QA Record

DNE CALCULATIONS

TITLE: System: 74 Calculations for Pipe Support: 47A437-1-7	PLANT/UNIT WBN/UNIT 1
PREPARING ORGANIZATION Bechtel Job 20652	KEY NOUNS (Consult RIMS DESCRIPTORS LIST) Pipe Support, Hanger, Civil Calculation
BRANCH/PROJECT IDENTIFIERS 47A437 01 007	Each time these calculations are issued, preparers must ensure that the original (RO) RIMS accession number is filled in.

Rev	(for RIMS' use)	RIMS accession number
R0	820428E0065	SWP '82 0413 303
R1	900419C0014	B18 '90 0314 085
R2	900615C0033	B18 '90 0501 080
R3	900731F0008	B18 '90 0703 004

APPLICABLE DESIGN DOCUMENT(S): WB-DC-40-31.9

SAR SECTION(S): 3.9 | UNID SYSTEM(S): N/A

Revision 0	R-1	R2	R3
ECN No. (or indicate Not Applicable) or DCN No. N/A	P-0571I-A	P-0571I-A	N/A
Prepared TVA	V.D. Patel	P. SEN	F Yeung
Checked TVA	M. Arsala	C. mehta	S. Shah
Reviewed TVA	BMT C. mehta	C. mehta	S. Shah
Approved TVA	Dr Jagannath	Dr Jagannath	[signature]
Date 8-12-'80	2-24-90	4-21-90	~~6-13-90~~ 6-21-90
List all pages added by this revision.	SEE	SEE	SEE
List all pages deleted by this revision.	REV.	REV	REVISION
List all pages changed by this revision.	LOG	LOG.	LOG
These calculations contain unverified assumption(s)	Yes ☐ No ☒	Yes ☒ No ☐	Yes ☒ No ☐

Use form 10534 if more space required

Safety-related? Yes ☒ No ☐

Statement of Problem

Document design calculations for pipe support referenced in calculations title.

ORIGINAL

Abstract

This calculation verifies the structural adequacy of the subject pipe support.

Legibility evaluated and accepted for issue.

Signature [signature] 2/28/90 Date

B2, B3, B4

☐ Microfilm and store calculations in RIMS Service Center.

☐ Microfilm and return calculations to: RETURN TO: BNAPC 7th FLOOR DOC. CONTROL

☐ Microfilm and destroy.

Address: CEB

cc: RIMS, SL 26 C-K

1/5/90

EN DES CALCULATIONS

TITLE: SUPPORT CALCS FOR 47A437-1-7		UNID SYSTEM(S):	PLANT/UNIT: WBNP-1 SAR SECTION(S):
[redacted] ING ORGANIZATION: SWP MECH. #3	REV	(FOR MEDS USE)	MEDS ACCESSION NUMBER
APPLICABLE DESIGN DOCUMENTS: WB-DC-40-31.9	R0	820428E0065 (10)	SWP '82 0413 303
BRANCH/PROJECT IDENTIFIERS: (1) WMG 1024 (2) 47A437O1007	R1		
KEY NOUNS: HANGERS, PIPE SUPPORTS	R2		
	R3		

REV	R0	R1	R2	R3
DATE	8-12-80			
PREPARED	M. Ogle			
CHECKED	D K Schulte.			
SUBMITTED	AC Robertson			
APPROVED	AC Robertson			
ATTACHMENTS MICROFILMED:				
LIST ALL PAGES * ADDED BY THIS REV:				
[redacted] PAGES * [redacted] BY THIS REV:				
LIST ALL PAGES * CHANGED BYTHIS REV:				

V.P.P. 2-14-90
N.A. 2/15/90

STATEMENT OF PROBLEM

DOCUMENT DESIGN CALCS FOR PIPE SUPPORT DWGS LISTED ABOVE

ABSTRACT

R0 47A437-1-7 (REV 2) FOUND TO BE ADEQUATE

TVA

SYSTEM: 74

Title: CALCULATIONS FOR PIPE SUPPORT: 47A437010D7

REVISION LOG

Sheet No. i

Revision No.	DESCRIPTION OF REVISION	Date Approved
1	SUPPORT REQUALIFIED PER HAAUP CALCULATION REPLACED IN ITS ENTIRETY THIS CALCULATION SUPPORTS DCN # P-05711-A . " REV. 0 - OF REVISION LOG IS NOT AVAILABLE.	2-24-90
2	SUPPORT REQUALIFIED PER HAAUP REVISED DUE TO NEW LOAD THIS CALCULATION SUPPORTS DCN # P-05711A REVISED SHTS ii, 2, 3 REPLACED SHTS. A1, A2, 11 ADDED SHTS 4.1	4-21-90

NAME (PRINT)	SIGNATURE	INITIALS
ANIL JAIN	Ajain	AJ
A. PAPADOPOULOS	A. Papadopoulos	AP
VIKRAM. D. PATEL	V. D. Patel	V.D.P.
MATI ARSALA	M. Arsala	M.A.

NAME (PRINT)	SIGNATURE	INITIALS
PARTHA SEN	P. Sen	PS
CHAND MEHTA	C. mehta	CM

TVA

SYSTEM: 74

Title: CALCULATIONS FOR PIPE SUPPORT: 47A437-1-7

REVISION LOG
Sheet No. ii

Revision No.	DESCRIPTION OF REVISION	Date Approved
3	SUPPORT REQUALIFIED PER HAAUP ADDED: SHEET iii* & ATTACH. H (H1), SHT. 12 AND SHT. A3, A4, A5 OF ATTACH. ~~A~~ DELETED: _____ REVISED: SHEETS ii*, 2, 3, 10, 11, G1 THIS CALCULATION SUPPORTS DCN# P-0571 1 A . NAME (PRINT) / SIGNATURE / INITIALS F YONG / F Yong / FY SURESH SHAH / Suresh Shah / S. Shah MARVIN P. ANDRIADE / [signature] / MPA / / / * SHEET ii REVISED & RENAMED SHEET iii	6-21-90 ~~6-19-90~~

TVA 10534 (EN DES-4-78)

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	2	iii

ORIGINATOR	DATE	CHECKED	DATE
V.D. Patel	2/23/90	M. Arsala	2/24/90

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	F Yong	6/6/90	S. Shah	6/7/90

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
2	P.Sen	4/20/90	C.Mehta	4/20/90

TABLE OF CONTENTS

SECTION	DESCRIPTION	SHEET NO.	
	Cover Sheet		
	Revision Sheets	i, ii	3
	Table of Contents	iii	
1.0	Purpose	1	
1.1	Assumptions	1	
1.2	Sources of Data/References	2-3	
1.3	Calculations	4, 4.1, 5-10 / 3-~~10~~	2
1.4	Conclusion	11-12	3

ATTACHMENT NO.	DESCRIPTION	SHEET NO.	
A	Load Data Sheets	A1 - ~~A2~~ A5	3
B	Pipe Support Configuration Data	B1 - B5	
G	Unverified Calculation Assumption Form	G1	
N/A	HAAUP Open Item Transmittal	—	
D	CIVIL/MECH. REQUEST MEMO.	D1 - D2	
E	FAPPS OUTPUT - (ME-150)	E1 - E15	
F	IAP OUTPUT	F1 - F10	
H	CQR # BP-R053	H1	3

NOTE: Total numbers of sheets in this calculation to be microfilmed including attachments ~~50~~ ~~51~~ 57. | 3

CALCULATION SHEET

BEPC-2706 Rev. 8/86 (ED-69)

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A437O1007	1	1

ORIGINATOR	DATE	CHECKED	DATE
V. D. Patel	2/23/90	M. Arsala	2/24/90

SECTION 1.0: PURPOSE

The purpose of this calculation is to establish the adequacy of the pipe support configuration at the Watts Bar Project per current design requirements.

SECTION 1.1: ASSUMPTIONS

Assumptions are as noted below and/or as noted in the body of the calculation.

1. Coefficient of friction (μ) = 0.3 (steel on steel) (UNO)

2. Concrete strength (f'c) = 3000 PSI (UNO)

3. All carbon steel items (including tube) material properties are as follows:

   A. Yield stress of steel:
   Fy = 36.0 KSI (UNO)

   B. Modulus of elasticity of steel:
   E = 29,000 KSI (UNO)

   C. Shear modulus of elasticity of steel:
   G = 11,000 KSI (UNO)

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
~~2~~	P. SEN	4/20/90	C. Mehta	4/20/90

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	2	2

ORIGINATOR	DATE	CHECKED	DATE
V. D. Patel	2-23-90	M. Arsala	2/24/90

SECTION 1.2 SOURCES OF DATA/REFERENCES

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	PV Patel	6/6/90	S. Shah	6/11/90

X 1. Load data sheets per Attachment A.

X 2. Pipe Support configuration data per attachment B.

X 3. Piping Analysis Calc. No. N3-74-02A, Rev. ~~1~~ 2 | 3
Jt. No. L15.

X 4. WB-DC-40-31.9, Rev. 10, "Criteria for Design of Piping Supports and Supplemental Steel in Category I Structures".

X 5. WBEP 5.40, Rev. 3, and 5.40C, Rev. 0, "Procedure for Design of Supports for Category I Piping".

X 6. Watts Bar Pipe Support Design Manual, Vol. 1 & 2, Rev. ~~0~~ 1 | 2

X 7. Pipe Support Load Capacity Data Sheets Manual Revision 2. (RIMS No. B26 '89 1228 103)

N/A 8. TVA Civil Design Standard DS-C1.7.1, Rev. 4, "General Anchorage to Concrete".

N/A 9. TVA General Construction Spec. G-32, Rev. 13, "Bolt Anchors Set in Hardened Concrete".

X 10. TVA Specific construction Spec. N3C-912, Rev. 5, "Support and Installation of Piping Systems in Category I Structures".

N/A 11. Civil Design Standard DS-C1.6.14, Rev. 0, "Design of Unistrut and B-Line Clamps for Piping and Tubing."

X 12. AISC Manual, 7th Edition, Feb. 1969 with Supplements 1, 2, and 3.

X 13. AISC Manual, 8th Edition, (for member dimensions and properties only).

N/A 14. 47A053-10 Pipe Strap Calculation Rev. 3 (RIMS No. B41 '88 0427 803).

N/A 15. AWS D1.1-81.

X 16. Blodgett, "Design of Welded Structures", 1966.

X 17. WBEP 5.55C, Rev. ~~0~~ 3, "Reconciliation of HAAUP Walkdown Data".

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	2	3

ORIGINATOR	DATE	CHECKED	DATE
V. D. Patel	2-24-90	M. Arsala	2/24/90

SECTION 1.2: SOURCES OF DATA/REFERENCES (Continued)

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
2	P. SEN	4/20/90	C. Mehta	4/20/90

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	P Soni	4/6/90	S. Shah	4/7/90

X 18. Computer Programs

— BASEPLATE II, Version —

X IAP, Version 1

— CONAN, Version —

X ME150, FAPPS, Version 9.

— ME035, BASEPLATE, Version —

— Other (Specify) —

—

X 19. QIR CEB-WBN-88-002 R4 (RIMS No. B26 89 0922 101)

Building Seismic Response Spectra and DBA Spectra for PAID Documents

X 20. Qualification for Use of E70 Electrode for Welds at WBNP (Ref. RIMS No. B26 881109021)

N/A 21. Civil Design Guide, DG-C1.6.10, Rev. 0, "Design of Steel Members for Local Stresses".

N/A 22. Civil Pipe Support Calculation N3-PS-002, Analysis for Concrete Bearing Stress check. RIMS # B26'89 0913 153

X 23. QIR-CEB-WBN-89-251 "Footprint Load Transmittal"

N/A 24. Other —

SECTION 1.3: CALCULATIONS (follows)

Based on a review of DCDTS, report #6140, dated ~~2-10-90~~ 6-2-90 ~~4-7-90~~, are there any open documents (ECN, DCN, etc.) applicable to this calculation? 3

X Yes (See ~~next sheet~~ BELOW for listing)

X No DCN P05144A, NO IMPACT ON SUPPORT CALC.

Are there any non-generic HAAUP Open Items (i.e., CAQR's, PIR's, NCR's, SCN's, SCR's) against this support? (Exclude Construction Open Items)

— Yes (See next sheet for listing)

X No

Note: For the resolution of generic open documents associated with the HAAUP program and related stress problem, see Block #8 of the DCN package cover sheet.

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	1	4

ORIGINATOR	DATE	CHECKED	DATE
V. D. Patel	2-23-90	M. Arsala	2/24/90

Section 1.3: (continued)

STRESS ANALYSIS LOADS AND MOVEMENTS: (* REF. NO. 1)

DIR	* FORCES (LBS)				CALC DESIGN LOADS (LBS)	*MOVEMENTS (IN)	
	NORMAL	UPSET	EMERG.	FAULTED		THER	MAX
X +						0.012	0.293
X -						-0.061	-0.383
Y +	0	—	—	—	GOVERNING	0.267	1.033
Y -	1729	—	—	—	LOAD IS	-0.048	-0.117
Z +					NORMAL LOAD	0.009	0.279
Z -						0.030	0.301

COMMENTS: THIS IS A SPRING SUPPORT

CONSIDER FRICTION LOADING: (REF# 4) —YES (SEE BELOW) ✓N/A (SPRING)

CONSIDER S.W.E. (REF# 19): ✓YES (SEE BELOW) —NO (SEE COMMENTS)

X = 2.67 Y = 110.73 (*) Z = 2.67 ACTUAL PEAK ACCELERATION @ 17.5 HZ. IS TAKEN @ EL. 842 FOR SCV. (CONT. BLDG.)

Based on ✓ Peak Acceleration (*) ✓ Actual Acceleration

CHECK GAPS (REF. # 10): —YES (SEE BELOW) ✓N/A (SPRING SUPPORT)

DOES TOTAL GAP IN ANY RESTRAINED DIRECTION EXCEED N3C-912 REQUIREMENTS
—YES (SEE COMMENTS BELOW) — NO (THEREFORE OK)

CALCULATION ANALYSIS APPROACH (SEE BELOW): ✓APPLICABLE —N/A

FAULTED LOADS OR LOADS GREATER THAN FAULTED LOADS WILL BE USED WITH NORMAL CONDITION ALLOWABLES (CONSERVATIVE) UNLESS OTHERWISE NOTED.

COMMENTS:

CALCULATION SHEET

BEPC-2706 Rev. 8/86 (ED-69)

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	2	4.1

ORIGINATOR	DATE	CHECKED	DATE
P. SEN	4-19-90	C. Mehta	4-20-90

SUPPORT LOAD COMPARISON SHEET The purpose of this sheet is to document the acceptance of previously performed calc's (per attached sheets) based on revised loads.

A. **LOAD COMPARISON BETWEEN**

RESTR. TYPE & DIR.	OPER. COND.	DESIGN LOAD (LB)	REVISE LOAD (LB)	LOAD RATIO (REV/DES)	REMARK
Y	NORM.	-1729	-1729	1	SPRING HANGER. NEW MOV'TS ARE ALMOST SAME
	UPSET				AS OLD MOV'T. ΔY = .268"/-.049" (NEW)
	FAULT				ΔY = .267"/-.048" (OLD)
	NORM.				MAX = ΔY = 1.034"/-.118 (NEW)
	UPSET				ΔY = 1.033"/-.117 (OLD)
	FAULT				
	NORM.				
	UPSET				
	FAULT				

Results: _____ Load Increase (Continuation Sht. Req'd.)
*✓ Load Decrease (OK)
* SEE REMARKS

B. **MOVEMENT EVALUATION FOR REVISED HANGER MOVEMENT.**

1. FRICTION — ✓ Not Applicable; — Applicable (Explain) _____
2. GAPS — ✓ Not Applicable; ___ Acceptable
3. SWING ANGLE — — Not Applicable; ✓ Acceptable
4. SPRINGS/SNUBBER SETTINGS — — Not Applicable; ✓ Acceptable

REVIEW/COMPARISON RESULT: Revision 11 of the stress hanger guidance has been reviewed and found to be acceptable. Previous pipe support calculation as shown on succeeding sheets need not be revised to incorporate the revised loads and movements since sufficient margins exist.

CALCULATION SHEET

BEPC-2706 Rev. 8/86 (ED-69)

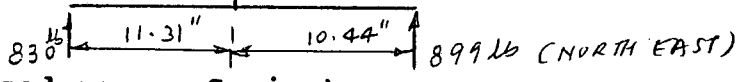
JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A437010007	1	5

ORIGINATOR	DATE	CHECKED	DATE
V. D. Patel	2-23-90	M. Arsala	2/24/90

STATICALLY DISTRIBUTED LOAD TO EACH SPRING. 1729 lb

SECTION 1.3: (Continued)

NORTH EAST SPRING QUALIFICATION



Variable Spring Calculation (Based on one Spring)

Spring Part No VS1-A, Size 9 Spring Rate(K) = 308 #/in.,
Design Load (DL) 899. lb., Lower Component Weight (WL) = —,
Max. Movement (△Max.) = +1.033 in., -0.117, Thermal Movement(Mvt.) = 0.267 / -0.048 in.
Spring Working Range 587 # To 953 #
Spring Total Range 434 # To 1011 #

When Mvt. is up: ✓ Applicable ___ Not Applicable

Check Spring Working Range:
Hot Load (HL) = DL + WL = 899.0 lbs.
Cold Load (CL) = HL + (K x Mvt.) = 981 lbs.
Check Spring Total Range (Top-Out or Bottom-Out):
Max. Load = CL -[K x (- △ Max)] = 939 * lbs.
Min. Load = CL -[K x (+ △ Max)] = 585 * lbs.

PER REF-4 - DESIGN SUP.
% CHANGE IN COLD SETTING
$= \frac{981-903}{903} \times 100 = 8.6\%$
WHICH IS WITH IN ±10%.
∴ EXIST. C.L. USED FOR CHECKING SPRING.

When Mvt. is down: ✓ Applicable ___ Not Applicable

Check Spring Working Range:
Hot Load (HL) = DL + WL = 899 lbs.
Cold Load (CL) = HL - (K x Mvt.) = 884 lbs.
Check Spring Total Range (Top-Out or Bottom-Out):
Max. Load = CL -[K x (- △ Max)] = 939 * lbs.
Min. Load = CL -[K x (+ △ Max)] = 585 * lbs.

% CHANGE IN C.S.
$= \frac{903-884}{903} \times 100$
$= 2.1\% < 10\%$.

Check Spring Variability

$$\text{Variability} = \frac{(\text{Mvt.})(K)}{HL} = \frac{0.267 \times 308}{981} \times 100 = 8.4\ \%$$

Conclusion:

Spring Variability < 25%	✓ Yes (OK)	___ No (N.G.)
Spring Within Working Range	___ Yes (OK)	✓ No (See Below) ▲
Spring Within Total Range	✓ Yes (OK)	___ No (N.G.)

Comments: * - CHECK MAX. LOAD = C.L. -[k x - △MAX.] = 903 - [308 x -0.117] = 939 lb
MIN. LOAD = C.L. -[K x + △MAX] = 903 - [308 x 1.033] = 585 lb.

▲ - SPRING EXCEEDS ALLOW. BY 2 lb. IN LOWER WORKING RANGE. HOWEVER SPRING HAS TOTAL RANGE WITH LOWER SIDE HAVING PLENTY OF LOAD RANGE AVAILABLE ∴ ACCEPTABLE.

CALCULATION SHEET

BEPC-2706 Rev. 8/86 (ED-69)

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	1	6

ORIGINATOR	DATE	CHECKED	DATE
Y. D. Patel	2-23-90	M. Arsala	2/24/90

SECTION 1.3: (Continued)

SOUTHWEST SPRING QUALIFICATION.

Variable Spring Calculation (Based on one Spring)

Spring Part No VS1-A, Size 9 Spring Rate(K) = 308 #/in.,
Design Load (DL) 830, Lower Component Weight (WL) = —,
Max. Movement (Δ Max.) = + 1.033 in., −0.117, Thermal Movement (Mvt.) = 0.267 −0.048 in.
Spring Working Range 587 # To 953 #
Spring Total Range 434 # To 1011 #

When Mvt. is up: ✓ Applicable — Not Applicable

Check Spring Working Range:
Hot Load (HL) = DL + WL = 830 lbs.
Cold Load (CL) = HL + (K x Mvt.) = 912 lbs.
Check Spring Total Range (Top-Out or Bottom-Out):
Max. Load = CL − [K x (− Δ Max)] = 939 lbs.
Min. Load = CL − [K x (+ Δ Max)] = 585 lbs.

% CHANGE IN COLD SETTING $= \frac{912-903}{903} \times 100 = 0.1\%$

∴ USE EXIST. C.S. $< 10\%$ ∴ O.K.

When Mvt. is down: ✓ Applicable — Not Applicable

Check Spring Working Range:
Hot Load (HL) = DL + WL = 830 lbs.
Cold Load (CL) = HL − (K x Mvt.) = 815 lbs.
Check Spring Total Range (Top-Out or Bottom-Out):
Max. Load = CL − [K x (− Δ Max)] = 939 lbs.
Min. Load = CL − [K x (+ Δ Max)] = 585 lbs.

% CHANGE IN C.S. $= \frac{903-815}{903} \times 100 = 9.75\%$ WHICH IS LESS THAN 10%

∴ USE EXIST. C.S.

Check Spring Variability

$$\text{Variability} = \frac{(\text{Mvt.})\ (K)}{HL} = \frac{0.267 \times 308}{981} \times 100 = 8.4\ \%$$

Conclusion:

Spring Variability < 25% ✓ Yes (OK) — No (N.G.)
Spring Within Working Range — Yes (OK) ✓ No (See Below)
Spring Within Total Range ✓ Yes (OK) — No (N.G.)

Comments: SEE NOTE ON SHT. 5

SWING ANGLE CHECK - BINDING ANGLE $= \sin^{-1}[\Delta MAX/C\text{-}C] = \sin^{-1}[0.301/46.5]$
$= 0.37° < 5°$

SWING ANGLE $= \sin^{-1}[\Delta MAX/C\text{-}C] = \sin^{-1}[0.383/46.5]$
$= 0.47° < 5°$

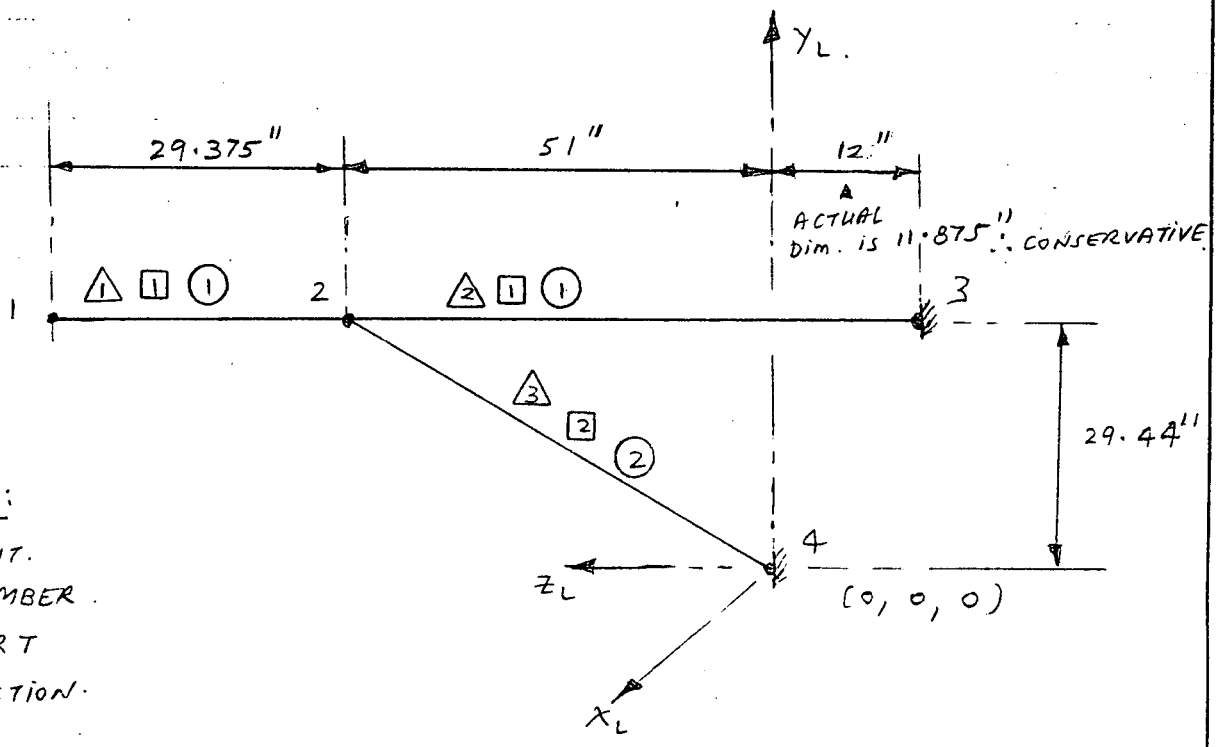
∴ EFFECT DUE TO SWING ANGLE IS INSIGNIFICANT.

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	1	7

ORIGINATOR	DATE	CHECKED	DATE
V. D. Patel	2-23-'90	M. Arsala	2/24/90

SECTION 1.3 (CONT'D.)



LEGEND:

- • - JOINT.
- △ - MEMBER.
- □ - PART
- ○ - SECTION.

FAPPS MATH MODEL.

MEMBER 1-2 - TS 4X4X1/4

MEMBER - 3 - TS 3 x 3 x 1/4

NOTE:

TWO IDENTICAL FRAMES ARE INVOLVED IN THIS CALC. AND AS BOTH ARE SIMILAR FRAMES, ONLY ONE IS QUALIFIED FOR BOTH FRAMES.

THIS SUPPORT IS A SPRING SUPPORT AND IS ONLY QUALIFIED FOR D.L. (NORMAL, COND.).

S.W.E. LOADS ARE BASED ON ACTUAL PEAK ACCELERATION AT EL. 842'.0 & ACTUAL FREQUENCY OF FRAME. (SEE SHT. 9)

FOR I.A.P. EVALUATION SEE ATTACHMENT - "F"

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	1	8

ORIGINATOR	DATE	CHECKED	DATE
V.D.Patel	2-23-90	M. Arsala	2/24/90

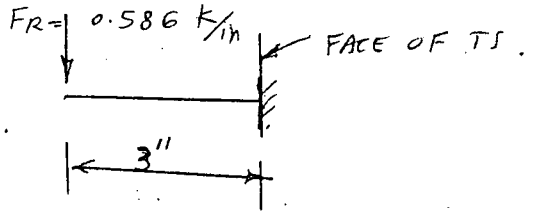
SECTION 1.3 (CONT'D.)

ACTUAL FORCES AT JOINT 3 & JOINT 4 FOR WELD ANALYSIS AND PLATE QUALIFICATION SHOULD HAVE BEEN RESOLVED. HOWEVER FROM RESULTS OF WELD PER FAPPS OUTPUT PLENTY OF MARGIN EXISTS ∴ EFFECT WILL BE INSIGNIFICANT.

QUALIFICATION OF 8"Ø X 1" THK. PLATE : (ALL FOUR PLATE)

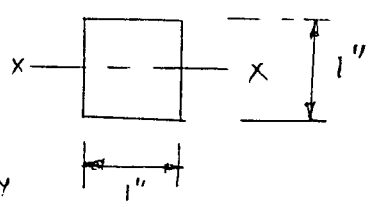
CONSERVATIVELY CONSIDER WELD FORCE FR @ JOINT-3 OF MEM. 2. AND CONSIDER MAX. DIST. FROM (FROM FAPPS OUTPUT.) FACE OF 1" PLATE WELDED @ SCV TO FACE OF TS 3X3.

FROM ATTACH. # B AND CONSIDERING 1" STRIP OF PLATE AS CANTILEVER TO CHECK PLATE STRESS. AS SHOWN BELOW.



MOMENT @ FACE OF TS = 0.586X3
= 1.758 in.k.

$$S_x = \frac{1 \times 1^2}{6} = 0.166 \text{ in}^3$$



$$\therefore \text{ M. STRESS} = \frac{1.758}{0.166} = 10.548 \text{ ksi}$$

$< 0.75 F_y = 27 \text{ ksi}$ ∴ O.K.

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A4370 1007	1	9

ORIGINATOR	DATE	CHECKED	DATE
V. D. Patel	2-23-'90	M. Arsala	2/24/90

SECTION 1.3 (CONT'D.)

CHECK FREQUENCY

FROM FAPPS OUTPUT. (ATTACH. E).

MAX. $\Delta_x = 0.03277$" @ JT. 1 (SHT. 9 OF ATT. E.)

$\therefore$ FREQUENCY $= 3.13\sqrt{\frac{1}{\Delta_x}}$

$= 3.13\sqrt{\frac{1}{0.03277}} = 17.29$ Hz.

$\therefore$ USE PEAK ACCLERATION VALUE @ 17.25 Hz. @ EL. 842'.0 (FOR HORIZONTAL DIR.)

$A_{x_g} = 1.5 \times 1.78 = 2.67\ g$ & $A_{z_g} = 2.67\ g$ (CONS.)

MAX. $\Delta_y = 0.00098$" @ JT. 1

FREQUENCY $= 3.13\sqrt{\frac{1}{\Delta_y}}$

$= 3.13\sqrt{\frac{1}{0.00098}} = 99.98$ Hz. > 33 Hz.

$\therefore$ USE ACTUAL ACCELERATION ZPA VALUE @ EL. 842'.

$A_{y_g} = 1 + 0.73^{*} = 1.73\ g$

* - CONSIDERING D.L. OF STRUCTURE.

CALCULATION SHEET

BEPC-2706 Rev. 8/86 (ED-69)

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	1	10

ORIGINATOR	DATE	CHECKED	DATE
V. D. Patel	2-23-'90	M. Arsala	2/24/90

Section 1.3: (Continued)

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	F Yang	5/6/90	S. Shah	6/7/90

EVALUATE STD. COMPONENTS:
(UNITS - INCHES/LBS.)

ITEM NO.	PART NO.	SIZE	DESCRIPTION	ALLOWABLE LOADS	DESIGN LOADS	OK/ NG	REF#
4	133A	5/8"ϕ	ROD	NORMAL = 1810	899	O.K.	7
				UPSET = N/A			
				FAULTED = N/A			

ITEM NO.	PART NO.	SIZE	DESCRIPTION	ALLOWABLE LOADS	DESIGN LOADS	OK/ NG	REF#
5	92A	5/8"ϕ	WELDED EYE ROD.	NORMAL = 1810	899	O.K	*
				UPSET =			
				FAULTED =			

ITEM NO.	PART NO.	SIZE	DESCRIPTION	ALLOWABLE LOADS	DESIGN LOADS	OK/ NG	REF#
6	—	8"ϕ	RISER CLAMP	NORMAL = 7664	1729	OK	H1
				UPSET = 7664	—	—	—
				FAULTED = 14408	—	—	—

ITEM NO.	PART NO.	SIZE	DESCRIPTION	ALLOWABLE LOADS	DESIGN LOADS	OK/ NG	REF#
				NORMAL =			
				UPSET =			
				FAULTED =			

COMMENTS: * - THIS ITEM HAS SAME DIA. OF ROD AS B.P. 133A ROD. ∴ USE SAME ALLOWABLE AS B.P. PART NO. 133A.

3

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A437 01007	2	11

ORIGINATOR	DATE	CHECKED	DATE
P. SEN	4-20-90	C. Mehta	4-20-90

SECTION 1.4 CONCLUSION

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	P Yong	6/6/90	S. Shah	6/7/90

Based on the detailed calculations performed for the support configuration shown on the design documents attached, the following has been concluded:

✓ A. Support meets current criteria requirements

— B. Support meets current criteria requirements with proposed modification.

NOTE: The following open item(s) have been addressed in the preceeding detailed calculation per WBEP 5.55C (See Attachment # -).

1-74-HAAVP-002-007 IS CLOSED.

THIS CALCULATION HAS BEEN REVISED AND THE ABOVE CONCLUSION REMAINS VALID

3

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A43701007	3	12

ORIGINATOR	DATE	CHECKED	DATE
[signature]	6-21-90	S. Shah	6-21-90

Section 1.4 (Continued)

CONCLUSION:

This support calculation has been subsequently evaluated for the loads and movements per rev. 12 of the stress calculation (reference sheet. A3). The calculation has been reviewed for overall compliance with the requirements of the applicable criteria with emphasis on the following key attributes:

Load increase factor= 1.0

1.	Member stresses	☑
2.	Deflection	☑
3.	Weld stresses	☑
4.	Anchor bolt loads	☐ N/A
5.	Base plate stresses	☑
6.	Standard component allowables and settings	☑
7.	Piping attachments welds and local stresses	☑
8.	All other applicable requirements of the criteria	☑

Based upon the above evaluation, the support meets the current criteria requirement. The documentation of the above evaluation has been issued with the rev. 12 of the stress calculation.

PLANT : WATTS BAR
PIPING SYSTEM : RHR SPRAY A
UNIT UNIT 1
SHEET 1 OF 2

NODE NAME : L15
SUPPORT DIR : Y
SUPPORT TYPE: VS
ANALYSIS PROBLEM : N3-74-02A
ISOMETRIC DRAWING : B-47W432-205 SHT 2 REV R0
SUPPORT ID : 47A437-1-7

DESIGN TRAVEL (+) 1.03 IN
DESIGN TRAVEL (-) -.11 IN
LUG DESIGN LOAD 1729 LB
LUG ALLOW STRESS = 16998 PSI

MAX PIPE MOVEMENT (IN.)

	X	Y	Z
(+)	.293	1.034	.279
(-)	-.387	-.118	-.299

THERMAL PIPE MOVEMENT (IN.)

	X	Y	Z
(+)	.010	.268	.007
(-)	-.054	-.049	-.024

LOAD CASE	LOAD (LB) +	-
DW		-1729

LOADING CONDITION	LOAD (LB) +	-	SUPPORT LOAD COMBINATIONS
NORMAL	0	-1729	VSALL =DW

LOAD DATA SHEETS

Attachment No. A
Calc. No. 47A43701007 Rev. 2
Sheet No. A1 ~~of~~ A12

3

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	MPA	6/20/90	S. Shal	6/21/90

PLANT : WATTS BAR
PIPING SYSTEM : RHR SPRAY A

UNIT : UNIT 1
SHEET 2 OF 2

NODE NAME : L15
SUPPORT DIR : Y
SUPPORT TYPE: VS

ANALYSIS PROBLEM : N3-74-02A
ISOMETRIC DRAWING : B-47W432-205 SHT 2 REV R0
SUPPORT ID : 47A437-1-7

CODE STRESS EQUATION	CODE PIPE STRESS (PSI)	LUG LOAD (LB)	LUG ALLOWABLE STRESS (PSI)	LUG LOAD COMBINATIONS
8	1301	1729	16998	VSALL =DW
L9U	1940	1729	20019	VSALL =DW
9E	2034	1729	30905	VSALL =DW
9F	4309	1729	39610	VSALL =DW
L10	10155	1729	17919	VSALL =DW
L11	11457	1729	34917	VSALL =DW
2SY	14384	1729	40615	VSALL =DW
L10A	0	1729	56399	VSALL =DW
TEST8	1301	1729	20658	VSALL =DW
L10T	8868	1729	19206	VSALL =DW
L11T	10170	1729	36204	VSALL =DW

Attachment No. A
Calc. No. 47A43701007 Rev. 2
Sheet No. A2 ~~OF A2~~ 3

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	[illegible]	6/20/90	S. Shah	6/21/90

ANT : WATTS BAR
IPING SYSTEM : RHR SPRAY A

UNI UNIT 1
SHEET 1 OF 2

NODE NAME : L15
SUPPORT DIR : Y
SUPPORT TYPE: VS

ANALYSIS PROBLEM : N3-74-02A
ISOMETRIC DRAWING : 47W432-205 SHT 2 REV R0
SUPPORT ID : 47A437-1-7

DESIGN TRAVEL (+) 1.03 IN
DESIGN TRAVEL (-) -.11 IN
LUG DESIGN LOAD 1729 LB

LUG ALLOW STRESS = 16998 PSI

MAX PIPE MOVEMENT (IN.)

	X	Y	Z
(+)	.323	1.034	.320
(-)	-.387	-.118	-.340

THERMAL PIPE MOVEMENT (IN.)

	X	Y	Z
(+)	.010	.268	.007
(-)	-.054	-.049	-.024

LOAD CASE	LOAD (LB) +	LOAD (LB) -
DW		-1729

LOADING CONDITION	LOAD (LB) +	LOAD (LB) -	SUPPORT LOAD COMBINATIONS
NORMAL	0	-1729	VSALL =DW

ATTACHMENT: 4
CALC: 47A437001007 REV. 3
SHEET: A3

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	MPP	6/26/90	S. Shah	9/24/90

PLANT : WATTS BAR UN[illegible] UNIT 1
PIPING SYSTEM : RHR SPRAY A SHEET 2 OF 2

NODE NAME : L15 ANALYSIS PROBLEM : N3-74-02A
SUPPORT DIR : Y ISOMETRIC DRAWING : 47W432-205 SHT 2 REV R0
SUPPORT TYPE: VS SUPPORT ID : 47A437-1-7

CODE STRESS EQUATION	CODE PIPE STRESS (PSI)	LUG LOAD (LB)	LUG ALLOWABLE STRESS (PSI)	LUG LOAD COMBINATIONS
8	1301	1729	16998	VSALL =DW
L9U	1940	1729	20019	VSALL =DW
9E	2034	1729	30905	VSALL =DW
9F	4309	1729	39610	VSALL =DW
L10	10155	1729	17919	VSALL =DW
L11	11457	1729	34917	VSALL =DW
2SY	14384	1729	40615	VSALL =DW
L10A	0	1729	56399	VSALL =DW
TEST8	1301	1729	20658	VSALL =DW
L10T	8868	1729	19206	VSALL =DW
L11T	10170	1729	36204	VSALL =DW

ATTACHMENT: 4
CALC: 47A437010007 REV. 3
SHEET: A4

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	MPA	6/20/90	S. Shah	6/21/90

N3-74-02A WATTS BAR UNIT 1 RHR SPRAY A

****
* *
* SUPPORT DESIGN DATA *
* *
****

SUPPORT TYPE SUMMARY TABLE

MODE NAME	SUPPORT DIRECT	SUPPORT TYPE	COORDINATE SYSTEM	DIRECTION COSINES X	Y	Z	AXIS
K89	SX	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
K89	SZ	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
K93	SX	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
K93	SZ	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
K95	SX	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
K95	SZ	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
K99	SX	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
K99	SZ	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
L14	SX	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
L14	SZ	RR	NONGLO	-.8090	.0000	-.5878	X
				.0000	1.0000	.0000	Y
				.5878	.0000	-.8090	Z
L15	Y	VS	GLOBAL				

1
??

ATTACHMENT: 4
CALC: 7743701007 REV. 3
SHEET: A5

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	MMA	6/20/90	S. Shah	6/21/90

CALCULATION SHEET

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A437O1007	1	B-1

ORIGINATOR	DATE	CHECKED	DATE
V. D. Patel	2-23-'90	M. Arsala	2/24/90

ATTACHMENT B

PIPE SUPPORT CONFIGURATION DATA

1. **Walkdown Data:**
   Walkdown Package: HAAUP Pkg. 74 - HAAUP-002

   Drawing Number: 47A437-1-7 **Rev.:** 3A

2. **Applicable RFI's:**

   Information RFI's: GB-2140

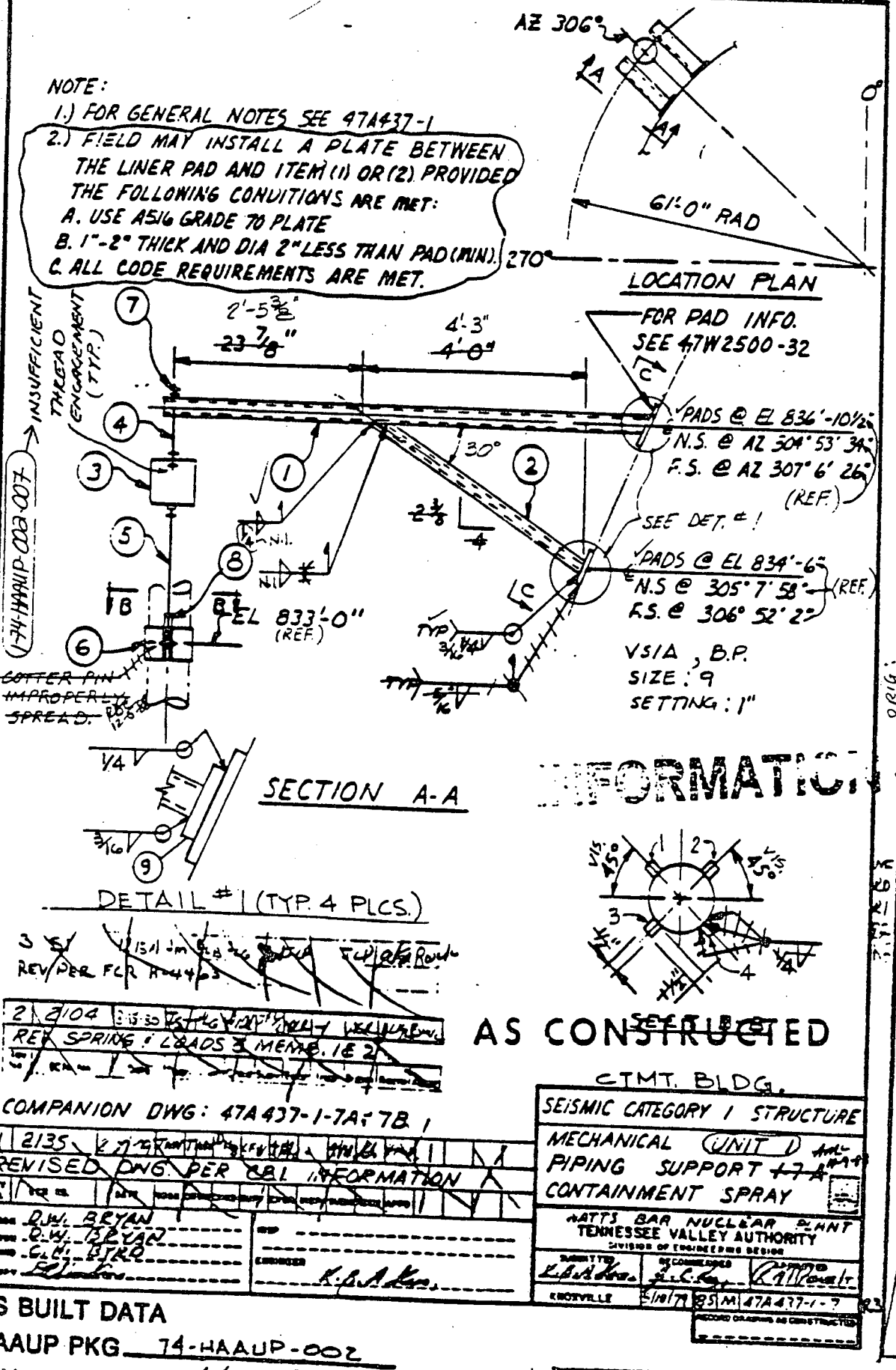
   Feasibility RFI's: N/A

   Constructability RFI's: N/A

3. **Reason and Description of Modification** N/A

4. **Pipe Support Configuration** ~~DCA:~~ WALKDOWN SKETCH. V.D.P. 2/23/90 M.A 2/24/90 **See Sheet B2** → B5

5. **Other Data:** N/A



AS BUILT DATA

HAAUP PKG 74-HAAUP-002

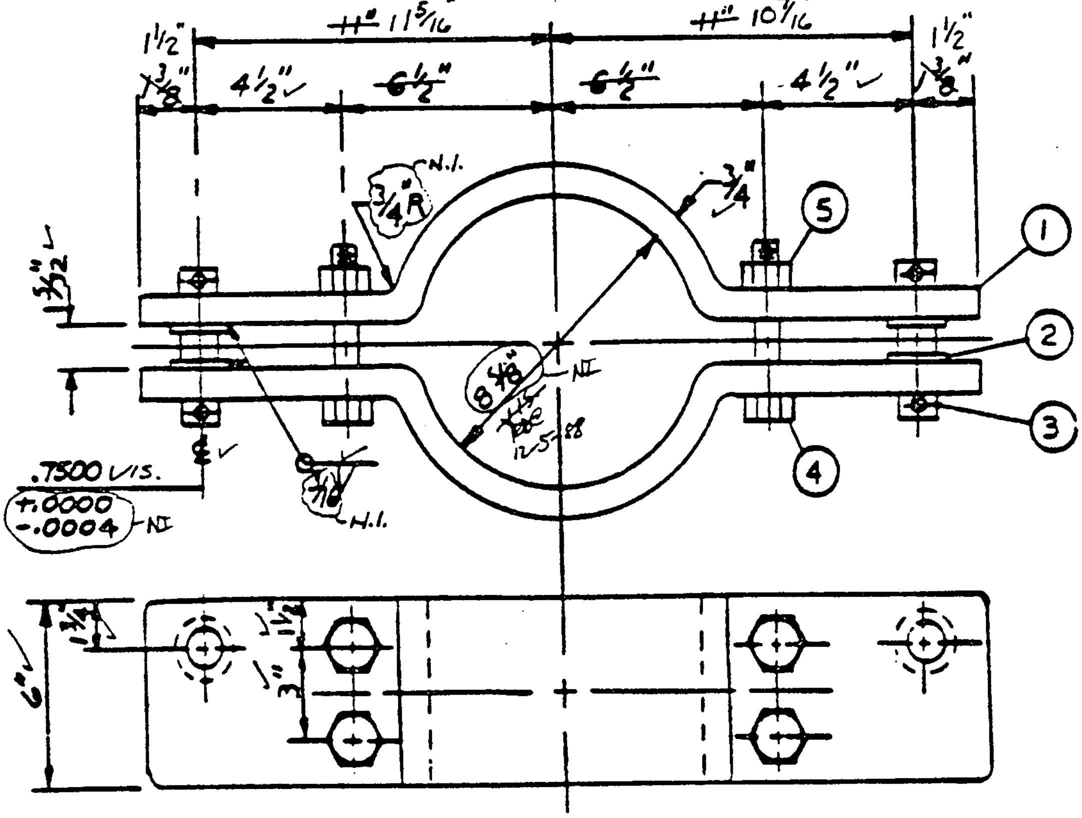
WALK DOWN BY [signature] 10-31-88

CHECKED BY [signature] 10-31-88

* → CATALOG NO. NOT STAMPED ON PART-VERIFIED BY COMPARISON OF CATALOG DIMENSIONS

ITEM NO.	NO REQ'D	PART NO.	DESCRIPTION	N.I.	WGT.
✓1	2		CLAMP HALVES 6" x 3/4" x ~~2'-5 1/4"~~ 24 3/8" (A36)		
✓2	4	VIS.	27/32" Ø x 1/4" THK WASHER (A36)		
✓3	2	VIS.	3/4" Ø x 3 3/4" LG PIN W/ 2 - 1/8" Ø x 1 1/4" LG. COTTERS		
✓4	4		3/4" Ø x ~~3 1/4"~~ 5" LG. BOLT		
✓5	4	VIS.	3/4" Ø AHH NUT (NI)		

2	2104		REV SPRING LOADS ON SH 3 7 E 7B
REV NO.	ECN No.	Date	



DETAIL OF ⑥

HOLE SIZES: 1/16" OVERSIZE BOLT DIA. (N.I.)

INFORMATION AS CONSTRUCTED

COMPANION DWG: 47A437-1-7 1 7B

1	2135		REVISED DWG. PER C.B.I INFORMATION
REV NO.	ECN No.	DATE	

DSGN DW BRYAN
DRWN DW BRYAN
CHKD CH BIRD
SUPV

ENGINEER I.B. Abrams

SEISMIC CATEGORY I STRUCTURE

MECHANICAL UNIT ~~1 & 2~~ 1 (11-9-88)
PIPING SUPPORT ~~1-7-A~~
CONTAINMENT SPRAY

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

KNOXVILLE 5/20/85 M 47A437-1-74 R2

RECORD DRAWING AS CONSTRUCTED

Attachment No. B
Calc. No. 47A437 01007 Rev. 1
Sheet No. B-3

AS BUILT DATA
HAAUP PKG 74-HAAUP-002
WALK DOWN BY Athena McCollum 10-31-88
CHECKED BY Mark Haddox 10-31-88

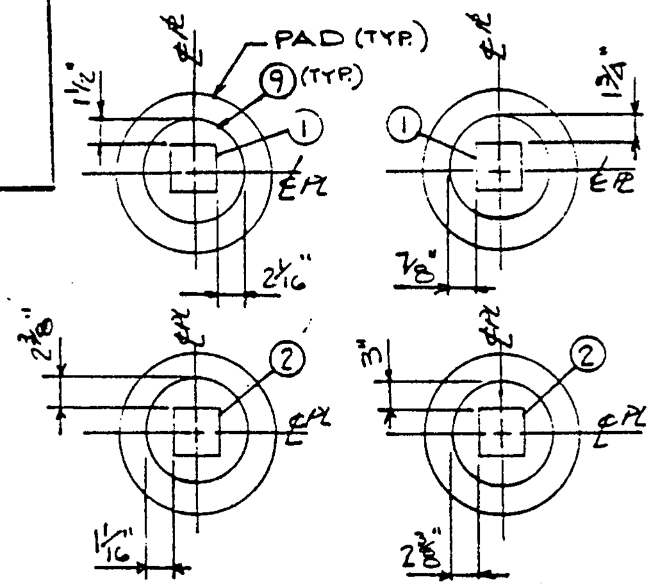
ITEM NO	NO REQ'D.	PART NO.	DESCRIPTION			
✓1	2		TS 4x4x¼ 8'-4" LG (CUT TO FIT)	VIS.		
✓2	2		TS 3x3x¼ 4'-10" LG (CUT TO FIT) N.I.	VIS.		
✓3	2	VS1A	9 V.S. (H.L. 865 # SPRING C.S. 903 # W/1⅛ UP)			
✓4	2*	133A	⅝"Ø x 1'-10" LG ROD (T=6" T=6")			
✓5	2*	92A	⅝"Ø x 2'-0" LG WELDED EYE ROD, (THD 6") N.I.			
✓6	1		8" PIPE SIZE RISER CLAMP (SEE SH 7A)			
✓7	8		⅝"Ø (AHH) NUT NI			
✓8	4		~~1½" x ½" PL. x 2" LG.~~ SEE ATTACH. J			
9	4		PL 8"Ø x 1" THK.			

~~* SPRING LOADS INCLUDE WT. OF HARDWARE~~

ISO: 47W432-205
JT: L15
TYPE: VS
DIRECTION: Y
+ 0
- 1645

MAL NO N3-74-2A

X-49A-0



SECTION C-C

AS CONSTRUCTED

2 2104 REV SPRING & LOADS & MEMB. 1 & 2

COMPANION DWG: 47A437-1-7 & 7A

1 2135 8-22-79 REVISED DWG. PER CBI INFORMATION

DSGN DW BRYAN
DRWN DW BRYAN
CHKD
SUPV

ENGINEER K.A. Akers

SEISMIC CATEGORY I STRUCTURE

MECHANICAL UNIT 1
PIPING SUPPORT ~~1-7A~~
CONTAINMENT SPRAY

WATTS BAR NUCLEAR PLANT
TENNESSEE VALLEY AUTHORITY
DIVISION OF ENGINEERING DESIGN

KNOXVILLE 855 M 47A437-1-7B R2

Attachment No. B
Calc. No. 47A437010007 Rev. 1
Sheet No. B-4

AS BUILT DATA
HAAUP PKG 74-HAAUP-002
WALK DOWN BY Athena McCollum 10-31-88
CHECKED BY Mark [signature] 10-31-88

WALKDOWN OF AS-BUILT PIPING SYSTEMS
UNDER THE SCOPE OF THE HAAUP

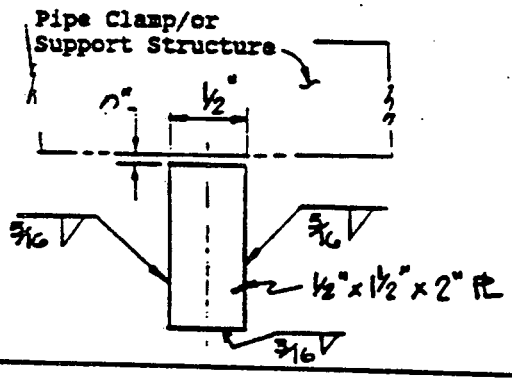
WP-32 R2

WALKDOWN SKETCH

ATTACHMENT J PAGE 1 OF 1

Attachment No. B
Calc. No. 47A437 01007 Rev. 1
Sheet No. B-5

1



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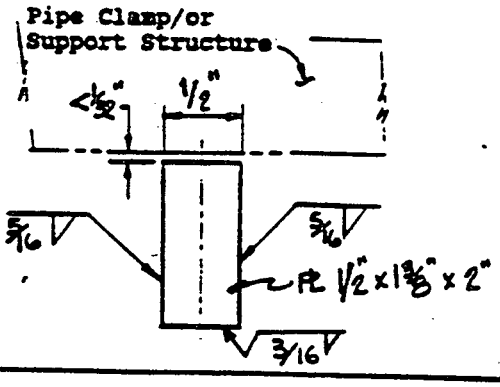

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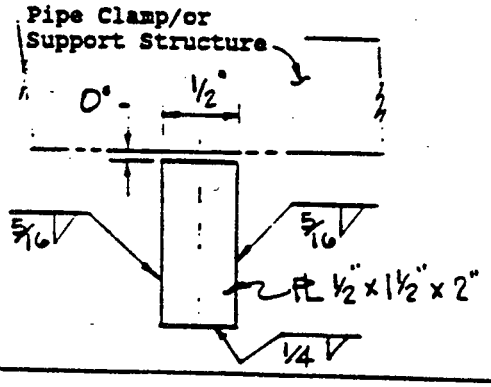

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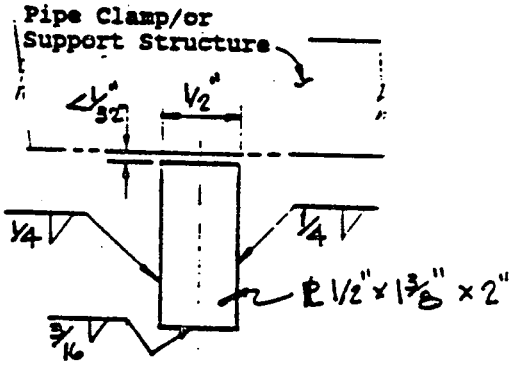
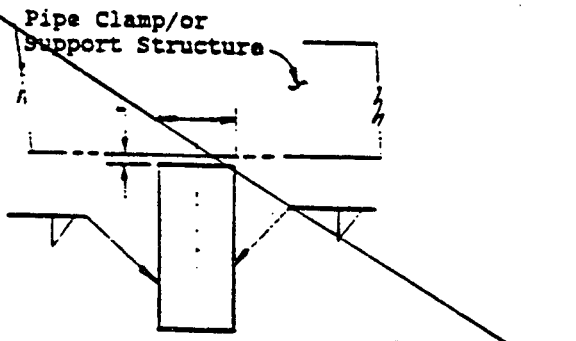
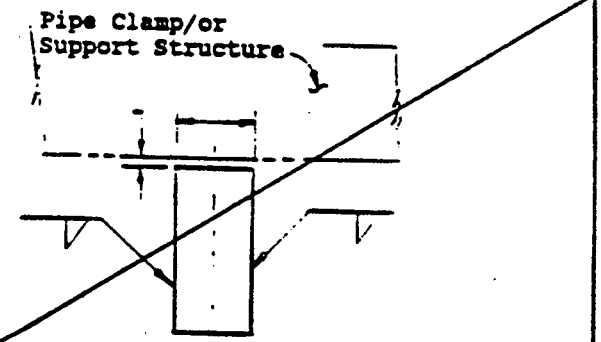
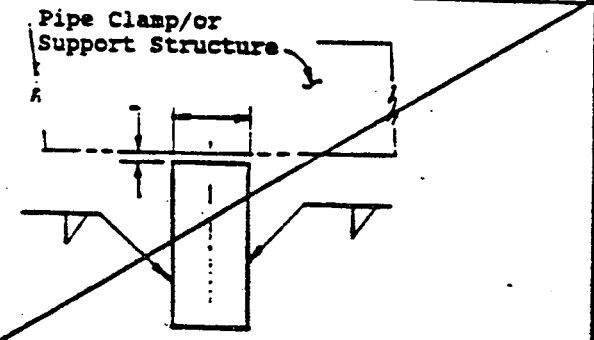
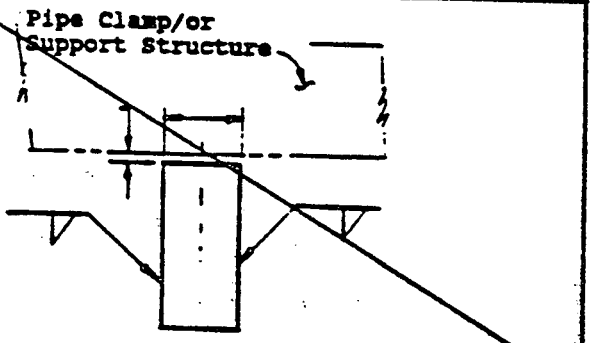










Iso. or
Hanger No. 47A437-1-7

Package No. 74-HAAUP-002

Originated Athena McCollum Date 10-31-88
Drafted N/A Date
Checked Mack Hobbs Date 10-31-88

TVA 40533 (EN DES-7-77)

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
1	Y. D. Patel	2/23/90	M. Arsala	2/24/90

ATTACHMENT: D
CALC: 47A43701007 R/1
SHEET D-1

ATTACHMENT D

DESCRIPTION: CIVIL/MECH. REQUEST MEMO.

Attachment No. D
Calc. No. 47A437O1007 Rev. 1
Sheet No. D-2

CIVIL/MECHANICAL REQUEST MEMO
CHRM

No. 74-58

Drawing No. 47A437-1-7

Stress Calc. No. N3-74-02A

Data Point No. L-15

Description:
The following information is required for the local stress evaluation at the welded attachment.

1) Pipe Size (OD, Sch.) and Pipe Material

2) Design Pressure

3) T_{MAX} (Hot)/T_{MIN} (Cold), operating temp. including faulted condition.

4) Sif used in stress analysis at data pt of welded attachment.

Prepared by: V. D. Patel **Date:** 2-12-'90.

Approved by: M. Deshpande **Date:** 2-12-90

Response: (2,8)

1) OD = 8.625" SCH/Thickness = 0.372"

MAT = SA312 TP304 SC = 18.8 ($T_{ambient}$) SH = 17.9 (T_{MIN}) SY = 25.5 (T_{MAX}) ksi

2) P_{DES} = 150 psi

3) T_{MAX} = 190°F T_{MIN} = 40°F

4) SIF = 1.0

☐ Approved ☐ Disapproved

Prepared by: R Lee **Date:** 2/11/90

Approved by: [signature] **Date:** 2-11-90

Lead Stress Engineer

TITLE: B47A43701007
JOB NUMBER: WBN - 1
INPUT FILE: FAPPS1_DAT

CALCULATION NO. 47A43701007
ATTACHMENT NO.
OUT FILE: FAPPS1_OUT

DATE: 90-02-23
TIME: 17:39:23

SHEET 1
ME150 VERS.- 9

```
************************************************************
*        FRAME ANALYSIS PROGRAM FOR PIPE SUPPORTS          *
*                    "FAPPS" ME-150                        *
************************************************************
*             VERSION                    :9                *
*             TVA RELEASE DATE           :10-22-1989       *
*             USER MANUAL REVISION       :8                *
*             VALIDATION MANUAL REVISION :8                *
*                                                          *
***************** TVA ENGINEERING SPONSOR ******************
*                                                          *
*  JOHN K. MCCALL, CHIEF CIVIL ENGINEER                    *
*                                                          *
*************** TVA ENGINEERING SPECIALISTS ****************
*                                                          *
*  JACK THOMISON,     PRINCIPAL CIVIL ENGINEER             *
*  FRANK PICKERING,   PRINCIPAL CIVIL ENGINEER             *
*                                                          *
***************** TVA PROGRAM SPECIALIST *******************
*                                                          *
*  DEAN DEARING,      WT 6D 211 A-K       (615) 632-3302   *
*                                                          *
************************************************************
```

ORIGINATOR: V. D. Patel DATE: 2-23-90

CHECKER: M. Arsala DATE: 2/24/90

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
1	V. D. Patel	2/23/90	M. Arsala	2/24/90

Attachment No. E
Calc. No. 47A43701007 Rev. 1
Sheet No. E-1 OF E 15

****
INPUT DATA
****

CODE DESIGN
0. 0.
UNITS: KIPS,INCH,DEGREES (EXCEPT NOTED)

FY	SU(M)	SU(W)	E	G	DENSITY
36.00	58.00	70.00	29000.	11200.	.000285000

FYCT	FYCS	SUCT	SUCS
.90	.52	.70	.42

STRUCTURAL PARAMETERS:

NLS	M	NJ	NJREL	NJWELD	NJEM&BP
6	3	4	0	3	0

NJSTF	NJDSP
0	1

JOINT COORDINATES-GLOBAL:

JOINT	X	Y	Z	S (0=FREE,1=SUPPORT)
1	0.000	29.440	80.375	0
2	0.000	29.440	51.000	0
3	0.000	29.440	-12.000	1
4	0.000	0.000	0.000	1

MEMBER INFORMATION:

MEMBER	JJ	JK	BETA	PART	SECTION
1	1	2	0.0	1	1
2	2	3	0.0	1	1
3	2	4	0.0	2	2

PART INFORMATION:

PART	LY	LZ	KY	KZ	WRPBC	WRPLEN
1	0.00	0.00	2.10	2.10	0.	0.00
2	0.00	0.00	2.10	2.10	0.	0.00

SECTION INFORMATION:

SECTION	TRY(1)	TRY(2)	TRY(3)	TRY(4)	TRY(5)
1	208	0	0	0	0
2	204	0	0	0	0

****
LOADING INFORMATION FOR LOADING SET # 1:
****
NAME OF LOADING SET # 1
SWE-X
ALLOW. FACTOR:
1.000
DESIRED OUTPUT INFORMATION:
DISP. FORC. REAC. STR. EM-BP WELD (1=YES,0=NO)

```
   1.     0.     0.     0.     0.     0.
 RESULT-TYPE:
  2
 NUMBER OF LOAD-JOINTS:
  0
 DEAD WEIGHT CONSIDERATION(1=YES,0=NO):
  1.000
 DEAD WEIGHT GLOBAL COEFFICIENT:
         X           Y           Z
      1.00        0.00        0.00
 ****************************************
 LOADING INFORMATION FOR LOADING SET # 2:
 ****************************************
 NAME OF LOADING SET #  2
SWE-Y
 ALLOW. FACTOR:
  1.000
 DESIRED OUTPUT INFORMATION:
 DISP.  FORC.  REAC.  STR.   EM-BP  WELD    (1=YES,0=NO)
   1.     0.     0.     0.     0.     0.
 RESULT-TYPE:
  2
 NUMBER OF LOAD-JOINTS:
  0
 DEAD WEIGHT CONSIDERATION(1=YES,0=NO):
  1.000
 DEAD WEIGHT GLOBAL COEFFICIENT:
         X           Y           Z
      0.00        1.00        0.00
 ****************************************
 LOADING INFORMATION FOR LOADING SET # 3:
 ****************************************
 NAME OF LOADING SET #  3
SWE-Z
 ALLOW. FACTOR:
  1.000
 DESIRED OUTPUT INFORMATION:
 DISP.  FORC.  REAC.  STR.   EM-BP  WELD    (1=YES,0=NO)
   1.     0.     0.     0.     0.     0.
 RESULT-TYPE:
  2
```

```
 NUMBER OF LOAD-JOINTS:
  0
 DEAD WEIGHT CONSIDERATION(1=YES,0=NO):
  1.000
 DEAD WEIGHT GLOBAL COEFFICIENT:
         X           Y           Z
       0.00        0.00        1.00
 ****************************************
 LOADING INFORMATION FOR LOADING SET # 4:
 ****************************************
 NAME OF LOADING SET #  4
NORMAL
 ALLOW. FACTOR:
  1.000
 DESIRED OUTPUT INFORMATION:
 DISP.  FORC.  REAC.  STR.   EM-BP  WELD    (1=YES,0=NO)
    1.     1.     1.     1.     0.     1.
 RESULT-TYPE:
  2
 NUMBER OF LOAD-JOINTS:
  1
 JOINT       FX          FY          FZ          MX          MY          MZ
     1      0.000        .940       0.000       0.000       0.000       0.000
 DEAD WEIGHT CONSIDERATION(1=YES,0=NO):
  1.000
 DEAD WEIGHT GLOBAL COEFFICIENT:
         X           Y           Z
       0.00        1.00        0.00
 ****************************************
 LOADING INFORMATION FOR LOADING SET # 5:
 ****************************************
 NAME OF LOADING SET #  5
UPSET
 ALLOW. FACTOR:
  1.330
 DESIRED OUTPUT INFORMATION:
 DISP.  FORC.  REAC.  STR.   EM-BP  WELD    (1=YES,0=NO)
    1.     1.     1.     1.     0.     1.
 RESULT-TYPE:
  2
 NUMBER OF LOAD-JOINTS:
```

```
 1
JOINT       FX          FY          FZ          MX          MY          MZ
    1      0.000        .899       0.000       0.000       0.000       0.000
DEAD WEIGHT CONSIDERATION(1=YES,0=NO):
 1.000
DEAD WEIGHT GLOBAL COEFFICIENT:
         X           Y           Z
      2.66        1.73        2.66
****************************************
LOADING INFORMATION FOR LOADING SET # 6:
****************************************
NAME OF LOADING SET #  6
FAULTED
ALLOW. FACTOR:
 1.500
DESIRED OUTPUT INFORMATION:
DISP.  FORC.  REAC.  STR.   EM-BP  WELD    (1=YES,0=NO)
   1.     1.     1.    1.     0.     1.
RESULT-TYPE:
 2
NUMBER OF LOAD-JOINTS:
 1
JOINT       FX          FY          FZ          MX          MY          MZ
    1      0.000        .899       0.000       0.000       0.000       0.000
DEAD WEIGHT CONSIDERATION(1=YES,0=NO):
 1.000
DEAD WEIGHT GLOBAL COEFFICIENT:
         X           Y           Z
      2.66        1.73        2.66
****** END OF LOAD DATA ******
DISPLACEMENT CHECK INFORMATION:
  ALLDSX   ALLDSY   ALLDSZ (ALLOW. DISP.)
  .0625    .0625    .0625
JOI  DSXCHK  DSYCHK  DSZCHK (1=YES,0=NO)
 1     0.     1.     0.
WELD DESIGN INFORMATION:
JOINT  MEM(B)  MEM(M)  WELD-PLANE  BMTHK    PHI
  3      2       0          2       .500   0.00
  2      3       1          1       .250   0.00
  4      3       0          2       .500   0.00
**LE  (LOCAL EFFECT EVALUATION):
```

NUMBER OF CONNECTIONS:
1

JOINT	MEM(B)	MEM(M1)	MEM(M2)	CONN-PLANE	PHI	K
2	3	1	2	1	0.00	0.00

****
RESULTS
****

UNITS: KIPS,INCH,DEGREES

** FOR TRY(1) **

SECTION PROPERTIES:

SECT.NO.	NAME	AX	AY	AZ	IX	IY	IZ	SY
		SZ	RY	RZ	B	D	TF	TW
1	T4X4X4	3.540	2.000	2.000	13.184	8.000	8.000	4.000
		4.000	1.500	1.500	4.000	4.000	.250	.250
		EY= 0.0000	EZ= 0.0000					
2	T3X3X4	2.590	1.500	1.500	5.199	3.160	3.160	2.100
		2.100	1.100	1.100	3.000	3.000	.250	.250
		EY= 0.0000	EZ= 0.0000					

FOR JOINT# 1 DISPLACEMENT IN THE GLOBAL Y DIRECTION IS .08926 WHICH IS GREATER THAN THE ALLOWABLE OF .0625

FOR JOINT# 1 DISPLACEMENT IN THE GLOBAL Y DIRECTION IS .08619 WHICH IS GREATER THAN THE ALLOWABLE OF .0625

FOR JOINT# 1 DISPLACEMENT IN THE GLOBAL Y DIRECTION IS .08619 WHICH IS GREATER THAN THE ALLOWABLE OF .0625

THIS IS D.L. SUPPORT ONLY
∴ ALLOW. DEFLECTION IS LESS THAN 1/8".
V.D.P. 2-23-90
M.A 2/24/90

****
CODE CHECK PASSED
****

UNITS: KIPS,INCH,DEGREES

MEMBER BUCKLING DATA:

MEM	LY	LZ	KY	KZ
1	92.375	92.375	2.100	2.100
2	92.375	92.375	2.100	2.100
3	58.887	58.887	2.100	2.100

STRESS RESULTS IN ABSOLUTE TERMS(+/-)

				STRESSES						INTERACTION VALUES			STRESS
MEM	JOI	LOAD NAME	TYPE	AXIAL	BENDING Y	BENDING Z	WARPING NORMAL	SHEAR Y	SHEAR Z	SHEAR TORSIONAL	ALLOW. FACTOR	MAXIMUM NORMAL	MAXIMUM SHEAR	MARGIN FACTOR
1														
	1	NORMAL	ACTUAL	0.000	0.000	.000	0.000	.470	0.000	0.000	1.000	.000	.033	30.638
	2		ACTUAL	0.000	0.000	7.012	0.000	.485	0.000	0.000	1.000	.295	.034	3.389
		NORMAL	ALLOW	8.929	23.760	23.760	23.760	14.400	14.400	14.400				
	1	UPSET	ACTUAL	.000	.000	.000	0.000	.450	.000	0.000	1.330	.000	.024	41.646
	2		ACTUAL	.022	.289	6.790	0.000	.475	.039	0.000	1.330	.226	.025	4.425
		UPSET	ALLOW	11.409	31.601	31.601	31.601	18.720	18.720	18.720				
	1	FAULTED	ACTUAL	.000	.000	.000	0.000	.450	.000	0.000	1.500	.000	.024	41.646
	2		ACTUAL	.022	.289	6.790	0.000	.475	.039	0.000	1.500	.220	.025	4.536
		FAULTED	ALLOW	11.409	32.400	32.400	32.400	18.720	18.720	18.720				
2														
	2	NORMAL	ACTUAL	.824	0.000	4.918	0.000	.233	0.000	0.000	1.000	.299	.016	3.341
	3		ACTUAL	.824	0.000	2.136	0.000	.235	0.000	0.000	1.000	.182	.016	5.488
		NORMAL	ALLOW	8.929	23.760	23.760	23.760	14.400	14.400	14.400				
	2	UPSET	ACTUAL	.853	.286	4.805	0.000	.237	.024	.068	1.330	.236	.016	4.239
	3		ACTUAL	.901	2.387	2.158	0.000	.241	.109	.068	1.330	.223	.017	4.489
		UPSET	ALLOW	11.409	31.601	31.601	31.601	18.720	18.720	18.720				
	2	FAULTED	ACTUAL	.853	.286	4.805	0.000	.237	.024	.068	1.500	.232	.016	4.312
	3		ACTUAL	.901	2.387	2.158	0.000	.241	.109	.068	1.500	.219	.017	4.561
		FAULTED	ALLOW	11.409	32.400	32.400	32.400	18.720	18.720	18.720				
3														
	2	NORMAL	ACTUAL	1.253	0.000	3.988	0.000	.144	0.000	0.000	1.000	.278	.010	3.593
	4		ACTUAL	1.261	0.000	1.751	0.000	.145	0.000	0.000	1.000	.185	.010	5.408
		NORMAL	ALLOW	11.343	23.760	23.760	23.760	14.400	14.400	14.400				
	2	UPSET	ACTUAL	1.256	.108	3.965	0.000	.164	.020	.112	1.330	.216	.015	4.635
	4		ACTUAL	1.282	2.353	1.924	0.000	.170	.097	.112	1.330	.224	.015	4.464
		UPSET	ALLOW	14.462	31.601	31.601	31.601	18.720	18.720	18.720				

2	FAULTED	ACTUAL	1.256	.108	3.965	0.000	.164	.020	.112	1.500	.213	.015	4.704
4		ACTUAL	1.282	2.353	1.924	0.000	.170	.097	.112	1.500	.221	.015	4.531
	FAULTED	ALLOW	14.462	32.400	32.400	32.400	18.720	18.720	18.720				

OVERALL MINIMUM STRESS MARGIN FACTOR= 3.34087 — o.k.

V.D.P. 2-23-'90
M.A 2/24/90

UNITS: KIPS,INCH,DEGREES

DISPLACEMENT CHECK RESULTS(GLOBAL)

JOINT	DIRECTION	ALLOW.	ACTUAL	
1	Y	.06250	.08926	$< \frac{1}{8}''$ ∴ o.k. V.D.P. 2-23-'90 M.A 2/24/90

UNITS: KIPS,INCH,DEGREES

USE FOR FREQUENCY CHECK.
V.D.P. 2-23-'90
M.A 2/24/90

JOINT DISPLACEMENTS(GLOBAL)

JOINT	LOAD NAME		X DISP		Y DISP		Z DISP		X ROT		Y ROT		Z ROT
1	SWE-X	+/-	.03277	+/-	0.00000	+/-	0.00000	+/-	0.00000	+/-	.02712	+/-	.00441
	SWE-Y	+/-	0.00000	+/-	.00098	+/-	.00008	+/-	.00136	+/-	0.00000	+/-	0.00000
	SWE-Z	+/-	0.00000	+/-	.00002	+/-	.00005	+/-	.00019	+/-	0.00000	+/-	0.00000
	NORMAL	+/-	0.00000	+/-	.08926	+/-	.00179	+/-	.18930	+/-	0.00000	+/-	0.00000
	UPSET	+/-	.08717	+/-	.08619	+/-	.00192	+/-	.18260	+/-	.07215	+/-	.01173
	FAULTED	+/-	.08717	+/-	.08619	+/-	.00192	+/-	.18260	+/-	.07215	+/-	.01173
2	SWE-X	+/-	.01898	+/-	0.00000	+/-	0.00000	+/-	0.00000	+/-	.02607	+/-	.00441
	SWE-Y	+/-	0.00000	+/-	.00040	+/-	.00008	+/-	.00031	+/-	0.00000	+/-	0.00000
	SWE-Z	+/-	0.00000	+/-	.00007	+/-	.00005	+/-	.00019	+/-	0.00000	+/-	0.00000
	NORMAL	+/-	0.00000	+/-	.00821	+/-	.00179	+/-	.08808	+/-	0.00000	+/-	0.00000
	UPSET	+/-	.05048	+/-	.00835	+/-	.00191	+/-	.08499	+/-	.06935	+/-	.01173

FAULTED +/- .05048 +/- .00835 +/- .00191 +/- .08499 +/- .06935 +/- .01173

UNITS: KIPS,INCH,DEGREES

MEMBER END-ACTIONS IN LOCAL COORDINATE SYSTEM

MEMBER	JOINT	LOAD NAME	FORCES AXIAL	FORCES SHEAR Y	FORCES SHEAR Z	MOMENTS TORSIONAL	MOMENTS BENDING Y	MOMENTS BENDING Z
1	1	NORMAL +/-	0.000 +/-	.940 +/-	0.000 +/-	0.000 +/-	0.000 +/-	.000
	2	NORMAL +/-	0.000 +/-	.970 +/-	0.000 +/-	0.000 +/-	0.000 +/-	28.048
	1	UPSET +/-	.000 +/-	.899 +/-	.000 +/-	0.000 +/-	.000 +/-	.000
	2	UPSET +/-	.079 +/-	.950 +/-	.079 +/-	0.000 +/-	1.158 +/-	27.161
	1	FAULTED +/-	.000 +/-	.899 +/-	.000 +/-	0.000 +/-	.000 +/-	.000
	2	FAULTED +/-	.079 +/-	.950 +/-	.079 +/-	0.000 +/-	1.158 +/-	27.161
2	2	NORMAL +/-	2.919 +/-	.466 +/-	0.000 +/-	0.000 +/-	0.000 +/-	19.672
	3	NORMAL +/-	2.919 +/-	.471 +/-	0.000 +/-	0.000 +/-	0.000 +/-	8.542
	2	UPSET +/-	3.020 +/-	.473 +/-	.049 +/-	.480 +/-	1.143 +/-	19.222
	3	UPSET +/-	3.189 +/-	.482 +/-	.218 +/-	.480 +/-	9.547 +/-	8.631
	2	FAULTED +/-	3.020 +/-	.473 +/-	.049 +/-	.480 +/-	1.143 +/-	19.222
	3	FAULTED +/-	3.189 +/-	.482 +/-	.218 +/-	.480 +/-	9.547 +/-	8.631
3	2	NORMAL +/-	3.245 +/-	.216 +/-	0.000 +/-	0.000 +/-	0.000 +/-	8.376
	4	NORMAL +/-	3.267 +/-	.218 +/-	0.000 +/-	0.000 +/-	0.000 +/-	3.678
	2	UPSET +/-	3.254 +/-	.246 +/-	.030 +/-	.423 +/-	.227 +/-	8.326
	4	UPSET +/-	3.321 +/-	.256 +/-	.146 +/-	.423 +/-	4.942 +/-	4.041
	2	FAULTED +/-	3.254 +/-	.246 +/-	.030 +/-	.423 +/-	.227 +/-	8.326
	4	FAULTED +/-	3.321 +/-	.256 +/-	.146 +/-	.423 +/-	4.942 +/-	4.041

UNITS: KIPS,INCH,DEGREES

SUPPORT REACTIONS(GLOBAL)

JOINT	LOAD NAME		FX		FY		FZ		MX		MY		MZ
3	NORMAL	+/-	0.000	+/-	.471	+/-	2.919	+/-	8.542	+/-	0.000	+/-	0.000
	UPSET	+/-	.218	+/-	.482	+/-	3.189	+/-	8.631	+/-	9.547	+/-	.480
	FAULTED	+/-	.218	+/-	.482	+/-	3.189	+/-	8.631	+/-	9.547	+/-	.480
4	NORMAL	+/-	0.000	+/-	1.479	+/-	2.919	+/-	3.678	+/-	0.000	+/-	0.000
	UPSET	+/-	.146	+/-	1.499	+/-	2.969	+/-	4.041	+/-	4.492	+/-	2.104
	FAULTED	+/-	.146	+/-	1.499	+/-	2.969	+/-	4.041	+/-	4.492	+/-	2.104

UNITS: KIPS,INCH,DEGREES

WELD DESIGN:

PLATE ½" & R. ½" TO SCV. V.D.P. 2-23-90
M.A 2/24/90

JOINT 3 MEMBER 2 T4X4X4 WELDED TO ~~AUX. STEEL~~
WELD PLANE = XY BASE METAL THK. = .5000
THETA Y = 90. THETA Z = 90.

WELD TYPE	AW1/ AW2/ AW3	SW2/ SW3/ JW	C2/ C3	CLC / FR	F1/ F2/ F3	M1/ M2/ M3	MINIMUM SIZE FILLET L<90 L=90 L>90	MINIMUM SIZE FILLET W<90 W=90 W>90	MINIMUM SIZE PENE. S<90 S=90 S>90	STRENGTH SIZE FILLET L<90 L=90 L>90	STRENGTH SIZE FILLET W<90 W=90 W>90	STRENGTH SIZE PENE. S<90 S=90 S>90	RECOMMENDED SIZE FILLET L<90 L=90 L>90	RECOMMENDED SIZE FILLET W<90 W=90 W>90	RECOMMENDED SIZE PENE. S<90 S=90 S>90	MARGIN FACTOR
	6.00	3.00	1.50	5	3.189	.480	-	-	-	-	-	-	-	-	-	
1	3.00	12.00	2.00		.482	9.547	3/16	3/16	-	1/4	1/4	-	1/4	1/4	-	1.055
	6.00	28.50		4.438	.218	8.631	-	-	-	-	-	-	-	-	-	
	6.00	12.00	2.00	4	2.919	0.000	-	-	-	-	-	-	-	-	-	
2	6.00	3.00	1.50		.471	0.000	3/16	3/16	-	1/4	1/4	-	1/4	1/4	-	1.080
	3.00	28.50		3.335	0.000	8.542	-	-	-	-	-	-	-	-	-	
	16.00	21.33	2.00	5	3.189	.480	-	-	-	-	-	-	-	-	-	
(3)	8.00	21.33	2.00		.482	9.547	3/16	3/16	-	1/16	1/16	-	3/16	3/16	-	3.328
	8.00	85.33		1.055	.218	8.631	-	-	-	-	-	-	-	-	-	

< * 0.17" & 0.227"
∴ O.K. V.D.P. 2-23-90
M.A 2/24/90

* ACTUAL WELD IS ON INCLINED SURFACE MAKING AN ANGLE OF 68° & 122° ∴ MIN. WELD EQUIVALENT SIZE @ 65° = WELD SIZE × FACTOR PER AWS (REF. 15). (CONSERVATIVELY) = 0.1875 × 0.91 = 0.17"
0.25 × 0.91 = 0.227"

	11.00	16.67	2.00	5	3.189	.673	-	-	-	-	-	-	:	-	-	-	
4	7.00	6.26	2.39		.482	9.547	3/16	3/16	-	3/16	3/16	-	:	3/16	3/16	-	1.302
	4.00	48.27		2.696	.218	11.458	-	-	-	-	-	-	:	-	-	-	
	11.00	6.26	2.39	5	3.189	.907	-	-	-	-	-	-	:	-	-	-	
5	4.00	16.67	2.00		.482	12.374	3/16	3/16	-	3/16	3/16	-	:	3/16	3/16	-	1.258
	7.00	48.27		2.790	.218	8.631	-	-	-	-	-	-	:	-	-	-	

UNITS: KIPS,INCH,DEGREES

WELD DESIGN:

JOINT 2 MEMBER 3 T3X3X4 WELDED TO T4X4X4
WELD PLANE = XZ BASE METAL THK. = 0.0000
THETA Y = 90. THETA Z = 30.

							MINIMUM SIZE FILLET			STRENGTH SIZE FILLET			:	RECOMMENDED SIZE FILLET			
								PENE.			PENE.		:		PENE.		
WELD	AW1/	SW2/	C2/	CLC	F1/	M1/	L<90	W<90	S<90	L<90	W<90	S<90	:	L<90	W<90	S<90	MARGIN
TYPE	AW2/	SW3/	C3		F2/	M2/	L=90	W=90	S=90	L=90	W=90	S=90	:	L=90	W=90	S=90	
	AW3	JW		FR	F3	M3	L>90	W>90	S>90	L>90	W>90	S>90	:	L>90	W>90	S>90	FACTOR
	4.00	1.33	1.00	4	1.809	0.000	-	-	3/8	-	-	3/8	:	-	-	PP 3/8	
1	2.00	12.00	3.00		2.919	0.000	-	-	-	-	-	-	:	-	-	-	1.003
	4.00	37.34		1.858	0.000	8.376	-	-	1/8	-	-	1/8	:	-	-	PP 1/8	
	8.00	12.00	1.50	4	1.809	0.000	-	-	-	-	-	-	:	-	-	-	
(2)	8.00	5.33	2.00		2.919	0.000	3/16	3/16	-	3/16	3/16	-	:	3/16	3/16	-	1.473

GENERAL NOTES FOR WELD
1) MINIMUM AND MAXIMUM WELD CHECKS ARE BASED ON ONLY MEMBER 3 THICKNESSES

$< \frac{1}{4}$". CONSERVATIVELY CONSIDER TWO SIDE ON FLAT PORTION ONLY.
∴ O.K. V.D.P. 2-23-90
M.A 2/24/90

	4.00	28.67		1.833	0.000	8.376	-	-	-	-	-	-	:	-	-	-	
	18.00	21.00	1.50	4	1.809	0.000	-	-	3/8	-	-	5/16	:	-	-	PP 3/8	
3	12.00	30.01	3.00		2.919	0.000	3/16	3/16	-	1/16	1/16	-	:	3/16	3/16	-	4.133
	6.00	121.53		.451	0.000	8.376	-	-	1/8	-	-	1/16	:	-	-	PP 1/8	
	13.00	16.50	1.50	4	1.809	0.000	-	-	3/8	-	-	3/8	:	-	-	PP 3/8	
4	10.00	11.46	3.08		2.919	0.000	3/16	3/16	-	1/8	1/8	-	:	3/16	3/16	-	1.725
	3.00	60.02		1.080	0.000	10.324	-	-	1/8	-	-	1/8	:	-	-	PP 1/8	
	11.00	3.55	1.93	4	1.809	2.720	-	-	3/8	-	-	3/8	:	-	-	PP 3/8	
5	6.00	21.00	3.00		2.919	1.686	3/16	3/16	-	1/8	1/8	-	:	3/16	3/16	-	1.572
	5.00	69.88		1.186	0.000	8.376	-	-	1/8	-	-	1/8	:	-	-	PP 1/8	

UNITS: KIPS,INCH,DEGREES

WELD DESIGN:

SCV. V.D.P. 2-23-90
M.A 2/24/90

JOINT 4 MEMBER 3 T3X3X4 WELDED TO ~~AUX. STEEL~~
WELD PLANE = XY BASE METAL THK. = .5000
THETA Y = 90. THETA Z = 60.

WELD TYPE	AW1/ AW2/ AW3	SW2/ SW3/ JW	C2/ C3	CLC FR	F1/ F2/ F3	M1/ M2/ M3	MINIMUM SIZE FILLET L<90 L=90 L>90	MINIMUM SIZE FILLET W<90 W=90 W>90	MINIMUM SIZE PENE. S<90 S=90 S>90	STRENGTH SIZE FILLET L<90 L=90 L>90	STRENGTH SIZE FILLET W<90 W=90 W>90	STRENGTH SIZE PENE. S<90 S=90 S>90	:	RECOMMENDED SIZE FILLET L<90 L=90 L>90	RECOMMENDED SIZE FILLET W<90 W=90 W>90	RECOMMENDED SIZE PENE. S<90 S=90 S>90	MARGIN FACTOR
	4.00	1.33	1.00	5	3.004	2.837	3/16	3/16	-	5/16	1/4	-	:	5/16	1/4	-	
1	2.00	6.93	1.73		1.882	4.492	-	-	-	-	-	-	:	-	-	-	1.014
	4.00	13.33		4.859	.146	4.041	3/16	3/16	-	3/8	5/16	-	:	3/8	5/16	-	

	4.62	6.93	1.50	5	3.004	2.837	-	-	-	-	-	-	:	-	-	-	
2	4.62	1.78	1.15		1.882	4.492	3/16	3/16	-	1/4	1/4	-	:	1/4	1/4	-	1.277
	2.31	12.44		3.664	.146	4.041	-	-	-	-	-	-	:	-	-	-	
	12.93	13.39	1.50	5	3.004	2.837	3/16	3/16	-	1/16	1/16	-	:	3/16	3/16	-	
3	6.93	14.39	1.73		1.882	4.492	3/16	3/16	-	1/16	1/16	-	:	3/16	3/16	-	2.741
	6.00	45.01		.934	.146	4.041	3/16	3/16	-	1/8	1/16	-	:	3/16	3/16	-	
	8.77	10.16	1.50	5	3.004	2.951	3/16	3/16	-	3/16	1/8	-	:	3/16	3/16	-	
4	5.77	4.19	1.94		1.882	4.492	3/16	3/16	-	3/16	3/16	-	:	3/16	3/16	-	1.074
	3.00	23.36		2.384	.146	6.391	3/16	3/16	-	3/16	3/16	-	:	3/16	3/16	-	
	8.46	3.29	1.76	5	3.004	4.270	3/16	3/16	-	3/16	3/16	-	:	3/16	3/16	-	
5	3.46	10.66	1.73		1.882	6.780	3/16	3/16	-	3/16	3/16	-	:	3/16	3/16	-	1.006
	5.00	24.26		2.939	.146	4.041	3/16	3/16	-	1/4	3/16	-	:	1/4	3/16	-	

ANGLE ARE LARGER THAN 90° < ∴ 3/16" (CONSERVATIVE)
∴ O.K. V.D.P. 2-23-90
M.A 2/24/90

UNITS: KIPS,INCH,DEGREES

LOCAL EFFECT EVALUATION:

JOINT MEMBERS:
2 3 T3X3X4 CONNECTED TO T4X4X4
CONN. PLANE = XZ
THETA Y = 90. THETA Z = 30.
BRANCH: B= 3.000 D= 3.000 TF= .250 TW= .250
MAIN : B= 4.000 D= 4.000 TF= .250 TW= .250 K= 0.000

LOAD CASE	LOAD NAME	ALLOW. FACTOR	fab/ fam	fbyb/ fbym	fbzb/ fbzm	F1	M2	M3	/--ACTING---/ VP	F	/--ALLOWABLE--/ VP	F	/MARGIN FACTOR
4	NORMAL	1.00	1.3	0.0	4.0	1.8	0.0	8.4	2.0	N/A	10.0	N/A	4.97
			.8	0.0	4.9								
5	UPSET	1.33	1.3	.1	4.0	1.8	.5	8.3	2.0	N/A	13.0	N/A	6.48

			.9	.3	4.8							
6	FAULTED	1.50	1.3	.1	4.0	1.8	.5	8.3	2.0	N/A	13.0	N/A	6.48
			.9	.3	4.8							

OVERALL MINIMUM LOCAL EFFECTS MARGIN FACTOR(w/o stiffeners): 4.97 - O.K.
Y.D.P. 2-23-90
M.A 2/24/90

THE FOLLOWING FILES WERE USED FROM YOUR PROJECTFILE=$USER.WBNFAPPS
FOR CONSTANTS =:NVE.KXLIBDC.WBN_FAPPS.FAPPSCONST
FOR STEEL TABLE =:NVE.KXLIBDC.WBN_FAPPS.AISCTAB
FOR SHAPE MENU =:NVE.KXLIBDC.WBN_FAPPS.AISCMEN
FOR BASE PLATE W/ANCHORS =:NVE.KXLIBDC.WBN_FAPPS.FAPPSBP
FOR EMBED PLATES =:NVE.KXLIBDC.WBN_FAPPS.FAPPSEMB
FOR STD. FRAME CONSTANTS =:NVE.KXLIBDC.WBN_FAPPS.STD
FOR ME150 BANNER =$SYSTEM.APPLICATIONS.ME150.VER_9.BANNER

****
PROGRAM EXECUTION FINISHED
****

****
PROGRAM EXECUTION FINISHED
****

Attachment No. E
Calc. No. 47A4370100Z Rev. 1
Sheet No. E-15 of E-15

CALCULATION SHEET

BEPC-2706 Rev. 8/86 (ED-69)

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
20652	47A4370100 7	1	F1 OF F10

ORIGINATOR	DATE	CHECKED	DATE
Azfain	12/15/89	A. Papadopoulos	12/15/89

ATTACHMENT F

INTEGRAL WELDED ATTACHMENT EVALUATION

ATTACHMENT F

CALCULATION SHEET

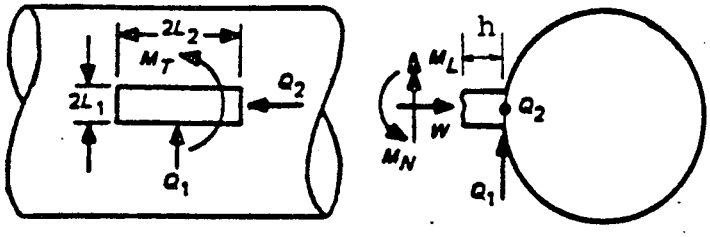
BEPC-2706 Rev. 8/86 (ED-69)

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
18968	47A4370100.7	1	F2

ORIGINATOR	DATE	CHECKED	DATE
Ajain	12/15/89	a. Papadopoulos	12/15/89

REF

Integral Welded Attachment Evaluation



Lug height
h= 1 1/2",

D.P. L15

$M_L = Q_2 * 3/4"$
L clamp thickness

DESIGN DATA: (Units: Lbs., In., Deg. F., PSI)
Pipe Size: 8 Sch.: 40 Material: SA312 TP304
Design Temp: Cold 40 Hot 190 Pipe OD: 8.625" t: 0.322"

ITEM	LENGTH ($2L_2$)	WIDTH ($2L_1$)	SC	SH	SY	MAT'L
ATTACHMENT	2"	1/2"	15700	15700	21490	Assume A240 304L/316L

REF. 4 SEC. 5.1

Weld Size and Type 3/16" 3-sided Fillet, Sy (Weld) = 50000
Welds Inspected

Loads at surface of pipe (C.G. of lug): No. of Active Lugs = 4/2 = 2
Friction Force ____ Applicable ✓ Not Applicable
Friction Load: Q_1 = _____, Q_2 = _____

RESERVE

LOAD CASE	Q_1	Q_2 'y'	W	M_L	M_N	M_T	PIPE STRESS
NC8		865		649			17265
NC9U		865		649			20514
NC9F		865		649			41153
NC10		865		649			15005
2SY		865		649			—

IAP OUTPUT EVALUATION: (Code Case N-318-3) NC11→ 32271

CHECK PARAMETERS:

1. For 2-sided Fillet or Partial Penetration Welds:
   L_2 (=____) ≥ $3L_1$ (=____) ____OK ____N.G. ✓ NA

2. a) Circum. Separation = 6.27" > $\sqrt{rt}$ (= 1.156"), ✓ OK ____N.G.
   b) Long. Separation = 6" > $\sqrt{rt}$ (= 1.156"), ✓ OK ____N.G.

3. All Other Parameters:
   ✓ Acceptable As Is
   ____ Acceptable Based on Modified Conservative Dimensions.

PIPE LOCAL STRESSES ACCEPTABLE FOR ALL EQUATIONS: ✓ Yes ____ No
LUG IS STRUCTURALLY ADEQUATE: YES ✓ NO ____

SHT. 3/10

ATTACHMENT F

CALCULATION SHEET

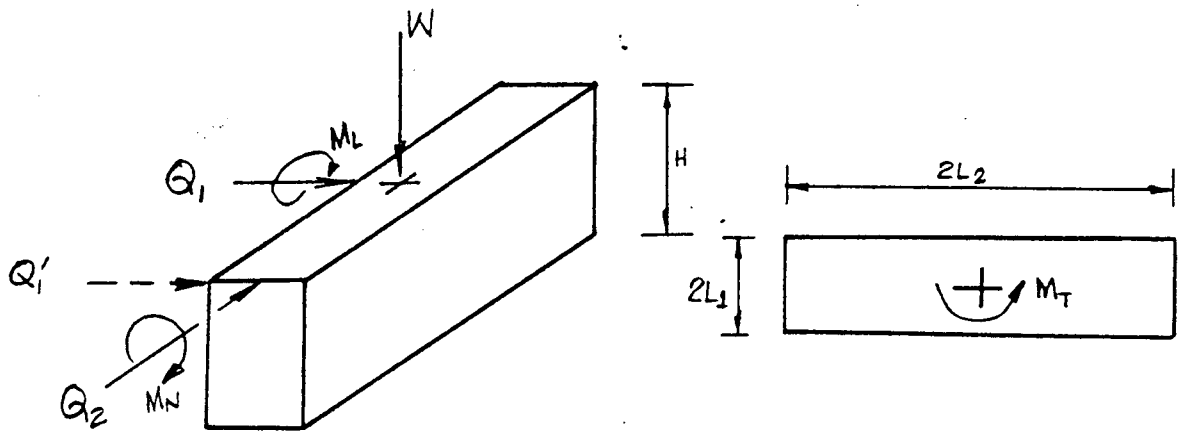
BEPC-2706 Rev. 8/86 (ED-69)

JOB NO.	CALC. NO.	REV. NO.	SHEET NO.
18968	47A43701007	1	F3

ORIGINATOR	DATE	CHECKED	DATE
Afaim	12/15/89	a. Papadopoulos	12/15/89

INTEGRAL WELDED ATTACHMENT EVALUATION (continued)

Structural Adequacy Of The Lug Attachment



PARAMETERS

$H' = 3/4''$ INCHES (MOMENT ARM)

$2L_2 =$ 2" inches, $2L_1 =$ 1/2" inches, $H =$ 1 1/2" inches, $S_y =$ 21490 Psi

$S_N = (2L_2)(2L_1)^2/6 =$ in^3

$S_L = (2L_1)(2L_2)^2/6 =$ 0.3333 in^3

$S_T = abd^2 = 0.208(2L_2)(2L_1)^2 =$ in^3 *

$A_V = 0.67(H * 2L_1) =$ in^2

$A_h = 0.67(2L_1)(2L_2) =$ 0.67 in^2

$A_b = 1/2 * 3/4 =$ 0.375 in^2 (Contact Area)

MOMENTS & STRESSES

$M_N/S_N \leq 0.6S_y$; N/A $M_N = Q_1H' =$ N/A in-lb

$M_L/S_L \leq 0.6S_y$; $649/.3333 = 1947 \leq 12894$ $M_L = Q_2H' =$ 649 in-lb

TORSIONAL STRESSES:

$M_T/S_T \leq 0.4S_y$; N/A $M_T = Q_1'L_2 =$ N/A in-lb

SHEAR STRESSES:

$Q_2/A_h \leq 0.4S_y$; $865/.67 = 1291 \leq 8596$ $Q_1/A_V \leq 0.4S_y$; N/A

Bearing Stress $= Q_2/A_b = 865/.375 = 2307 \leq 0.9S_y$

Notes: * Design of Welded Structures by Blodgett; a=0.208 for b/d=1.0

I742L15
0742L15

ATTACHMENT: F
CALC: 47A4370100 REV. 1
SHEET: F4

```
          IIIIIIIIII   AAAAAAAA   PPPPPPPPP
          IIIIIIIIII  AAAAAAAAAA  PPPPPPPPPP
             II      AA      AA  PP      PP
             II      AA      AA  PP      PP
             II      AA      AA  PPPPPPPPPP
             II      AAAAAAAAAA  PPPPPPPPP
             II      AAAAAAAAAA  PP
             II      AA      AA  PP
          IIIIIIIIII AA      AA  PP
          IIIIIIIIII AA      AA  PP
```

TENNESSEE VALLEY AUTHORITY

INTEGRAL ATTACHMENT ANALYSIS PROGRAM
TVA SOFTWARE ID: 262402 VERSION 1 JUNE 17, 1988

TITLE: PROB: N3-74-2A SUPP: 47A437-1-7 D.P. L15
ANALYSIS = N-318-3 DATE: 15 DEC 89 TIME: 5:07 PM

PROGRAM CAPABILITIES:

1) RECTANGULAR LUG ATTACHED TO STRAIGHT PIPE PER ASME CODE CASE N-318-3

2) HOLLOW CIRCULAR ATTACHMENTS ON STRAIGHT PIPE PER ASME CODE CASE N-392

PROGRAM LIMITATIONS:

THIS PROGRAM ONLY ANALYZES THE LOCAL STRESSES INDUCED INTO THE PIPE AND THE INTEGRAL FILLET WELD IF USED. QUALIFICATION OF THE INTEGRAL ATTACHMENT IS BEYOND THE SCOPE OF THIS PROGRAM.

USER IS RESPONSIBLE FOR ANY OVERLAPPING STRESS OCCURING BECAUSE OF LUG SPACING OR OTHER STRESS RISERS LOCATED ON THE PIPE.

ATTACHMENT: F
CALC: 47A437701007 REV. 1
SHEET: F 5

TITLE: PROB: N3-74-2A SUPP: 47A437-1-7 D.P. L15
ANALYSIS = N-318-3 DATE: 15 DEC 89 TIME: 5:07 PM

****
* *
* GEOMETRY DATA *
* *
****

PIPE SHELL INFORMATION (INCHES, PSI, DEGREES F)

PIPE SIZE	PIPE SCH	MATERIAL ID	PIPE DIA	WALL THK	ALLOW STR & MTL TEMP SC/TC	SH/TH	SY/TH
8		USER MATL	8.625	.3220	18800.	17900.	25500.
					40.	190.	190.

ATTACHMENT INFORMATION (INCHES, PSI, DEGREES F)

ATTACHMENT LENGTH	WIDTH	MATERIAL ID	ALLOW STR & MTL TEMP SC/TC	SH/TH	SY/TH
2.0000	.5000	USER MATL	15700.	15700.	21490.
			40.	190.	190.

WELD MAT PROPERTIES BASED ON A ROUNDED TEMPERATURE OF 100 F

WELD INFORMATION (INCHES, PSI)

WELD TYPE	LEG SIZE	SY WLD THROAT	KL
3S-FILLET	.1875	50000.	3.6

ATTACHMENT: F
CALC: 47A437101 007 REV. 1
SHEET: F6

TITLE: PROB: N3-74-2A SUPP: 47A437-1-7 D.P. L15
ANALYSIS = N-318-3 DATE: 15 DEC 89 TIME: 5:07 PM

****
* *
* LOAD DATA *
* *
****

APPLIED ATTACHMENT LOADS AND STRESS RESERVE MARGINS

LOAD CASE	Q1 (LB) MN (IN-LB)	Q2 (LB) ML (IN-LB)	W (LB) MT (IN-LB)	RESERVE STR (PSI)
NC8	.0	865.0	.0	17265.0
	.0	649.0	.0	
NC9U	.0	865.0	.0	20514.0
	.0	649.0	.0	
NC9E				
NC9F	.0	865.0	.0	41153.0
	.0	649.0	.0	
NC10	.0	865.0	.0	15005.0
	.0	649.0	.0	
NC10A				
NC11				32271.0

ABSOLUTE VALUES OF MAXIMUM LOADS OCCURING SIMULTANEOUSLY

Q1A (LB)	Q2A (LB)	WA (LB)	MNA (IN-LB)	MLA (IN-LB)	MTA (IN-LB)
.0	865.0	.0	.0	649.0	.0

ATTACHMENT: F
CALC: 47A437010 07 REV. 1
SHEET: F 7

****
* *
* ANALYSIS RESULTS *
* *
****

CALCULATED ATTACHMENT-SHELL GEOMETRY PARAMETERS

PARAMETER	VALUE	LIMIT
BETA1	.060	0.500
BETA2	.241	0.500
BETA1*BETA2	.015	0.075
DO/T	26.786	100.000
SQRT(RM/T)	1.156	MINIMUM ATT SEPERATION

INTERMEDIATE EQUATION PARAMETERS

PARAMETER	VALUE	PARAMETER	VALUE
[illegible]	10.279	BT	6.853
[illegible]	2.664	BL	1.776
[illegible]	1.307	BN	.872

ATTACHMENT AND WELD SECTION PROPERTIES FOR STRESS CALCULATIONS

/----ATT SECTION PROP----/			/----WELD SECTION PROPERTIES-----/			
AL (IN**2)	ZLL (IN**3)	ZLN (IN**3)	AW (IN**2)	ZWD (IN**3)	ZWL (IN**3)	ZWT (IN**3)
1.000	.333	.083	.552	.196	.128	.220

CALCULATED WELD GAP (IN)	SKEW WELD ANGLE (DEGREES)	EFFECTIVE THROAT (IN)
.0073	94.5730	.1227

ATTACHMENT: F
CALC: 47A437O1007 REV. 1
SHEET: F 8

TITLE: PROB: N3-74-2A SUPP: 47A437-1-7 D.P. L15
ANALYSIS = N-318-3 DATE: 15 DEC 89 TIME: 5:07 PM

****
* *
* ANALYSIS RESULTS *
* *
****

STRESS SUMMARY OF CODE CASE N-318-3 ANALYSIS (PSI)

CODE CASE EQUATION	SML	SPL/2	TOTAL STRESS	RESERVE STRESS
NC8	5188.3		5188.3	17265.0
NC9U	5188.3		5188.3	20514.0
NC9E				
NC9F	5188.3		5188.3	41153.0
NC10		12451.4	12451.4	15005.0
NC10A				
NC11	5188.3	12451.4	17639.7	32271.0

SML FOR NC11 = SML FROM NC8
SPL FOR NC11 = SPL FROM NC10

N-318-3 EQUATION	STRESS	ALLOW
EQN 5	6917.5	53725.0
EQN 6	1730.0	21490.0
EQN 7	6440.4	42980.0
EQN 8	3133.9	21490.0

ATTACHMENT: F
CALC: 47A437 01007 REV. 1
SHEET: F 9

CIVIL/MECHANICAL REQUEST MEMO
CMRM

No. 74-11

Drawing No. 47A437-1-7

Stress Calc. No. N3-74-2A

Data Point No. L15

ATTACHMENT: F
CALC: 47A437-0-007 REV. 1
SHEET: F10 OF F10

Description:
The following information is required for the local stress evaluation at the welded attachment.

1) Pipe Size (OD, Sch.) and Pipe Material

2) Design Pressure

3) T_{MAX} (Hot)/ T_{MIN} (Cold), operating temp. including faulted condition.

4) Sif used in stress analysis at data pt of welded attachment.

Prepared by: Ajain **Date:** 11/22/89

Approved by: G. Papadopoulos **Date:** 11/22/89

Response: (2,8)

1) OD = 8.625" SCH/Thickness = 0.322

MAT = SA312 TP304 SC = 18.8 (T_{MIN}) SH = 17.9 (T_{MAX}) SY = 25.5 (T_{MAX}) (ksi)

2) P_{DES} = 150 PSi

3) T_{MAX} = 190 °F T_{MIN} = 40 °F

4) SIF = 1.0

☐ Approved ☐ Disapproved

Prepared by: R Jen **Date:** 11/27/89

Approved by: [signature] **Date:** 11-27-89
Lead Stress Engineer

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
1	V. D. Patel	2/23/90	M. Arsala	2/24/90

ATTACHMENT: G
CALC: 47A43701007 REV. 1
SHEET: G1

TENNESSEE VALLEY AUTHORITY
WBN HAAUP

BNAPC
JOB 18968

UNVERIFIED CALCULATION ASSUMPTION

UCA NO: 47A 43701007 - 001
(SUPPORT MARK NO.) (SEQ. NO.)

OPEN: 2-23-90 BY: V. D. PATEL
(DATE)

CLOSED: 6-6-90 BY: F Yong | 3
(DATE)

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	F Yong	6/6/90	S. Shah	6/7/90

DETAILED DESCRIPTION:

The Non Standard Component Item listed in this calculation (Item/s No. 6) has been sent to Bechtel Plant Design Staff for evaluation and is not qualified in this calculation.

REQUIREMENTS TO CLOSE:

Approval of the above mentioned Non Standard Component based on analysis performed by Bechtel Plant Design Staff.

Note: Authorization by TVA is req'd to perform. Ref. Analysis

CLOSED PER FOLLOWING DOCUMENTATION/CALCULATION:

THIS UCA IS CLOSED PER CQR-BP-R053. SEE ATTACH. H | 3

R007258

REV. NO.	ORIGINATOR	DATE	CHECKER	DATE
3	F Henry	6/6/90	S. Shah	6/7/90

ATTACHMENT: H
CALC: 47A437010 07 REV. 3
SHEET: H1

COMPONENT QUALIFICATION REQUEST
WATTS BAR PROJECT

COMPONENT QUALIFICATION REQUEST NO. BP-R053

STRESS PROB.NO. N3-74-02A
DRAWING NO. 47A437-1-7
BILL OF MATERIAL ITEM NO. (SEE ATTACHED SKETCH) 6

BERGEN PATERSON COMPONENT PART NO: N/A
TVA CONTRACT NO. 78KA2-824160
RD # 981421

TASK: LOAD RATE THE CLAMP SHOWN ON THE ATTACHED SKETCH.

BECHTEL

PIPE TEMPERATURE: 190° F

COMMENTS:
1. CLAMP MATERIAL IS
2. BOLTS ARE A307
3. PINS ARE A193 GR. B7

PREPARER: George K. Malany DATE: 12/1/89
CHECKER: S R Dutta DATE: 12/5/89

BERGEN PATERSON

RESULTS OF ENGINEERING EVALUATION

LOAD RATING

NORMAL: 7664#
UPSET: 7664#
FAULTED: 14408#

ENGINEERING APPROVAL Lena Bandyopadhyay DATE: 1-26-90