, 5 SUPPORTED IN THE Y-DIRECTION WITH FORCES AND MOMENTS RELEASED IN OTHER DIRECTIONS.

LOADINGS (DW+TH)



Fx	Fy
+589/+4768	-5003/-4816

DERATION OF FRICTION

FROM LOADINGS 5 & 6 RESPECTIVELY

JOINT 2 Z DISP. = $\frac{1573}{1000}(.002) = .0031'' < .0625''$

∴

FULL FRICTIONAL FORCE BUILDS UP AT JOINT 2.

JOINT 8 Z DISP. = 1.314"

∴

$\frac{1.314}{1000} = \frac{.0625}{x}$ $x = 47.56^{\#} \approx 48^{\#}$

DISP. CONT. FROM LOAD AT JOINT 2 NOT INCLUDED* NEG.

CONCLUSION: RERUN STRUDL WITH FULL FRICTIONAL FORCE AT JOINT 2 AND DERATED FRICTION ($48^{\#}$) AT JOINT 8.

CODE CHECK

SINCE 'STRESS 2' INDICATOR WAS USED AND NO OUTPUT WAS GENERATED ALL MEMBERS HAVE PASSED CODE CHECK. ALL DISPLACEMENTS IN A RESTRAINED DIRECTION ARE LESS THAN .0625".

WELDS AT JOINTS 1 & 2

SINCE THE WELD CONFIGURATIONS ARE THE SAME AT JOINTS 1 & 2 AND THE LOADINGS AT JOINT 1 ARE MORE SEVERE ONLY JOINT 1 [illegible] BE ANALYZED. ANALYZING FOR THE WORST LOAD CASE (LOADING 3) WE HAVE:

* Fx = 4.768 KIPS Mx = .864 in-KIPS
[illegible] = .296" [illegible] = 13,835"
[illegible]/C = 1.621" [illegible]/C = 1.010"

* COMPRESSION SINCE REACTION IS +.

TREATING THE WELD AS A LINE THE FOLLOWING PROPERTIES HAVE BEEN DETERMINED:

$L_W = 12.63$ in

$S_{Wz} = 16.88$ in^2

$S_{Wy} = 5.17$ in^2

$J_W = 43.95$ in^3

$C_y = 2.00$ in.

$C_z = 1.97$ in

M4X13

$$F_N = \frac{4.768}{12.63} + \frac{13.835}{5.17} + \frac{1.010}{16.88} = 3.113 \text{ K/in}$$

$$F_{Sy} = \frac{.296}{12.63} + \frac{.864(1.97)}{43.95} = .062 \text{ K/in}$$

$$F_{Sz} = \frac{1.621}{12.63} + \frac{.864(2)}{43.95} = .167 \text{ K/in}$$

$$F_R = [3.113^2 + .062^2 + .167^2]^{1/2} = 3.118 \text{ K/in}$$

SINCE THIS SUPPORT HAS BEEN SHOWN ACCEPTABLE FOR DW + TH LOADS ONLY, THE RESULTANT FORCE CAN BE COMPARED TO THREE TIMES THE STRESS LIMITS OF XVII-2000 (PER NF-3231.1a)

$\therefore$

$$3(.3S_u) = 3(.3(60)) = 3(18 \text{ ksi}) = 54 \text{ ksi}$$

$\therefore$

$$F_R = 3.118 \text{ K/in} < .707(3/16)(54) = 7.158 \text{ K/in}$$

BASE METAL ALLOWABLE NOT TO EXCEED SHEAR YIELD $= \frac{S_y}{\sqrt{3}} = .577 S_y \approx .6 S_y$

$$F_R = 3.118 \text{ K/in} < .6 S_y (3/16) = .6(30.5)(.1875) = 3.431$$

THE BASEPLATE AND BOLTS WILL BE ANALYZED BY THE PROGRAM FUB II R3 WHICH IS EXPLAIN IN E.S. 21 REV. A

'TEST STRIP'

INPUT

0.	00
0.	01
0.	02
0.	03
400.	04
500.	05
600.	06
4000.	07
5000.	08
6000.	09
3.	10
4.	11
5.	12
6.	13
4.	14
5.	15
6.	16
7.	17
0.	18
0.	19
0.	20
1.33	21
2.	22
3.	23
0.	24
0.75	25
1.12	26
0.	27
0.	28
0.	29

OUTPUT

F MAX
1880.60

P STR
6591.20

SHEAR
418.00
437.75
449.16
465.71

FUB II R3

ITT Grinnell Corporation

PIPE HANGER ENGINEERING DIVISION

BY RTW DATE 5/8/84 SUBJECT

CHKD. BY JRJ DATE 5-15-84 CUSTOMER 'TUSI'

PROJECT COMM. PEAK

SHEET NO. 5 OF 6

SUPPORT I.D.

OTHER I.D. SA-4995

REF.

FINAL RUN

INPUT

0.	00
0.	01
0.	02
0.	03
0.	04
296.	05
1621.	06
864.	07
13835.	08
1010.	09
6.	10
6.	11
6.	12
6.	13
6.	14
6.	15
6.	16
6.	17
0.	18
0.	19
0.	20
1.	21
1.97	22
2.	23
0.	24
1.	25
1.	26
0.	27
0.	28
0.	29

OUTPUT

F MAX
963.61

P STR
4805.91

SHEAR
504.71
504.71
504.71
504.71

FUB II R3

PLATE STRESS

FROM FUB II R3 OUTPUT

4805.91 psi < 1.5(14500) = 21750 psi

HILTIS 4000 psi CONC

EMBEDMENT DEPTH = 9 - 1 - 1 - .25 = 6.75"

(1 = PL THK; 1 = NUT THK; .25 = TOL.)

ASSUME 6" OF EMBEDMENT

MIN. SPACING = 10 BOLT DIAMETERS
10(1) = 10" < 12" USED

FROM FUB II R3 OUTPUT

F MAX = 963.61 #
SHEAR = 504.71 #

PER COMMANCHE SPEC. A 5:1 FACTOR OF SAFETY IS TO BE USED.

∴

FROM GIBBS & HILL SPECIFICATION NO.
2323-SS-30 APPENDIX 2 PAGE 3 OF 8

F_{ALL} = 4688 #
S_{ALL} = 5375 #
} F.S. = 5.0

$$\frac{963.61}{4688} + \frac{504.71}{5375} = .2994 < 1.0$$

CONCLUSION: THE M4x13, 1"x16"x16" C.S. PL, AND 1"x9" HILTIS MEET ALL CODE REQUIREMENTS.

ITT Grinnell Corporation PIPE HANGER ENGINEERING DIVISION

BY .... DATE .... SUBJECT .... SHEET NO. .... OF ....

CHKD. BY .... DATE .... CUSTOMER .... SUPPORT I.D. ....

PROJECT .... OTHER I.D. ....

REF P

THIS CASE CONSIST OF

- NLU LOADS IN THE RESTRAINED DIRECTION.

- FRICTION FORCES BASED ON .33 (D.W. + TH) DERATED FOR PIPE ACTUAL MVTS IF NECESSARY.

- "STRUTS" MODELLED AS RIGIDS

OBJECTIVE:

TO QUALIFY THE M4x13, 1"x16"x16" C.S. PL, 1"x9" HILTIS AND 3/16" WELD AT JOINT 1 ON MK. NO. SW-1-012-009-A33R REV. 1, STRUDL MODEL I RUN #1 LOADING CASES 1 → 4 WILL BE USED TO EXTRACT FORCES AND MOMENTS AT JOINT 1.

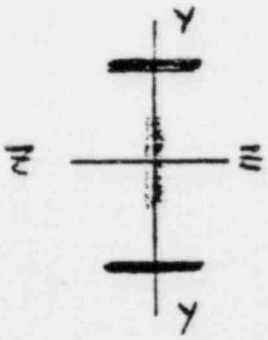
ANALYSIS

"M4x13"

THE M4x13 PASSED ALL CODE CHECK REQUIREMENTS.

" 3/16" WELD AT JOINT 1 "

TREATING THE WELD AS A LINE THE FOLLOWING PROPERTIES HAVE BEEN DETERMINED:



$L_w = 12.63$ in

$S_{wz} = 16.88$ in^2

$S_{wy} = 5.17$ in^2

$J_w = 43.95$ in^3

$C_y = 2.00$ in

$C_z = 1.97$ in

THE FOLLOWING CONDITIONS WILL BE INVESTIGATED:

1) THE WELD STRESS DUE TO AXIAL COMPRESSION AND BENDING WILL BE COMPARED TO THREE TIMES THE ALLOWABLES SHOWN IN TABLE NF-3292.1. IN ADDITION THE SHEAR STRESS ON THE BASE METAL DUE TO BENDING ALONE WILL BE COMPARE TO THE SHEAR YIELD STRESS.

2) THE WELD STRESS DUE TO AXIAL TENSION AND BENDIN WILL BE COMPARED TO THREE TIMES THE ALLOWABLE.

SHOWN IN TABLE NF-3292.1 AND THE SHEAR YIELD STRESS.

NOTE: SHEAR STRESSES WILL BE INTERACTED IN ALL CONDITIONS.

1) AXIAL COMPRESSION & BENDING (LOADING 3)

F_x = 12.018 KIPS M_x = .756 IN.-KIPS
F_y = 1.304 KIPS M_y = 15.438 IN.-KIPS
F_z = 1.631 KIPS M_z = 6.377 IN.-KIPS

$$F_N = \frac{12.018}{12.63} + \frac{15.438}{5.17} + \frac{6.377}{16.88} = 4.315\ K/IN$$

$$F_{Sy} = \frac{1.304}{12.63} + \frac{.756(1.97)}{43.95} = .137\ K/IN$$

$$F_{Sz} = \frac{1.631}{12.63} + \frac{.756(2)}{43.95} = .1635\ K/IN$$

$$F_R = [4.315^2 + .137^2 + .1635^2]^{1/2} = 4.32\ K/IN$$

$$F_{ALL} = 3(18)(.707)(3/16) = 7.158\ K/IN$$

4.32 < 7.158 K/IN O.K.

BENDING ALONE

$$F_N = \frac{15.438}{5.17} + \frac{6.377}{16.88} = 3.363\ K/IN$$

F_{Sy} = .137 K/IN
F_{Sz} = .1635 K/IN

$$F_R = [3.363^2 + .137^2 + .1635^2]^{1/2} = 3.369\ K/IN$$

$$F_{ALL} = .6(30.5)(3/16) = 3.431\ K/IN$$

3.369 < 3.431 K/IN O.K.

2) AXIAL TENSION PLUS BENDING (LOADING 4)

F_x - 6.66 KIPS	M_x - .756 in-KIPS
F_y - 1.306 KIPS	M_y - 1.137 in-KIPS
F_z - .042 KIPS	M_z - 6.366 in-KIPS

$$F_N = \frac{6.66}{12.63} + \frac{1.137}{5.17} + \frac{6.366}{16.88} = 1.124 \ ^{K}/_{IN}$$

$$F_{Sy} = \frac{1.306}{12.63} + \frac{.756(1.97)}{43.95} = .137 \ ^{K}/_{IN}$$

$$F_{Sz} = \frac{.042}{12.63} + \frac{.756(2)}{43.95} = .037 \ ^{K}/_{IN}$$

$$F_R = \left[1.124^2 + .137^2 + .037^2\right]^{1/2} = 1.132 \ ^{K}/_{IN} < 3.431 \ ^{K}/_{IN}$$

SHEAR YIELD ALLOWABLE CONTROLS

BASEPLATE AND BOLTS

THE BASEPLATE AND BOLTS WILL BE ANALYZED BY THE PROGRAM FUB II R3 WHICH IS EXPLAINED IN E.S. 21 REV. A. A WORST LOADING CASE WILL BE RUN ON FUB II R3 REGARDLESS OF LOAD CASE.

F_x - 6.66 KIPS	M_x - .756 in-KIPS
F_y - 1.306 KIPS	M_y - 15.438 in-KIPS
F_z - 1.631 KIPS	M_z - 6.377 in-KIPS

ITT Grinnell Corporation PIPE HANGER ENGINEERING DIVISION

BY RTW DATE 5/15/84 SUBJECT .... SHEET NO. 4 OF 6

CHKD. BY JRJ DATE 5-15-84 CUSTOMER 'TUSI' SUPPORT I.D. ....

PROJECT COMM. PEAK OTHER I.D. SA-4995

REF. P

TEST STRIP

INPUT

0.	00
0.	01
0.	02
0.	03
400.	04
500.	05
600.	06
4000.	07
5000.	08
6000.	09
3.	10
4.	11
5.	12
6.	13
4.	14
5.	15
6.	16
7.	17
0.	18
0.	19
0.	20
1.33	21
2.	22
3.	23
0.	24
0.75	25
1.12	26
0.	27
0.	28
0.	29

OUTPUT

F MAX
1880.60

P STR
6591.20

SHEAR
418.00
437.75
449.16
465.71

FUB II R3

FINAL RUN

INPUT

0.	00
0.	01
0.	02
0.	03
6660.	04
1306.	05
1631.	06
756.	07
15438.	08
6377.	09
6.	10
6.	11
6.	12
6.	13
6.	14
6.	15
6.	16
6.	17
0.	18
0.	19
0.	20
1.	21
1.97	22
2.	23
0.	24
1.	25
1.	26
0.	27
0.	28
0.	29

OUTPUT

F MAX
3138.04

P STR
15542.33

SHEAR
756.52
756.52
756.52
756.52

FUB II R3

PLATE STRESS

FROM FUB II R3 OUTPUT

15542.33 psi < 1.5 (14500) = 21750 psi

HILTIS 4000 psi CONC

EMBEDMENT DEPTH = 9 - 1 - 1 - .25 = 6.75"

(1 = PL THK.; 1 = NUT THICK; .25 = TOL.)

ASSUME 6" OF EMBEDMENT

MIN. SPACING = 10 BOLT DIAMETERS

10(1) = 10" < 12" USED

FROM FUB II R3 OUTPUT

FMAX = 3138.04 LBS

SHEAR = 756.52 LBS

PER COMMANCHE SPEC. A 5:1 FACTOR OF SAFETY IS TO BE USED

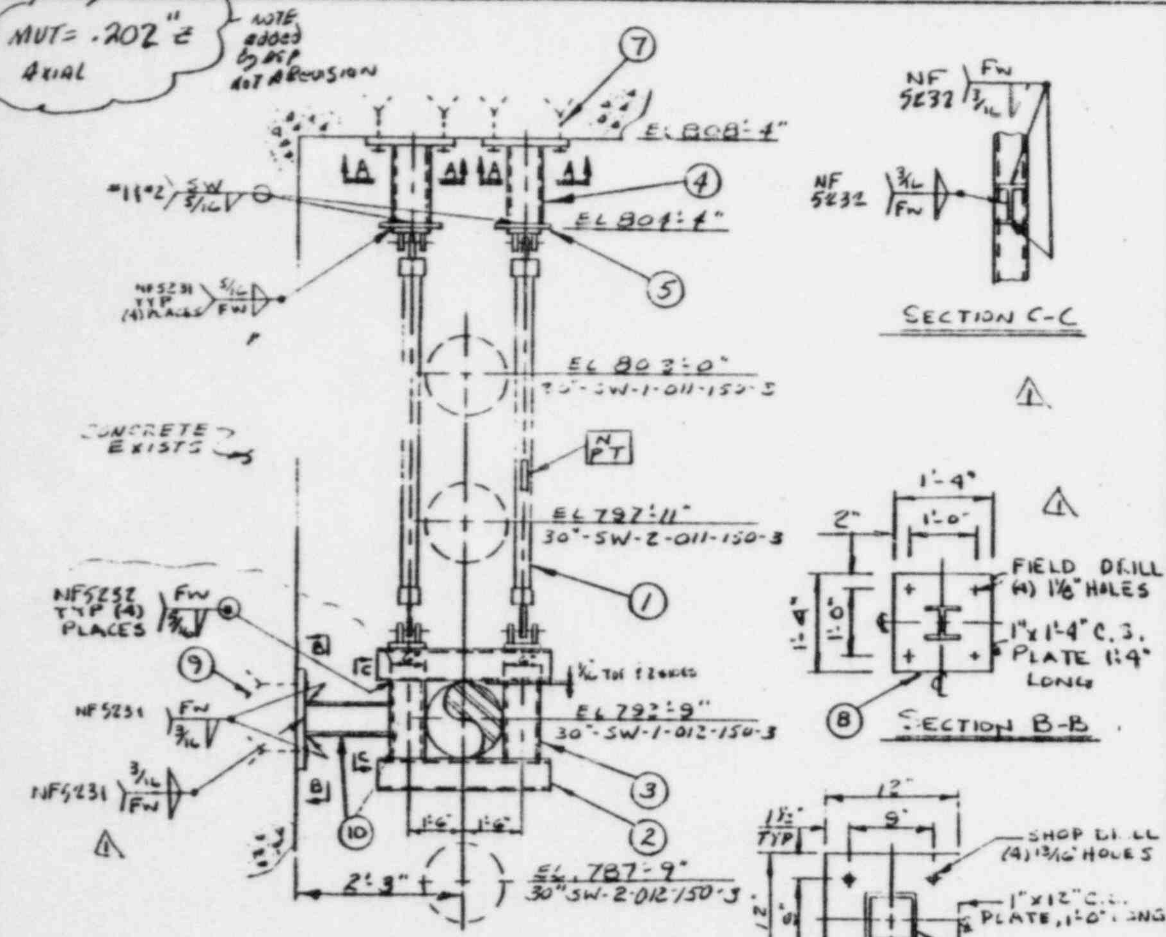
∴

FROM GIBBS & HILL SPECIFICATION NO. 2323-SS-30 APPENDIX 2 PAGE 3 OF 8

FALL = 4688#
SALL = 5375#
} F.S. = 5.0

$$\frac{3138.04}{4688} + \frac{756.52}{5375} = .81 < 1.0$$

CONCLUSION: THE M4X13, 1"X16"X16" C.S. PL, AND 1"X9" HILTIS MEET ALL CODE REQUIREMENTS.



ITEM NO.	MATERIALS & OPERATIONS	QUAN.	SHIP.
	SEISMIC SWAY STRUT ASSEMBLY CONSISTING OF:	ONE	
	MATERIAL EXISTS IN FIELD		
1	Fig. 211 #2 Sway Strut Assembly Option #2 W=8'-6 1/4", Load=13,316#	2	
2	6"x6"x1/2" T.S. (A500 GR.B) 3'-7" Long, TW=247#	2	
3	4"x6"x3/8" T.S. (A500 GR.B) 2'-6½" Long, TW=110#	2	
4	6"x6"x1/2" T.S. (A500 GR.B) 3'-10" Long, TW=264#, Shop Center & Weld Each End To Items #5 & #6 As Shown	2	
5	1"x7" Carbon Steel (SA515 GR.65 or SA-36) Plate, 0'-7" Long, TW=28#	2	
6	Carbon Steel (SA515 GR.65 or SA-36) Plate/ Section A-A, TW=82#	2	
7	3/4"x10" Hilti Kwik Concrete Anchor, TW=5#	4	
	NEW MATERIAL REQUIRED BY FIELD		
8	1"x1'-4" Carbon Steel (SA-36 or SA-515 GR 65) Plate 1'-4" Long, TW=73#	1	
9	1"x9" (I144) Hilti Kwik Concrete Anchors	4	
10	M4x13, (SA-36) 0'-5" Long, TW=5#	1	

Apply one coat of Carbo Zinc #11 to above mat'l except th'ds which shall be coated w/a rust preventative.

SEISMIC ASSEMBLY SKETCH AND ENGINEERING 1
BUNDLE AND TAG 1
MARK # SW-1-012-009-A33R

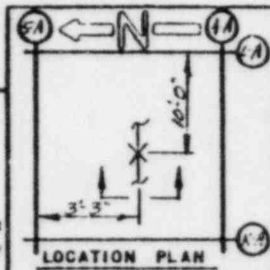
	Fx	Fy
D + TH	+5091/+9768	-5003/-4916
N + U	-6660/+12318	-12567/+2218
EMER	-11480/+16838	-19147/+9377

Approved By: DSP
Date: 5/8/78

NOTES A: Material by ITT Grinnell
1) All tolerances in accordance with QCP #2A001 U. N. O.
2) Fab. Procedure is FH-101-N-4
3) All products designed in accordance with EPL File No. 1 Rev. 9

G.H.I. Iso. MI-3233-36-REV.C
I.P.B. Iso. SW-1-AB-02 REV 11
Data Point 1790 / PROB #68C-1A
Pipe Mat'l. SA155 CLASS1, SCH 20
Insul. ______ Bldg. AUX

1,2,3&4	1-01-1-13	I-SF-1502NF-2
Shop Field No.	Weld Procedure	Exam. Procedure

THIRD PARTY INSPECTION YES [X] NO [ ]
CODE CLASS: ASME III-3

FOR MATERIALS AND OPERATIONS SEE SKETCH NO. SHEET

ITT GRINNELL
PIPE HANGER DIVISION
REF. DRAWING NUMBERS
PIPE: MI-0704-REV.10 ELECT: E1-0700-31-REV.1
STEEL: S-0702-REV.11 H.V.A.C.: MI-0705-REV.3

CONDITIONS	Fx	Fy	Fz	M
DESIGN				
NORMAL & UPSET	±11500	±13385		
EMERGENCY	±18132	±21010		
FAULTED				

REV.	DATE	ENG. BY	ENG. CHK.	DWN. BY	CHK. BY	DESCRIPTION
0	3/1/78	RW	HK	SW	CTD	ISSUED FOR CONSTRUCTION
1	5/8/78	RCC	JF	JF	EB	ADD BRACE DSP 5/22/78
2						
3						
4						

CUSTOMER Texas Utilities Se
ORDER OR CONT. NO. CP-0046
JOB NAME Comanche Peak 1 &
MARK NO. SW-1-012-009
SKETCH NO.
SHEET 1 OF 1

V6

TABLE 1

SUPPORT #	CASE	COMB. BEND + COMP. STRESS INTERACTION	SHEAR STRESS	WELD T.S. TO BASE PLATE	PLATE STRESS	BOLT INTER.	REMARKS
	LEV. A & F	0.40	1884 PSI	2706 #/In	* 4500	* 0.5 to 0.7	* Plate stress and bolt interaction is estimated by comparing results of Lev. C which has been previously run.
CT1-004-011-S32R	LEV. B & F	0.49	2388 PSI	3394 #/In	* 5500	* 0.3 to 0.5	
	ALLOW.	1.0	13100 PSI	3976 #/In	(A) 14500 PSI (B) 21700 PSI	1.0	
	LEV. A & F	0.038	209 PSI	1604 #/In	2957 PSI	0.35	
SW1-129-088-Y33R	LEV. B & F	0.051	666 PSI	1775 #/In	3428 PSI	0.384	
	ALLOW.	1.0	13100	7660 #/In	(A) 14500 PSI (B) 21700 PSI	1.0	
	LEV. A & F	*0.04	3694 PSI	1280 #/In	*8900 PSI	*0.4	*Estimated by comparing to Level B
SW1-010-001-A33R	LEV. B & F	0.069	4174 PSI	1532 #/In	9959 PSI	0.46	
	ALLOW.	1.0	13100 PSI	3181 #/In	(A) 14500 PSI (B) 21700 PSI	1.0	
	LEV. A & F	0.58	891 PSI	3042 #/In	12065 PSI	0.59	
SI1-029-055-S32R	LEV. B & F	0.61	891 PSI	3152 #/In	14972	0.50	
	ALLOW.	1.0	12700 PSI	3181 #/In	(A) 14500 PSI (B) 21700 PSI	1.0	
	LEV. A & F	0.20	1088 PSI	1391 #/In	6671 PSI	0.48	
SW1-129-060-543R	LEV. B & F	0.31	2507 PSI	3214 #/In	9372	0.67	
	ALLOW.	1.0	13100 PSI	3712 #/In	(A) 14500 PSI (B) 21700 PSI	1.0	