LOUISIANA POWER & LIGHT / 142 DELARONDE STREET
P. O. BOX 6008 • NEW ORLEANS, LOUISIANA 70174 • (504) 366-2345
MIDDLE SOUTH UTILITIES SYSTEM

June 29, 1984

W3K84-1506
Q-3-A35.07.88

Mr. John T. Collins
Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 1000
Arlington, Texas 76012

Dear Mr. Collins:

SUBJECT: Waterford SES Unit No. 3
Docket No. 50-382
Significant Construction Deficiency No. 88
"Refueling Water Storage Pool Nozzle/Liner Overstressed Condition"

The attached information is provided as requested by Mr. R. Hall at the USNRC Exit for Inspection 84-29.

Very truly yours,

T. F. Gerrets

T. F. Gerrets
Corporate Quality Assurance Manager

TFG:CNH:VBR

Attachment

cc: Director
Office of Inspection & Enforcement
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Director
Office of Management
Information and Program Control
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

IE-27 1/1

cc: Mr. E. L. Blake
Shaw, Pittman, Potts & Trowbridge
1800 M Street, N.W.
Washington, D.C. 20036

Mr. W. M. Stevenson
Monroe & Lemann
1424 Whitney Building
New Orleans, Louisiana 70130

Records Center
Institute of Nuclear Power Operations
1100 Circle 75 Parkway, Suite 1500
Atlanta, Georgia 30339

Mr. W. A. Cross
7910 Woodmont Avenue
Suite 1200
Bethesda, Maryland 20814

X

M E M O R A N D U M

June 21, 1984
ES-9417-84

TO: J. Pertuit/S. Horton

FROM: B. Grant BG

SUBJECT: LOUISIANA POWER & LIGHT COMPANY
WATERFORD SES - UNIT NO. 3
SCD - 88

In response to the specific questions raised by the NRC inspector during the review of SCD-88, a recalcalation was performed using the resultant of the two bending moments as the maximum bending moment. $[\sqrt{M_1^2 + M_2^2}]$

The reanalysis results indicate that the actual stresses are still within allowable stress limit.

The analysis and the results are attached as back up data.

BG/tw

cc: J. Houghtaling
A. Bishara
B. Esnes
L. Biller
J. DeBruin
E. Kowalski
B. Milde w/att
R. McGann w/att
ESSE File P. 83

ATTACHMENT

(1) LOADING SHEETS FOR THIS PAGE ATTACHED

SCD-88

D J LOFT
8-2-83

Refueling Water Storage Pool (Total Nozzles = 15)

Line #	S/A Calc #		Piping Dwg	Flow Diag
F3 3F53-42 A/B ✓	6666 -		G-193 Sh2 (N-10)	G-163
F3 2F24-2A NG!	1125	ANCHORS REQ'D.	G-195 Sh4 (I-7)	
F4 2F24-3B NG!	1125-3	ANCHORS REQ'D.	Sh1 (B-7)	ALREADY SENT
F6 3CF3-6A ✓ ✓	2300		Sh1 (A-11)	
F20 3CF3-8 A/B ✓ ✓	2302		Sh1 (H-4)	
F7 3CF3-7B ✓ ✓	2301		Sh1 (K-10)	
F2 3CH2-27 A/B ✓ ✓	2869		G-194 Sh3 (I-4)	
N10 3CF6-48 A/B ✓ ✓	1056-10		G-200 Sh1 (L-10)	
N13 3F56-66 A/B ✓ ✓	5555		G-197 Sh3 (L-6)	
N21 3H3-38 A/B ✓ (N121)	2881		G-197 Sh2 (J-7)	
N11 3F53-40 A/B ✓	2892		G-198 Sh2 (G-4)	
3CF4-63 A/B ¥	—	WALL PENET @ EL +18.50'	G-195 Sh3 (M-2)	B31.1 NS NO CALC.
3CD4-93 A/B	2688	WALL PENET @ EL +18.50'	G-204 Sh4 (F-11)	
3CF16-41A ¥	—	ABOVE TOP OF LINER EL +17.00'	G-195 Sh3 (M-2)	SHORT LINE NO CALC.
3CF16-41B ¥	—	ABOVE TOP OF LINER EL +17.00'	G-195 Sh3 (M-3)	SHORT LINE NO CALC.

Condensate Storage Pool (Total Nozzles = 8)

Line #	S/A Calc #		Piping Dwg	Flow Diag
N20 3CL2-74 A/B ✓	2503		G-185 Sh5 (C-7B)	G-160 Sh2
F15 3CD6-69A ✓	2372 ✓		G-176 Sh2 (L-7)	
F16 3CD3-125 A/B ✓	2690 ✓		G-204 Sh4 (F-10)	
F14 3CL6-144 A/B NG! (SEE F13 F14)	2502 ✓	LATERAL SUPPORT REQ'D	G-185 Sh5 (J-8)	
F13 3CD6-65 B NG!	2372 ✓	LATERAL SUPPORT REQ'D	G-176 Sh2 (L-7)	
N19 3CD4-96 A/B ✓	2688 ✓		G-204 Sh4 (F-9)	
N18 3FN2-42 A/B ✓ X	N72-1 ✓		G-176 Sh2 (H-16)	
3CD8-124 —	2681	FLOOR PENET @ EL +21.00'	G-204 Sh4 (E-10)	

EBASCO SERVICES INCORPORATED

BY RMM DATE 6-16-

CHKD. BY J. CHOU DATE 6/20/84

SHEET 1 OF 2

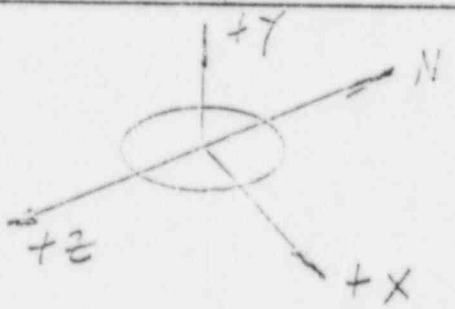
OFS NO. 2145.140 DEPT. NO. 453

CLIENT

PROJECT

SUBJECT STRESS ANALYSIS FOR NOZZLE PE-7

EQUIPMENT	
NOZZLE	PE-7
LINE NUMBER	
CALC. NO.	2669
PORTION NO	1
ISOMETRIC NO	CH-190-39
POINT NO	207
OUTPUT DATE	



TYPE ANALYSIS	FORCES (lbs)			MOMENTS (Ft-lbs)			RESULTANT SHEAR MOMENT
	Fx	Fy	Fz	Mx	My	Mz	
THERMAL	48	-127	32	-226	-9	197	
WEIGHT	1	220	-1	3	2	2	
SEISMIC OBE MAX X COMPONENT	-27	-10	5	-35	12	-57	
SEISMIC OBE MAX Y COMPONENT	0	-66	0	-1	-1	0	
SEISMIC OBE MAX Z COMPONENT	1	-2	-37	106	-39	9	
THER. + WT + SEISMIC OBE MAX X + Y	75	296	37	259	20	247	354
THER + WT + SEISMIC OBE + MAX Z + Y	49	283	14	330	-16	196	337
THER + WT + SEISMIC OBE MAX X + Y	104	372	41	295	33	299	420
THER + WT + SEISMIC OBE MAX Z + Y	51	356	95	137	55	203	432

Ref Correspondence with [illegible]

EBASCO SERVICES INCORPORATED

BY RMN DATE [illegible] SHEET 2 OF 2

CHKD. BY J. CHOU DATE 6/20/84 OFS NO. 7365.140 DEPT. NO. 353

CLIENT LP&L

PROJECT WATERFORD SES #3

SUBJECT RAB SST PIPE NOZZLE & REFUELING WATER [illegible]

PF-2

CHECK STRESS DUE TO BENDING FOR RESULTANT MOMENTS

FR. PIPE STRESS ANALYSIS

OBE (WORSTCASE) RESULTANT MOMENTS
383 FT·lb = 4.6 IN·K

ANALYSIS

FOR BENDING STRESS (USE ROARK METHOD ON FLODGETT [illegible]
CASE 5 EDGE SUPPORTED COUPLE LOADING @ HUB
(TRUNNION LOADING)

r = 4.3125"
r_1 = 1.75"
t = 0.25"

$$Max\ \sigma_r = \frac{69\ M}{40\pi r_1 t^2} Log_e \frac{2(r - r_1)}{Kr}$$

$$K = \frac{0.09\ r^2}{(.7r + r_1)^2} = 0.4$$

$$\sigma_r = \frac{69 \times 4.6}{40\pi \times 1.75 \times .25^2} Log_e \frac{2(4.3125 - 1.75)}{0.4 \times 4.3125}$$

= 25.15 ksi < 26.75 ksi OK

DBE (WORSTCASE) RESULTANT MOMENTS
482 FT·lb = 5.78 IN·K

$$Max\ \sigma_r = \frac{69 \times 5.78}{40\pi \times 1.75 \times .25^2} \times 1.0899$$

= 29.02 ksi < 32.5 ksi OK

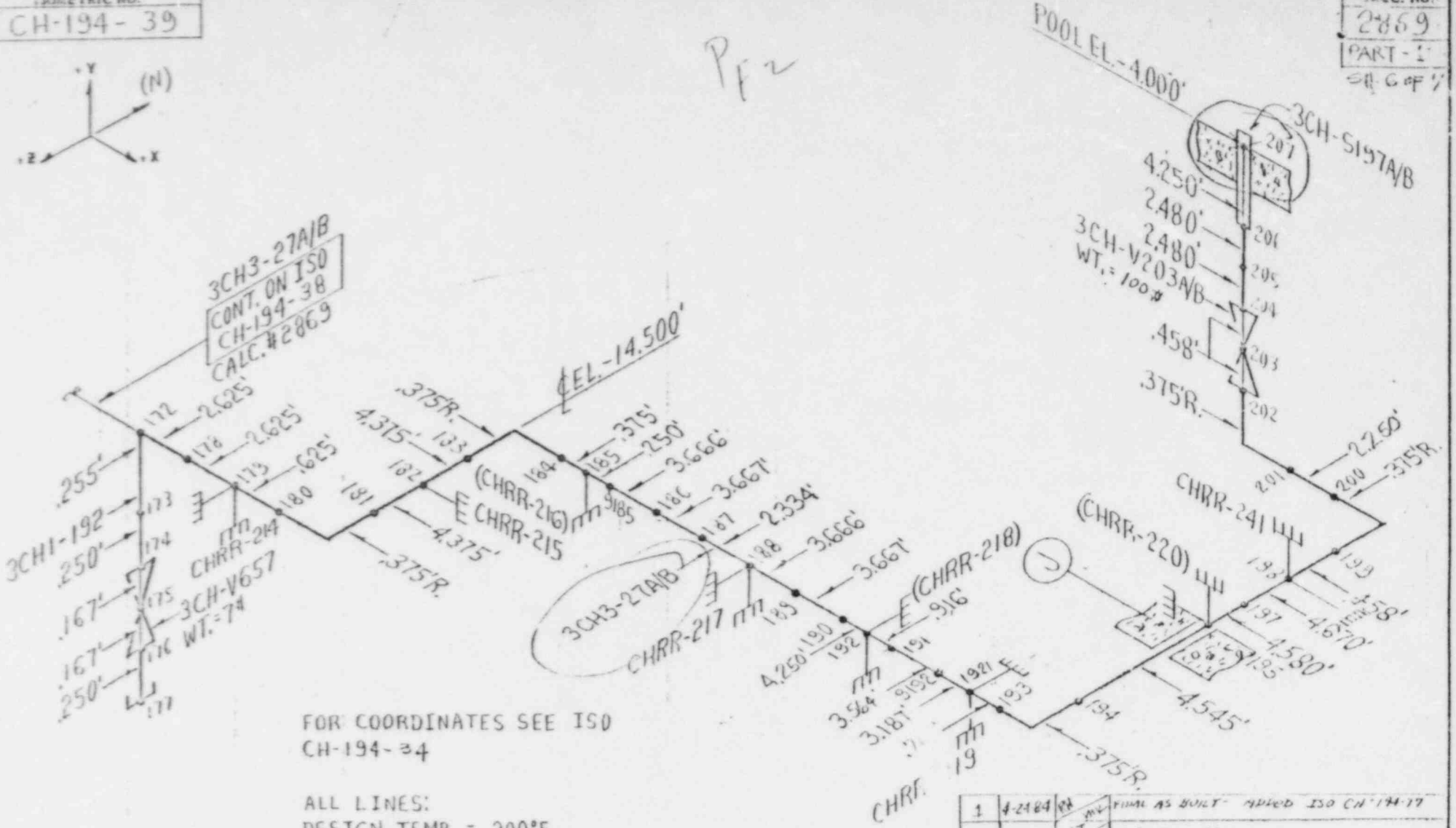
SINCE THE STRESSES FOR PF-3, PF-6, PF-7, PF-11, PF20 & PW-21 ARE SMALLER THAN THAT OF PF-2, FURTHER ANALYSIS IS NOT REQUIRED.

581/8-81

ISOMETRIC NO.
CH-194-39

CALC. NO.
2869
PART-1
SH. 6 OF 7

P F 2



FOR COORDINATES SEE ISO
CH-194-34

ALL LINES:
DESIGN TEMP. = 200°F.
OPER. PRESS. = 100 PSIG.

REV.	DATE	BY	DESCRIPTION
1	4-21-84	RA MK	FINAL AS BUILT - ADDED ISO CH-194-39
0	6-14-82	EET JW	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX. BLDG.
CH PIPING

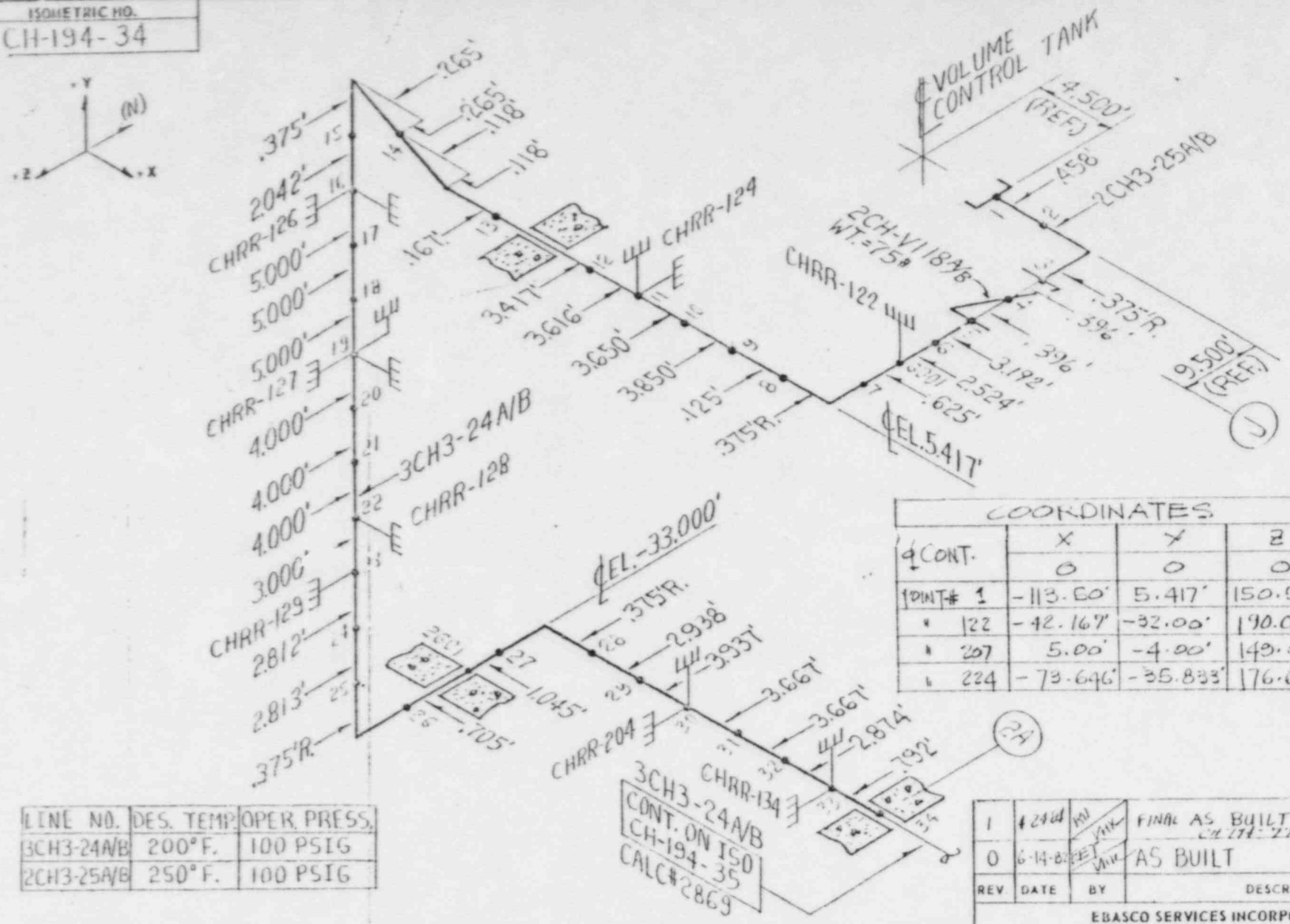
DR. R.PIRONCIAK DATE 7-28-81
CH. E.TRINIDAD DATE 8-22-81

ISOMETRIC NO.
CH-194-39

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CH3-27A/B	3.500	.216	SS-1	140			150			LOU 1564 G-194 SH.1	9	2-28-84
3CH1-192	1.315	.179	SS-1	140			150	DYNAMIC ☐	HORIZ X=.38	SH 3	10	2-28-84
								STATIC ☒	VERT. Y=.30			
								THERMAL ☒	HORIZ. Z=.37			

ISOMETRIC NO.
CH-194-34

CALC. NO.
2869
PART-1
CH-197



COORDINATES			
℄ CONT.	X	Y	Z
	0	0	0
POINT # 1	-113.50'	5.417'	150.50'
" 122	-42.167'	-32.00'	190.083'
" 207	5.00'	-4.00'	149.00'
" 224	-73.646'	-35.833'	176.625'

LINE NO.	DES. TEMP.	OPER. PRESS.
3CH3-24A/B	200°F.	100 PSIG
2CH3-25A/B	250°F.	100 PSIG

REV.	DATE	BY	DESCRIPTION
1	8-24-81	MH	FINAL AS BUILT ADDED ISO CH-194-37
0	6-14-81	PEET	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX. BLDG.
CH PIPING

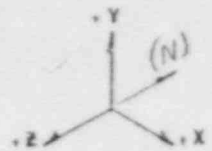
LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CH3-24A/B	3.500	.216	SS-1	170			150			LOU 1564 G-194 SH.1	9	2-28-84
2CH3-25A/B	3.500	.216	SS-1	170			150	DYNAMIC ☐	NOK. X=.38	LOU 1564 G-194 SH.3	10	2-28-84
								STATIC ☑	VERT. Y=.30			
								THERMAL ☑	HORIZ. Z=.35			

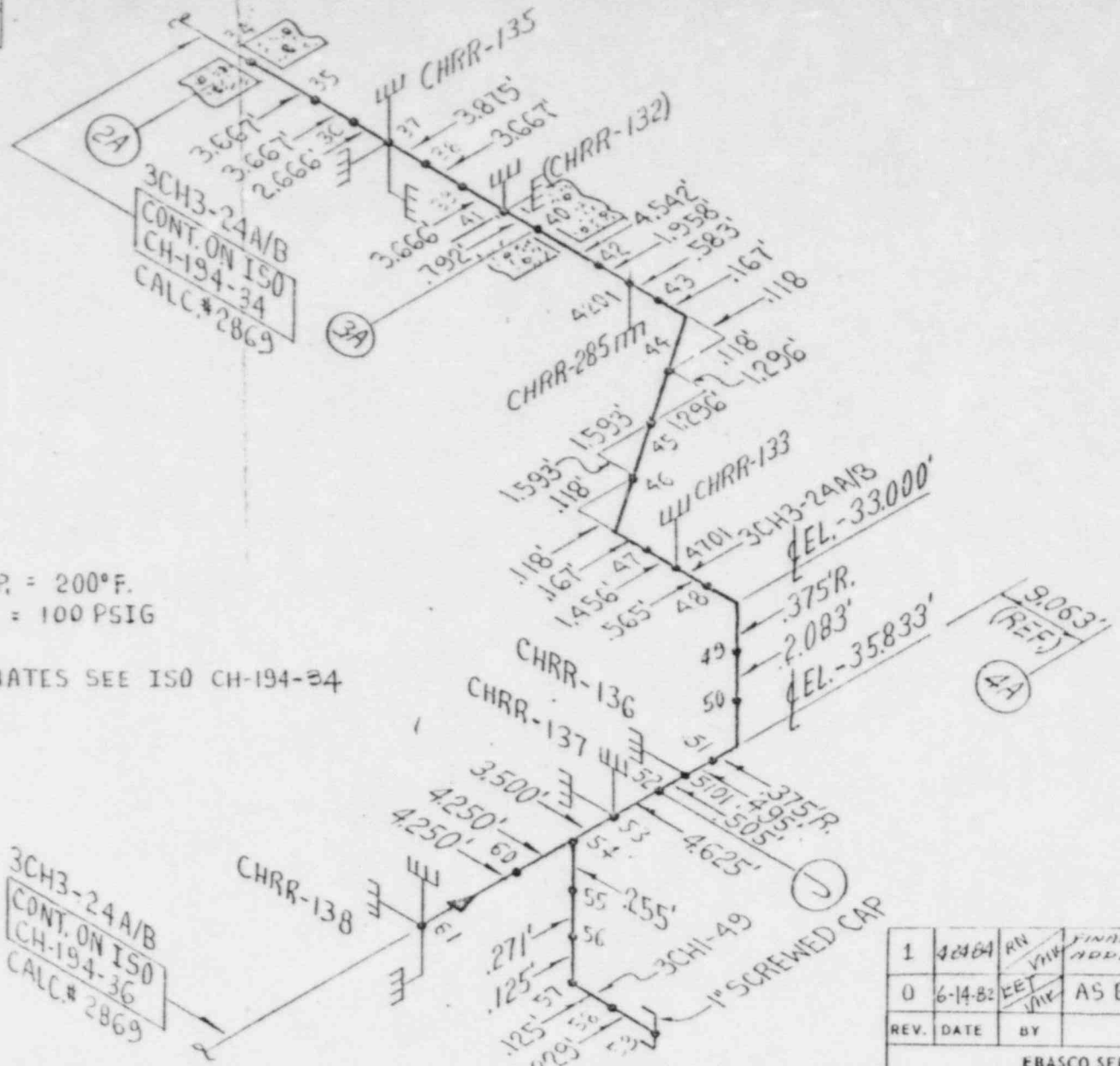
DR. R. MIRONCHAN DATE 7-22-81
CH. E. TRINIDAD DATE 8-29-81

ISOMETRIC NO.
CH-194-34

ISOMETRIC NO.
CH-194-35

CALC. NO.
286.9
PART-1
SH. 2 OF 7





ALL LINES:
DESIGN TEMP. = 200°F.
OPER. PRESS. = 100 PSIG

FOR COORDINATES SEE ISO CH-194-34

REV.	DATE	BY	DESCRIPTION
1	4-29-84	RN / VHK	FINAL AS BUILT ADDED ISO - CH-194-37
0	6-14-82	EET / VHK	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX BLDG.
CH PIPING

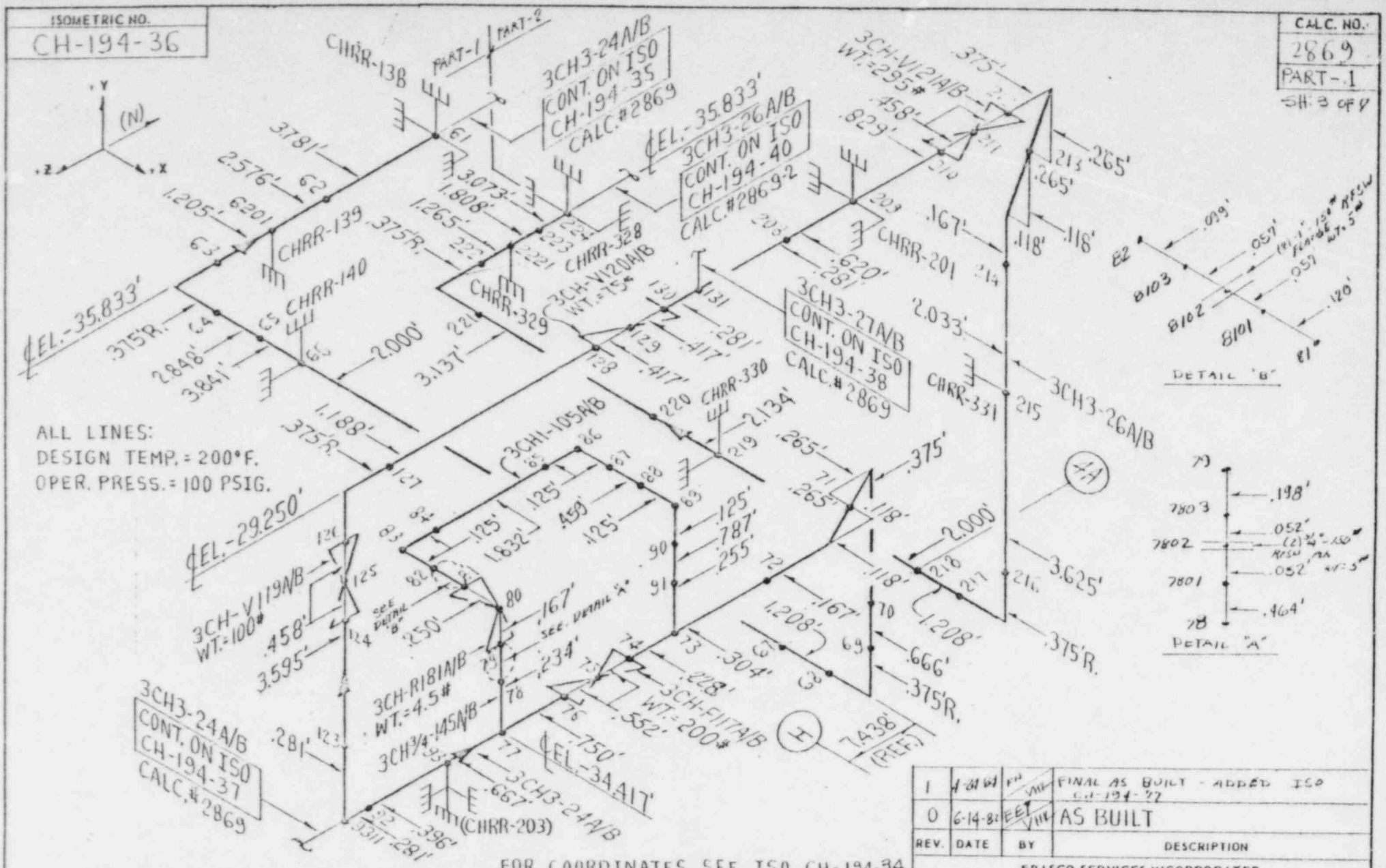
DR. R. PIRONCHAK DATE: 7-22-81
CH. E. TRINIDAD DATE: 8-28-81

ISOMETRIC NO.
CH-194-35

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CH3-24A/B	3.500	.216	SS-1	170			150			LDO 1524 GI34 SH.1	9	2-28-84
3CH1-49	1.315	.179	SS-1	170			150	DYNAMIC ☐				
								STATIC ☒	VERT.			
								THERMAL ☒	HORIZ.			

ISOMETRIC NO.
CH-194-36

CALC. NO.
2869
PART-1
SH. 3 OF 9



REV.	DATE	BY	DESCRIPTION
1	9-21-81	RP	FINAL AS BUILT - ADDED ISO CH-194-72
0	6-14-81	EET	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX. BLDG.
CH PIPING

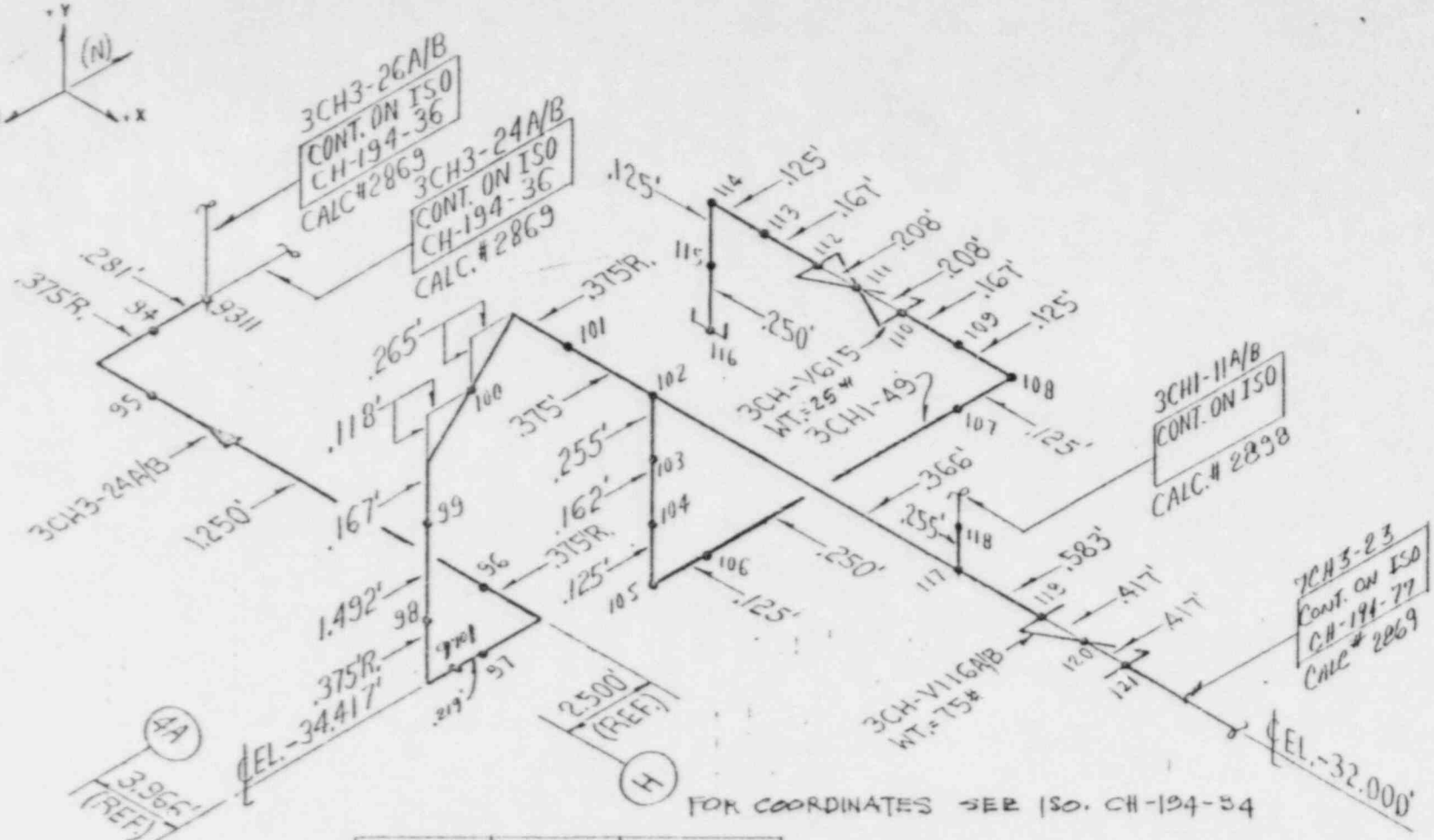
DR. R.PIRONCIAK DATE: 7-28-81
CH. E.TRINIDAD DATE: 8-13-81

ISOMETRIC NO.
CH-194-36

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CH3-24A/B	3.500	.216	SS-1	170			150	DYNAMIC ☐		LOU 1564 G-194 SH. 1	9	2-24-84
3CH3-26A/B	3.500	.216						STATIC ☒	VERT.			
3CH1-105A/B	1.315	.179						THERMAL ☒	HORIZ.			
3CH3/4-145A/B	1.050	.154										

ISOMETRIC NO.
CH-194-37

CALC. NO.
2869
PART-1
SH. 4 of 7



FOR COORDINATES SEE ISO. CH-194-54

LINE NO.	DES. TEMP.	OPER. PRESS.
3CH3-24A/B	200°F.	100 PSIG
3CH1-49	200°F.	100 PSIG
7CH3-23	120°F.	100 PSIG

REV.	DATE	BY	DESCRIPTION
1	4-21-84	KJ / VHV	FINAL AS BUILT- ADDED ISO CH-194-77
0	6-14-82	EET / VHV	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX. BLDG.
CH PIPING

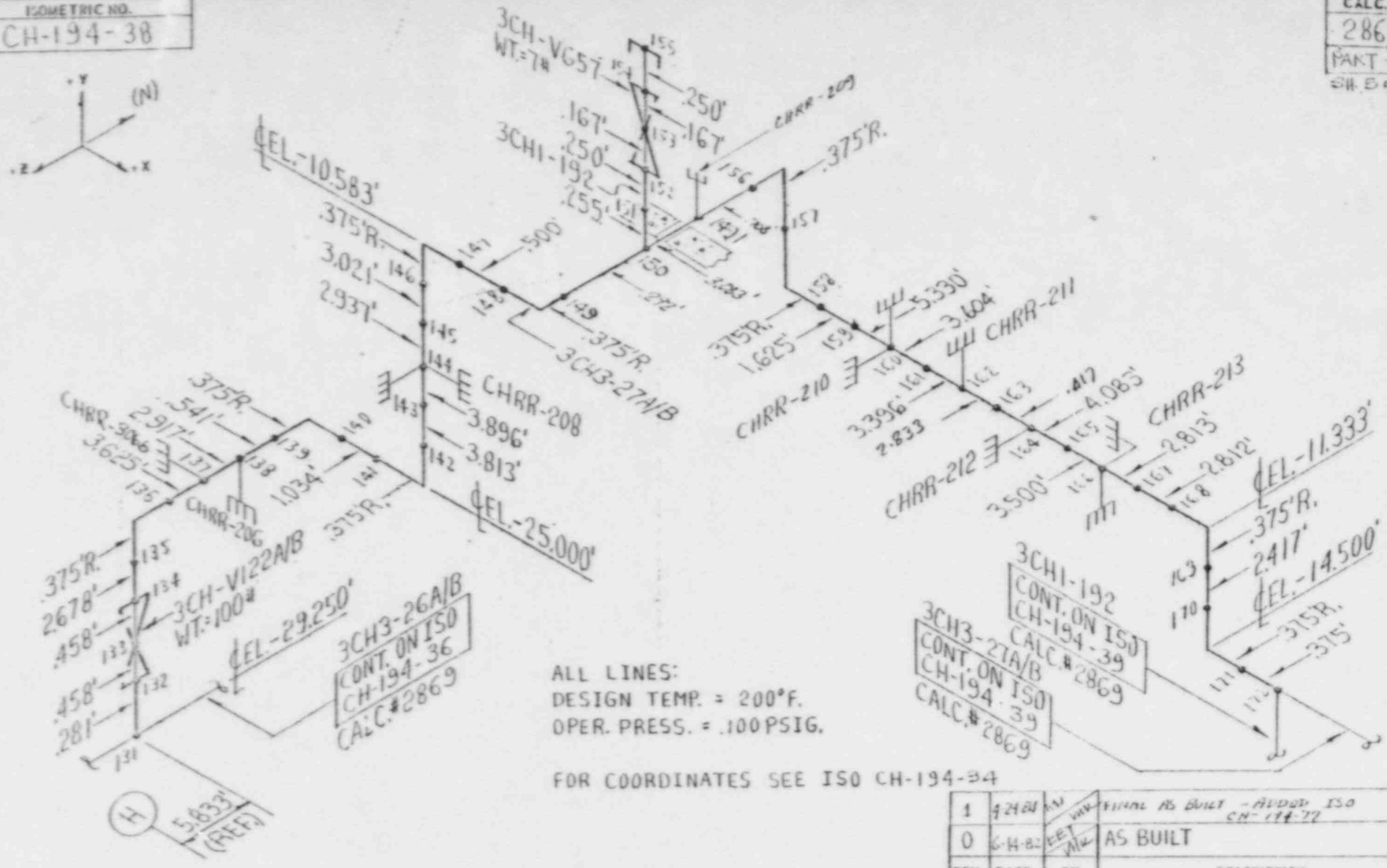
DR. R.PIRONCIAK DATE: 7-29-81
CH. E.TRINIDAD DATE: 8-23-81

ISOMETRIC NO. CH-194-37

LINE NO.	PIPE O.D.	SCH. NOM. WL THK	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CH3-24A/B	3.500	.216	SS-1	170			150			LOV ISC4 G154 SH. 1	9	2-28-84
3CH1-49	1.315	.179	SS-1	170			150	DYNAMIC ☐		LOV ISC4 G154 SH. 2	8	2-28-84
7CH3-23	3.500	.216	SS-1	104			150	STATIC ☒	VERT.			
								THERMAL ☒	HORIZ.			

ISOMETRIC NO.
CH-194-38

CALC. NO.
2869
PART-1
SH. 5 OF 6



ALL LINES:
DESIGN TEMP. = 200°F.
OPER. PRESS. = 100 PSIG.

FOR COORDINATES SEE ISO CH-194-34

REV.	DATE	BY	DESCRIPTION
1	4-24-81	MV	FINAL AS BUILT - ADDED ISO CH-194-72
0	6-11-81	EET MV	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX. BLDG.
CH PIPING

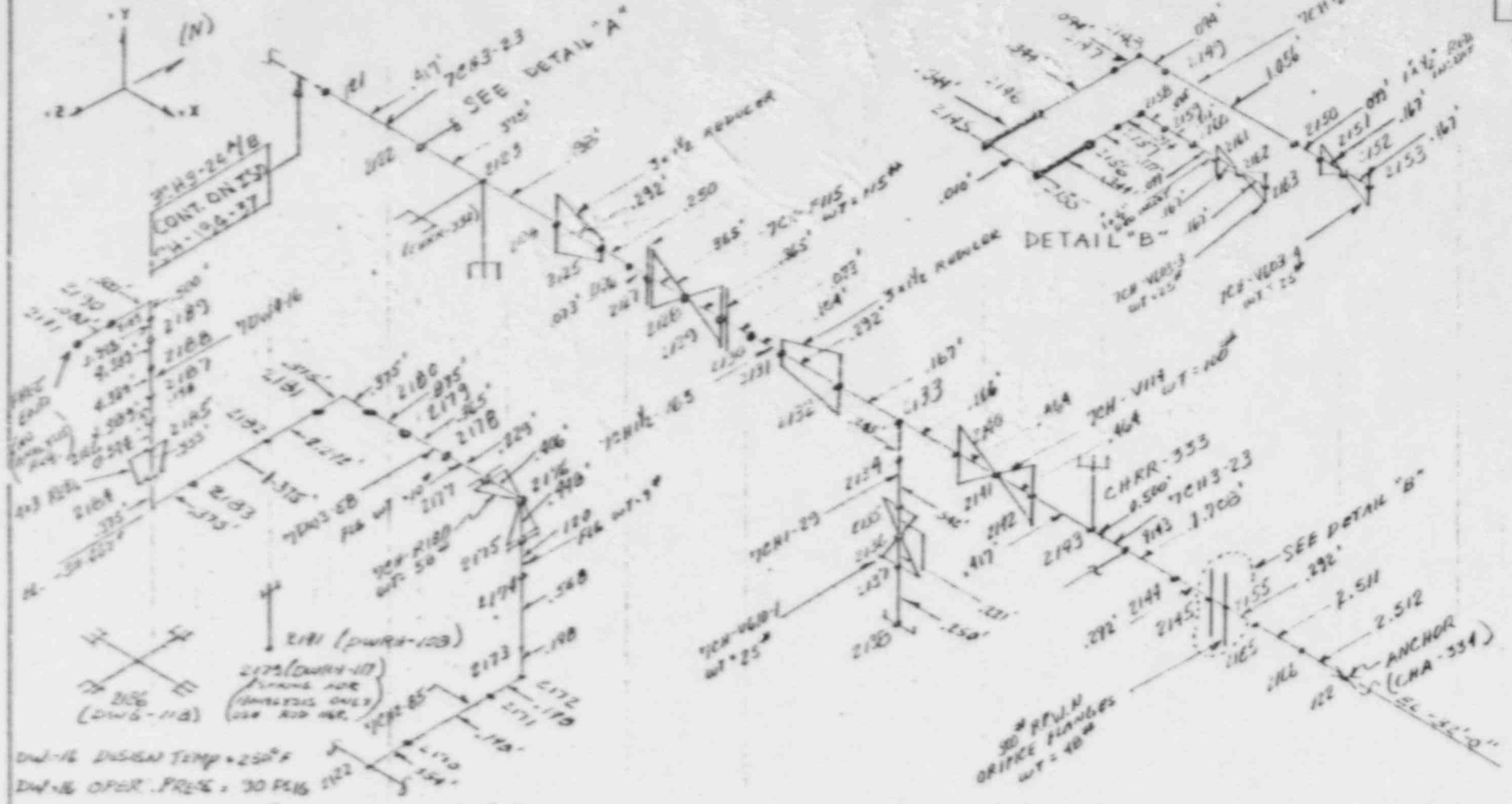
DR. R. PIRONCAR DATE: 7-28-81
CH. E. TRINIDAD DATE: 8-28-81

ISOMETRIC NO.
CH-194-38

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV.	DATE
3CH3-27A/B	3.500	.216	SS-1	140			150			LOU 1564 C-194 SH.1	3	2-28-81
3CH1-192	1.315	.179	SS-1	140			150	DYNAMIC ☐	RANGE X - .38	SH 3	10	2-28-81
								STATIC ☒	VERT. Y .30			
								THERMAL ☒	HORIZ. Z .35			

ISOMETRIC NO.
CH-194-77

CALC. NO.
2869
PART 1
SH 7 of 7



DW-16 DESIGN TEMP. = 250°F
DW-16 OPER. PRESS. = 30 PSIG

DESIGN TEMP. = 120°F
OPER. PRESS. = 100 PSIG
DW-58 OPER. PRESS. = 104 PSIG

FOR COORDINATES SEE ISO CH-194-34

LINE NO.	PIPE O.D.	SCH. NOM. WL. THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION IN/IN/100	MODULUS OF ELASTICITY	DES PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
DW4-16	2.500	.237	SS-1	180			150					
DCH1-23 DW3-39	5.500	0.216	SS-1	104 / 102			150					
DCH-[illegible]-63	1.900	0.145	SS-1	104			150			LOU 1569 6-134 Sh. 1	9	2-28-84
DCH1-29	1.315	0.133	SS-1	104			150	DYNAMIC ☐	HORIZ. X-38			
DCH 1½-173	0.840	0.109	SS-1	104			150	STATIC ☒	VERT. Y-30			
DCH2-85	2.375	0.154	SS-1	104			150	THERMAL ☒	HORIZ. Z-38			

REV.	DATE	BY	DESCRIPTION
1	4-24-84	KN / [illegible]	FINAL AS BUILT - ADDED ISO CH-194-77

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX. BLDG.
CH PIPING

DR. K.NAVRATIL DATE 4-17-84
CH. V. [illegible] DATE 4-24-84

ISOMETRIC NO.
CH-194-77

```
         1         2         3         4         5         6         7         8                 CARD
***1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678 90***    NO.

2869       IC     2   138 RAVRATIL        WATERFORD UNIT #3 REACTOR AUX BLDG CH FI                   1
PING 150  CH-194-34,35,36,37,38,39,77  PART-1  REV 1    FINAL AS BUILT                              2
2869   1   FA     5                                                                                 3
2869      ILC    1                                       NORMAL OPERATING                           4
2869  10 41LC    13                                      OPERATING WEIGHT                           5
2869   1 51LC    110000      38                          X-STATIC                                   6
2869   1 52LC    1100               38                   Y-STATIC                                   7
2869   1 53LC    1100                         33         Z-STATIC                                   8
2869  10101CC     14    1      51      53                MAXIMUM OF X AND Z                         9
2869  10102CC    111          101      52                MAXIMUM OF HORIZONTAL PLUS Y              10
2869  10110CC      0            1      41                THERMAL + WEIGHT                          11
2869  10111CC    1 4           41     110                HIGHER OF (TH+WT) OR WT                   12
2869  10112CC    111    8     111     102                OBE + FI (TH+WT) OR WT                    13
2869  10113CC    121    8     111   2.102                DBE + HI (TH+WT) OR WT                    14
2869  10652CS     12    3      41     102                DESIGN EQ 9                               15
2869        74             150     250                                                             16
2869        72             376304                                                                  17
2869       171             176                     180                                             18
2869      1071             250                     150                                             19
2869        70               35      216    773     1      1                                       20
2869        66  1        -1135      5417 1505                                                      21
2869        66 122       -47167 -32     190883                                                     22
2869        66 287      *  5        -4     149                                                     23
2869        66 224       -73646 -35833 176625                                                      24
2869        61   1 2    1                                                                          25
2869             2 2         458                                                                   26
2869         1   3 2         375                                   375                             27
2869         4   4      1                   396                                                    28
2869         5   4       *   875                                                                   29
2869         4   5 2    1                   396                                                    30
2869        74             150     200                                                             31
2869      1071             200                     150                                             32
2869             6                          3192                                                   33
2869          6081                          2524                                                   34
2869             7 2                         625                                                   35
2869         1   8 2                         375    -375                                           36
2869             9            -125                                                                 37
2869            10            -385                                                                 38
2869            11            -365                                                                 39
2869            12            -3616                                                                40
2869            13 2          -3417                                                                41
2869         1  14 2          -167                   -118          -118                            42
2869         1  15 2          -265             -265        -375                                    43
2869            16                   -2042                                                         44
2869            17                   -5                                                            45
2869            18                   -5                                                            46
2869            19 3                 -5                                                            47
2869            20                   -4                                                            48
2869            21                   -4                                                            49
2869            22                   -4                                                            50

***1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678 90***
         1         2         3         4         5         6         7         8
```

ACTION OF ANCHORS,SUPPORTS AND RESTRAINTS ON PIPING

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT	REST. NO.
NOZZLE	1	-82.	-6.	64.	6.	-378.	-32.	104.	382.	1- 6
ANCHOR	122	-306.	-4.	9.	25.	37.	9.	307.	45.	7- 12
ANCHOR	207	48.	-127.	32.	-226.	-9.	183.	140.	291.	13- 18
RESTRAINT	1001	0.	47.	0.				47.		19
RESTRAINT	11	0.	-110.	0.				110.		20
RESTRAINT	11	0.	0.	-98.				98.		21
RESTRAINT	16	85.	0.	0.				85.		22
RESTRAINT	16	0.	0.	29.				29.		23
RESTRAINT	19	-35.	0.	0.				35.		24
RESTRAINT	19	0.	-26.	0.				26.		25
RESTRAINT	19	0.	0.	-1.				1.		26
RESTRAINT	22	108.	0.	0.				108.		27
RESTRAINT	23	0.	0.	-35.				35.		28
RESTRAINT	30	0.	135.	0.				135.		29
RESTRAINT	30	0.	0.	41.				41.		30
RESTRAINT	33	0.	-51.	0.				51.		31
RESTRAINT	33	0.	0.	2.				2.		32
RESTRAINT	37	178.	0.	0.				178.		33
RESTRAINT	37	0.	15.	0.				15.		34
RESTRAINT	37	0.	0.	-49.				49.		35
RESTRAINT	41	0.	-18.	0.				18.		36
RESTRAINT	41	0.	0.	132.				132.		37
RESTRAINT	4201	0.	-73.	0.				73.		38
RESTRAINT	4701	0.	54.	0.				54.		39
RESTRAINT	5101	272.	0.	0.				272.		40
RESTRAINT	53	10.	0.	0.				10.		41
RESTRAINT	53	0.	50.	0.				50.		42
RESTRAINT	61	37.	0.	0.				37.		43
RESTRAINT	61	0.	-22.	0.				22.		44
RESTRAINT	61	0.	0.	-70.				70.		45
RESTRAINT	6201	0.	-6.	0.				6.		46
RESTRAINT	66	0.	-1.	0.				1.		47
RESTRAINT	66	0.	0.	33.				33.		48
RESTRAINT	93	268.	0.	0.				268.		49
RESTRAINT	93	0.	391.	0.				391.		50
RESTRAINT	93	0.	0.	20.				20.		51
RESTRAINT	137	-34.	0.	0.				34.		52
RESTRAINT	138	0.	60.	0.				60.		53
RESTRAINT	144	60.	0.	0.				60.		54
RESTRAINT	144	0.	0.	-6.				6.		55
RESTRAINT	1491	0.	-75.	0.				75.		56
RESTRAINT	160	0.	19.	0.				19.		57
RESTRAINT	160	0.	0.	36.				36.		58
RESTRAINT	162	0.	-10.	0.				10.		59
RESTRAINT	164	0.	0.	-13.				13.		60

EBASCO SERVICES, INC. PIPING STRESS ANALYSIS PIPESTRESS2010/REL.3.15.1 PAGE NO. 9[illegible]
CALCULATION NUMBER 2869 CODE SECTION III CLASS 2 1971 INCL S73 R NAVRATIL TIME= [illegible]:34 PM 10/11/84
WATERFORD UNIT #3 REACTOR AUX BLDG CH PIPING ISO CH-194-34,35,36,37,38,39,77 PART-1 REV 1 FINAL AS BUILT
LOADING CASE NO. 41 OPERATING WEIGHT OUTPUT: SUSTAINED LOAD

ACTION OF ANCHORS,SUPPORTS AND RESTRAINTS ON PIPING

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT	REST. NO.
NOZZLE	1	-1.	106.	1.	-45.	-4.	71.	106.	84.	1- 6
ANCHOR	122	-9.	80.	3.	28.	12.	-130.	81.	134.	7- 12
ANCHOR	6207	1.	220.	-1.	3.	2.	2.	220.	4.	13- 18
RESTRAINT	6101	0.	92.	6.				92.		19
RESTRAINT	11	0.	98.	0.				98.		20
RESTRAINT	11	0.	0.	-0.				0.		21
RESTRAINT	16	0.	0.	0.				0.		22
RESTRAINT	16	0.	0.	-2.				2.		23
RESTRAINT	19	2.	0.	0.				2.		24
RESTRAINT	19	0.	501.	0.				501.		25
RESTRAINT	19	0.	0.	4.				4.		26
RESTRAINT	22	-1.	0.	0.				1.		27
RESTRAINT	23	0.	0.	4.				4.		28
RESTRAINT	30	0.	116.	0.				116.		29
RESTRAINT	30	0.	0.	-12.				12.		30
RESTRAINT	33	0.	109.	0.				109.		31
RESTRAINT	33	0.	0.	7.				7.		32
RESTRAINT	37	-1.	0.	0.				1.		33
RESTRAINT	37	0.	126.	0.				126.		34
RESTRAINT	37	0.	0.	-2.				2.		35
RESTRAINT	41	0.	104.	0.				104.		36
RESTRAINT	41	0.	0.	0.				0.		37
RESTRAINT	4201	0.	69.	0.				69.		38
RESTRAINT	4701	0.	92.	0.				92.		39
RESTRAINT	5101	2.	0.	0.				2.		40
RESTRAINT	53	-2.	0.	0.				2.		41
RESTRAINT	53	0.	118.	0.				118.		42
RESTRAINT	61	4.	0.	0.				4.		43
RESTRAINT	61	0.	116.	0.				116.		44
RESTRAINT	61	0.	0.	6.				6.		45
RESTRAINT	6201	0.	48.	0.				48.		46
RESTRAINT	66	0.	145.	0.				145.		47
RESTRAINT	66	0.	0.	-19.				19.		48
RESTRAINT	93	35.	0.	0.				35.		49
RESTRAINT	93	0.	479.	0.				479.		50
RESTRAINT	93	0.	0.	-20.				20.		51
RESTRAINT	137	46.	0.	0.				46.		52
RESTRAINT	138	0.	242.	0.				242.		53
RESTRAINT	144	-38.	0.	0.				38.		54
RESTRAINT	144	0.	0.	12.				12.		55
RESTRAINT	1491	0.	110.	0.				110.		56
RESTRAINT	160	0.	77.	0.				77.		57
RESTRAINT	160	0.	0.	-12.				12.		58
RESTRAINT	162	0.	80.	0.				80.		59
RESTRAINT	164	0.	9.	[illegible]				[illegible]		60

EBASCO SERVICES, INC. PIPING STRESS ANALYSIS PIPESTRESS2010/REL.3.15.1 PAGE NO. 113
CALCULATION NUMBER 2PFS CODE SECTION III CLASS 2 1971 INCL S73 R KAVRATIL TIME= 4:54 PM 06/11/84
WATERFORD UNIT #3 REACTOR AUX BLDG CH PIPING ISO CP-194-34,35,36,37,38,39,77 PART-1 REV 1 FINAL AS BUILT
LOADING CASE NO. 51 X-STATIC OUTPUT: OCCASIONAL LOAD (UPSET)

ACTION OF ANCHORS,SUPPORTS AND RESTRAINTS ON PIPING

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT	REST. NO.
NOZZLE	1	-49.	0.	-0.	-1.	-46.	2.	49.	46.	1- 6
ANCHOR	122	-180.	-4.	-9.	-1.	-33.	9.	180.	34.	7- 12
ANCHOR	207	-27.	-10.	5.	-35.	12.	-57.	29.	68.	13- 18
RESTRAINT	6401	0.	-3.	0.				3.		19
RESTRAINT	11	0.	14.	0.				14.		20
RESTRAINT	11	0.	0.	5.				5.		21
RESTRAINT	16	-124.	0.	0.				124.		22
RESTRAINT	16	0.	0.	-6.				6.		23
RESTRAINT	19	-49.	0.	0.				49.		24
RESTRAINT	19	0.	-13.	0.				13.		25
RESTRAINT	19	0.	0.	3.				3.		26
RESTRAINT	22	-51.	0.	0.				51.		27
RESTRAINT	23	0.	0.	-6.				6.		28
RESTRAINT	30	0.	2.	0.				2.		29
RESTRAINT	30	0.	0.	3.				3.		30
RESTRAINT	33	0.	-1.	0.				1.		31
RESTRAINT	33	0.	0.	1.				1.		32
RESTRAINT	37	-250.	0.	0.				250.		33
RESTRAINT	37	0.	1.	0.				1.		34
RESTRAINT	37	0.	0.	1.				1.		35
RESTRAINT	41	0.	-2.	0.				2.		36
RESTRAINT	41	0.	0.	-6.				6.		37
RESTRAINT	4201	0.	1.	0.				1.		38
RESTRAINT	4701	0.	3.	0.				3.		39
RESTRAINT	5101	-20.	0.	0.				20.		40
RESTRAINT	53	-33.	0.	0.				33.		41
RESTRAINT	53	0.	-3.	0.				3.		42
RESTRAINT	61	-67.	0.	0.				67.		43
RESTRAINT	61	0.	5.	0.				5.		44
RESTRAINT	61	0.	0.	-5.				5.		45
RESTRAINT	6201	0.	-8.	0.				8.		46
RESTRAINT	66	0.	18.	0.				18.		47
RESTRAINT	66	0.	0.	42.				42.		48
RESTRAINT	93	-227.	0.	0.				227.		49
RESTRAINT	93	0.	-37.	0.				37.		50
RESTRAINT	93	0.	0.	-8.				8.		51
RESTRAINT	137	-48.	0.	0.				48.		52
RESTRAINT	138	0.	4.	0.				4.		53
RESTRAINT	144	-58.	0.	0.				58.		54
RESTRAINT	144	0.	0.	-11.				11.		55
RESTRAINT	1491	0.	-8.	0.				8.		56
RESTRAINT	160	0.	6.	0.				6.		57
RESTRAINT	160	0.	0.	7.				7.		58
RESTRAINT	162	0.	-1.	0.				1.		59
RESTRAINT	164	0.	0.	-2.				2.		60

ACTION OF ANCHORS, SUPPORTS AND RESTRAINTS ON PIPING

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT	REST. NO.
NOZZLE	1	0.	-32.	-0.	14.	1.	-21.	32.	25.	1- 6
ANCHOR	122	2.	-25.	-1.	-12.	-4.	41.	25.	42.	7- 12
ANCHOR	207	-0.	-66.	0.	-1.	-1.	-0.	66.	1.	13- 18
RESTRAINT	4501	0.	-28.	0.				28.		19
RESTRAINT	11	0.	-29.	0.				29.		20
RESTRAINT	11	0.	0.	0.				0.		21
RESTRAINT	16	-0.	0.	0.				0.		22
RESTRAINT	16	0.	0.	1.				1.		23
RESTRAINT	19	-1.	0.	0.				1.		24
RESTRAINT	19	0.	-150.	0.				150.		25
RESTRAINT	19	0.	0.	-1.				1.		26
RESTRAINT	22	0.	0.	0.				0.		27
RESTRAINT	23	0.	0.	-1.				1.		28
RESTRAINT	30	0.	-35.	0.				35.		29
RESTRAINT	30	0.	0.	4.				4.		30
RESTRAINT	33	0.	-33.	6.				33.		31
RESTRAINT	33	0.	0.	-2.				2.		32
RESTRAINT	37	0.	0.	0.				0.		33
RESTRAINT	37	0.	-38.	0.				38.		34
RESTRAINT	37	0.	0.	1.				1.		35
RESTRAINT	41	0.	-31.	0.				31.		36
RESTRAINT	41	0.	0.	-0.				0.		37
RESTRAINT	4201	0.	-21.	0.				21.		38
RESTRAINT	4701	0.	-28.	0.				28.		39
RESTRAINT	5101	-1.	0.	0.				1.		40
RESTRAINT	53	1.	0.	0.				1.		41
RESTRAINT	53	0.	-35.	0.				35.		42
RESTRAINT	61	-1.	0.	0.				1.		43
RESTRAINT	61	0.	-35.	0.				35.		44
RESTRAINT	61	0.	0.	-2.				2.		45
RESTRAINT	6201	0.	-14.	0.				14.		46
RESTRAINT	66	0.	-43.	0.				43.		47
RESTRAINT	66	0.	0.	6.				6.		48
RESTRAINT	93	-10.	0.	9.				10.		49
RESTRAINT	93	0.	-147.	0.				147.		50
RESTRAINT	93	0.	0.	-9.				9.		51
RESTRAINT	137	-14.	0.	0.				14.		52
RESTRAINT	138	0.	-73.	0.				73.		53
RESTRAINT	144	12.	0.	0.				12.		54
RESTRAINT	144	0.	0.	-4.				4.		55
RESTRAINT	1491	0.	-33.	0.				33.		56
RESTRAINT	160	0.	-23.	0.				23.		57
RESTRAINT	160	0.	0.	4.				4.		58
RESTRAINT	162	0.	-24.	0.				24.		59
RESTRAINT	164	0.	0.	-2.				2.		60

ACTION OF ANCHORS,SUPPORTS AND RESTRAINTS ON PIPING

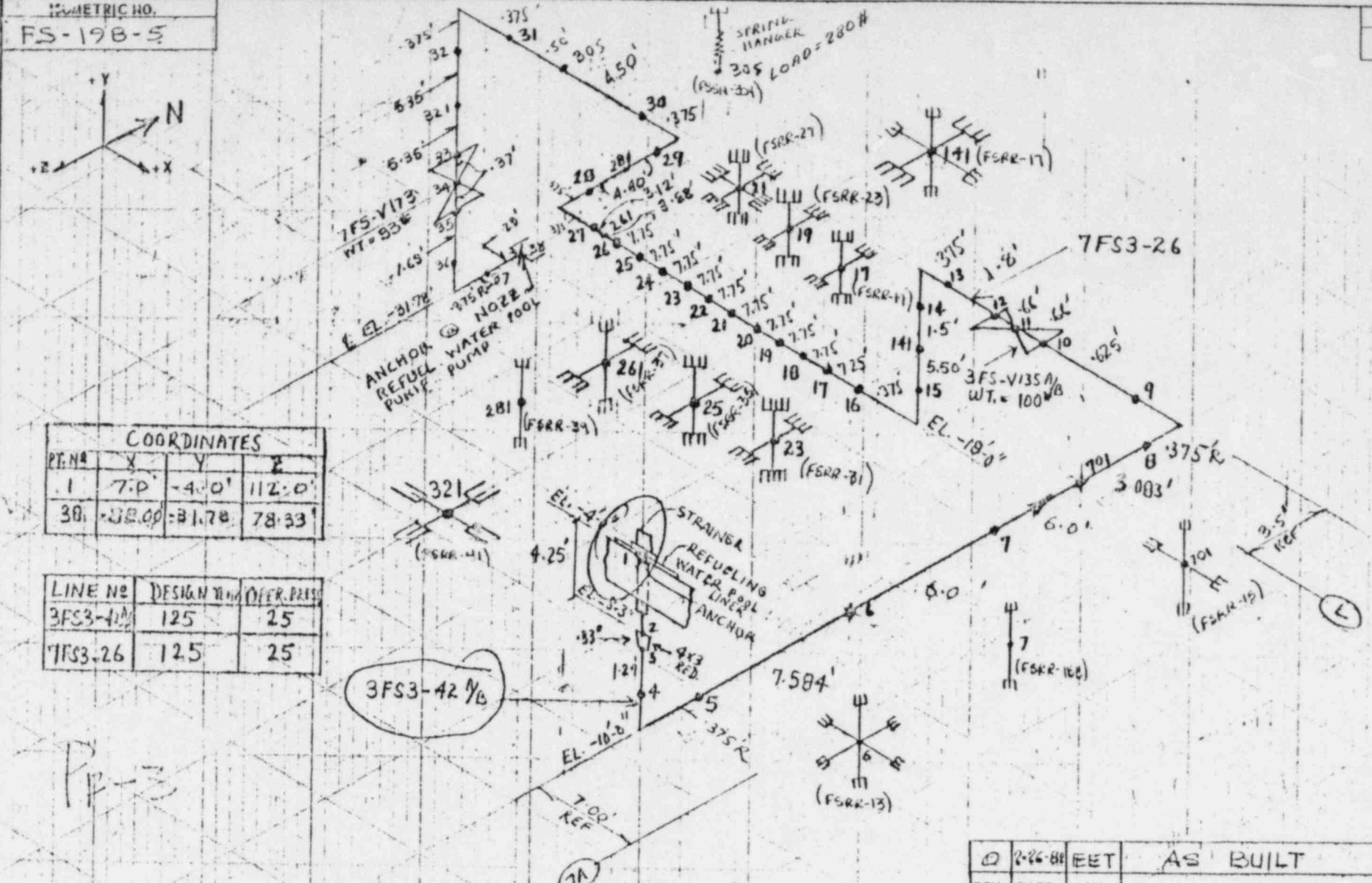
	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT	REST. NO.
NOZZLE	1	-0.	0.	-66.	-0.	47.	0.	66.	47.	1- 6
ANCHOR	122	-3.	-2.	-61.	18.	-163.	5.	61.	163.	7- 12
ANCHOR	207	1.	-2.	-32.	106.	-38.	9.	32.	113.	13- 18
RESTRAINT	6061	0.	-0.	0.				0.		19
RESTRAINT	11	0.	-0.	0.				0.		20
RESTRAINT	11	0.	0.	-31.				31.		21
RESTRAINT	16	-0.	0.	0.				0.		22
RESTRAINT	16	0.	0.	-47.				47.		23
RESTRAINT	19	1.	0.	0.				1.		24
RESTRAINT	19	0.	-4.	0.				4.		25
RESTRAINT	19	0.	0.	-52.				52.		26
RESTRAINT	22	-2.	0.	0.				2.		27
RESTRAINT	23	0.	0.	-61.				61.		28
RESTRAINT	30	0.	7.	0.				7.		29
RESTRAINT	30	0.	0.	-49.				49.		30
RESTRAINT	33	0.	-3.	0.				3.		31
RESTRAINT	33	0.	0.	-31.				31.		32
RESTRAINT	37	12.	0.	0.				12.		33
RESTRAINT	37	0.	0.	0.				0.		34
RESTRAINT	37	0.	0.	-38.				38.		35
RESTRAINT	41	0.	3.	0.				3.		36
RESTRAINT	41	0.	0.	-50.				50.		37
RESTRAINT	4201	0.	-9.	0.				9.		38
RESTRAINT	4701	0.	-6.	0.				6.		39
RESTRAINT	5101	-7.	0.	0.				7.		40
RESTRAINT	53	-4.	0.	0.				4.		41
RESTRAINT	53	0.	14.	0.				14.		42
RESTRAINT	61	0.	0.	0.				0.		43
RESTRAINT	61	0.	-2.	0.				2.		44
RESTRAINT	61	0.	0.	-142.				142.		45
RESTRAINT	6201	0.	1.	0.				1.		46
RESTRAINT	66	0.	-0.	0.				0.		47
RESTRAINT	66	0.	0.	-26.				26.		48
RESTRAINT	93	-1.	0.	0.				1.		49
RESTRAINT	93	0.	26.	0.				26.		50
RESTRAINT	93	0.	0.	-114.				114.		51
RESTRAINT	137	11.	0.	0.				11.		52
RESTRAINT	138	0.	22.	0.				22.		53
RESTRAINT	144	-10.	0.	0.				10.		54
RESTRAINT	144	0.	0.	-81.				81.		55
RESTRAINT	1491	0.	-25.	0.				25.		56
RESTRAINT	160	0.	3.	0.				3.		57
RESTRAINT	160	0.	0.	-42.				42.		58
RESTRAINT	162	0.	-1.	0.				1.		59
RESTRAINT	164	0.	0.	-62.				62.		60

ACTION OF ANCHORS, SUPPORTS AND RESTRAINTS ON PIPING

	POINT NO.	----- FORCES IN POUNDS ----- FX	FY	FZ	----- MOMENTS IN FOOT POUNDS ----- MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT	REST. NO.
NOZZLE	1	50.	32.	66.	14.	49.	23.	89.	56.	1- 6
ANCHOR	122	182.	28.	62.	30.	166.	58.	194.	176.	7- 12
ANCHOR	201	27.	76.	33.	107.	39.	57.	87.	127.	13- 18
RESTRAINT	6001	0.	31.	0.				31.		19
RESTRAINT	11	0.	43.	0.				43.		20
RESTRAINT	11	0.	0.	31.				31.		21
RESTRAINT	16	124.	0.	0.				124.		22
RESTRAINT	16	0.	0.	48.				48.		23
RESTRAINT	19	49.	0.	0.				49.		24
RESTRAINT	19	0.	163.	0.				163.		25
RESTRAINT	19	0.	0.	53.				53.		26
RESTRAINT	22	51.	0.	0.				51.		27
RESTRAINT	23	0.	0.	62.				62.		28
RESTRAINT	30	0.	41.	0.				41.		29
RESTRAINT	30	0.	0.	53.				53.		30
RESTRAINT	33	0.	36.	0.				36.		31
RESTRAINT	33	0.	0.	33.				33.		32
RESTRAINT	37	250.	0.	0.				250.		33
RESTRAINT	37	0.	38.	0.				38.		34
RESTRAINT	37	0.	0.	38.				38.		35
RESTRAINT	41	0.	35.	0.				35.		36
RESTRAINT	41	0.	0.	50.				50.		37
RESTRAINT	4201	0.	30.	0.				30.		38
RESTRAINT	4701	0.	34.	0.				34.		39
RESTRAINT	5101	21.	0.	0.				21.		40
RESTRAINT	53	33.	0.	0.				33.		41
RESTRAINT	53	0.	49.	0.				49.		42
RESTRAINT	61	68.	0.	0.				68.		43
RESTRAINT	61	0.	39.	0.				39.		44
RESTRAINT	61	0.	0.	145.				145.		45
RESTRAINT	6201	0.	23.	0.				23.		46
RESTRAINT	66	0.	62.	0.				62.		47
RESTRAINT	66	0.	0.	48.				48.		48
RESTRAINT	93	237.	0.	0.				237.		49
RESTRAINT	93	0.	184.	0.				184.		50
RESTRAINT	93	0.	0.	123.				123.		51
RESTRAINT	137	62.	0.	0.				62.		52
RESTRAINT	138	0.	95.	0.				95.		53
RESTRAINT	144	69.	0.	0.				69.		54
RESTRAINT	144	0.	0.	84.				84.		55
RESTRAINT	1491	0.	58.	0.				58.		56
RESTRAINT	160	0.	30.	0.				30.		57
RESTRAINT	160	0.	0.	46.				46.		58
RESTRAINT	162	0.	25.	0.				25.		59
RESTRAINT	164	0.	0.	63.				63.		60

ISOMETRIC NO.
FS-198-5

CALC. NO.
6666



COORDINATES			
PT. No.	X	Y	Z
1	7.P'	-4.0'	112.0'
38	-38.00'	-31.78'	78.33'

LINE No.	DESIGN TEMP.	OPER. PRESS.
3FS3-42 A/B	125	25
7FS3-26	125	25

REV.	DATE	BY	DESCRIPTION
0	8-26-88	EET	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUXILIARY BLDG.
FUEL POOL COOLING PIPING

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3FS3-42 A/B	3.500	.216	TP 304 S/S	100	.337"	EC = 28.3 x 10^6	50			G-198	4	3-10-77
7FS3-26	3.500	.300	TP 304 S/S	100	.337"	EH = 27.5 x 10^6	50	DYNAMIC ☐		SHT. 2 OF 2		
								STATIC ☒	VERT. Y = 1.34			
								THERMAL ☒	HORIZ. X = .3, Z = .3			

DR. I M DATE: 7-2-75
CH. MD DATE: 7-7-75

ISOMETRIC NO.
FS-198-5

CASE	LOADING CASE TITLE	ANALYSIS TYPE	EQ	STRESS OUTPUT	REFERENCE CASE	GX	GY	GZ	EST. WT. STRESS
1	NORMAL OPERATING	EXPANSION	10	THERMAL EXPANSION	1				0
3	DESIGN WEIGHT ANALYSIS	DESGN WEIGHT	8	SUSTAINED LOAD	1		-1.0		0
4	X-INERTIA OBE STATIC	SEISMIC	9	OCCASIONAL LOAD UPSET	1	0.3			0
5	Y-INERTIA OBE STATIC	SEISMIC	9	OCCASIONAL LOAD UPSET	1		0.234		0
6	Z-INERTIA OBE STATIC	SEISMIC	9	OCCASIONAL LOAD UPSET	1			0.3	0

****

CASE	COMBINATION CASE TITLE	METHOD	EQ	STRESS OUTPUT	PRES CASE	FACT	CASE	FACT	CASE	FACT	CASE	FACT	CASE	E.WT STRS
101	MAXIMUM OF X AND Z	MAX COMPO	9	OCCASIONAL LOAD UPSET	1	1.0	4	1.0	6					0
102	MAXIMUM HORIZONTAL PLUS Y	ADD ABS VALS	9	OCCASIONAL LOAD UPSET	1	1.0	101	1.0	5					0

PERFORM FREQUENCY ANALYSIS

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	-2.	19.	63.	-298.	2.	-7.	66.	298.
NOZZLE	38	16.	-32.	23.	57.	21.	-31.	43.	69.
RESTRAINT	6	6.	0.	0.				6.	
RESTRAINT	6	0.	-23.	0.				23.	
RESTRAINT	6	0.	0.	-29.				29.	
RESTRAINT	7	0.	-22.	0.				22.	
RESTRAINT	701	17.	0.	0.				17.	
RESTRAINT	701	0.	83.	0.				83.	
RESTRAINT	141	75.	0.	0.				75.	
RESTRAINT	141	0.	1.	0.				1.	
RESTRAINT	141	0.	0.	-38.				38.	
RESTRAINT	17	0.	-64.	0.				64.	
RESTRAINT	17	0.	0.	1.				1.	
RESTRAINT	19	0.	9.	0.				9.	
RESTRAINT	19	0.	0.	2.				2.	
RESTRAINT	21	-52.	0.	0.				52.	
RESTRAINT	21	0.	-2.	0.				2.	
RESTRAINT	21	0.	0.	-0.				0.	
RESTRAINT	23	0.	0.	0.				0.	
RESTRAINT	23	0.	0.	-1.				1.	
RESTRAINT	25	0.	2.	0.				2.	
RESTRAINT	25	0.	0.	6.				6.	
RESTRAINT	261	0.	-17.	0.				17.	
RESTRAINT	261	0.	0.	35.				35.	
RESTRAINT	281	0.	48.	0.				48.	
VAR SUPPORT	305	0.	0.	0.				0.	
RESTRAINT	321	-59.	0.	0.				59.	
RESTRAINT	321	0.	0.	-63.				63.	
TOTAL		-0.	0.	-0.					

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	1.	-150.	-2.	5.	-3.	-1.	150.	5.
NOZZLE	38	-0.	-83.	0.	43.	-4.	-0.	83.	43.
RESTRAINT	6	-4.	0.	0.				4.	
RESTRAINT	6	0.	-96.	0.				96.	
RESTRAINT	6	0.	0.	2.				2.	
RESTRAINT	7	0.	-26.	0.				26.	
RESTRAINT	701	7.	0.	0.				7.	
RESTRAINT	701	0.	-158.	0.				158.	
RESTRAINT	141	19.	0.	0.				19.	
RESTRAINT	141	0.	-219.	0.				219.	
RESTRAINT	141	0.	0.	-6.				6.	
RESTRAINT	17	0.	-189.	0.				189.	
RESTRAINT	17	0.	0.	9.				9.	
RESTRAINT	19	0.	-234.	0.				234.	
RESTRAINT	19	0.	0.	-4.				4.	
RESTRAINT	21	-26.	0.	0.				26.	
RESTRAINT	21	0.	-223.	0.				223.	
RESTRAINT	21	0.	0.	1.				1.	
RESTRAINT	23	0.	-233.	0.				233.	
RESTRAINT	23	0.	0.	-0.				0.	
RESTRAINT	25	0.	-200.	0.				200.	
RESTRAINT	25	0.	0.	0.				0.	
RESTRAINT	261	0.	-137.	0.				137.	
RESTRAINT	261	0.	0.	-3.				3.	
RESTRAINT	281	0.	-123.	0.				123.	
VAR SUPPORT	305	0.	-279.	0.				279.	
RESTRAINT	321	2.	0.	0.				2.	
RESTRAINT	321	0.	0.	2.				2.	
TOTAL		-0.	-2352.	0.					

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	39.	0.	0.	-0.	13.	133.	39.	134.
NOZZLE	38	9.	17.	8.	6.	2.	25.	21.	25.
RESTRAINT	6	43.	0.	0.				43.	
RESTRAINT	6	0.	-1.	0.				1.	
RESTRAINT	6	0.	0.	2.				2.	
RESTRAINT	7	0.	3.	0.				3.	
RESTRAINT	701	41.	0.	0.				41.	
RESTRAINT	701	0.	-6.	0.				6.	
RESTRAINT	141	59.	0.	0.				59.	
RESTRAINT	141	0.	5.	0.				5.	
RESTRAINT	141	0.	0.	-3.				3.	
RESTRAINT	17	0.	-1.	0.				1.	
RESTRAINT	17	0.	0.	1.				1.	
RESTRAINT	19	0.	0.	0.				0.	
RESTRAINT	19	0.	0.	-1.				1.	
RESTRAINT	21	405.	0.	0.				405.	
RESTRAINT	21	0.	-0.	0.				0.	
RESTRAINT	21	0.	0.	0.				0.	
RESTRAINT	23	0.	1.	0.				1.	
RESTRAINT	23	0.	0.	-1.				1.	
RESTRAINT	25	0.	-6.	0.				6.	
RESTRAINT	25	0.	0.	5.				5.	
RESTRAINT	261	0.	19.	0.				19.	
RESTRAINT	261	0.	0.	2.				2.	
RESTRAINT	281	0.	-30.	0.				30.	
VAR SUPPORT	305	0.	0.	0.				0.	
RESTRAINT	321	109.	0.	0.				109.	
RESTRAINT	321	0.	0.	-14.				14.	
TOTAL		705.	0.	0.					

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	-0.	35.	0.	-1.	1.	0.	35.	1.
NOZZLE	38	3.	78.	-1.	-43.	4.	-5.	78.	43.
RESTRAINT	6	1.	0.	0.				1.	
RESTRAINT	6	0.	23.	0.				23.	
RESTRAINT	6	0.	0.	-1.				1.	
RESTRAINT	7	0.	6.	0.				6.	
RESTRAINT	701	-2.	0.	0.				2.	
RESTRAINT	701	0.	37.	0.				37.	
RESTRAINT	141	-4.	0.	0.				4.	
RESTRAINT	141	0.	51.	0.				51.	
RESTRAINT	141	0.	0.	1.				1.	
RESTRAINT	17	0.	44.	0.				44.	
RESTRAINT	17	0.	0.	-2.				2.	
RESTRAINT	19	0.	55.	0.				55.	
RESTRAINT	19	0.	0.	1.				1.	
RESTRAINT	21	5.	0.	0.				5.	
RESTRAINT	21	0.	52.	0.				52.	
RESTRAINT	21	0.	0.	-0.				0.	
RESTRAINT	23	0.	54.	0.				54.	
RESTRAINT	23	0.	0.	0.				0.	
RESTRAINT	25	0.	49.	0.				49.	
RESTRAINT	25	0.	0.	-1.				1.	
RESTRAINT	261	0.	25.	0.				25.	
RESTRAINT	261	0.	0.	1.				1.	
RESTRAINT	281	0.	40.	0.				40.	
VAR SUPPORT	305	0.	0.	0.				0.	
RESTRAINT	321	-2.	0.	0.				2.	
RESTRAINT	321	0.	0.	1.				1.	
TOTAL		-0.	550.	-0.					

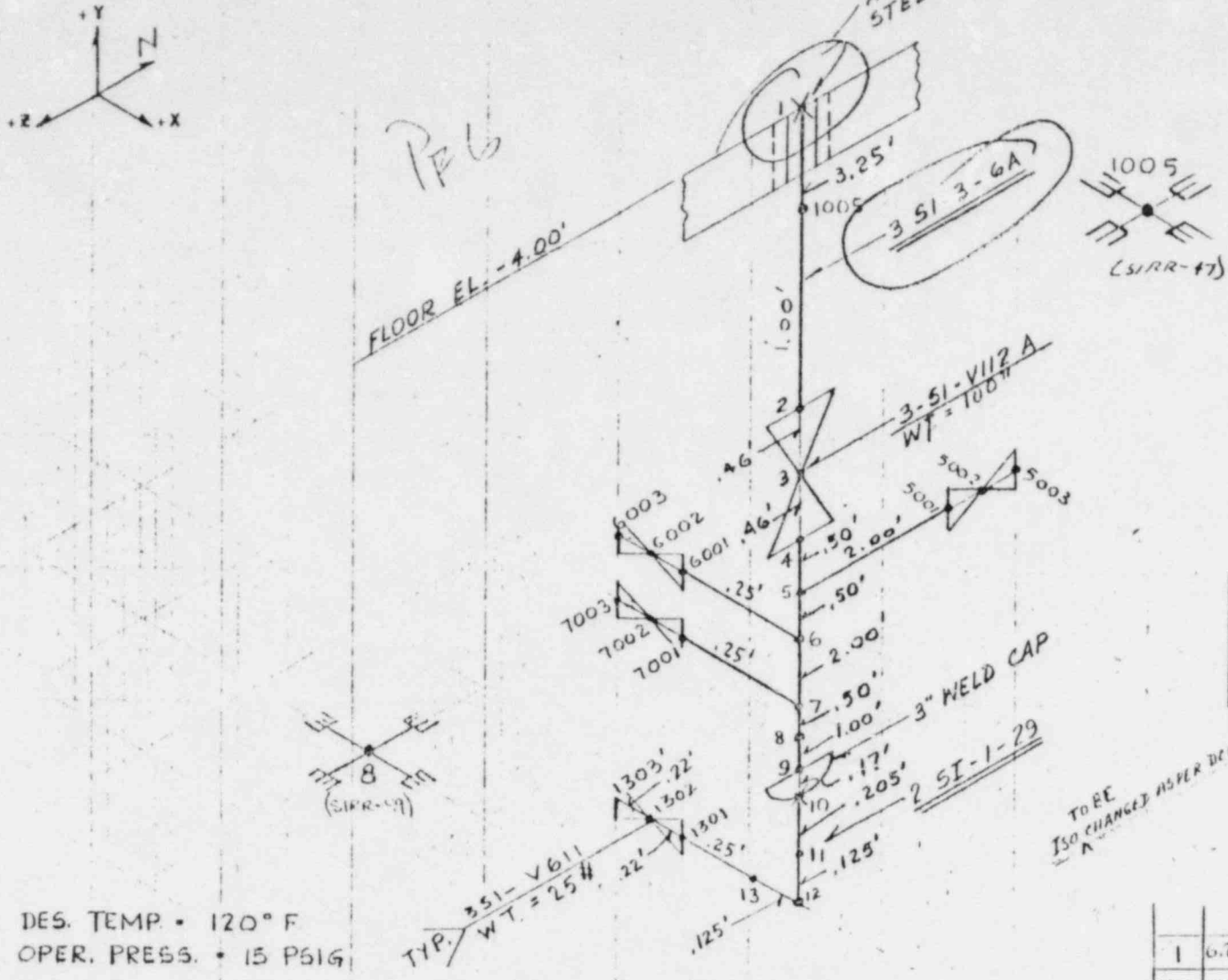
ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	0.	-0.	19.	-15.	-1.	-1.	19.	15.
NOZZLE	38	8.	-2.	22.	3.	6.	-16.	23.	17.
RESTRAINT	6	-0.	0.	0.				0.	
RESTRAINT	6	0.	-0.	0.				0.	
RESTRAINT	6	0.	0.	119.				119.	
RESTRAINT	7	0.	5.	0.				5.	
RESTRAINT	701	-4.	0.	0.				4.	
RESTRAINT	701	0.	-2.	0.				2.	
RESTRAINT	141	8.	0.	0.				8.	
RESTRAINT	141	0.	-2.	0.				2.	
RESTRAINT	141	0.	-0.	48.				48.	
RESTRAINT	17	0.	-1.	0.				1.	
RESTRAINT	17	0.	0.	71.				71.	
RESTRAINT	19	0.	0.	0.				0.	
RESTRAINT	19	0.	0.	64.				64.	
RESTRAINT	21	7.	0.	0.				7.	
RESTRAINT	21	0.	0.	0.				0.	
RESTRAINT	21	0.	0.	68.				68.	
RESTRAINT	23	0.	-0.	0.				0.	
RESTRAINT	23	0.	0.	72.				72.	
RESTRAINT	25	0.	2.	0.				2.	
RESTRAINT	25	0.	0.	46.				46.	
RESTRAINT	261	0.	-7.	0.				7.	
RESTRAINT	261	0.	0.	107.				107.	
RESTRAINT	281	0.	7.	0.				7.	
VAR SUPPORT	305	0.	0.	0.				0.	
RESTRAINT	321	-19.	0.	0.				19.	
RESTRAINT	321	0.	0.	70.				70.	
TOTAL		-0.	-0.	705.					

FORM 478

ISOMETRIC NO.
SI - 195 - 76A

CALC. NO.
2300



COORDINATES			
℄	X	Y	Z
CONT.	0	0	0
PT #1	47.00'	-4.00'	101.00'

DES. TEMP. • 120° F
OPER. PRESS. • 15 PSIG

REV.	DATE	BY	DESCRIPTION
1	6.20.77	CVILL	ADDED (4) VALVES, 3 SI-V611, ETC.

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD #3

SAFETY INJECTION SYSTEM PIPING

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3 SI-3-6A	3.500	.216	SS-1 SS TP-304	104	.382	EC = 28.3 x 10⁶ EH = 28.143 x 10⁶	25			LOU-1564 G-195 SHT. 1	S	5-3-76
								DYNAMIC ☐				
								STATIC ☐	VERT. .3			
								THERMAL ☐	HORIZ. .3			

DR. D B H DATE: 11-21-74
CH. DATE:

ISOMETRIC NO.
SI - 195 - 76A

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	39.	35.	19.	16.	14.	134.	56.	135.
NOZZLE	30	12.	95.	23.	49.	10.	29.	98.	58.
RESTRAINT	6	44.	0.	0.				44.	
RESTRAINT	6	0.	23.	0.				23.	
RESTRAINT	6	0.	0.	120.				120.	
RESTRAINT	7	0.	11.	0.				11.	
RESTRAINT	701	42.	0.	0.				42.	
RESTRAINT	701	0.	43.	0.				43.	
RESTRAINT	141	64.	0.	0.				64.	
RESTRAINT	141	0.	56.	0.				56.	
RESTRAINT	141	0.	0.	49.				49.	
RESTRAINT	17	0.	45.	0.				45.	
RESTRAINT	17	0.	0.	73.				73.	
RESTRAINT	19	0.	55.	0.				55.	
RESTRAINT	19	0.	0.	65.				65.	
RESTRAINT	21	410.	0.	0.				410.	
RESTRAINT	21	0.	53.	0.				53.	
RESTRAINT	21	0.	0.	68.				68.	
RESTRAINT	23	0.	55.	0.				55.	
RESTRAINT	23	0.	0.	72.				72.	
RESTRAINT	25	0.	55.	0.				55.	
RESTRAINT	25	0.	0.	47.				47.	
RESTRAINT	261	0.	44.	0.				44.	
RESTRAINT	261	0.	0.	108.				108.	
RESTRAINT	281	0.	71.	0.				71.	
VAR SUPPORT	305	0.	0.	0.				0.	
RESTRAINT	321	111.	0.	0.				111.	
RESTRAINT	321	0.	0.	70.				70.	

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***************************************************************************************************************************************

            1         2         3         4         5         6         7         8                          CARD
***12345678901234567890123456789012345678901234567890123456789012345678901234567890***                          NO.

   2300        TC     2   13                        SI DRAIN LINE                                               1
   ISO: SI-195-76A                                                                                              2
   2300        FA      1                                                                                        3
   2300       1LC     1                                  NORMAL OPERATING                                       4
   2300    1 41LC     13                                 OPERATING WEIGHT                                       5
   2300    1 51LC     11          34                     X STATIC                                               6
   2300    1 52LC     11                 25              Y STATIC                                               7
   2300    1 53LC     11                        33       Z STATIC                                               8
   2300    1101CC     114          51      53            MAXIMUM OF X AND Z                                     9
   2300    1102CC     111         101      52            MAXIMUM HORIZONTAL PLUS Y                             10
   2300        74            25     120                                                                        11
   2300        72           376304                                                                             12
   2300       171           104                   15                                                           13
   2300        70             35'      216    8      1      1                                                  14
   2300        66     1       47     -4    101                                                                 15
   2300        61     1                                                                                        16
   2300          1005               -325                                                                       17
   2300        601005                                                                                          18
   2300        681005         1                                                                                19
   2300        681005                        1                                                                 20
   2300         0   2 2             -1                                                                         21
   2300         4   3     1*         -46                                                                       22
   2300         9   3          100                                                                             23
   2300         4   4     1          -46                                                                       24
   2300             5                -5                                                                        25
   2300        60   5                                                                                          26
   2300        60   5                                                                                          27
   2300        70             1315    133   25     1      1                                                    28
   2300         5001 3                     -2                                                                  29
   2300         45002     1                 -22                                                                30
   2300         95002          25                                                                              31
   2300         45003     1                 -22                                                                32
   2300        605003                                                                                          33
   2300        60   5                                                                                          34
   2300        70             35      216    8     1      1                                                    35
   2300             6               -5                                                                         36
   2300        60   6                                                                                          37
   2300        60   6                                                                                          38
   2300        70             1315    133   25     1      1                                                    39
   2300         6001 3       -25                                                                               40
   2300         46002     1  -22                                                                               41
   2300         96002          25                                                                              42
   2300         46003     1  -22                                                                               43
   2300        606003                                                                                          44
   2300        60   6                                                                                          45
   2300        70             35      216    8     1      1                                                    46
   2300             7              -2                                                                          47
   2300        60   7                                                                                          48
   2300        60   7                                                                                          49
                                                                                                               50

***12345678901234567890123456789012345678901234567890123456789012345678901234567890***
            1         2         3         4         5         6         7         8
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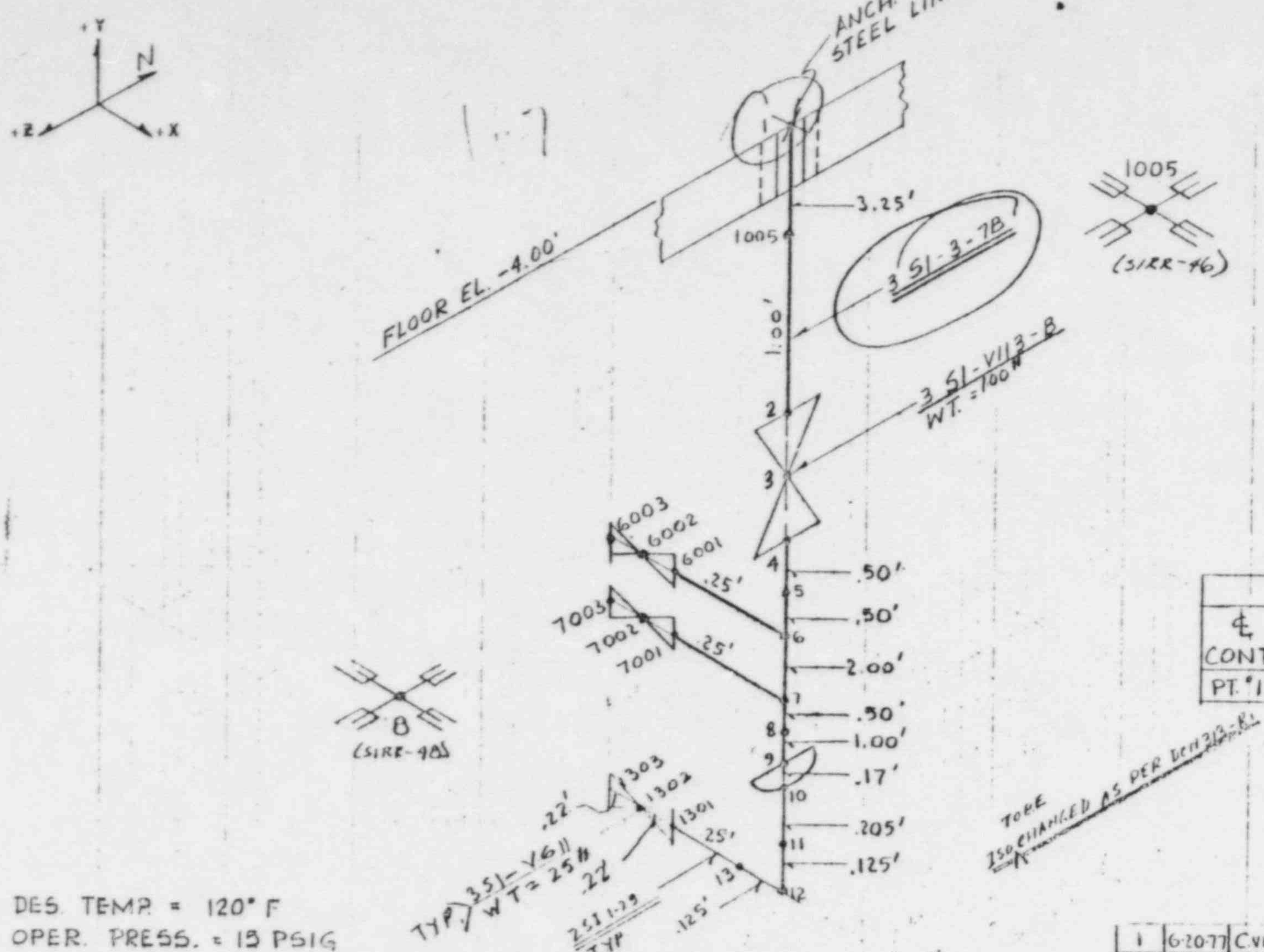
ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	1	1	0	0	0	0	0	0	0	0	-0.000	-0.000	0.000	0.000
		41	-4	313	1	313	-1	0	-5	5	0.000	-0.000	-0.000	0.000
		51	9	0	0	9	0	21	16	26	-0.000	0.000	-0.000	0.000
		52	1	-78	0	78	0	0	1	1	-0.000	0.000	0.000	0.000
		53	6	0	8	8	-14	-12	0	18	0.000	-0.000	-0.000	0.000
		101	9	0	8	12	-14	21	16	30	-0.000	0.000	-0.000	0.000
		102	10	78	8	79	14	21	17	30	0.000	0.000	0.000	0.000

ISOMETRIC NO.
SI-135-77A

CALC. NO.
2301



DES. TEMP. = 120° F
OPER. PRESS. = 15 PSIG

COORDINATES			
℄	X	Y	Z
CONT.	0	0	0
PT. #1	47.00'	-4.00'	156.50'

REV.	DATE	BY	DESCRIPTION
1	6-20-77	C.VILL	ADDED (3) VALVES: 3SI-V611, ETC.

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD # 3

SAFETY INJECTION SYSTEM PIPING

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G.FACTOR	REF. DWGS.	REV	DATE
3SI-3-78	3.500	.216	SS-1 SS TP-304	104	.382	EC = 28.3 X 10^6 EH = 28.143 X 10^6	25	DYNAMIC ☐		LOU-1564 S-195 SHT. 1	5	5-3-76
								STATIC ☐	VERT.			
								THERMAL ☐	HORIZ.			

DR. D.B.H. DATE: 11-21-74
CH. [illegible] DATE: [illegible]

ISOMETRIC NO.
SI-195-77A

CASE	LOADING CASE TITLE	ANALYSIS TYPE	EQ	STRESS OUTPUT	REFERENCE CASE	GX	GY	GZ	EST. WT. STRESS
41	OPERATING WEIGHT	OPER. WEIGHT		SUSTAINED LOAD	1		-1.0		0
51	X STATIC	SEISMIC		OCCASIONAL LOAD UPSET	1	0.34			0
52	Y STATIC	SEISMIC		OCCASIONAL LOAD UPSET	1		0.25		0
53	Z STATIC	SEISMIC		OCCASIONAL LOAD UPSET	1			0.3	0

CASE	COMBINATION CASE TITLE	METHOD	EQ	STRESS OUTPUT	PRFS CASE	FACT	CASE	FACT	CASE	FACT	CASE	FACT	CASE	E.WT STRS
101	MAXIMUM OF X AND Z	MAX COMPO		OCCASIONAL LOAD UPSET	1	1.0	51	1.0	53					0
102	MAXIMUM HORIZONTAL PLUS Y	ADD ABS VALS		OCCASIONAL LOAD UPSET	1	1.0	101	1.0	52					0
	PERFORM FREQUENCY ANALYSIS													

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	4.	-279.	0.	0.	0.	5.	279.	5.
RESTRAINT	1005	-13.	0.	0.				13.	
RESTRAINT	1005	0.	0.	0.				0.	
RESTRAINT	A	9.	0.	0.				9.	
RESTRAINT	A	0.	0.	0.				0.	
TOTAL		0.	-279.	0.					

There is no thermal run

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	-5.	-0.	0.	0.	0.	-11.	5.	11.
RESTRAINT	1005	56.	0.	0.				56.	
RESTRAINT	1005	0.	0.	0.				0.	
RESTRAINT	8	44.	0.	0.				44.	
RESTRAINT	8	0.	0.	0.				0.	
TOTAL		95.	-0.	0.					

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	-1.	70.	0.	0.	0.	-1.	70.	1.
RESTRAINT	1005	3.	0.	0.				3.	
RESTRAINT	1005	0.	0.	0.				0.	
RESTRAINT	A	-2.	0.	0.				2.	
RESTRAINT	B	0.	0.	0.				0.	
TOTAL		-0.	70.	0.					

ACTION OF PIPING ON ANCHORS,SUPPORTS AND RESTRAINTS

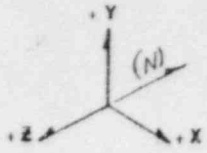
	POINT NO.	----- FORCES IN POUNDS ----- FX	FY	FZ	----- MOMENTS IN FOOT POUNDS ----- MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	0.	0.	-4.	10.	12.	0.	4.	15.
RESTRAINT	1005	0.	0.	0.				0.	
RESTRAINT	1005	0.	0.	49.				49.	
RESTRAINT	8	0.	0.	0.				0.	
RESTRAINT	8	0.	0.	38.				38.	
TOTAL		0.	0.	84.					

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

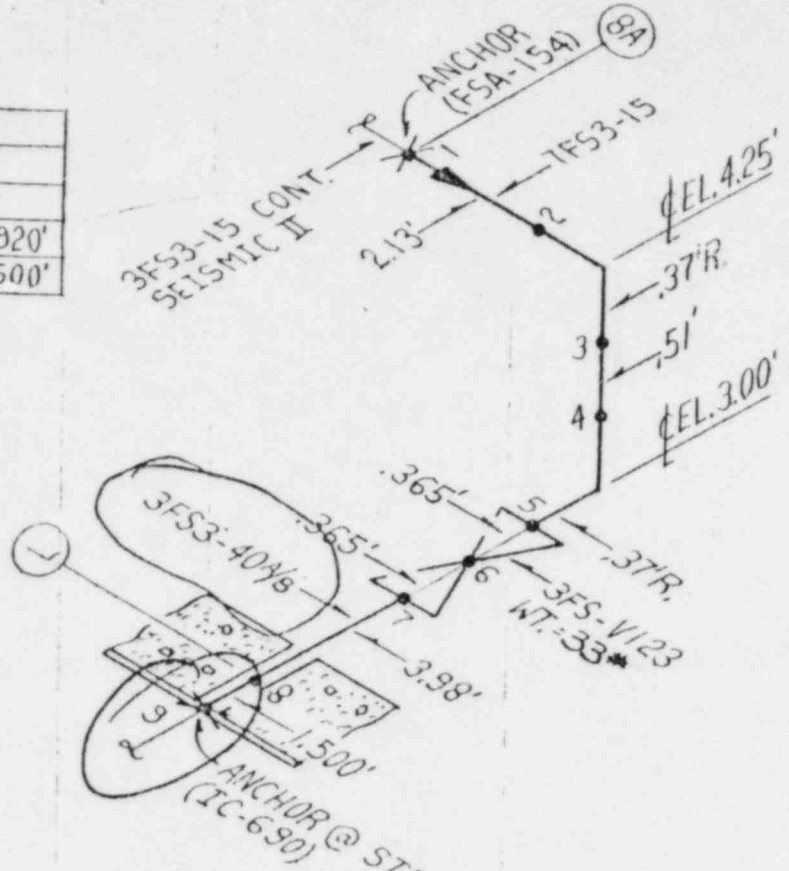
	POINT NO.	----- FORCES IN POUNDS ----- FX	FY	FZ	----- MOMENTS IN FOOT POUNDS ----- MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	6.	70.	4.	10.	12.	12.	70.	20.
RESTRAINT	1005	59.	0.	0.				59.	
RESTRAINT	1005	0.	0.	49.				49.	
RESTRAINT	8	46.	0.	0.				46.	
RESTRAINT	8	0.	0.	38.				38.	

ISOMETRIC NO.
R-FS-198-4

CALC. NO.
2892



COORDINATES			
℄ CONT.	X	Y	Z
	0	0	0
POINT #1	22.000'	4.250'	90.920'
POINT #9	24.500'	3.000'	97.500'



ALL LINES:
DESIGN TEMP. = 200°F.
OPER. PRESS. = 100PSIG.

LINE NO.	PIPE O.D.	SCH. & NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
1FS3-15	3.50	.216	SS-1	150			150			LOU 1569 G198 SHT. 2	6	1-23-80
3FS3-40⅜	3.50	.216	SS-1	150			150	DYNAMIC ☐	HOR. X=.38			
								STATIC ☐	VERT. Y=.30			
								THERMAL ☐	HORIZ. Z=.33			

REV.	DATE	BY	DESCRIPTION
0	4-14-82	RSAPP PET	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX BLDG.
FUEL POOL COOLING PIPING

DR. R.PIRONCIAK DATE: 4-14-82
CH. R.SAPP DATE: 4-19-82

ISOMETRIC NO.
R-FS-198-4

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***12345678901234567890123456789012345678901234567890123456789012345678901234567890***
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2892       IC    3   15      R SAPP     WATERFORD UNIT #3 REACTOR AUX BLDG FUEL
POOL COOLING PIPING ISO R-FS-198-4 "AS BUILT" REV-6
2892       FA    1       .
2892      1LC    1                                  NORMAL OPERATING
2892  10 41LC   13                                  OPERATING WEIGHT
2892   1 51LC   110        38                       X_STATIC
2892   1 52LC   1100                30              Y_STATIC
2892   1 53LC   1100                        33      Z_STATIC
2892  10101CC   114          51     53              MAXIMUM OF X AND Z
2892  10102CC   111         101     52              MAXIMUM OF HORIZONTAL PLUS Y
2892  10110CC     0   8       1     41              THERMAL + WEIGHT
2892  10111CC   1 4   8      41    110              HIGHER OF (TH+WT) OR WT
2892  10112CC   111   8     111    102              OPE + HI (TH+WT) OR WT
2892  10113CC   121   8     111  2.102              OPE + HI (TH+WT) OR WT
2892  10652CS    12   3      41    102              DESIGN EQ 9
2892       74              150    200
2892       72              376304
2892      171              150                 150
2892     1071              200                 150
2892       73                35      216    773    1       1
2892       66   1            22      425   9092
2892       66   9           245        3    975
2892       61   1 3
2892            2 2          213
2892        1   3 2           37                          -37
2892            4 2                 -51
2892        1   5 2                 -37                             37
2892        4   6       1                      365
2892        9   6         033
2892        4   7 2     1                      365
2892            8                              398
2892       60   8
2892       60   8
2892            9 3                            15
2892       61   9
2892       89
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***12345678901234567890123456789012345678901234567890123456789012345678901234567890***
          1         2         3         4         5         6         7         8
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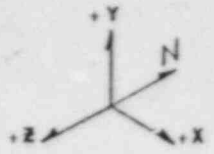
ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

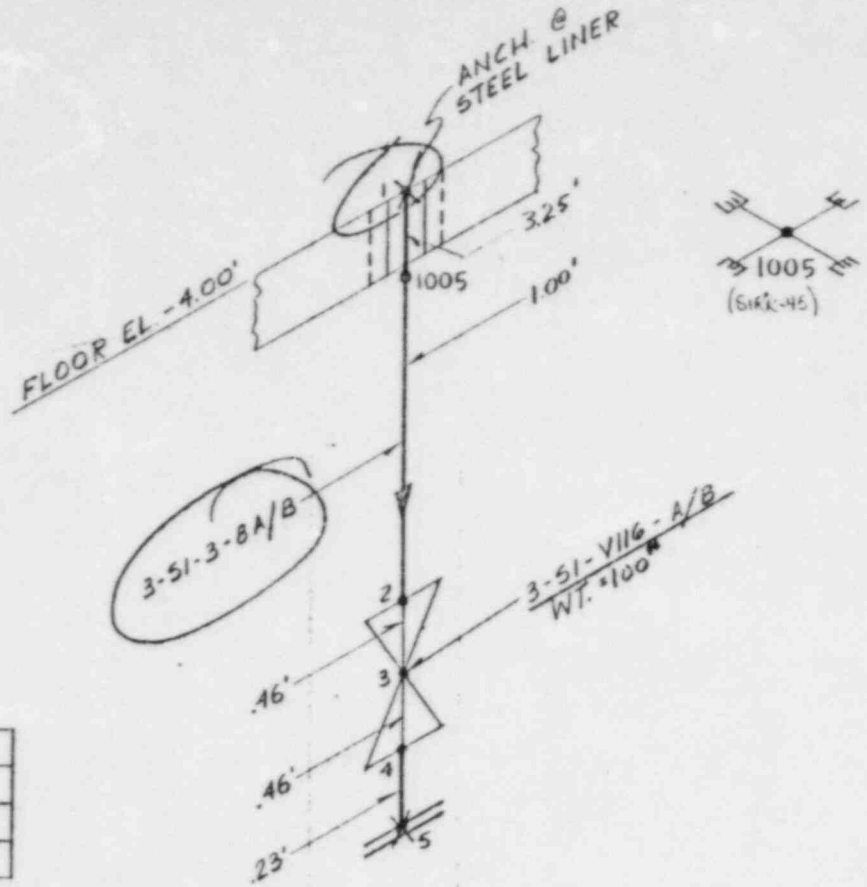
NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	1	1	77	-82	501	514	-282	-962	-135	1011	-0.000	0.000	-0.000	0.000
		41	-3	87	-3	87	2	2	163	163	0.000	-0.000	0.000	0.000
		51	-14	1	-2	14	0	3	-15	15	0.000	-0.000	0.000	0.000
		52	1	-26	1	26	0	0	-49	49	-0.000	0.000	-0.000	0.000
		53	0	-1	-7	7	-2	0	-1	7	0.000	0.000	0.000	0.000
		101	-14	1	-7	34	-2	6	-15	16	0.000	-0.000	0.000	0.000
		102	35	27	8	45	2	7	64	64	0.000	0.000	0.000	0.000
		111	74	87	498	511	-286	-960	163	1013	-0.000	-0.000	-0.000	0.000
		112	108	114	507	530	282	977	226	1032	0.000	0.000	0.000	0.000
		113	143	141	515	563	284	973	290	1055	0.000	0.000	0.000	0.000
ANCHOR	9	1	-77	82	-501	514	194	215	26	291	0.000	-0.000	0.000	0.000
		41	3	50	3	51	76	-16	15	79	-0.000	-0.000	-0.000	0.000
		51	-18	-1	2	19	-5	28	-9	28	0.000	0.000	-0.000	0.000
		52	-1	-15	-1	15	-23	5	-4	24	0.000	0.000	0.000	0.000
		53	0	1	-38	38	1	0	0	1	-0.000	-0.000	0.000	0.000
		101	-18	-1	-38	42	-5	26	-9	28	0.000	0.000	0.000	0.000
		102	19	16	35	46	28	30	13	43	0.000	0.000	0.000	0.000
		111	-74	132	-498	521	270	240	41	339	0.000	-0.000	0.000	0.000
		112	93	149	537	565	298	230	54	381	0.000	0.000	0.000	0.000
		113	112	165	576	609	326	261	68	423	0.000	0.000	0.000	0.000

FORM 78

ISOMETRIC NO.
SI - 195 - 50

CALC. NO.
2302





Pr 20

COORDINATES			
℄	X	Y	Z
CONT.	0	0	0
PT. 1	5.00'	-4.00'	151.75"

DES. TEMP. = 120° F
OPER. PRESS. = 15 PSIG

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3-51-3-8A/B	3.500	.216	SS-1 SS TP-304	104	.382	EC-28.3x10⁶ EH-28.143x10⁶	25	DYNAMIC ☐		LDD-1564 & 195 SHT. 1	S	5-3-74
								STATIC ☐	VERT. .3			
								THERMAL ☐	HORIZ. .3			

REV.	DATE	BY	DESCRIPTION

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD "3

SAFETY INJECTION SYSTEM PIPING

REACTOR BUILDING

DR. DBH DATE: 11-21-74
CH. DATE:

ISOMETRIC NO.
SI - 195 - 50

CASE	LOADING CASE TITLE	ANALYSIS TYPE	EQ	STRESS OUTPUT	REFERENCE CASE	GX	GY	GZ	EST. WT. STRESS
41	OPERATING WEIGHT	OPER. WEIGHT		SUSTAINED LOAD	1		-1.0		0
51	X STATIC	SEISMIC		OCCASIONAL LOAD UPSET	1	0.34			0
52	Y STATIC	SEISMIC		OCCASIONAL LOAD UPSET	1		0.25		0
53	Z STATIC	SEISMIC		OCCASIONAL LOAD UPSET	1			0.3	0

****

CASE	COMBINATION CASE TITLE	METHOD	EQ	STRESS OUTPUT	PRE. CASE	FACT	CASE	FACT	CASE	FACT	CASE	FACT	CASE	E.WT STRS
101	MAXIMUM OF X AND Z	MAX COMPO		OCCASIONAL LOAD UPSET	1	1.0	51	1.0	53					0
102	MAXIMUM HORIZONTAL PLUS Y	ADD ABS VALS		OCCASIONAL LOAD UPSET	1	1.0	101	1.0	52					0

PERFORM FREQUENCY ANALYSIS

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	0.	-170.	0.	0.	0.	0.	170.	0.
RESTRAINT	1005	0.	0.	0.				0.	
RESTRAINT	1005	0.	0.	0.				0.	
TOTAL		0.	-170.	0.					

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	-25.	0.	0.	0.	0.	-32.	25.	32.
RESTRAINT	1005	83.	0.	0.				83.	
RESTRAINT	1005	0.	0.	0.				0.	
TOTAL		58.	0.	0.					

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	0.	43.	0.	0.	0.	0.	43.	0.
RESTRAINT	1003	0.	0.	0.				0.	
RESTRAINT	1005	0.	0.	0.				0.	
TOTAL		0.	43.	0.					

ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	0.	0.	-22.	29.	0.	0.	22.	29.
RESTRAINT	1005	0.	0.	0.				0.	
RESTRAINT	1005	0.	0.	73.				73.	
TOTAL		0.	0.	51.					

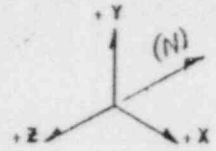
SI DRAIN LINE ISO: SI-195-50
COMBIN. CASE NO. 102 MAXIMUM HORIZONTAL PLUS Y OUTPUT: OCCASIONAL LOAD (UPSET)

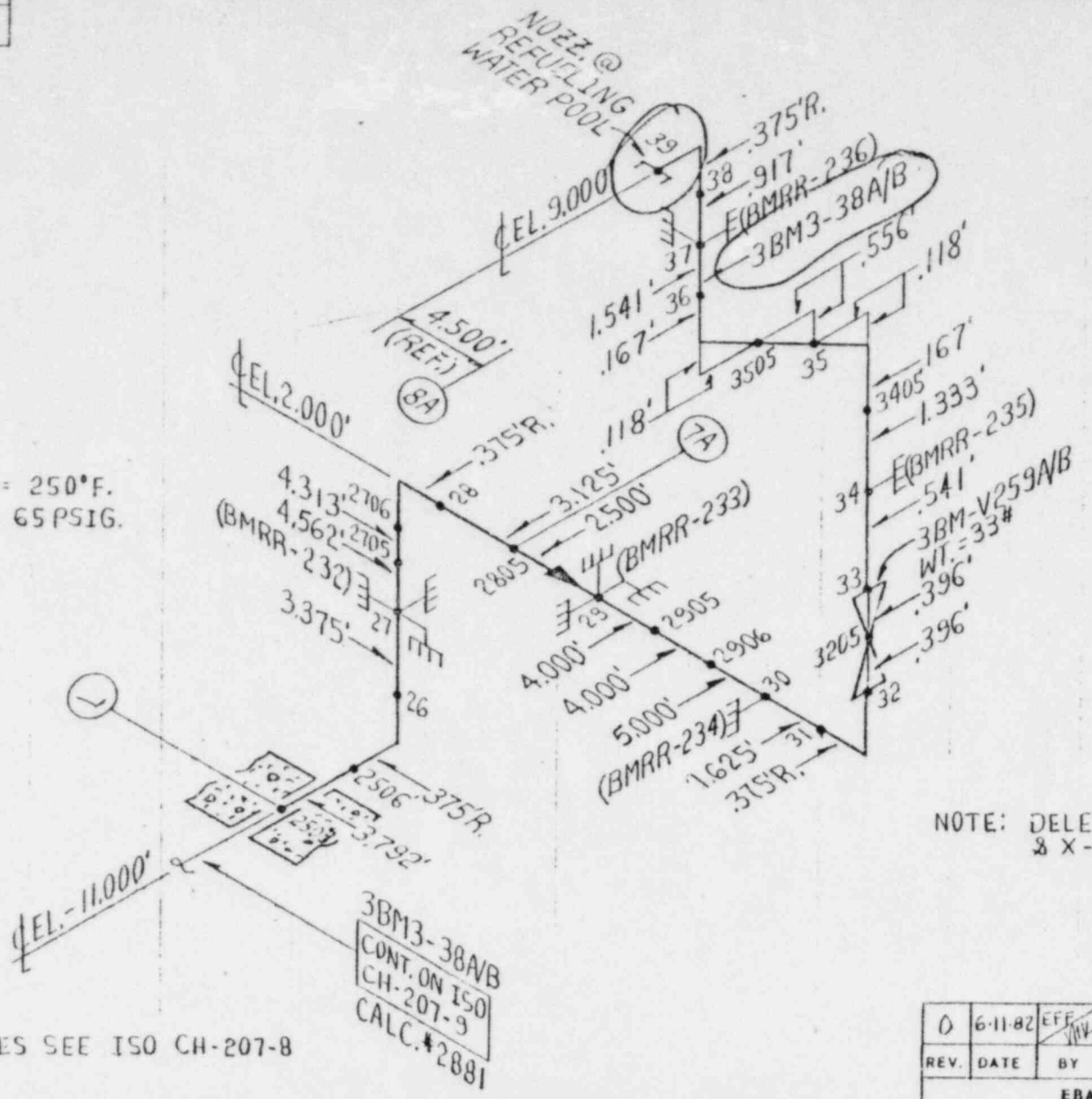
ACTION OF PIPING ON ANCHORS, SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	25.	43.	22.	29.	0.	32.	54.	43.
RESTRAINT	1005	83.	0.	0.				83.	
RESTRAINT	1005	0.	0.	73.				73.	

ISOMETRIC NO.
CH-207-10

CALC. NO.
2881





ALL LINES:
DESIGN TEMP. = 250°F.
OPER. PRESS. = 65 PSIG.

NOTE: DELETED Y-RESTRAINT @ PT. #30 & X-RESTRAINT @ PT. #34.

FOR COORDINATES SEE ISO CH-207-8

REV.	DATE	BY	DESCRIPTION
0	6-11-82	EFF JRV	'AS-BUILT'

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX. BLDG.
CHEMICAL & VOLUME CONTROL PIPING

DR. K. PIRONCIAK DATE: 5-3-82
CH. V Fonseca DATE: 5-17-82

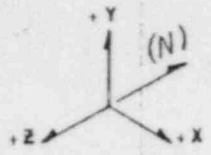
ISOMETRIC NO. CH-207-10

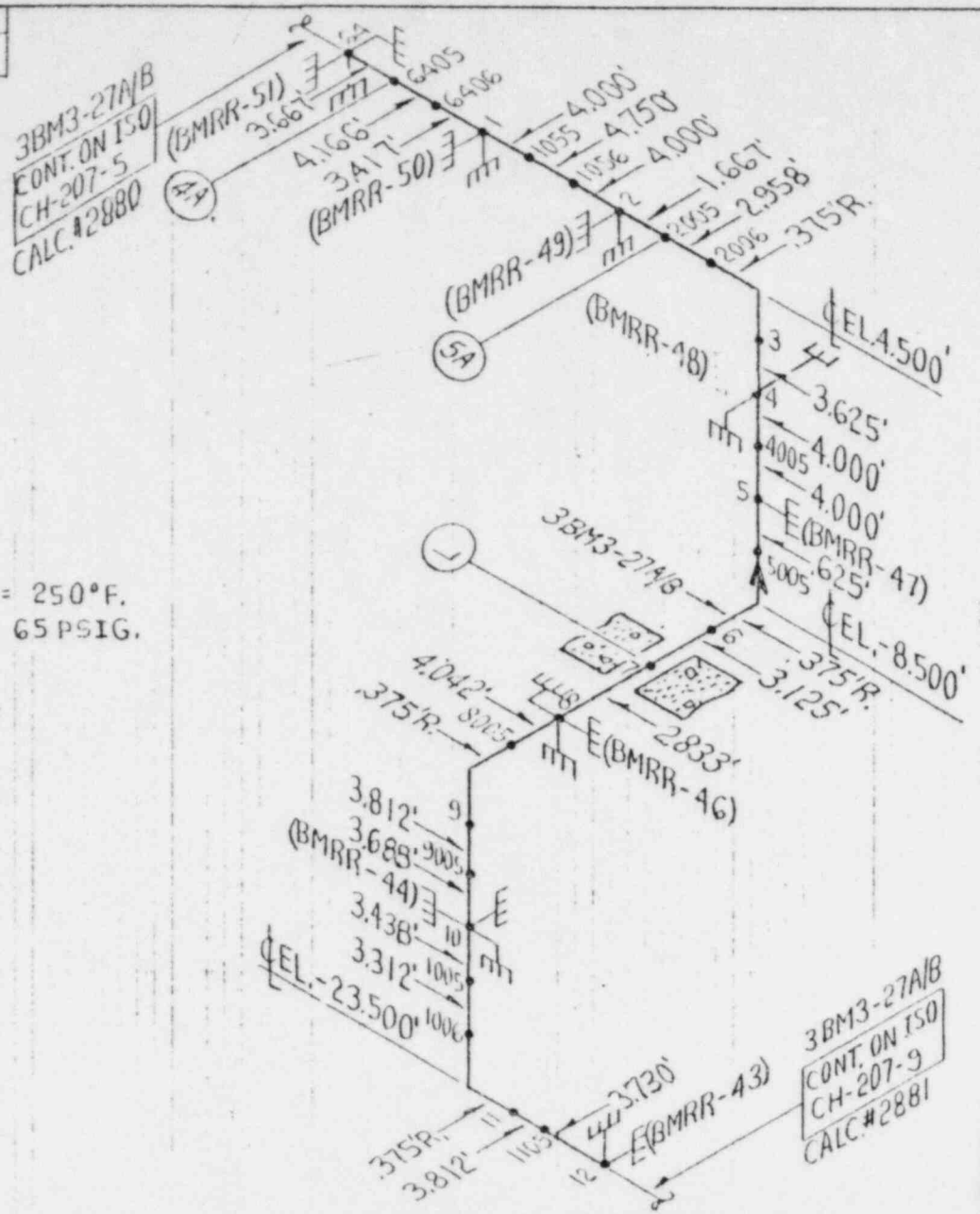
LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3BM3-38A/B	3.500	.216	SS-1	120			75			LOU 1564 6197 SH. 2	4	8-4-78
								DYNAMIC ☐		LOU 1564 6197 SH. 3	7	3-10-80
								STATIC ☒	VERT. 30			
								THERMAL ☒	HORZ. 38 & 39			

FORM 478

ISOMETRIC NO.
CH-207-8

CALC. NO.
2881





ALL LINES:
DESIGN TEMP. = 250°F.
OPER. PRESS. = 65 PSIG.

℄ CONT.	COORDINATES X	Y	Z
	0	0	0
POINT #64	-69.670'	4.500'	92.500'
" #39	17.500'	9.000'	93.000'
" #48	-11.000'	-33.100'	106.750'
" #58	-11.000'	-33.100'	113.000'

REV.	DATE	BY	DESCRIPTION
0	6-11-82	EFF VIK	'AS-BUILT'

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX. BLDG.
CHEMICAL & VOLUME CONTROL PIPING

DR. R.PIRONCIAK DATE: 5-3-82
CH. K.K. DATE: 5-11-82

ISOMETRIC NO. CH-207-8

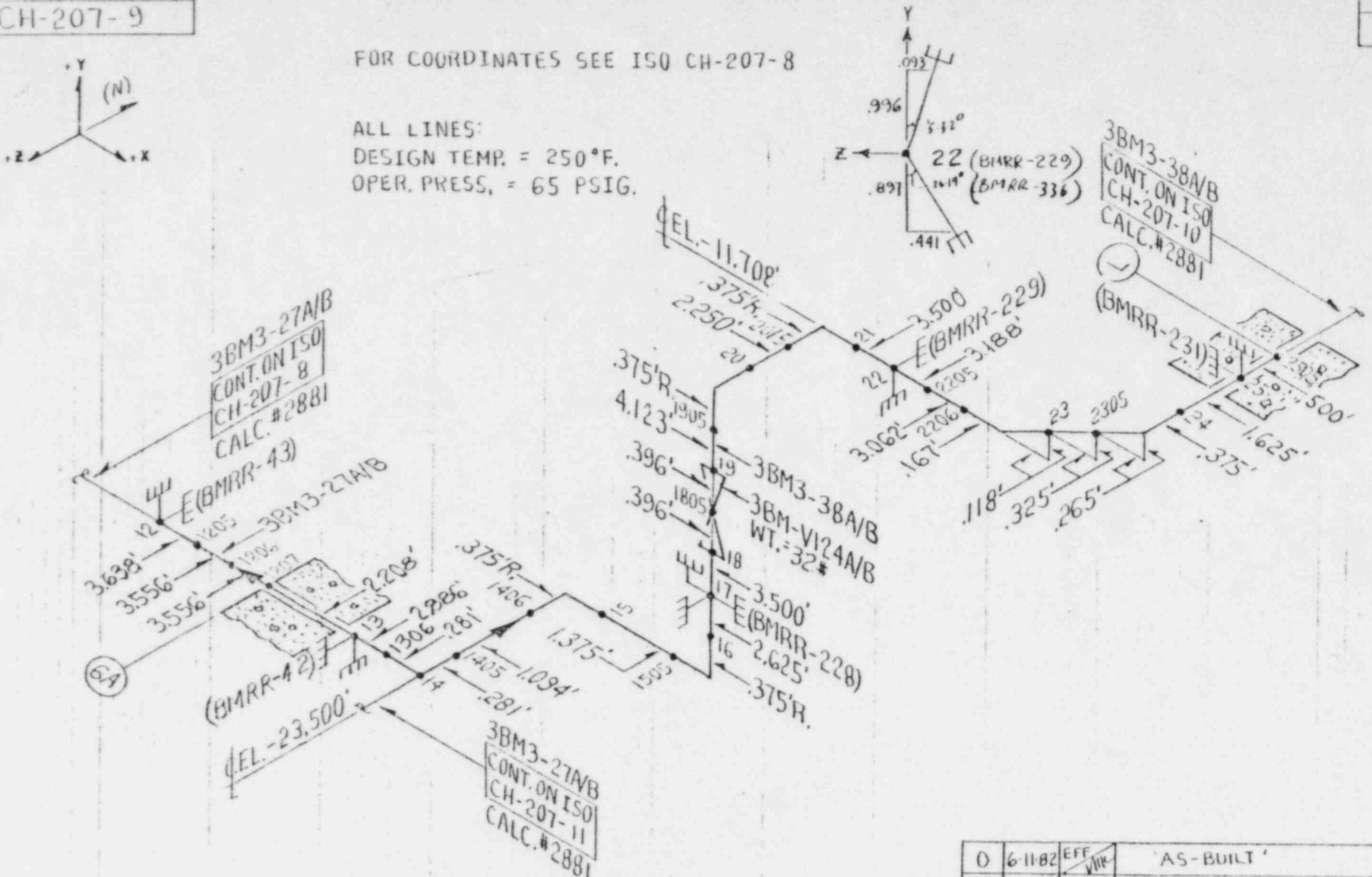
LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3BM3-27A/B	3.500	.216	SS-1	120			75			LOU 1564 G197 SH. 1	4	8-4-78
								DYNAMIC ☐		LOU 1564 G197 SH. 2	4	8-4-78
								STATIC ☒	VERT. -30			
								THERMAL ☒	HORIZ. X: 35 Z: -15			

ISOMETRIC NO.
CH-207-9

CALC. NO.
2881

FOR COORDINATES SEE ISO CH-207-8

ALL LINES:
DESIGN TEMP. = 250°F.
OPER. PRESS. = 65 PSIG.



REV.	DATE	BY	DESCRIPTION
0	6-11-82	EFF / VHK	'AS-BUILT'

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3BM3-27A/B	3.500	.216	SS-1	120			75			LOU 1564 G197 SH.2	4	8-4-78
3BM3-38A/B	3.500	.216	SS-1	120			75	DYNAMIC ☐				
								STATIC ☒	VERT. -.30			
								THERMAL ☒	HORIZ X=.37 Z=.38			

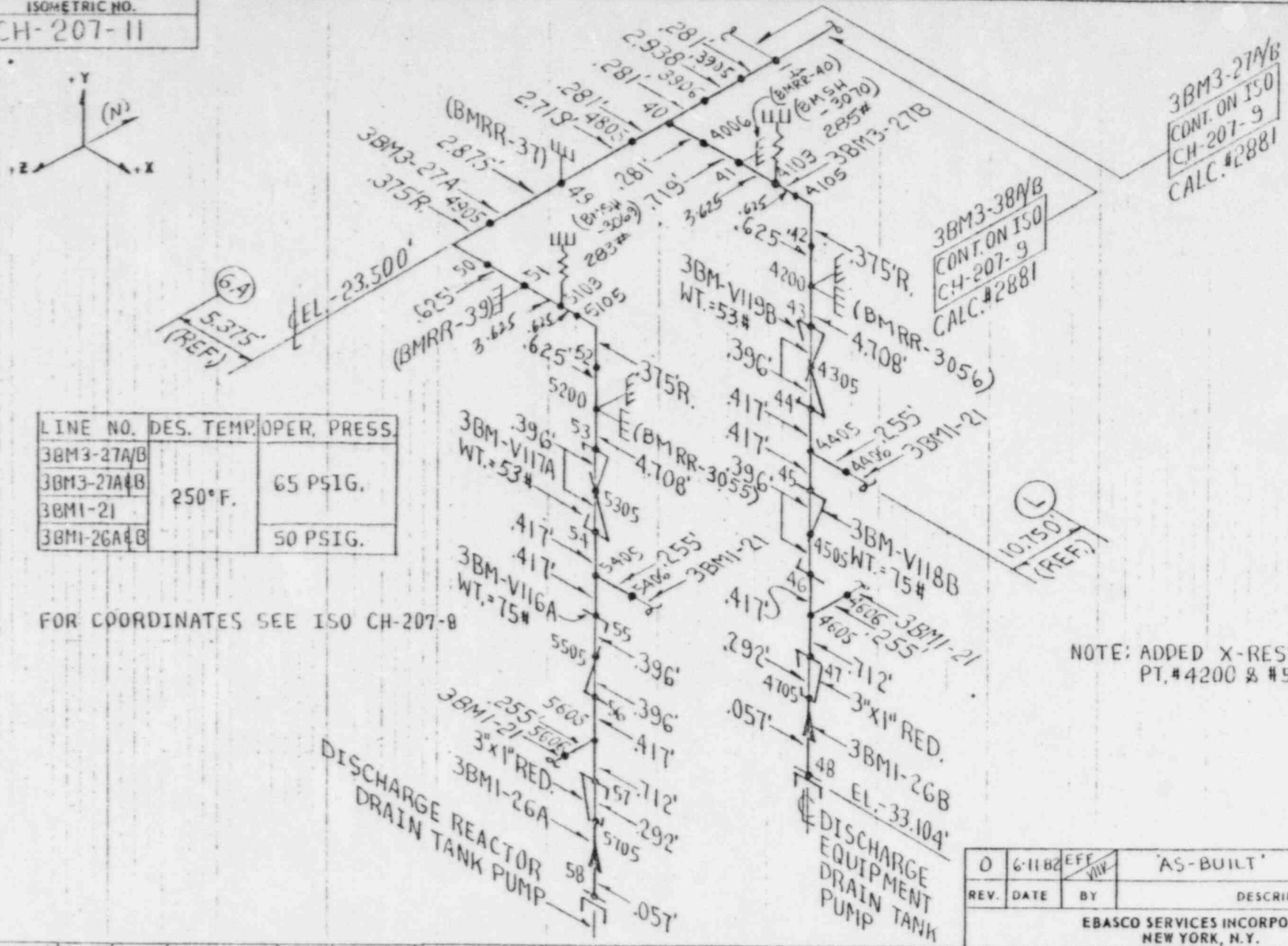
WATERFORD UNIT #3
REACTOR AUX. BLDG.
CHEMICAL & VOLUME CONTROL PIPING

DR. R. PIRONCIAK DATE: 5-3-82
CH. V. Kousagis DATE: 5-12-82

ISOMETRIC NO. CH-207-9

ISOMETRIC NO.
CH-207-11

CALC. NO.
2881



LINE NO.	DES. TEMP.	OPER. PRESS.
3BM3-27A/B	250°F.	65 PSIG.
3BM3-27A&B		
3BM1-21		
3BM1-26A&B		50 PSIG.

FOR COORDINATES SEE ISO CH-207-8

NOTE: ADDED X-RESTRAINT @ PT. #4200 & #5200.

REV.	DATE	BY	DESCRIPTION
0	6-11-82	EFF VIII	'AS-BUILT'

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT #3
REACTOR AUX. BLDG
CHEMICAL & VOLUME CONTROL PIPING

DR. R.PIRONCIAK DATE: 5-3-82
CH. V. Kansagra DATE: 5-17-82

ISOMETRIC NO.
CH-207-11

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100	MODULUS OF ELASTICITY	DES PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3BM3-27A/B	3.500	.216	SS-1	120			75	DYNAMIC ☐		LOU 1564 G197 SH. 2	4	8-4-78
3BM3-27A&B	3.500	.216						STATIC ☒	VERT.: 30	LOU 1564 G197 SH. 3	7	3-10-80
3BM1-26A&B	1.315	.179						THERMAL ☒	HORIZ. X: 30 Z: 30			
3BM1-21	1.315	.179										

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2881       IC    3   15E FARLEY          WATERFORD #3 REACTOR AUX BUILDING PORCH
MANAGEMENT S OF PIPING ISO CH-207-8-9-10-11 REV 0  "AS-BUILT"
2881   1   FA     1
2881       1LC   1                                   NORMAL OPERATING
2881  10 41LC    13                                  OPERATING WEIGHT
2881   1 51LC    110000      38                      X-STATIC
2881   1 52LC    11                30                Y-STATIC
2881   1 53LC    11                          38      Z-STATIC
2881  10101CC    114           51     53             MAXIMUM OF X AND Z (OBE)
2881  10102CC    111          101     52             MAX. HORIZONTAL + Y (OBE)
2881  10110CC      8            1     41             THERMAL + WEIGHT
2881  10111CC    1 4           41    110             HIGHER OF (TH+WT) OR WT
2881  10112CC    111    8     111    102             ABS OF OBE + HI(TH+WT) OR WT
2881  10113CC    121    8     111  2.102             ABS OF OBE + HI(TH+WT) OR WT
2881  10652CS     12    3      41    102             DESIGN EQ 9
2881        66  64          -6967   4500  92500
2881        66  39           17500   9000  93000
2881        66  48          -11000 -33100 10675
2881        66  58          -11000 -33100 113000
2881        74               75     250
2881        72              376304
2881       171              126                  65
2881      1071              250                  75
2881        70    4          3500    216   7730   1000   1000
2881        60  64
2881          6405           3667
2881          6406           4166
2881             1           3917
2881          1855         4  4
2881          1856           4750
2881             2           4
2881          2005           1667
2881          2006 2         2958
2881          1   3 2         375                          -375
2881             4 2                -3625
2881          4005                  -4
2881             5                  -4
2881          5005 2                -625
2881          1   6 2               -375                              375
2881             7                          3125
2881             8 2                        2833
2881          8005 2                        4042
2881          1   9 2                         375          -375
2881          9005                  -3812
2881            10 2                -3688
2881          1005                  -3438
2881          1006 2                -3312
2881          1  11 2                -375          375
2881          1105           3812
2881            12           3750

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ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
NOZZLE	39	1	255	-9	-45	259	35	-60	53	87	-0.000	0.000	0.000	0.000
		41	-51	186	12	193	42	2	-15	45	0.000	-0.000	-0.000	0.000
		51	13	1	-1	13	0	-2	4	4	-0.000	-0.000	0.000	0.000
		52	15	-56	-4	58	-13	-1	4	13	-0.000	0.000	0.000	0.000
		53	0	0	4	4	-1	-1	0	1	0.000	0.000	-0.000	0.000
		101	13	1	4	14	-1	-2	1	4	-0.000	-0.000	-0.000	0.000
		102	28	56	8	64	14	2	8	16	0.000	0.000	0.000	0.000
		111	204	186	-32	278	77	-58	38	104	-0.000	-0.000	0.000	0.000
		112	233	243	40	338	91	60	46	118	0.000	0.000	0.000	0.000
		113	261	299	48	400	104	63	54	133	0.000	0.000	0.000	0.000
NOZZLE	48	1	-7	44	7	45	10	-13	10	19	0.000	-0.000	-0.000	0.000
		41	7	15	0	16	0	0	-10	10	-0.000	-0.000	0.000	0.000
		51	-42	8	0	43	0	-1	21	21	0.000	-0.000	-0.000	0.000
		52	0	-76	0	76	0	0	-1	1	-0.000	0.000	-0.000	0.000
		53	-1	0	-52	52	-35	-1	1	35	0.000	0.000	0.000	0.000
		101	-42	8	-52	67	-35	-1	21	41	0.000	-0.000	0.000	0.000
		102	42	84	52	108	35	1	22	42	0.000	0.000	0.000	0.000
		111	7	59	7	59	10	-13	-10	19	-0.000	-0.000	-0.000	0.000
		112	49	143	58	162	45	15	31	57	0.000	0.000	0.000	0.000
		113	91	227	110	269	80	16	53	98	0.000	0.000	0.000	0.000
NOZZLE	58	1	-6	15	-15	22	-22	20	9	31	0.000	-0.000	0.000	0.000
		41	8	11	0	13	0	0	-11	11	-0.000	-0.000	0.000	0.000
		51	-50	-1	1	50	1	-1	32	32	0.000	0.000	-0.000	0.000
		52	1	-77	-1	77	-1	0	-1	2	-0.000	0.000	0.000	0.000
		53	1	0	-52	52	-36	-1	-1	36	-0.000	0.000	0.000	0.000
		101	-50	-1	-52	72	-36	-1	32	48	0.000	0.000	0.000	0.000
		102	51	78	53	107	37	2	34	50	0.000	0.000	0.000	0.000
		111	8	26	-15	31	-22	20	-11	31	-0.000	-0.000	0.000	0.000
		112	58	104	68	137	58	21	45	77	0.000	0.000	0.000	0.000
		113	109	183	120	244	95	23	78	125	0.000	0.000	0.000	0.000

X

EBASCO SERVICES INCORPORATED

BY RMH DATE 6-21-84

SHEET 1 OF 1

CHKD. BY J. CHOU DATE 6/21/84

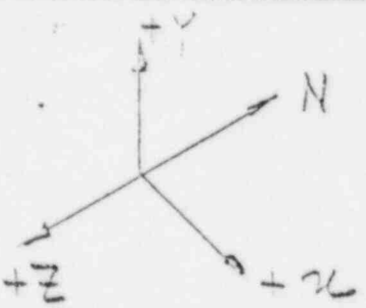
OFS NO. 2835.140 DEPT. NO. 658

CLIENT L P & L

PROJECT WATERFORD SES #3

SUBJECT ANALYSIS FOR NOZZLE P=4

EQUIPMENT	
NOZZLE	P=4
LINE NUMBER	2 SI 24 - 3?
CALC. NO.	1125
PORTION No	3
ISOMETRIC No	SI-195-12
POINT No	218
OUTPUT DATE	6/11/84



TYPE ANALYSIS	FORCES (lbs)			MOMENTS (Ft-lbs)			RESULTANT OF BENDING MOMENTS
	Fx	Fy	Fz	Mx	My	Mz	
THERMAL	-1653	-3[illegible]	-2022	22845	4963	-23700	
WEIGHT	-606	3857	-134	-700	2224	-4815	
SEISMIC OBE MAX X COMPONENT	575	61	183	1951	332	3119	
SEISMIC OBE MAX Y COMPONENT	215	397	17	229	54	1317	
SEISMIC OBE MAX Z COMPONENT	133	92	719	5445	497	1336	$\sqrt{Mx^2+Mz^2}$
THER. + WT + SEISMIC OBE MAX X + Y	3049	4295	2361	24323	7629	33431	41336
THER + WT + SEISMIC OBE + MAX Z + Y	2632	4326	2912	27322	7733	31693	42176
THER + WT + SEISMIC DBE MAX X + Y	3839	4733	2546	26503	8071	33117	46675
THER + WT + SEISMIC DBE MAX Z + Y	3005	4813	3643	33496	8289	31831	46523

LOADS ARE REDUCED PER STRESS CALC REV #5 (2-9-84)

RESULTANT MOMENTS ARE LESS THAN ORIGINAL MOMENTS USED IN CALCS. NO NEED FOR FUTHER ANALYSIS

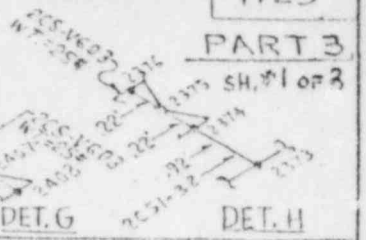
P-1

ISOMETRIC NO.
SI-195-42

REV.	DATE	BY	DESCRIPTION
5	2-9-83	EET	FINAL AS BUILT

CALC. NO. 1125

PART 3 SH. #1 of 3



PART 3 : COORDINATES (FT.)

POINT #	X	Y	Z
145	11.00	-30.62	116.50
1462	59.00	-27.17	130.75
209	4.00	-13.74	50.35
218	27.50	-4.00	99.50
243	22.00	-32.50	120.11
266	36.00	-31.54	120.00
2745	45.96	-25.79	120.00
9911	8.50'	-17.417'	86.282'

LINE NO.	DES. TEMP.	OPER. PRESS.
2SI1-28	250°F.	40 PSIG.
2SI24-3B		60 PSIG.
2SI24-2B		60 PSIG.
2CS14-23B		40 PSIG.
2CS14-2B		60 PSIG.
2SI3¼-213		60 PSIG.

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.
2SI1-28	1.315	.179	SS-TP-304	240			160			
2SI24-3B	24.00"	.375"	"	"			160			LOU-1564 G-195 SH.1
2SI24-2B	24.00"	"	"	"			160	DYNAMIC ☑	-	SH. 2
2CS14-23B	14.00"	"	"	"			50 / 160	STATIC ☐	VERT.	SH. 3
2CS14-2B	14.00"	"	"	"						
2SI3¼-213	1.050	.154	"	"			160	THERMAL ☑	HORIZ.	LOU-1564 G-200 SH.2

REV.	DATE	BY	DESCRIPTION
14	8-4-83		
13	4-15-83		
12	2-4-83		
10	7-26-82		
4	1-27-83	RJAPP	SEE ISO # SI-195-43A (SH 3 OF 3)
3	2-1-83	RJAPP	SEE ISO # SI-195-42A (SH 3 OF 3)
2	10-26-82	EET	REVISED LOC. OF VALVES 2SI-L102B, V106B / VENT, DRAIN & BRANCH LINE AS PER PDI-MP-207.
1	9-15-82	EET	AS BUILT (FOR REV. SEE ISO SI-195-43)
0	4-20-82	EET	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

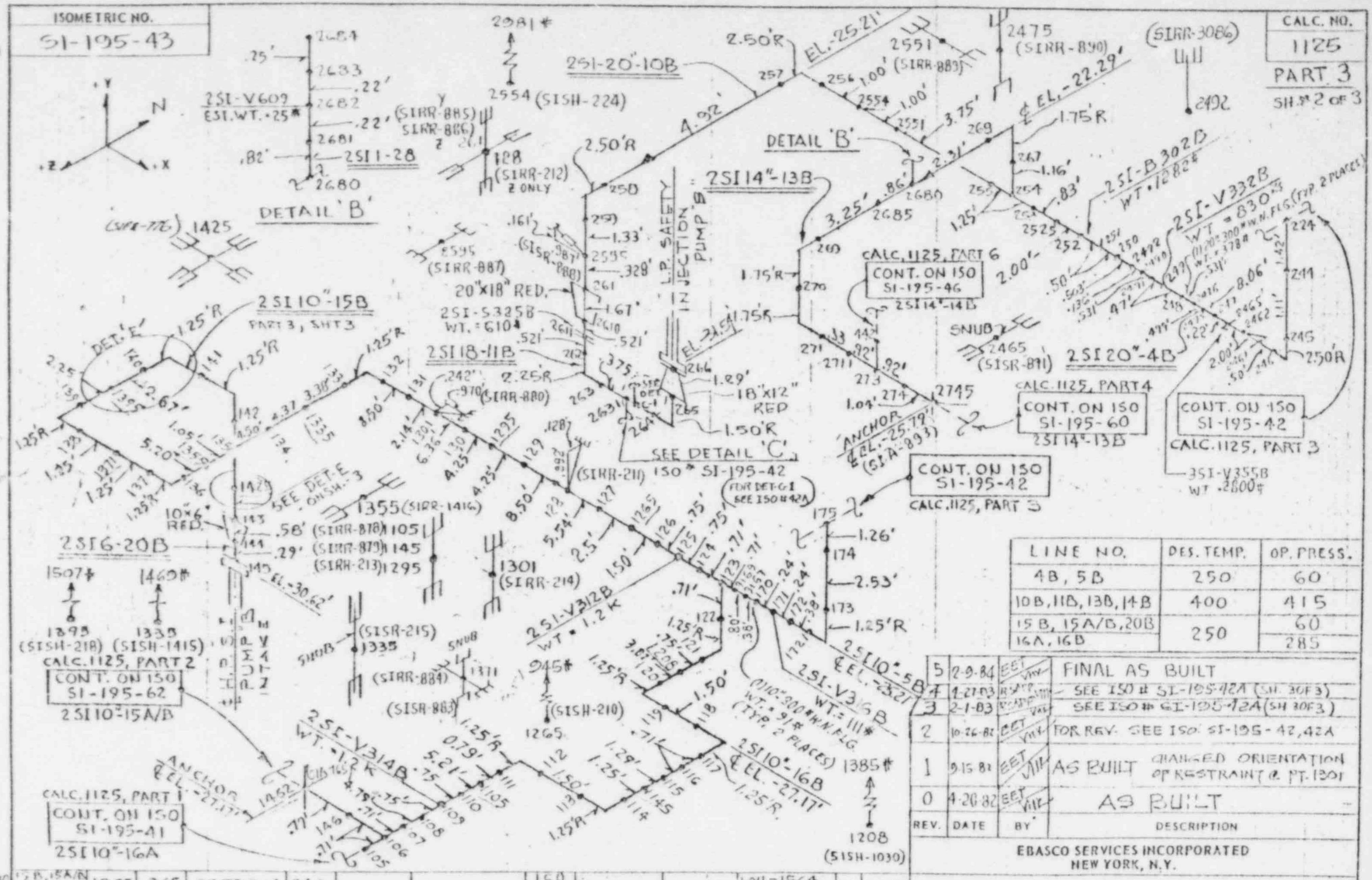
WATERFORD UNIT NO. 3
SAFETY INJECTION PIPING
AUX. BUILDING

DR. D.J.K. DATE: 5/7/73
CH. J. LIONG DATE: 5/7/73

ISOMETRIC NO. SI-195-42

ISOMETRIC NO.
SI-195-43

CALC. NO.
1125
PART 3
SH.# 2 OF 3



LINE NO.	DES. TEMP.	OP. PRESS.
4B, 5B	250	60
10B, 11B, 13B, 14B	400	415
15B, 15A/B, 20B	250	60
16A, 16B		285

REV.	DATE	BY		DESCRIPTION
5	2-9-84	EET	VHV	FINAL AS BUILT
4	1-27-83			SEE ISO # SI-195-42A (SH. 3 OF 3)
3	2-1-83			SEE ISO # SI-195-42A (SH 3 OF 3)
2	10-26-82	EET	VHV	FOR REV. SEE ISO. SI-195-42, 42A
1	9-15-82	EET	VHV	AS BUILT CHANGED ORIENTATION OF RESTRAINT @ PT. 1301
0	4-20-82	EET	VHV	AS BUILT

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH-100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
15B, 15A/B, 16A, 16B	10.75	.365	SS-TP-304	240			160 / 300			LOU-1564 G-195 SH. 1	14	3-4-83
2SI20-4B	20.00	.375					160	DYNAMIC ☑				
2SI10-5B	10.75	.365					300 / 440	STATIC ☐	VERT.			
2SI6-20B	6.625	.280										
2SI20-10B	20.00	.375		350								
2SI14-13B/14B	14.00											
2SI18-11B	18.00	.375					440	THERMAL ☑	HORIZ.			

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT NO. 3
SAFETY INJECTION PIPING
AUX. BUILDING

DR. D.J.K. DATE: 5/7/73
CH. J. McRIO DATE: 5/23/73

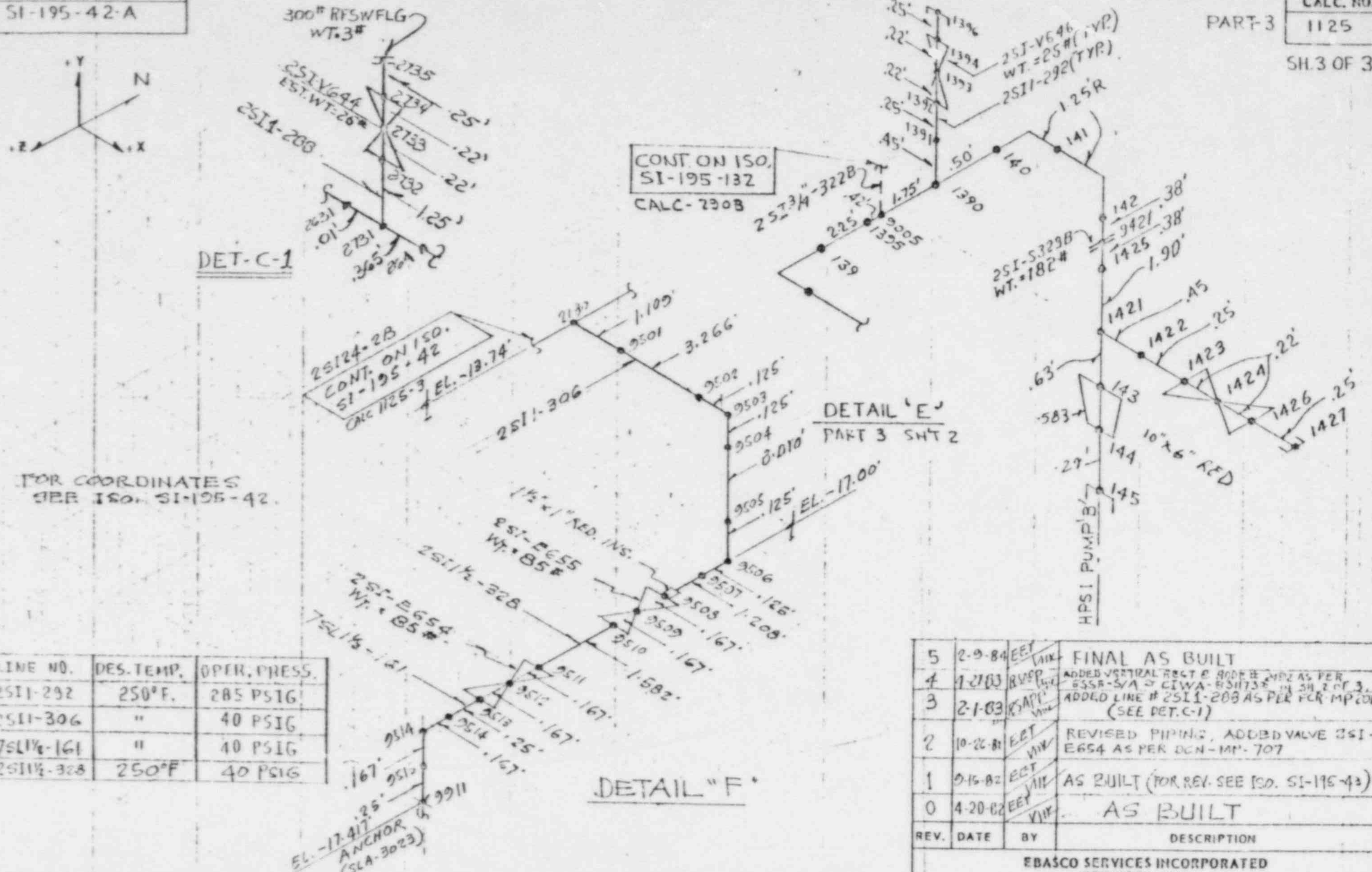
ISOMETRIC NO.
SI-195-43

ISOMETRIC NO.
SI-195-42-A

PART-3

CALC. NO.
1125

SH.3 OF 3



LINE NO.	DES. TEMP.	OPER. PRESS.
2SI1-292	250°F.	285 PSIG
2SI1-306	"	40 PSIG
7SL1½-161	"	40 PSIG
2SI1½-328	250°F	40 PSIG

REV.	DATE	BY		DESCRIPTION
5	2-9-84	EET	[illegible]	FINAL AS BUILT
4	1-27-83	RVPP	[illegible]	ADDED VERTICAL RSCT & MODE # 2 ... AS PER SSSR-S/A 3 CIWA-RS ... IN SH. 2 OF 3.
3	2-1-83	KSAPC	[illegible]	ADDED LINE # 2SI1-208 AS PER FCR-MP-... (SEE DET. C-1)
2	10-26-81	EET	[illegible]	REVISED PIPING, ADDED VALVE 2SI-E654 AS PER DCN-MP-707
1	9-15-82	EET	[illegible]	AS BUILT (FOR REV. SEE ISO. SI-195-43)
0	4-20-82	EET	[illegible]	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD # 3
REACTOR AUX. BLDG.
SAFETY INJECTION PIPING

DR. D.J.K DATE 5/7/73
CH. J. McB... DATE [illegible]

ISOMETRIC NO.
SI-195-42A

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
2-SI1-292	1.315	.179	SS-TP-304	240			300			LOU-1564 G-159 SH.2	13	1-16-83
2SI1-306	1.315	.179	↓	↓			160	DYNAMIC ☑				
7SL1½-161	1.900	.200	↓	↓			160	STATIC ☐	VERT.			
2SI1½-328	1.900	.200	SS-TP-304	240			160	THERMAL ☑	HORIZ.			

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          1         2         3         4         5         6         7         8                  CARD
***12345678901234567890123456789012345678901234567890123456789012345678901234567890***                NO.

  1125       IC    2   12EE TRINIDAD       WATERFORD #3 REACTOR AUX BLDG SAFETY INJ                    1
  ECTION PIPING ISO SI-195-42,424,43  PART-2  REV 5  (FINAL AS BUILT)                                  2
  1125       FA    50       1                                                                          3
  1125      ILC   1                                       NORMAL OPERATING                             4
  1125   10 4ILC   13                                     OPERATING WEIGHT                             5
  1125    1 31RC   11150      1.                          OBE X RESPONSE                               6
  1125    1 32RC   11250            1.                    OBE Y RESPONSE                               7
  1125    1 33RC   1135                    1.             OBE Z RESPONSE                               8
  1125   10101CC    14   1     31     33                  MAXIMUM OF X & Z                             9
  1125   10102CC   111        101     32                  MAXIMUM HORIZONTAL PLUS Y                    10
  1125   10105CC   1 4          1     41                  THERMAL+WT                                   11
  1125   10111CC   1 4         41    105                  MEMR OF (TH+WT) OR WT                        12
  1125   10112CC   111   8    111    102                  OBE +HISTH+WT) OR WT                         13
  1125   10113CC   121   8    111  2.102                  DBE +HISTH+WT) OR WT                         14
  1125   10652CS    12   3     41    102                  DESIGN EQ 9                                  15
  1125       FS    1     STAR     10                                                                   16
  WATERFSTAB    22               REACTOR AUX BLDG EL -4 OBE .5PC DAMPING E-W DIR.                      17
  WATERFSTAB 1X100  125   195  260   200  155   242  275   330  425   348  275                        18
  WATERFSTAB 2X450  330   460  550   490  775   500  762   530 1350   580 2400                        19
  WATERFSTAB 3X620 1750   610 3200   650 1150   790  675   759  525   809  375                        20
  WATERFSTAB 4X870  275   900  330   930  425   995  200                                              21
  1125       FS    2     STAP     10                                                                   22
  WATERFSTAB           23 *    REACTOR AUX BLDG EL -4 OBE .5PC DAMPING VER DIR.                        23
  WATERFSTAB 1Y100  125   200  155   270  235   300  235   262  400   400  560                        24
  WATERFSTAB 2Y410  925   458 1400   485 2255   500 1105   529 1400   561  650                        25
  WATERFSTAB 3Y581  600   603  447   618  604   640  355   736  275   780  235                        26
  WATERFSTAB 4Y800  200   850  140   900  260   950  215   999  125                                  27
  1125       FS    3     STAB     15                                                                   28
  WATERFSTAB             * 22REACTOR AUX BLDG EL -4 OBE .5PC DAMPING N-S DIR.                          29
  WATERFSTAB 1Z100  125   195  200   200  155   242  275   303  425   348  275                        30
  WATERFSTAB 2Z400  330   460  550   490  775   500  700   530 1550   580 2400                        31
  WATERFSTAB 3Z610 1750   610 3100   650 1150   709  675   759  525   860  375                        32
  WATERFSTAB 4Z870  275   905  330   930  425   999  200                                              33
  1125        74          166    250                                                                   34
  1125        72          376304                                                                       35
  1125       171          240                      60                                                  36
  1125      1071          250                      160                                                 37
  1125        74           1075     365  457       1      1                                            38
  1125 10     66 145       11    -3062  1165                                                           39
  1125        661462       590   -2717  13075                                                          40
  1125 12     66 209        4    -1374   5035                                                          41
  1125 13     66 218       275     -4     995                                                          42
  1125 14     66 243       22     -325   12011                                                         43
  1125 15     66 266       36    -3154  120                                                            44
  1125        662745       4596  -2579  120                                                            45
  1125        669911        65   -17417  86262                                                         46
  1125        611462                                                                                   47
  1125           146 2        79                                                                       48
  1125           106    1     71                                                                       49
  1125        62 106                                                                                   50

***12345678901234567890123456789012345678901234567890123456789012345678901234567890***
          1         2         3         4         5         6         7         8
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GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT	CASE	FORCES IN LBS				MOMENTS IN FT-LBS				DISPLACEMENTS IN INCHES			
	NO.	NO.	FX	FY	FZ	RES.	MX	MY	MZ	RES.	DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	1462	1	-414	-114	-3137	3166	-335	16418	-1047	16455	0.000	0.000	0.000	0.000
		41	-40	1339	497	1429	2267	-912	1952	3128	0.000	-0.000	-0.000	0.000
		31	289	5	135	320	15	1855	51	1896	0.000	0.000	0.000	0.000
		32	18	158	29	162	258	98	189	326	0.000	0.000	0.000	0.000
		33	203	5	453	496	15	1435	25	1435	0.000	0.000	0.000	0.000
		102	387	163	482	594	265	1986	248	2017	0.000	0.000	0.000	0.000
		105	-454	1225	-2640	2945	1932	15506	905	15652	0.000	-0.000	0.000	0.000
		111	-454	1339	-2640	2994	2267	15506	1952	15792	0.000	-0.000	0.000	0.000
		112	761	1562	3121	3546	2532	17492	2192	17810	0.000	0.000	0.000	0.000
		113	1068	1665	3603	4110	2796	19478	2432	19827	0.000	0.000	0.000	0.000
NOZZLE	145	1	-77	117	241	279	98	-267	30	286	0.000	-0.000	-0.000	0.000
		41	646	651	518	1049	234	496	-291	590	-0.000	-0.000	-0.000	0.000
		31	29	4	21	36	8	46	10	48	0.000	0.000	0.000	0.000
		32	21	129	4	130	2	2	10	10	0.000	0.000	0.000	0.000
		33	15	9	31	36	10	98	6	98	0.000	0.000	0.000	0.000
		102	50	138	35	151	12	99	20	102	0.000	0.000	0.000	0.000
		105	569	768	751	1215	333	189	-261	463	-0.000	-0.000	-0.000	0.000
		111	646	768	751	1253	333	456	-291	635	-0.000	-0.000	-0.000	0.000
		112	695	905	786	1386	345	555	311	724	0.000	0.000	0.000	0.000
		113	745	1043	821	1522	356	654	332	816	0.000	0.000	0.000	0.000
ANCHOR	9911	1	-26	45	-54	75	34	63	29	77	0.000	-0.000	0.000	0.000
		41	10	180	-5	181	238	-41	-3	242	0.000	0.000	0.000	0.000
		31	17	8	1	19	18	22	5	29	0.000	0.000	0.000	0.000
		32	9	18	1	20	22	19	1	29	0.000	0.000	0.000	0.000
		33	2	2	25	25	8	3	0	9	0.000	0.000	0.000	0.000
		102	26	26	26	45	40	42	6	58	0.000	0.000	0.000	0.000
		105	-16	225	-58	233	272	21	25	274	0.000	-0.000	0.000	0.000
		111	-16	225	-58	233	272	-41	25	276	0.000	-0.000	0.000	0.000
		112	42	251	85	268	312	83	31	324	0.000	0.000	0.000	0.000
		113	68	277	111	305	352	125	38	375	0.000	0.000	0.000	0.000
ANCHOR	209	1	840	14	1622	1827	-92	5482	6261	8323	-0.000	-0.000	-0.000	0.000
		41	-13	3341	-10	3341	-10148	-82	1071	10204	0.000	-0.000	0.000	0.000
		31	431	1	382	573	6	1357	258	1380	0.000	0.000	0.000	0.000
		32	2	418	46	420	1270	10	193	1284	0.000	0.000	0.000	0.000
		33	15	2	2290	2290	11	85	131	157	0.000	0.000	0.000	0.000
		102	433	420	2336	2412	1281	1317	443	1925	0.000	0.000	0.000	0.000
		105	827	3356	1612	3813	-10240	5400	7332	13703	-0.000	-0.000	-0.000	0.000
		111	827	3356	1612	3813	-10240	5400	7332	13703	-0.000	-0.000	-0.000	0.000
		112	1260	3775	3948	5606	11520	6767	7775	15458	0.000	0.000	0.000	0.000
		113	1693	4195	6284	7743	12801	8134	8218	17250	0.000	0.000	0.000	0.000
ANCHOR	218	1	-1653	-844	-2022	2745	22848	4963	-23708	35292	0.000	0.000	0.000	0.000
		41	-686	3837	-154	3887	-708	2224	-4845	5377	0.000	-0.000	0.000	0.000

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	218	31	575	61	168	602	1951	388	3119	3699	0.000	0.000	0.000	0.000
		32	215	397	17	452	229	54	1817	1833	0.000	0.000	0.000	0.000
		33	158	92	719	741	5445	497	1336	5629	0.000	0.000	0.000	0.000
		102	790	989	735	1185	5674	551	4936	7541	0.000	0.000	0.000	0.000
		105	-2268	2993	-2175	4335	22148	7187	-28545	36837	0.000	-0.000	0.000	0.000
		111	-2268	3837	-2175	4956	22148	7187	-28545	36837	0.000	-0.000	0.000	0.000
		112	3858	4325	2911	6840	27822	7738	33481	44214	0.000	0.000	0.000	0.000
		113	3848	4814	3646	7156	33496	8298	38417	51639	0.000	0.000	0.000	0.000
NOZZLE	243	1	-696	1491	-385	1638	-2186	-2877	-751	3690	0.000	-0.000	0.000	0.000
		41	-192	318	14	372	-247	-348	78	432	0.000	-0.000	-0.000	0.000
		31	15	29	14	35	84	115	38	147	0.000	0.000	0.000	0.000
		32	59	207	29	212	253	72	27	264	0.000	0.000	0.000	0.000
		33	24	6	90	93	76	59	69	119	0.000	0.000	0.000	0.000
		102	62	256	115	271	338	186	96	397	0.000	0.000	0.000	0.000
		105	-888	1759	-291	1992	-2433	-3224	-681	4096	0.000	-0.000	0.000	0.000
		111	-888	1759	-291	1992	-2433	-3224	-681	4096	0.000	-0.000	0.000	0.000
		112	951	1995	411	2248	2771	3410	777	4462	0.000	0.000	0.000	0.000
		113	1013	2230	538	2506	3108	3596	874	4833	0.000	0.000	0.000	0.000
NOZZLE	266	1	-133	187	-1308	1328	2754	-3897	-422	4791	0.000	-0.070	0.000	0.070
		41	-22	995	-62	997	267	-363	-474	654	0.000	-0.000	0.000	0.000
		31	116	19	56	130	102	142	179	250	0.000	0.000	0.000	0.000
		32	26	104	67	126	105	156	93	210	0.000	0.000	0.000	0.000
		33	26	2	111	114	183	496	56	531	0.000	0.000	0.000	0.000
		102	142	123	178	259	288	651	272	762	0.000	0.000	0.000	0.000
		105	-156	1182	-1370	1816	3021	-4260	-896	5299	0.000	-0.070	0.000	0.070
		111	-156	1182	-1370	1816	3021	-4260	-896	5299	0.000	-0.070	0.000	0.070
		112	297	1305	1548	2046	3309	4911	1168	6036	0.000	0.070	0.000	0.070
		113	439	1428	1726	2283	3597	5563	1440	6779	0.000	0.070	0.000	0.070
ANCHOR	2745	1	-2266	-26	-2667	3580	-6665	-2486	2197	7445	0.000	0.000	0.000	0.000
		41	-126	1691	-28	1695	111	80	-5789	5791	0.000	-0.000	0.000	0.000
		31	201	18	125	227	270	469	214	582	0.000	0.000	0.000	0.000
		32	9	193	21	194	87	71	731	739	0.000	0.000	0.000	0.000
		33	59	37	488	493	833	1746	90	1901	0.000	0.000	0.000	0.000
		102	218	229	589	596	920	1778	945	2213	0.000	0.000	0.000	0.000
		105	-2392	1665	-2695	3969	-6554	-2486	-3593	7852	0.000	-0.000	0.000	0.000
		111	-2392	1691	-2695	3980	-6554	-2486	-5789	9070	0.000	-0.000	0.000	0.000
		112	2681	1920	3204	4552	7474	4183	6734	10895	0.000	0.000	0.000	0.000
		113	2811	2149	3713	5129	8394	5961	7678	12843	0.000	0.000	0.000	0.000

EBASCO SERVICES INCORPORATED

BY RMH DATE [illegible]

CHKD. BY J. CHOU DATE 6/21/84

SHEET 1 OF 1

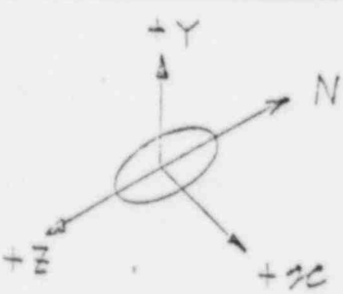
OFS NO. 2365.140 DEPT. NO. 653

CLIENT LP&L

PROJECT WATERFORD SES #3

SUBJECT NOZZLE LOAD P#3

EQUIPMENT	R[illegible] STORAGE P[illegible]		
NOZZLE	P#3	[illegible]	[illegible]
LINE NUMBER	[illegible]-24-[illegible]		
CALC. NO.	1125		
PORTION No	[illegible] 8H 1 of 2		
ISOMETRIC No	21-195-40		
POINT No	43		
OUTPUT DATE	6/11/84		

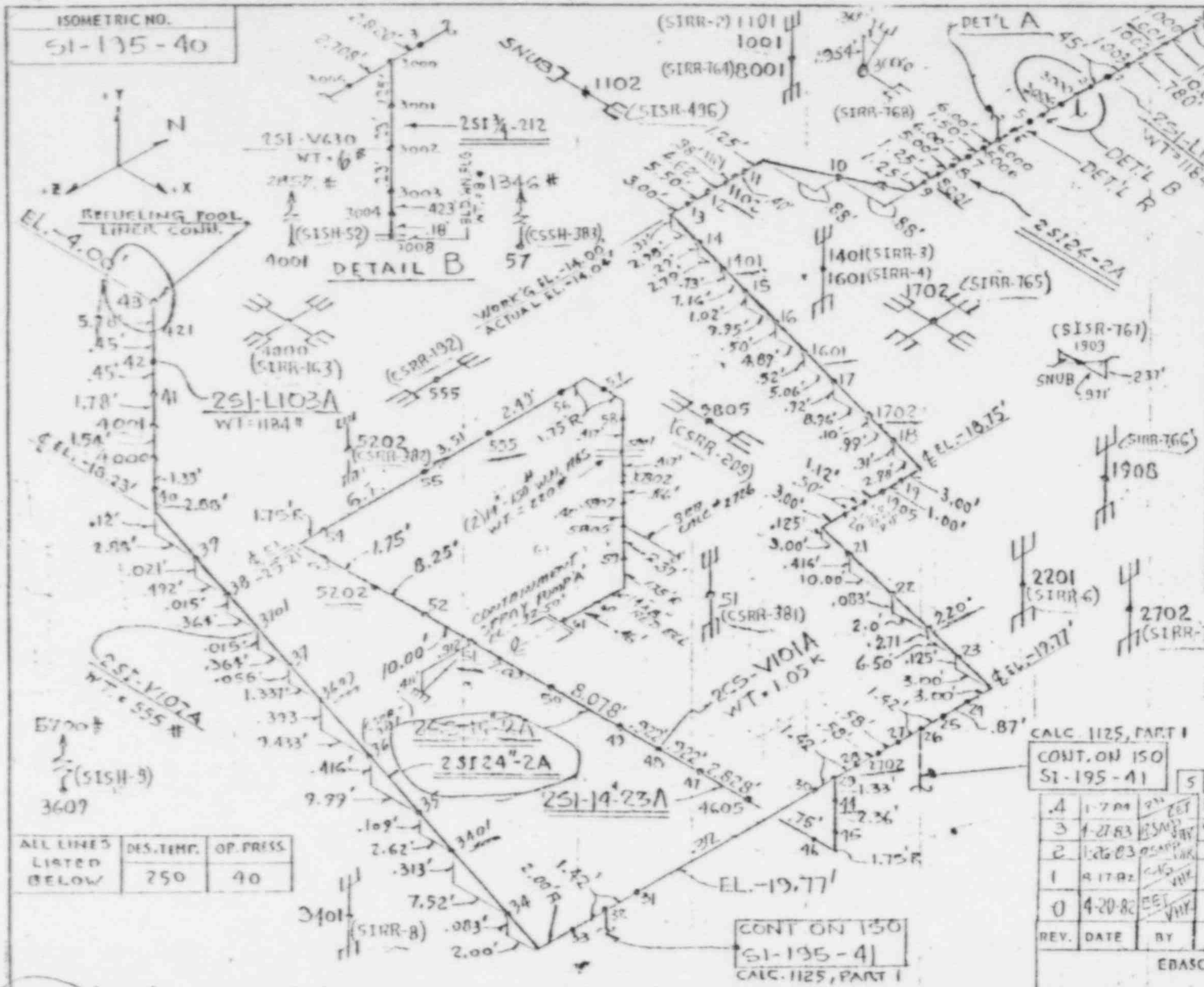


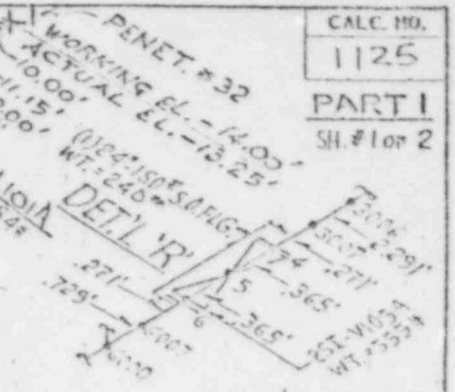
TYPE ANALYSIS	FORCES (lbs)			MOMENTS (Ft-lbs)			RESULTANT OF BENDING MOMENTS
	Fx	FY	Fz	Mx	MY	Mz	
THERMAL	808	-1159	87	-202	3033	2052	
WEIGHT	31	1457	3	-7	23	[illegible]	
SEISMIC OBE MAX X COMPONENT	352	162	14	41	158	905	
SEISMIC OBE MAX Y COMPONENT	59	1077	29	67	167	156	
SEISMIC OBE MAX Z COMPONENT	71	196	120	336	1953	153	[illegible]
THER. + WT + SEISMIC OBE MAX X + Y	1250	2696	133	317	3378	3213	3229
THER + WT + SEISMIC OBE + MAX Z + Y	969	2720	539	1162	5176	2153	2719
THER + WT + SEISMIC DBE MAX X + Y	1661	3935	130	429	3700	4277	4296
THER + WT + SEISMIC DBE MAX Z + Y	1099	3983	933	2115	7296	2767	3153

SEE P#-4 CALC.

ISOMETRIC NO.	CALC. NO.
SI-135-40	1125

PART I
SH. #1 OF 2





(SISR-761)
1903
SNUB

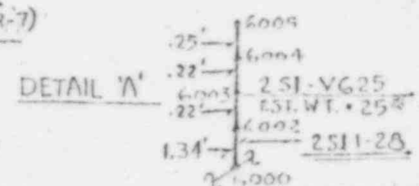
(SIRR-766)
1908

2201
(SIRR-6)

2702
(SIRR-7)

FROM ℄ COORDINATES

PART I:	COORDINATES (FT.)		
POINT #	X	Y	Z
43	27.50	-4.00	156.50
61	22.00	-32.50	135.89
88	11.00	-30.62	139.50
1462	59.00	-27.17	130.75
2885	44.00	-25.79	136.00
305	36.00	-30.50'	136.00
1	-4.00	-14.00	50.35



CALC. 1125, PART I
CONT. ON 150
SI-195-41

CONT ON 150
SI-195-41
CALC. 1125, PART I

ALL LINES LISTED BELOW	DES. TEMP.	OP. PRESS.
	250	40

REV.	DATE	BY		DESCRIPTION
5				
4	1-7-84			FINAL AS BUILT
3	4-27-83			ADDED VERTICAL... (SSE-SYA) CLWA-831173 SH 2 OF 2
2	1-26-83			SEE SHT. 2 OF 2
1	8-17-82			...SEE SHT. 2 OF 2.
0	4-20-82			AS BUILT

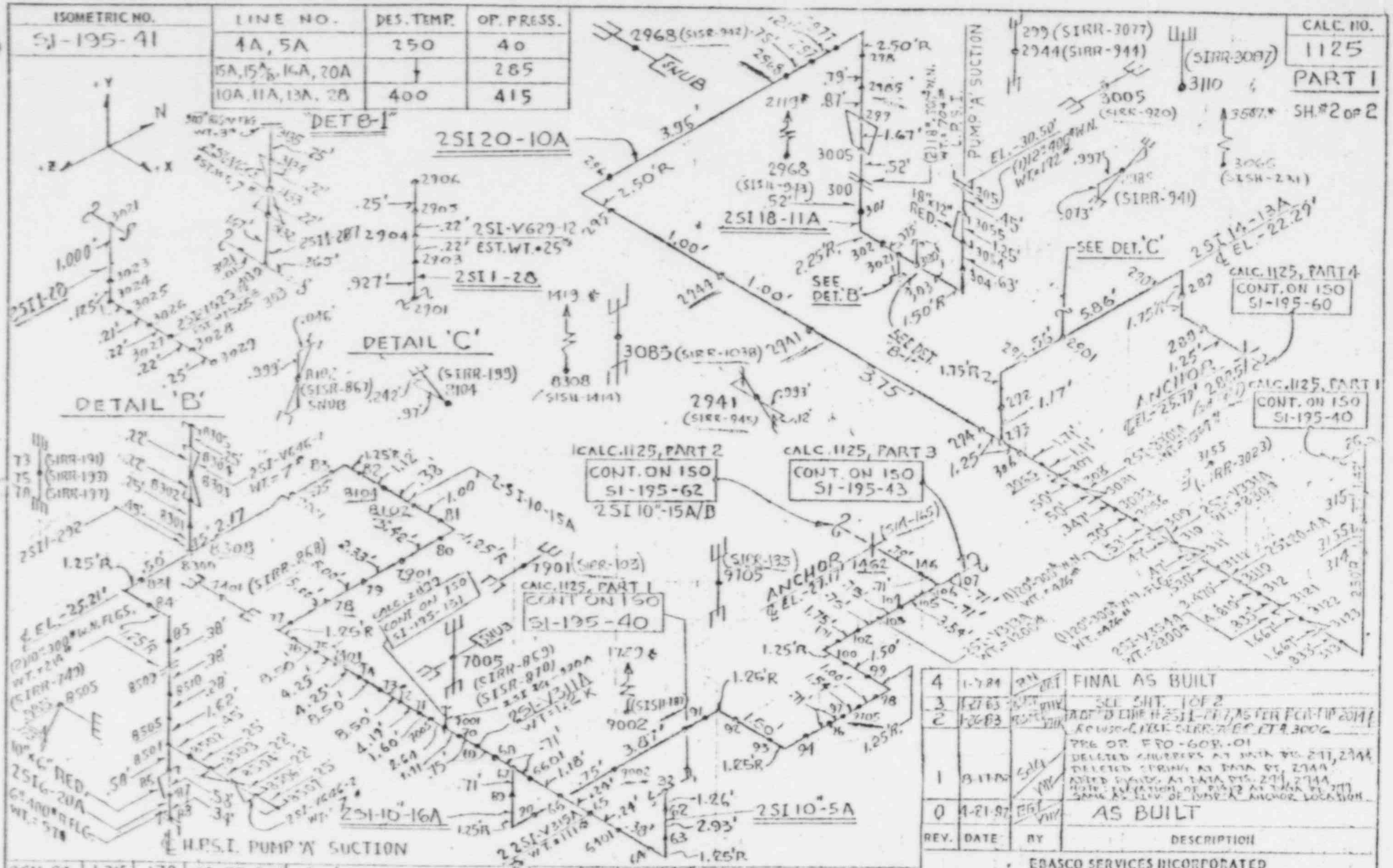
EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION IN/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
2SI24-2A	24.00	.375	SS-TP-304	240	—	—	160			LOU-1564 6-195 SH 1,2,3	4	3-4-?
2SI1-28	1.315	.179						DYNAMIC ☒				
2CS14-2A 2SI14-23A	14.00	.375			—		50	STATIC ☐	VERT.			
2SI¾-212	1.050	.154			—	—	160	THERMAL ☑	HORIZ.			

WATERFORD UNIT NO. 3
SAFETY INJECTION PIPING
AUX. BUILDING

DR. D.J.K. DATE 5/7/73
CH. L.[illegible] DATE 5/22/73

ISOMETRIC NO.
SI-135-40



ISOMETRIC NO.
SI-195-41

LINE NO.	DES. TEMP.	OP. PRESS.
4A, 5A	250	40
15A, 15A/B, 16A, 20A	↓	285
10A, 11A, 13A, 28	400	415

CALC. NO.
1125
PART 1
SH. #2 OF 2

REV.	DATE	BY	DESCRIPTION
4	1-7-84		FINAL AS BUILT
3	1-27-83		SEE SHT. 1 OF 2
2	1-26-83		ADD'D LINE # 2SI1-28, AS PER FCR-MP-2041; REVISED LOC. SIRR-... ECT-3006
1	8-11-82		PER DR. FRO-608-01 DELETED SNUBBERS AT DATA PTS. 2941, 2944 DELETED SPRING AT DATA PT. 2944 ADDED RIGIDS AT DATA PTS. 2941, 2944 NOTE: ELEVATION OF PIPE AT DATA PT. 2?? SAME AS ELEV. OF PUMP 'A' ANCHOR LOCATION
0	4-21-82		AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT NO. 3
SAFETY INJECTION PIPING
AUX. BUILDING

DR. D.J.K. DATE 5/7/?3
CH. J. Morris DATE 5/?/?3

ISOMETRIC NO.
SI-195-41

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	B-FACTOR	REF. DWGS.	REV	DATE
2SI1-28	1.315	.179	SS-TP-304	↑			↑	5	2-3-81	SEE ISO-SI-175-40		
2SI20-10A	20.00	.375		350			440			LOU 1564 @ 1195 SH. 1,2,3	1A	3-?-83
2SI18-11A	18.00							DYNAMIC [X]				
2SI14-13A	14.00	↓		240			300	STATIC [ ]	VERT.			
2SI6-20A	6.625	.280					160					
2SI20-4A	20.00	.375										
2SI10-5A	10.750	.365		↓			↓	THERMAL [X]	HORIZ.			
2SI10-15A, 16A, 15A/B	"	"	↓				300					

```
             1         2         3         4         5         6         7         8                CARD
***12345678901234567890123456789012345678901234567890123456789012345678901234567890***           NO.

1125       TC    2   13   R NAVRATIL    WATERFORD #3 REACTOR AUX BLDG SAFETY INJ                    1
ECTION PIPING ISO SI-195-40,41  PART-1  REV 5  (FINAL AS BUILT)                                     2
1125       FA    50       1                                                                         3
1125       ILC   1                                     NORMAL OPERATING                             4
1125  10 41LC    13                                    OPERATING WEIGHT                             5
1125  10 42LC    19                                    DESIGN    WEIGHT                             6
1125   1 31RC    1115       1.                         OBE X RESPONSE                               7
1125   1 32RC    1125             1.                   OBE Y RESPONSE                               8
1125   1 33RC    11350                  1.             OBE Z RESPONSE                               9
1125  10101CC    14   1    31    33                    MAXIMUM OF X & Z                             10
1125  10102CC    111      101    32                    MAXIMUM HORIZONTAL PLUS Y                    11
1125  10105CC    1 0        1    41                    THERMAL+WT                                   12
1125  10111CC    1 4       41   105                    EGER OF (TH+WT) OR WT                        13
1125  10112CC    111      111   102                    OBE +HI(TH+WT)ORWT                           14
1125  10113CC    121      111 2.102                    DBE +HI(TH+WT)ORWT                           15
1125  10652CS     12   3   41   102                    DESIGN EQ 9                                  16
1125       FS     1     STAB      10                                                                17
WATERFSIAB    22            REACTOR AUX BLDG EL -4 OBE .5PC DAMPING E-W DIR.                        18
WATERFSIAB 1X100  125   190  200   200  155   242  275   300  425   340  275                        19
WATERFSIAB 2X400  330   460  550   499  775   500  700   530 1050   580 2400                        20
WATERFSIAB 3X600 1750   618 3000   650 1150   700  675   750  525   800  375                        21
WATERFSIAB 4X870  275   ,500  330   930  ...   995  200                                              22
1125       FS     2     STAB      10                                                                23
WATERFSIAB           23     REACTOR AUX  LDG EL -4 OBE .5PC DAMPING VER DIR.                        24
WATERFSIAB 1Y100  125   200  155   270   35   300  235   362  400   400  500                        25
WATERFSIAB 2Y418  925   458 1400   485   50   500 1100   520 1400   561  650                        26
WATERFSIAB 3Y581  600   600  440   618   80   640  350   709  275   780  235                        27
WATERFSIAB 4Y800  200   858  140   900   ...  950  215   999  125                                   28
1125       FS     3     STAB      10                                                                29
WATERFSIAB                22REACTOR AUX BLDG EL -4 OBE .5PC DAMPING N-S DIR.                        30
WATERFSIAB 1Z100  125   190  200   200  155   242  275   300  425   340  275                        31
WATERFSIAB 2Z400  330   460  550   490  775   500  700   530 1050   580 2400                        32
WATERFSIAB 3Z600 1750   618 3000   650 1150   700  675   750  525   800  375                        33
WATERFSIAB 4Z870  275   900  330   930  425   999  200                                              34
1125       74           160   250                                                                   35
1125  3    72           376364                                                                      36
1125      171           240                   40                                                    37
1125     1071           250                  160                                                    38
1125       70           24      375 1081       1      1                                             39
1125  6    66   1       -4    -14    5035                                                           40
1125  7    66  43       275    -4    1565                                                           41
1125  8    66  61       22   -325   13589                                                           42
1125  9    66  88       11  -3062   1395                                                            43
1125       661462       590  -2717  13075                                                           44
1125       662885       4400 -2579  13600                                                           45
1125 16    66 305       36   -3050  136                                                             46
1125 20    61   1 2                                                                                 47
1125         1000                 10                                                                48
1125         1001                 1115                                                              49
1125         1002   1             10                                                                50

***12345678901234567890123456789012345678901234567890123456789012345678901234567890***
             1         2         3         4         5         6         7         8
```

GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS Fx	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	1	1	-1259	3	745	1463	-21	-15792	-199	15793	0.000	-0.000	-0.000	0.000
		41	-9	3294	21	3294	-9832	-139	-46	9833	0.000	-0.000	-0.000	0.000
		42	-9	3294	21	3294	-9832	-139	-46	9833	0.000	-0.000	-0.000	0.000
		31	766	2	45	767	12	4739	34	4739	0.000	0.000	0.000	0.000
		32	13	422	16	422	1267	126	49	1274	0.000	0.000	0.000	0.000
		33	43	0	3593	3593	2	480	74	486	0.000	0.000	0.000	0.000
		102	779	423	3608	3716	1279	4815	123	5032	0.000	0.000	0.000	0.000
		105	-1266	3297	766	3615	-9852	-15931	-246	18733	0.000	-0.000	-0.000	0.000
		111	-1268	3297	766	3615	-9852	-15931	-246	18733	0.000	-0.000	-0.000	0.000
		112	2047	3720	4374	6096	11131	20796	369	23591	0.000	0.000	0.000	0.000
		113	2826	4144	7983	9428	12410	25661	492	28509	0.000	0.000	0.000	0.000
ANCHOR	43	1	888	-1159	87	1415	-202	3033	2052	3667	-0.000	0.000	-0.000	0.000
		41	31	1457	3	1458	-7	23	97	100	-0.000	-0.000	-0.000	0.000
		42	31	1458	3	1458	-7	23	96	99	-0.000	-0.000	-0.000	0.000
		31	352	162	16	388	41	155	908	922	0.000	0.000	0.000	0.000
		32	59	1077	29	1079	67	167	156	238	0.000	0.000	0.000	0.000
		33	71	186	420	465	886	1953	153	2150	0.000	0.000	0.000	0.000
		102	411	1263	449	1402	953	2121	1064	2557	0.000	0.000	0.000	0.000
		105	839	299	90	896	-209	3056	2148	3741	-0.000	-0.000	-0.000	0.000
		111	839	1457	90	1684	-209	3056	2148	3741	-0.000	-0.000	-0.000	0.000
		112	1250	2720	540	3042	1162	5176	3212	6202	0.000	0.000	0.000	0.000
		113	1661	3983	589	4427	2115	7297	4277	8718	0.000	0.000	0.000	0.000
NOZZLE	61	1	88	284	465	552	1281	1801	-1312	2570	-0.000	-0.000	-0.000	0.000
		41	86	37	96	134	21	6	-129	131	-0.000	-0.000	-0.000	0.000
		42	90	25	97	135	4	0	-132	132	-0.000	-0.000	-0.000	0.000
		31	38	2	13	40	59	158	33	172	0.000	0.000	0.000	0.000
		32	53	172	10	180	242	83	23	257	0.000	0.000	0.000	0.000
		33	19	8	54	58	49	30	47	74	0.000	0.000	0.000	0.000
		102	91	181	64	212	301	241	69	392	0.000	0.000	0.000	0.000
		105	174	322	560	669	1302	1807	-1441	2653	-0.000	-0.000	-0.000	0.000
		111	174	322	560	669	1302	1867	-1441	2653	-0.000	-0.000	-0.000	0.000
		112	265	502	624	844	1603	2048	1510	3008	0.000	0.000	0.000	0.000
		113	357	683	688	1033	1904	2290	1580	3371	0.000	0.000	0.000	0.000
NOZZLE	88	1	45	227	-539	587	-290	1125	-10	1162	-0.000	-0.000	0.000	0.000
		41	659	582	-715	1133	-441	-573	-406	829	-0.000	-0.000	0.000	0.000
		42	648	597	-725	1141	-448	-577	-399	832	-0.000	-0.000	0.000	0.000
		31	31	3	15	35	9	26	17	32	0.000	0.000	0.000	0.000
		32	37	133	9	138	6	6	24	25	0.000	0.000	0.000	0.000
		33	20	11	49	54	24	115	13	118	0.000	0.000	0.000	0.000
		102	69	144	58	169	30	121	40	131	0.000	0.000	0.000	0.000
		105	734	809	-1254	1651	-732	552	-415	1006	-0.000	-0.000	0.000	0.000
		111	704	839	-1254	1651	-732	-573	-415	1018	-0.000	-0.000	0.000	0.000
		112	773	953	1313	1797	762	653	456	1126	0.000	0.000	0.000	0.000

EBASCO SERVICES INCORPORATED

BY RMH DATE 6/17/84 SHEET 1 OF 2

CHKD. BY L. CHOU DATE 6/21/84 OFS NO. 22.A.140 DEPT. NO. 653

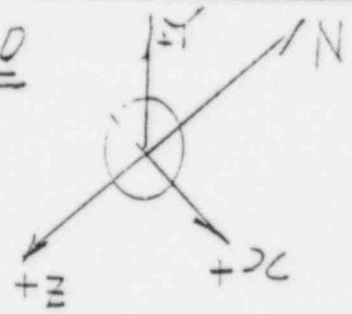
CLIENT LP&L

PROJECT WATERFORD SES # 3

SUBJECT NOZZLE LOADS PIN 10

EQUIPMENT	REFUELING WATER STORAGE POOL		
NOZZLE	SAFE END = 230	A N/A 10"	B N/A 10"
LINE NUMBER	551G-48 A/3		
CALC. NO.	1056-		
PORTION NO	PART 10 SHT 2 OF 4		
ISOMETRIC NO	SI-195-129		
POINT NO	678		
OUTPUT DATE	6/11/84		

PIN 10



TYPE ANALYSIS	FORCES (lbs)			MOMENTS (Ft-lbs)			RESULTANT OF RSS OF MOMENTS
	Fx	Fy	Fz	Mx	My	Mz	
THERMAL	-41	-48	197	-463	111	20	
WEIGHT	13	193	-2	396	-98	-87	
SEISMIC OBE MAX X COMPONENT	-89	4	6	24	162	-14	
SEISMIC OBE MAX Y COMPONENT	-4	-52	1	-107	27	24	$\sqrt{M_x^2+M_y^2}$
SEISMIC OBE MAX Z COMPONENT	33	-74	-274	-267	-69	-63	
THER. + WT + SEISMIC OBE MAX X +Y	121	249	202	527	257	179	601
THER + WT + SEISMIC OBE + MAX Z +Y	65	319	470	770	194	174	794
THER + WT + SEISMIC OBE MAX X +Y	214	305	209	658	476	163	812
THER + WT + SEISMIC OBE MAX Z +Y	102	445	745	1144	290	261	1185

EBASCO SERVICES INCORPORATED

BY RMY DATE 6/17/84 SHEET 2 OF 2

CHKD. BY J. CHOU DATE 6/21/84 OFS NO 3965.140 DEPT. NO. 653

CLIENT LP&L

PROJECT WATERFORD SES #3

SUBJECT RAW SST PIPE NOZZLE @ REFUELING WATER POOL G-905 & G-907

RW 10 6φ SCH. 40S x 2'-7 WALL (F10) LINE 3SI6-43 A/B

CHECK STRESS DUE TO BENDING FR. RESULTANT MOMENTS FR PIPE STRESS ANALYSIS

OBE (WORST CASE) RESULTANT MOMENT 794 FT·lb = 9.53 IN·K

ANALYSIS

FOR BENDING (USE ROARK METHOD)

CASE 5 EDGE SUPPORTED couple applied @ hub

$r = 5.375"$, $r_1 = 3.3125"$ (TRUNNION LOADING)

$t = 0.4375"$

$K = \frac{0.49r^2}{(0.7r + r_1)^2} = 0.283$ $m = \frac{1}{0.26} = 3.846$

$$\text{MAX } S_r = \frac{3 \times M}{4\pi r_1 t^2}\left[1 + \left(\frac{m+1}{m}\right)\log \frac{2(r - r_1)}{k(r)}\right]$$

$$= \frac{3 \times 9.53^{\text{IN·K}}}{4\pi \times 3.3125(0.4375)^2}\left[1 + \frac{3.846+1}{3.846}\log \frac{2(5.375 - 3.3125)}{0.283(5.375)}\right]$$

= 7.1 KSI < 26.25 KSI OK

DBE RESULTANT MOMENTS 1180 FT·lb = 14.16 IN·K

$$\text{MAX } S_r = \frac{3. \times 14.16}{4\pi \times 3.3125(0.4375)^2}\left[2.26(.99762)\right]$$

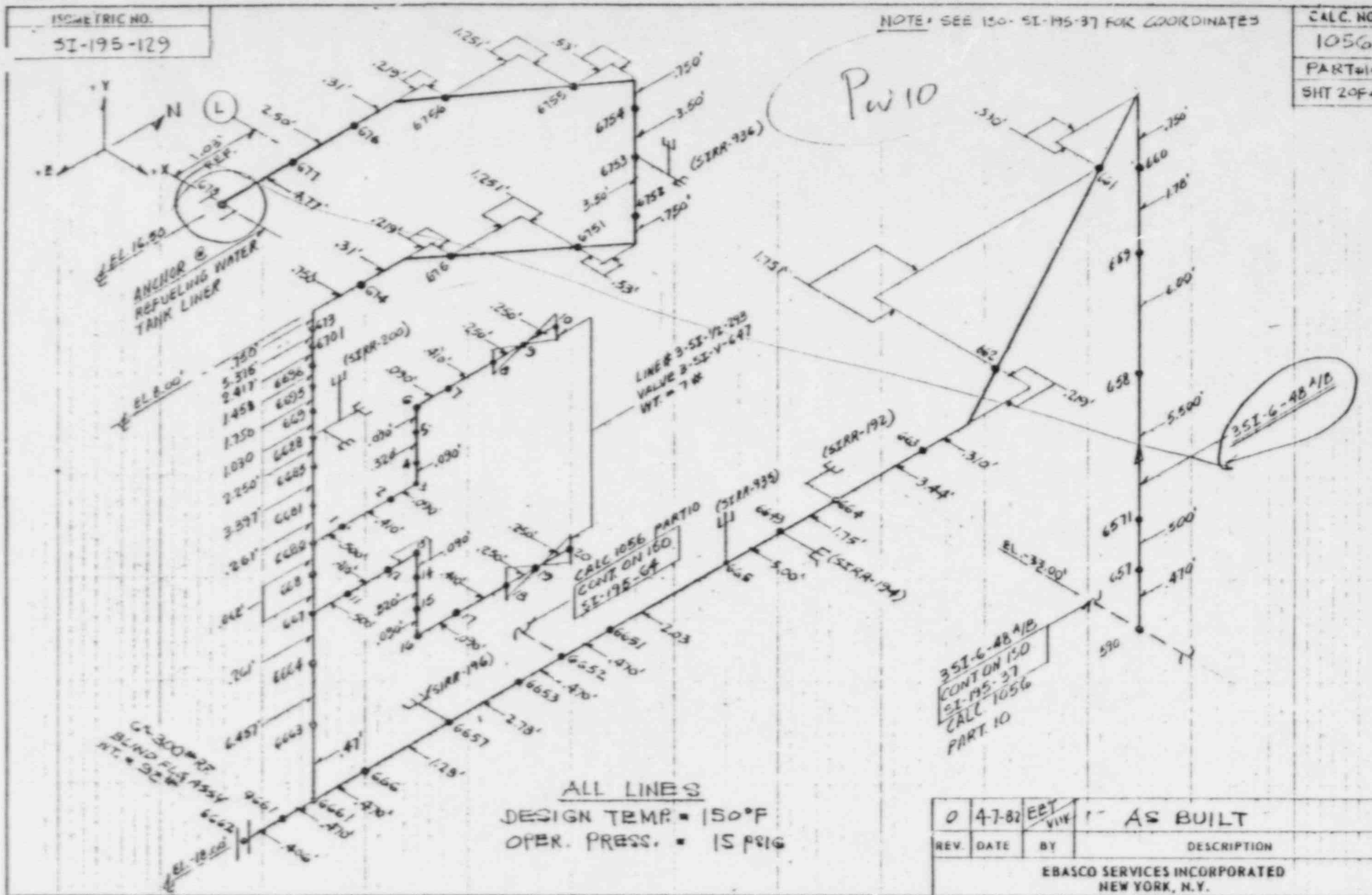
= 12.04 KSI < 32.5 KSI OK

581/8-81

ISOMETRIC NO.
SI-195-129

NOTE: SEE 150-SI-195-37 FOR COORDINATES

CALC. NO.
1056
PART 10
SHT 2 OF 4



ALL LINES
DESIGN TEMP. = 150°F
OPER. PRESS. = 15 PSIG

REV.	DATE	BY	DESCRIPTION
0	4-7-82	EET / VHK	1 — AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

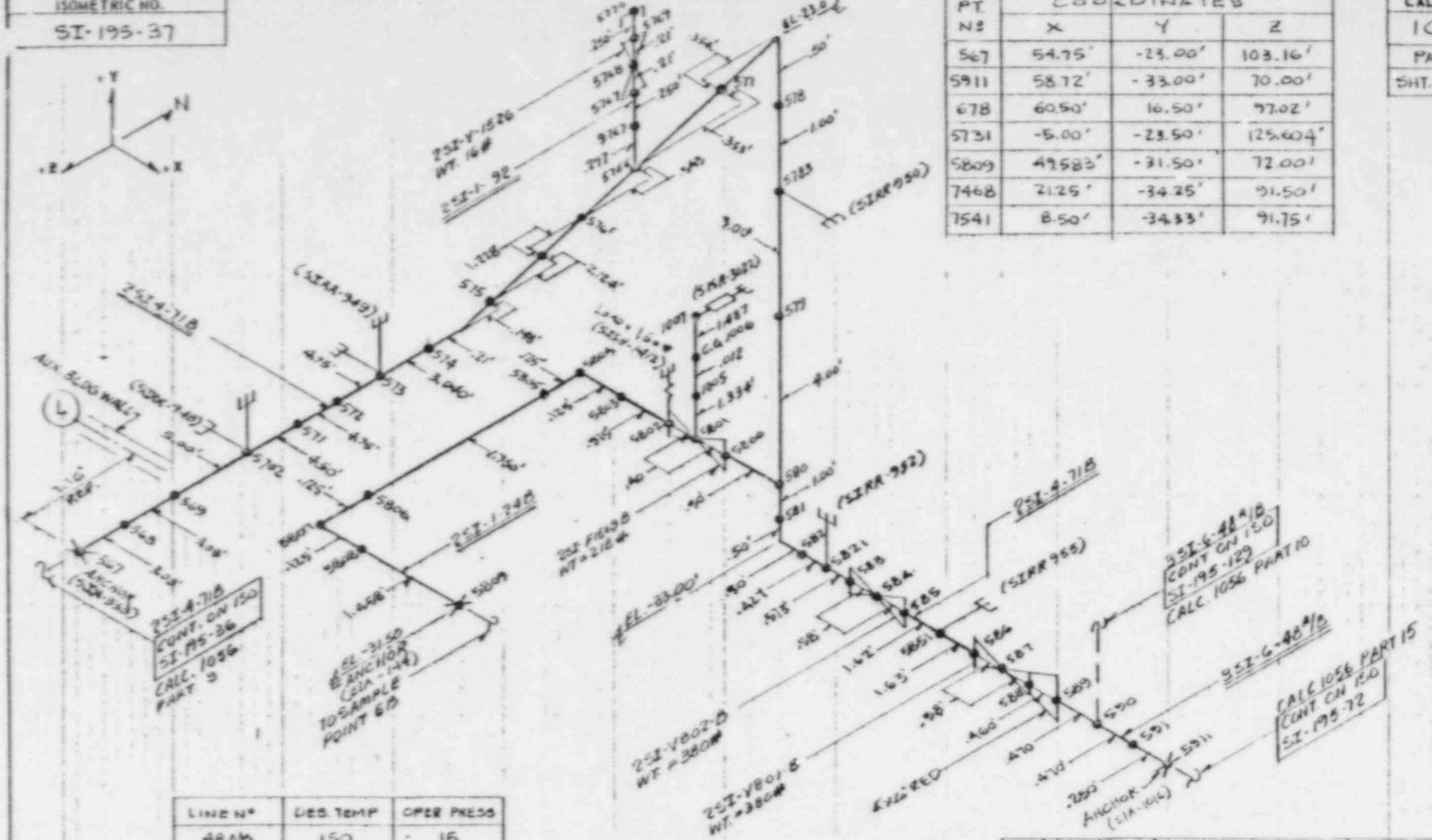
WATERFORD UNIT 3
AUX. BLDG
SAFETY INJECTION PIPING

DR. J.McDONALD DATE: 4-5-82
CH. E.TRINIDAD DATE: 4-7-82

ISOMETRIC NO.
SI-195-129

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS		G-FACTOR	REF. DWGS.	REV	DATE
								DYNAMIC	☐	X HORIZ. .38			
3-SI-½-293	.840	.109	↑	135			550	STATIC	☒	Y VERT. .27	LOU-1564 B-125 SH. 1,3	11	2-25-84
3-SI-6-48 A/B	6.625	.280	6.6-2 SS-TP-304	135			550	THERMAL	☒	Z HORIZ. .38	LOU 1564 G-200 SHEET 1	8	5/15/81

ISOMETRIC NO.
SI-195-37



PT. Nº	COORDINATES X	Y	Z
567	54.75'	-23.00'	103.16'
5911	58.72'	-33.00'	70.00'
678	60.50'	16.50'	97.02'
5731	-5.00'	-23.50'	125.604'
5809	49.583'	-31.50'	72.00'
7468	21.25'	-34.25'	91.50'
7541	8.50'	-34.33'	91.75'

CALC. NO.
1056
PART 10
SHT. 1 OF 4

LINE Nº	DES. TEMP	OPER PRESS
48A/B	150	- 15
718, 248, 92	400	1800

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
2SI-1-248 2SI-1-92	1.315	.179	SS-5 SS-TP-304	350			1950	DYNAMIC ☐	X HORIZ .38			
2SI-6-48A/B	6.625	.280	SS-2 SS-TP-304	135			550	STATIC ☒	Y VERT. .20	LOU-1564 G-155 SH.1,8	11	2-25-81
2SI-4-718	4.500	.337	SS-5 SS-TP-304	350			1950	THERMAL ☒	Z HORIZ. .38	LOU 1564G-200 SHEET 1	8	5/15/81

REV.	DATE	BY	DESCRIPTION
0	4-7-82	EET VIM	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT 3
AUX. BLDG
SAFETY INJECTION PIPING

DR. J. McDONALD DATE: 4-5-82
CH. E. TRINIDAD DATE: 4-7-82

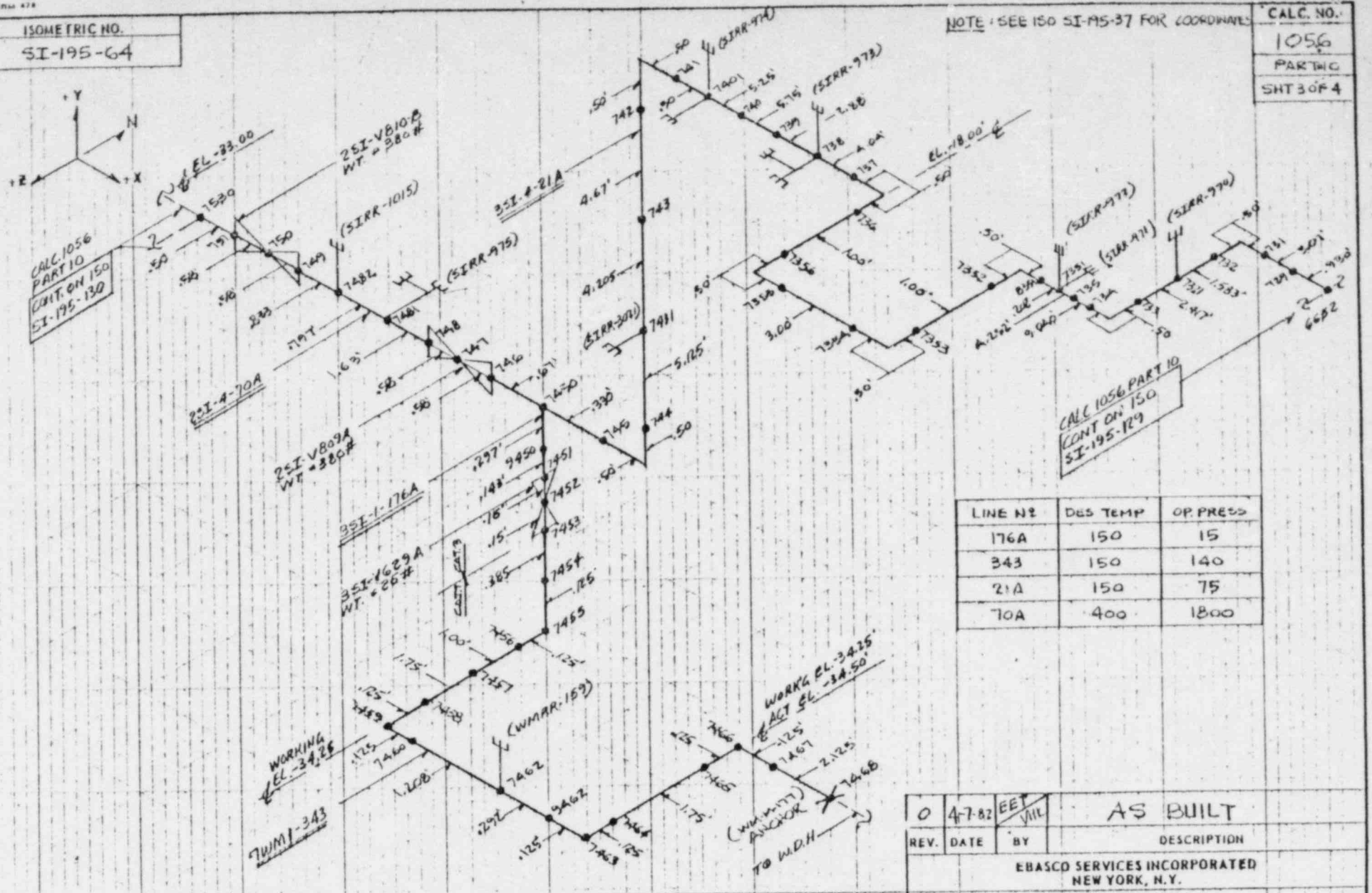
ISOMETRIC NO.
SI-195-37

FORM 474

ISOMETRIC NO.
SI-195-64

NOTE: SEE ISO SI-195-37 FOR COORDINATES

CALC. NO.
1056
PART IC
SHT 3 OF 4



LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3SI-1-176A 7UM1-343	1.315	.179	316 SS-TP-304	135			550	DYNAMIC ☐	HORIZ .38			
2SI-4-70A	4.500	.337	316 SS-TP-304	350			1950	STATIC ☒	VERT. .21	LOU-1564 G-135 SH 1,3	11	2-26-82
2SI-4-21A	4.500	.237	316 SS-TP-304	135			550	THERMAL ☒	HORIZ. .38	LOU-1564-G-200 SHEET 1	8	5/15/81

REV.	DATE	BY	DESCRIPTION
0	4-7-82	EET VIII	AS BUILT

LINE NO	DES TEMP	OP. PRESS
176A	150	15
343	150	140
21A	150	75
70A	400	1800

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT 3
AUX. BLDG.
SAFETY INJECTION PIPING

DR. J McDONALD DATE: 4-6-82
CH. E. TRINIDAD DATE: 4-7-82

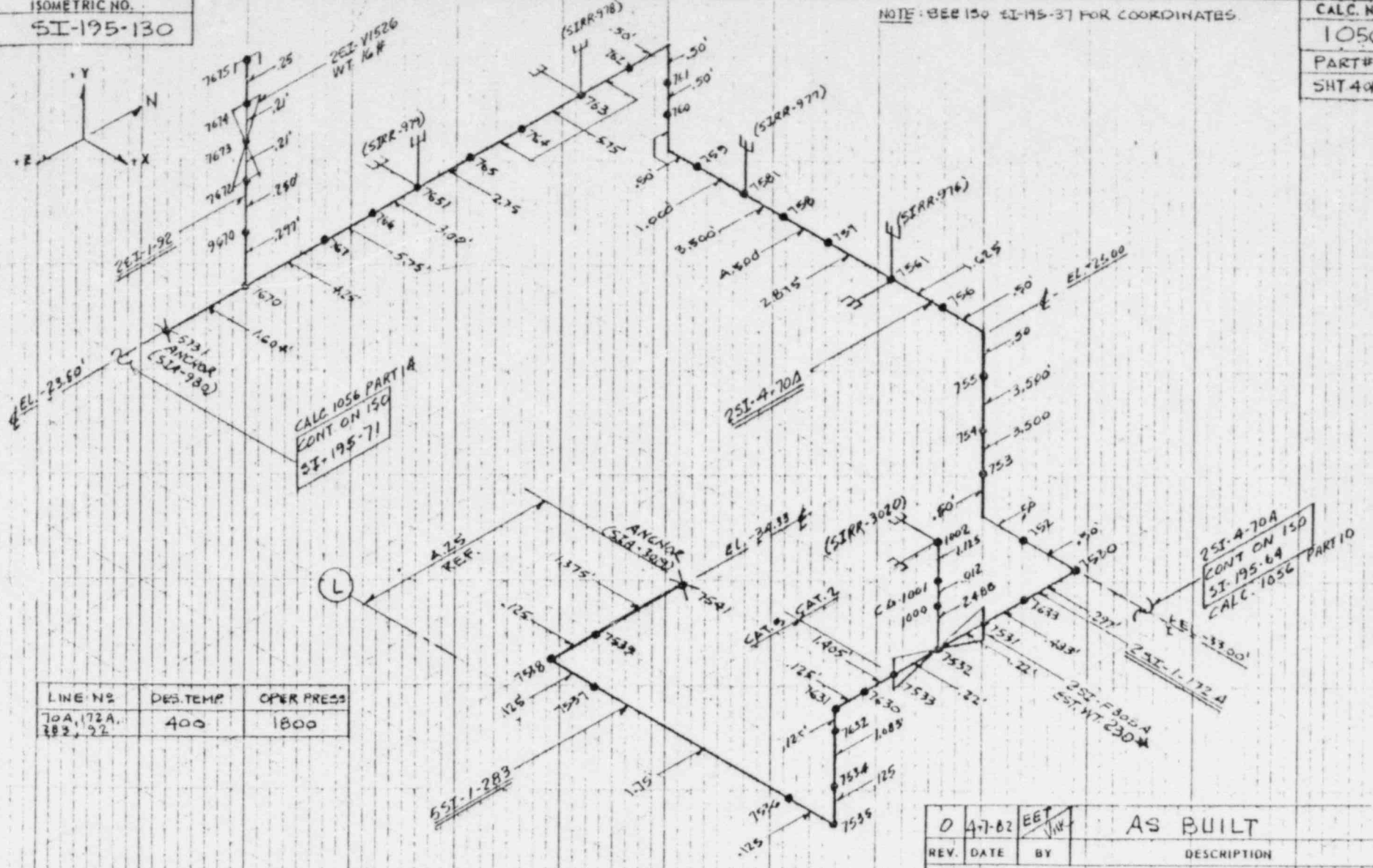
ISOMETRIC NO.
SI-195-64

FORM 478

ISOMETRIC NO.
SI-195-130

CALC. NO.
1056
PART #10
SHT 4 OF 4

NOTE: SEE 150 SI-195-37 FOR COORDINATES



LINE NO.	DES. TEMP.	OPER. PRESS.
70A, 172A, 283, 92	400	1800

REV.	DATE	BY	DESCRIPTION
0	4-7-82	EET VTN	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT 3
AUX. BLDG
SAFETY INJECTION PIPING

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
2SI-1-92	1.315	.250	SS B SS-TP-304	350			1950	DYNAMIC ☐	X HORIZ. .38			
2SI-1-172A 5SI-1-283	1.315	.179	SS-S SS-TP-304	350			1950	STATIC ☒	Y VERT. .27	LDR-1564 G-135 SH 1, 2	11	2-26-82
2SI-4-70A	4.500	.337	SS-S SS-TP-304	350			1950	THERMAL ☒	Z HORIZ. .38	LDR-1564-G-200 SHEET 1	8	5/15/81

DR. J.McDONALD DATE: 4-6-82
CH. E.TRINIDAD DATE: 4-7-82

ISOMETRIC NO.
SI-195-130

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          1         2         3         4         5         6         7         8                              CARD
***1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890***        NO.

   1056        TC     2   13ED TRINIDAD       WATERFORD #3 REACTOR AUX BLDG SAFETY INJ                               1
   ECTION PIPING ISO SI-195-37,64,129,130    REV 1  PART-10  (AS BUILT)                                            2
   1056         FA     1                                                                                            3
   1056        1LC    1                                       NORMAL OPERATING                                      4
   1056   10041LC    13                                       OPERATING WEIGHT                                      5
   1056   10051LC    110       38                             X-STATIC                                              6
   1056   10052LC    1100               27                    Y-STATIC                                              7
   1056   10053LC    1100                         38          Z-STATIC                                              8
   1056   10101CC    114         51      53                   MAXIMUM OF X AND Z                                    9
   1056   10102CC    111        101      52                   MAXIMUM OF HORIZONTAL PLUS Y                         10
   1056   10110CC      0    8     1      41                   THERMAL + WEIGHT                                     11
   1056   10111CC    1 4    8    41     110                   HIGHER OF (TH+WT) OR WT                              12
   1056   10112CC    111    8   111     102                   OBE + HI (TH+WT) OR WT                               13
   1056   10113CC    121    6   111   2.102                   DBE + HI (TH+WT) OR WT                               14
   1056   10202CS      2    8    41                1          EQUATION 11                                          15
   1056   10652CS     12    3    41     102                   DESIGN EQ 9                                          16
   1056         74          1950    400                                                                            17
   1056         72          376304                                                                                 18
   1056        171          350                    1800                                                            19
   1056       1671          400                    1950                                                            20
   1056         70            4500      337  1848      1         1                                                 21
   1056        66 567        5475  -23    10316                                                                    22
   1056        665911        5872  -33      70                                                                     23
   1056        66 678        605    165    9702                                                                    24
   1056        665731        -5    -235   125694                                                                   25
   1056        665809        49583 -3150   72                                                                      26
   1056        667468        2125  -3425   9150                                                                    27
   1056        667541         85   -34333  91750                                                                   28
   1056        61 567                                                                                              29
   1056           568                     -308                                                                     30
   1056           569                     -308                                                                     31
   1056          5702                     -500                                                                     32
   1056           571                     -45                                                                      33
   1056           572                     -475                                                                     34
   1056         0 573                     -475                                                                     35
   1056         0 574 2                   -304                                                                     36
   1056         1 575 2                    -21     -148          -148                                              37
   1056         0 576        -2124        -2124                                                                    38
   1056          5765        -1228        -1228                                                                    39
   1056          5766         -543         -543                                                                    40
   1056        605766                                                                                              41
   1056        605766                                                                                              42
   1056        76            1315     25    356    1       1                                                       43
   1056          9767 3  6             297                                                                         44
   1056          5767 3                 25                                                                         45
   1056         45768     1             21                                                                         46
   1056         95768          16                                                                                  47
   1056         45769 3   1             21                                                                         48
   1056          5770 4                 25                                                                         49
   1056        605770                                                                                              50

***1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890***
          1         2         3         4         5         6         7         8
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GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	567	1	-41	-18	-426	429	-67	151	348	385	0.000	0.000	0.000	0.000
		41	0	122	-4	122	185	1	1	185	0.000	-0.000	0.000	0.000
		51	-46	0	0	46	-1	69	-1	69	0.000	0.000	-0.000	0.000
		52	0	-33	1	33	-50	-1	-1	50	-0.000	0.000	-0.000	0.000
		53	-3	-1	-370	370	-2	11	2	11	0.000	0.000	0.000	0.000
		101	-46	-1	-370	373	-2	69	2	69	0.000	0.000	0.000	0.000
		102	46	34	371	375	53	69	3	87	0.000	0.000	0.000	0.000
		111	-41	122	-430	449	165	152	345	423	0.000	-0.000	0.000	0.000
		112	67	155	801	821	237	221	352	479	0.000	0.000	0.000	0.000
		113	133	189	1172	1195	298	291	355	543	0.000	0.000	0.000	0.000
ANCHOR	5809	1	128	-58	176	225	-19	77	72	107	-0.000	0.000	-0.000	0.000
		41	1	7	1	7	-3	1	-4	5	-0.000	-0.000	-0.000	0.000
		51	-5	-11	0	12	-9	1	23	24	0.000	0.000	-0.000	0.000
		52	0	-6	0	6	-3	0	9	9	0.000	0.000	-0.000	0.000
		53	-6	-1	-45	46	0	-45	1	45	0.000	0.000	0.000	0.000
		101	-6	-11	-45	47	-9	-45	23	51	0.000	0.000	0.000	0.000
		102	9	17	45	49	12	46	32	57	0.000	0.000	0.000	0.000
		111	129	-51	177	225	-22	78	67	105	-0.000	0.000	-0.000	0.000
		112	137	68	222	270	34	123	99	162	0.000	0.000	0.000	0.000
		113	196	85	267	316	46	169	131	219	0.000	0.000	0.000	0.000
ANCHOR	5911	1	-100	37	-271	291	1751	-513	-291	1829	0.000	-0.000	0.000	0.000
		41	23	1138	7	1138	73	20	-1277	1279	-0.000	-0.000	-0.000	0.000
		51	-588	32	-5	589	111	91	486	487	0.000	-0.000	0.000	0.000
		52	0	-300	-3	300	-20	-8	324	324	-0.000	0.000	0.000	0.000
		53	6	-3	-44	44	-275	61	-62	288	-0.000	-0.000	0.000	0.000
		101	-588	32	-44	591	-275	51	466	548	0.000	-0.000	0.000	0.000
		102	589	332	47	677	296	99	785	849	0.000	0.000	0.000	0.000
		111	-77	1174	-264	1206	1804	-493	-1567	2440	0.000	-0.000	0.000	0.000
		112	666	1506	311	1676	2095	592	2357	3211	0.000	0.000	0.000	0.000
		113	1255	1837	357	2253	2354	691	3146	4014	0.000	0.000	0.000	0.000
NOZZLE	678	1	-41	-48	197	207	-463	111	20	476	0.000	0.000	-0.000	0.000
		41	13	193	-2	194	396	-98	-87	417	-0.000	-0.000	0.000	0.000
		51	-89	4	6	89	24	162	-14	164	0.000	-0.000	-0.000	0.000
		52	-4	-52	1	52	-107	27	24	113	0.000	0.000	-0.000	0.000
		53	33	-74	-274	286	-267	-69	-65	283	-0.000	0.000	0.000	0.000
		101	-89	-74	-274	298	-267	162	-65	318	0.000	0.000	0.000	0.000
		102	92	126	275	316	374	189	87	427	0.000	0.000	0.000	0.000
		111	-28	193	195	276	396	-98	-87	417	0.000	-0.000	-0.000	0.000
		112	120	319	470	581	770	287	174	890	0.000	0.000	0.000	0.000
		113	212	445	745	894	1143	476	261	1265	0.000	0.000	0.000	0.000
ANCHOR	7468	1	-4	3	-3	10	3	-13	-11	17	0.000	-0.000	0.000	0.000
		41	0	6	0	6	2	-1	-8	9	-0.000	-0.000	0.000	0.000

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	7468	51	-8	0	3	8	0	2	0	2	0.000	-0.000	-0.000	0.000
		52	0	-2	0	2	-1	0	2	2	0.000	0.000	-0.000	0.000
		53	1	0	-4	4	0	-4	0	4	-0.000	-0.000	0.000	0.000
		101	-8	0	-4	9	0	-4	0	4	0.000	-0.000	0.000	0.000
		102	8	2	4	9	1	4	2	5	0.000	0.000	0.000	0.000
		111	-9	10	-3	13	6	-13	-19	24	0.000	-0.000	0.000	0.000
		112	16	12	8	21	7	18	21	29	0.000	0.000	0.000	0.000
		113	24	13	12	30	8	22	24	34	0.000	0.000	0.000	0.000
ANCHOR	7541	1	83	70	-12	109	-82	97	42	134	-0.000	-0.000	0.000	0.000
		41	7	25	6	27	-31	0	14	34	-0.000	-0.000	-0.000	0.000
		51	-10	-1	-3	10	0	-9	2	9	0.000	0.000	0.000	0.000
		52	-2	-7	-2	7	8	0	-4	9	0.000	0.000	0.000	0.000
		53	-5	-1	-11	12	-1	3	1	3	0.000	0.000	0.000	0.000
		101	-10	-1	-11	14	-1	-9	2	9	0.000	0.000	0.000	0.000
		102	12	8	12	19	9	9	6	14	0.000	0.000	0.000	0.000
		111	91	95	6.	131	-114	96	56	159	-0.000	-0.000	0.000	0.000
		112	102	103	18	146	123	106	62	174	0.000	0.000	0.000	0.000
		113	114	111	30	162	132	115	67	188	0.000	0.000	0.000	0.000
ANCHOR	5731	1	56	-14	-315	320	-68	-271	226	360	-0.000	0.000	0.000	0.000
		41	-1	189	6	189	398	6	-8	399	0.000	-0.000	-0.000	0.000
		51	-81	0	20	83	2	195	-10	196	0.000	-0.000	-0.000	0.000
		52	0	-51	-2	51	-108	-2	2	108	-0.000	0.000	0.000	0.000
		53	0	0	-384	384	-6	1	-1	6	0.000	0.000	0.000	0.000
		101	-81	0	-384	393	-6	195	-10	196	0.000	-0.000	0.000	0.000
		102	81	51	386	398	113	197	13	227	0.000	0.000	0.000	0.000
		111	55	189	-308	366	398	-265	218	526	-0.000	-0.000	0.000	0.000
		112	136	240	694	747	512	462	230	727	0.000	0.000	0.000	0.000
		113	217	292	1080	1140	625	659	243	940	0.000	0.000	0.000	0.000

EBASCO SERVICES INCORPORATED

BY RMH DATE 6/20/84 SHEET 1 OF 2

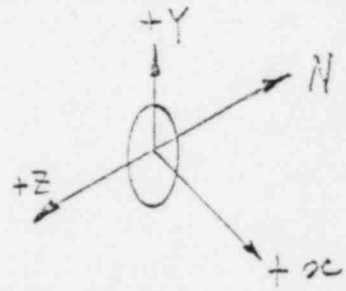
CHKD. BY J. CHOU DATE 6/20/84 OFS NO. 2965.110 DEPT. NO. 653

CLIENT L. P & L

PROJECT WATERFORD SES #3

SUBJECT NOZZLE LOADS PW12

EQUIPMENT	
NOZZLE	[illegible] 12
LINE NUMBER	[illegible]
CALC. No.	5555
PORTION No	-
ISOMETRIC No	FS-1[illegible]-2
POINT No	404
OUTPUT DATE	6/11/82



TYPE ANALYSIS	FORCES (lbs)			MOMENTS (FT-lbs)			RESULTANT OF BENDING MOMENTS
	Fx	Fy	Fz	Mx	My	Mz	
THERMAL	-710	-784	-56	-214	70	-1271	
WEIGHT	3	270	4	152	22	11	
SEISMIC OBE MAX x COMPONENT	-42	5	-2	8	13	-17	
SEISMIC OBE MAX Y COMPONENT	-1	-81	-1	-46	-7	-3	$\sqrt{M_x^2 + M_y^2}$
SEISMIC OBE MAX Z COMPONENT	4	-8	-103	197	56	26	
THER. + WT + SEISMIC OBE MAX x + Y	750	600	55	206	112	1280	234
THER + WT + SEISMIC OBE + MAX Z + Y	712	603	156	395	155	1289	424
THER + WT + SEISMIC DBE MAX x + Y	793	686	58	260	132	1300	292
THER + WT + SEISMIC DBE MAX Z + Y	717	692	260	639	218	1318	674

EBASCO SERVICES INCORPORATED

BY RWM DATE 6/7/84 SHEET 2 OF 2

CHKD. BY J. CHOU DATE 6/21/84 OFS NO. 2355.140 DEPT. NO. 652

CLIENT LP&L

PROJECT WATERFORD SES #3

SUBJECT NOZZLE PW12 ANALYSIS -

PW12

CHECK STRESS DUE BENDING FR RESULTANT MOMENTS.

FR PIPE STRESS ANALYSIS

OBE (WORST CASE) RESULTANT MOMENT $424^{ft\,lbs} = 5.09^{in\cdot K}$

ANALYSIS

FOR BENDING STRESS (USE ROARK METHOD FR. BLODGETT 17 pg. 7.28)
CASE 9 EDGE SUPPORTED COUPLE applied @ HUB. (TRUNION LOADING)

$r = 5.375''$
$r_1 = 3.3125''$
$k = 0.283$
$t = 0.4375$

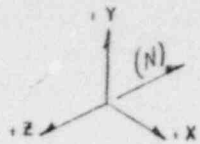
$$M_{ax}\ S_r = \frac{69\ M}{40 \pi r_1 t^2} \log \frac{2(r - r_1)}{k r}$$

OK BY INSPECTION SEE CALC. of NOZZLE PW10
DBE CHECK NOT NECESSARY SINCE ALLOWABLES FAR EXCEED DBE/OBE

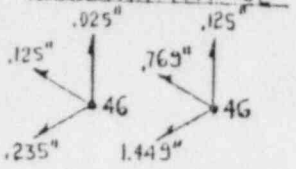
581/8-81

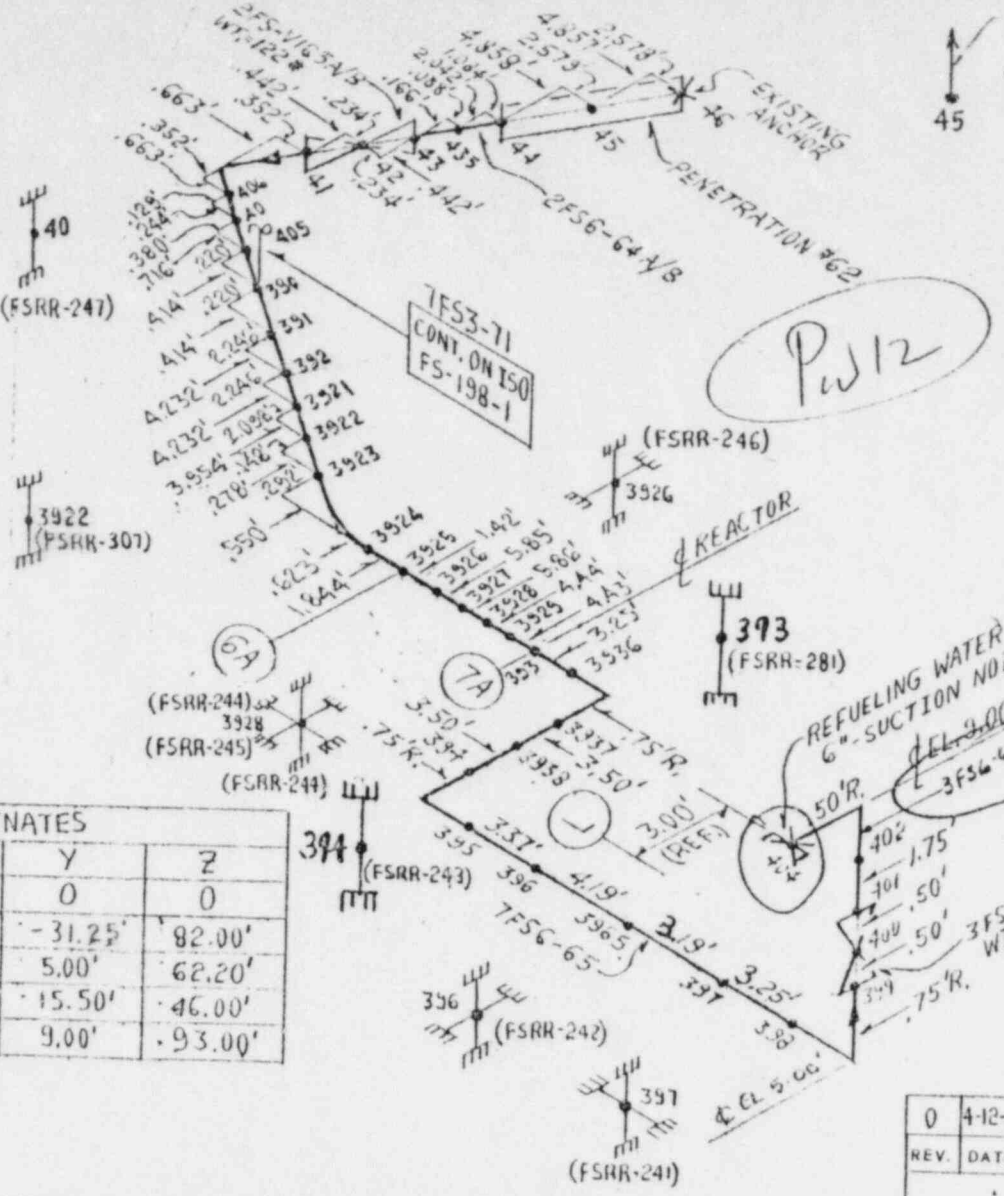
ISOMETRIC NO.
FS-198-2

CALC. NO.
5555
SH. # 2 OF 2.



PENETRATION # 62





LINE NO.	DESIGN TEMP.	OPER. PRESS.
7FS3-27	125°F	25 PSIG
7FS3-9	200°F	100 PSIG
2FS6-64 1/8		
7FS6-65		
3FS6-66 1/8		
7FS3-71		

COORDINATES			
℄ CONT.	X	Y	Z
	0	0	0
POINT # 1	-88.00'	-31.25'	82.00'
" #46	-33.014'	5.00'	62.20'
" #58	-97.500'	15.50'	46.00'
" #404	19.50'	9.00'	93.00'

LINE NO.	PIPE O.D.	SCH. NOM. WL THK	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
2FS6-64 1/8	6.625"	.280"	TP 304 S/S	150	.898	Ec = 28.3 x 10⁶ Eh = 27.9 x 10⁶	150	DYNAMIC ☐		G-197 SHT. 3 OF 4	7	3/10/80
7FS6-65	6.625"	.280"	TP 304 S/S	150	.898	Ec = 28.3 x 10⁶ Eh = 27.9 x 10⁶	150	STATIC ☒	VERT. .30			
3FS6-66 1/8	6.625"	.280"	"	"	"		"	THERMAL ☒	HORIZ. .38			

REV.	DATE	BY	DESCRIPTION
0	4-12-82	EFF	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

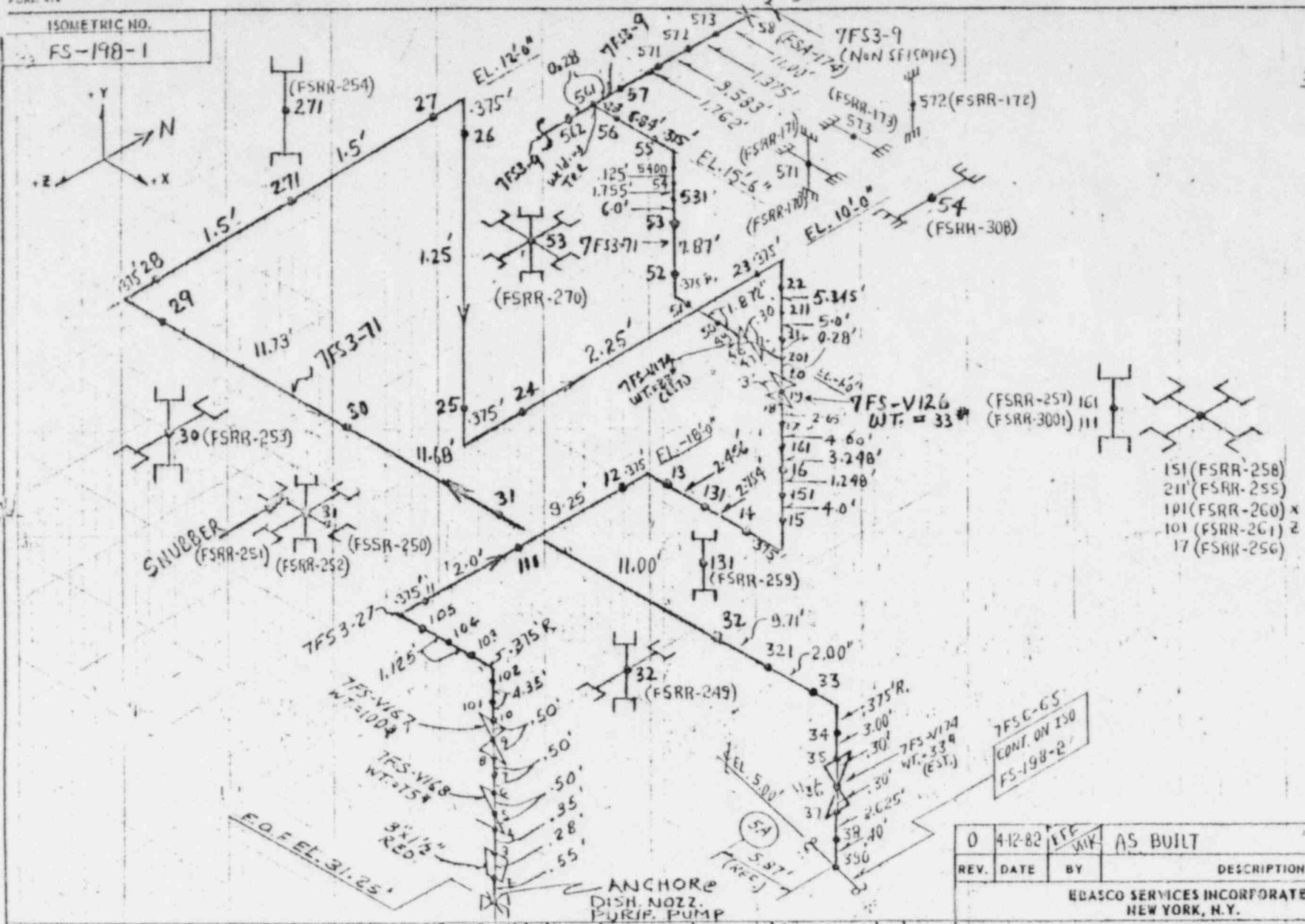
WATERFORD UNIT #3
REACTOR BLDG.
FUEL POOL COOLING PIPING

DR. R. PIRONCIAN DATE: 12-17-76
CH. T DI DATE: 12 27 11.

ISOMETRIC NO.
FS-198-2

ISOMETRIC NO.
FS-198-1

CALC. NO.
5555
SH. #1 OF 2



LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
7FS3-27	3.500	0.300	TP. 304 S/S	100	0.337"	Ec = 28.3 x 10⁶ Eh = 27.5 x 10⁶	50			G-198		
7FS3-71	3.500	0.216	TP. 304 S/S	150	0.898"	Ec = 28.3 x 10⁶ Eh = 27.5 x 10⁶	150	DYNAMIC ☐		SHT 2 OF 2	1	1/23/82
7FS3-9	3.500	0.216	TP. 304 S/S	150	0.898"	"	150	STATIC ☒ VERT. .20				
								THERMAL ☒ HORIZ. X=.38 Z=.38				

REV.	DATE	BY	DESCRIPTION
0	4-12-82	EFF WK	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT # 3
REACTOR BUILDING
FUEL POOL COOLING PIPING

DR. J.M. DATE: 7-2-75
CH. MD DATE: 7-7-75

ISOMETRIC NO.
FS-198-1

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***************************************************************************************************************************

          1         2         3         4         5         6         7         8                        CARD
***12345678901234567890123456789012345678901234567890123456789012345678901234567890***                   NO.

   5555        TC    200 13                          WATERFORD SES UNIT#3 FUEL POOL COOLING &               1
   PURIFICATION PIPING ISOMETRIC#FS-158-1,2. FUEL HANDLING BLDG. "AS BUILT"                                 2
   5555   1   FA      1                                                                                     3
   5555     -1LC   1000000                                  NORMAL OPERATING                                4
   5555      2LC   1000000                                  ACCIDENT CONDITIONS                             5
   5555  10 41LC   13                                       OPERATING WEIGHT ANALYSIS                       6
   5555   1 51LC   11          38                           X-INERTIA  OBE STATIC                           7
   5555   1 52LC   11                  30                   Y-INERTIA  OBE STATIC                           8
   5555   1 53LC   11                          28           Z-INERTIA  OBE STATIC                           9
   5555  10101CC   114          51      53                  MAXIMUM OF X AND Z                             10
   5555  10102CC   111         101      52                  MAXIMUM HORIZONTAL PLUS Y                      11
   5555  10105CC     0           1      41                  THERMAL 1 + WEIGHT                             12
   5555  10106CC     0           2      41                  THERMAL 2 + WEIGHT                             13
   5555  10111CC   1 4          41     105     156          HI OF (TH1+WT) (TH2+WT) OR WT                  14
   5555  10112CC   111   8     111     102                  ABSOLUTE OF OBE + (TH+WT)                      15
   5555  10113CC   121   8     111   2.102                  ABSOLUTE OF 2OBE + (TH+WT)                     16
   5555  10652CS    12   3      41     102                  DESIGN EQ 9                                    17
   5555       74          50   125                                                                         18
   5555       72          376304                                                                           19
   5555      171          100                      2?                                                      20
   5555      271          100                      25                                                      21
   5555     1071          125                      50                                                      22
   5555       70           19       2     47        1        1                                             23
   5555       66   1      -88   -3125     82                                                               24
   5555       66  46      -33014    5    622                                                               25
   5555       66  58      -975    155     46                                                               26
   5555       66 404       195      9     93                                                               27
   5555       61   1    1                                                                                  28
   5555          2 2                55                                                                     29
   5555        5   3 2              28                                                                     30
   5555       70           35      300    12        1        1                                             31
   5555          4 2                35                                                                     32
   5555        4   5    1           5                                                                      33
   5555        9   5        075                                                                            34
   5555        4   6 2  1           5                                                                      35
   5555          7                  5                                                                      36
   5555          8 2                5                                                                      37
   5555        4   9    1           5                                                                      38
   5555        5   9        1                                                                              39
   5555        4  10 2  1           5                                                                      40
   5555          101               435                                                                     41
   5555          102 2             435                                                                     42
   5555        1 103 2              375           -375                                                     43
   5555          104      -1125                                                                            44
   5555          105 2    -1125                                                                            45
   5555        1  11      -375                                   -375                                      46
   5555          111                     -2                                                                47
   5555           12 2                   -925                                                              48
   5555        1  13 2                    -375     375                                                     49
   5555          131       2496                                                                            50

***12345678901234567890123456789012345678901234567890123456789012345678901234567890***
          1         2         3         4         5         6         7         8
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GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
NOZZLE	1	1	-13	50	-2	51	-2	-4	17	18	0.000	-0.000	0.000	0.000
		2	-14	48	-3	50	-4	-2	18	18	0.000	-0.000	0.000	0.000
		41	-2	358	2	358	2	0	2	3	0.000	-0.000	-0.000	0.000
		51	-41	37	-1	55	-1	4	18	18	0.000	-0.000	0.000	0.000
		52	1	-107	-1	107	-1	0	-1	1	-0.000	0.000	0.000	0.000
		53	4	34	-24	42	4	-38	-5	39	-0.000	-0.000	0.000	0.000
		101	-41	37	-24	60	4	-38	18	43	0.000	-0.000	0.000	0.000
		102	42	144	25	152	4	39	19	43	0.000	0.000	0.000	0.000
		111	-15	498	2	468	2	-3	20	20	0.000	-0.000	-0.000	0.000
		112	57	552	24	554	7	42	38	57	0.000	0.000	0.000	0.000
		113	99	696	51	705	11	81	57	99	0.000	0.000	0.000	0.000
NOZZLE	404	1	-710	-784	-56	1059	-214	70	-1271	1291	0.000	0.000	0.000	0.000
		2	-706	-761	-48	1039	-264	85	-1262	1292	0.000	0.000	0.000	0.000
		41	3	270	4	270	152	-2	11	154	-0.000	-0.000	-0.000	0.000
		51	-42	5	-2	42	8	13	-17	23	0.000	-0.000	0.000	0.000
		52	-1	-81	-1	81	-46	-7	-3	46	0.000	0.000	0.000	0.000
		53	4	-8	-103	104	197	56	26	207	-0.000	0.000	0.000	0.000
		101	-42	-8	-103	112	197	56	26	207	0.000	0.000	0.000	0.000
		102	43	85	105	144	243	83	29	253	0.000	0.000	0.000	0.000
		111	-767	-514	-55	876	152	137	-1260	1274	0.000	0.000	0.000	0.000
		112	750	604	157	975	348	170	1289	1359	0.000	0.000	0.000	0.000
		113	792	693	262	1085	658	233	1318	1483	0.000	0.000	0.000	0.000
ANCHOR	98	1	-7	-1	41	41	5	-25	-19	32	0.000	0.000	-0.000	0.000
		2	-7	-1	44	44	5	-26	-19	32	0.000	0.000	-0.000	0.000
		41	0	78	0	78	-43	1	-2	43	-0.000	-0.000	-0.000	0.000
		51	-25	0	-8	27	6	0	0	0	0.000	0.000	0.000	0.000
		52	0	-23	0	23	13	0	1	13	0.000	0.000	0.000	0.000
		53	0	0	-135	135	-1	1	0	1	-0.000	-0.000	0.000	0.000
		101	-25	0	-135	137	-1	1	0	1	0.000	-0.000	0.000	0.000
		102	25	23	135	139	13	1	1	13	0.000	0.000	0.000	0.000
		111	-7	78	44	89	-43	-25	-22	54	0.000	-0.000	-0.000	0.000
		112	32	101	179	208	56	26	23	66	0.000	0.000	0.000	0.000
		113	58	124	313	342	69	27	24	78	0.000	0.000	0.000	0.000
ANCHOR	46	1	131	38	266	299	-264	2240	-62	2259	-0.125	0.025	0.235	0.267
		2	120	145	707	732	-1144	2974	-441	3218	-3.769	0.125	1.449	1.645
		41	0	35	0	35	39	0	155	166	-0.000	-0.000	0.000	0.000
		51	-184	1	98	191	-5	-270	1	270	0.000	-0.000	-0.000	0.000
		52	-1	-95	2	95	242	0	99	261	0.000	0.000	-0.000	0.000
		53	96	-18	-370	382	87	-360	41	372	-0.000	0.000	0.000	0.000
		101	-184	-18	-370	485	87	-360	41	372	0.000	0.000	0.000	0.000
		102	185	114	372	423	329	360	140	507	0.000	0.000	0.000	0.000
		111	151	186	707	741	-1164	2974	-286	3185	-3.769	0.125	1.449	1.645
		112	296	294	1079	1157	1433	3333	426	3653	0.769	0.125	1.449	1.645

GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	46	113	462	408	1451	1576	1762	3693	566	4131	0.769	0.125	1.449	1.645

EBASCO SERVICES INCORPORATED

BY RMM DATE 6/17/84 SHEET 1 OF 2

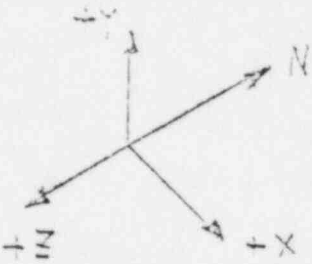
CHKD. BY J. CHOU DATE 6/21/84 OFS NO. 2865.140 DEPT. NO. 653

CLIENT L P & L

PROJECT WATERFORD SES # 3

SUBJECT STRESS ANALYSIS FOR NOZZLE P# 20

EQUIPMENT	CONDENSATE STORAGE POOL
NOZZLE	Pw 20
LINE NUMBER	300 2 - 74 A/B
CALC. NO.	2003
PORTION No	1
ISOMETRIC No	CC-185-93
POINT No	3344
OUTPUT DATE	6/18/84



TYPE ANALYSIS	FORCES (lbs)			MOMENTS (FT-lbs)			RESULTANT OF BENDING MOMENTS
	Fx	FY	Fz	Mx	MY	Mz	
THERMAL	-6	-43	0	0	1	133	—
WEIGHT	0	17	0	0	0	-13	
SEISMIC OBE MAX X COMPONENT	-40	-13	0	0	0	19	
SEISMIC OBE MAX Y COMPONENT	0	-5	0	0	0	4	$\sqrt{My^2+Mz^2}$
SEISMIC OBE MAX Z COMPONENT	0	0	-25	7	-83	0	
THER. + WT + SEISMIC OBE MAX X + Y	46	43	0	0	1	143	143
THER + WT + SEISMIC OBE + MAX Z + Y	6	30	25	7	86	124	151
THER + WT + SEISMIC DBE MAX X + Y	86	61	0	0	1	166	166
THER + WT + SEISMIC DBE MAX Z + Y	6	35	50	14	171	128	213

EBASCO SERVICES INCORPORATED

BY KMM DATE 6-17-94 SHEET 2 OF 3

CHKD. BY J. CHOU DATE 6/21/94 OFS NO. 2865.140 DEPT. NO. 553

CLIENT L P & L

PROJECT WATERFORD SES #3

SUBJECT STRESS ANALYSIS FOR NOZZLE PW20

PW 20

CHECK STRESS DUE TO BENDING USING RESULTANT MOMENTS.

FR. PIPING ANALYSIS

(WORST CASE) CODE

$151^{FT\text{-}LB} = 1.812^{IN\text{-}K}$

ANALYSIS

FOR BENDING STRESS (USE ROARK METHOD FR. BLODGETT 17 PG. 7.23)

CASE 5 EDGE SUPPORTED COUPLE APPLIED HUB. (TRUNNION LOADING)

$$\text{MAX } S_T = \frac{6M}{4\pi t^2} \log_e \frac{2(r - r_1)}{kr}$$

$r = 3.3125$ IN

$r_1 = 1.1875$ IN

$t = 0.4375$ CONSIDER

$$k = \frac{0.4 r^2}{(0.7r + r_1)^2} = 0.437$$

$$S_T = \frac{6 \times 1.812}{4\pi \times 1.1875 \times 0.4375^2} \log_e \frac{2(3.3125 - 1.1875)}{0.437 \times 3.3125}$$

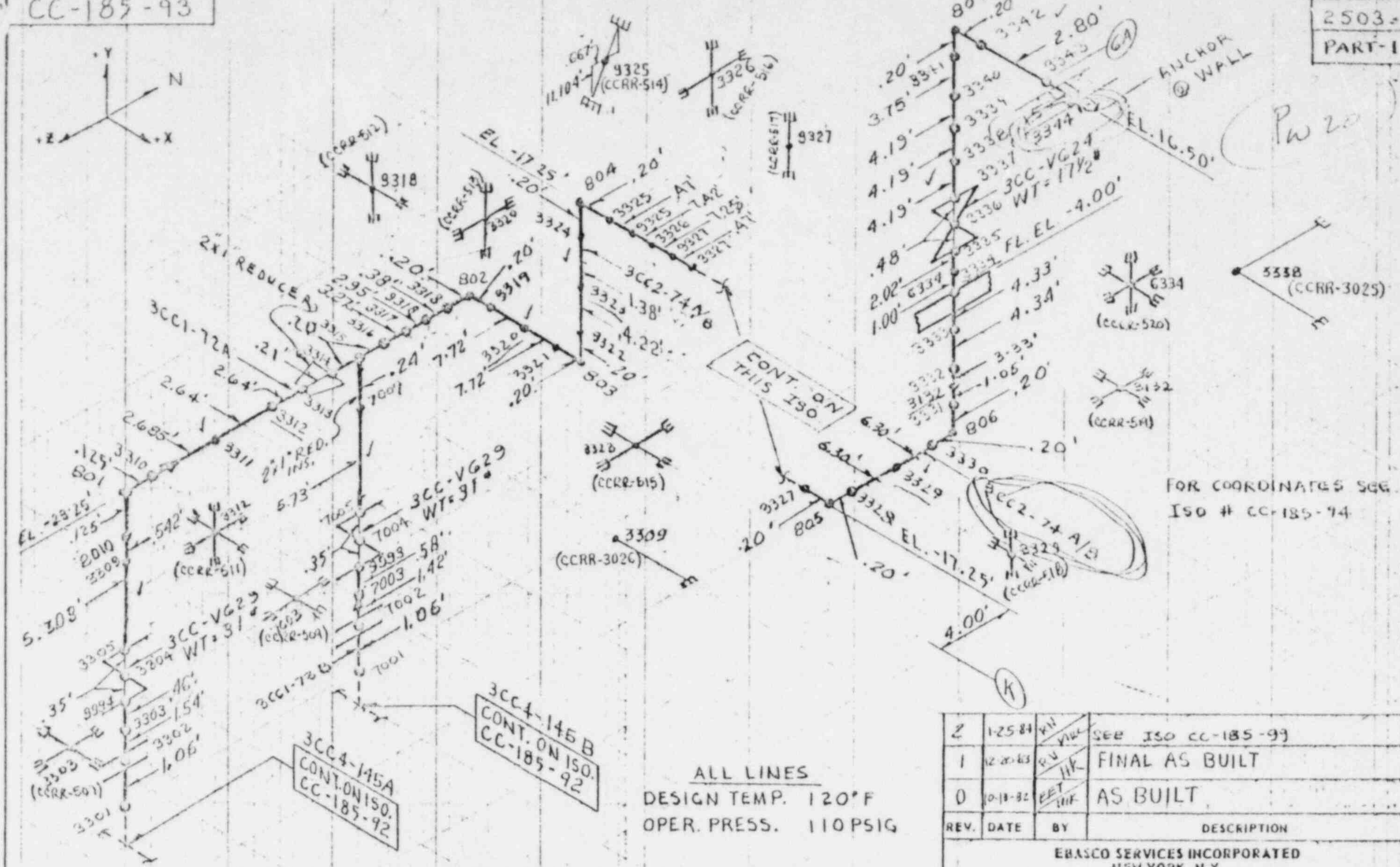
$= 4.72^{KSI} < 26.5^{KSI}$

D&E CHECK NOT NECESSARY, BENDING STRESS ALONE FAR EXCEED D&E/DSE.

581/8-81

ISOMETRIC NO.
CC-185-93

CALL NO.
2503
PART-1



ALL LINES
DESIGN TEMP. 120°F
OPER. PRESS. 110 PSIG

REV.	DATE	BY	DESCRIPTION
2	1-25-84	KN / VRL	SEE ISO CC-185-99
1	12-20-83	RV / HK	FINAL AS BUILT
0	10-18-82	EET / HK	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD # 3

COMPONENT COOLING WATER PIPING
AUX BLDG.

DR. W.P.B. DATE: 8-7-75
CH. WMF DATE: 8-21-75

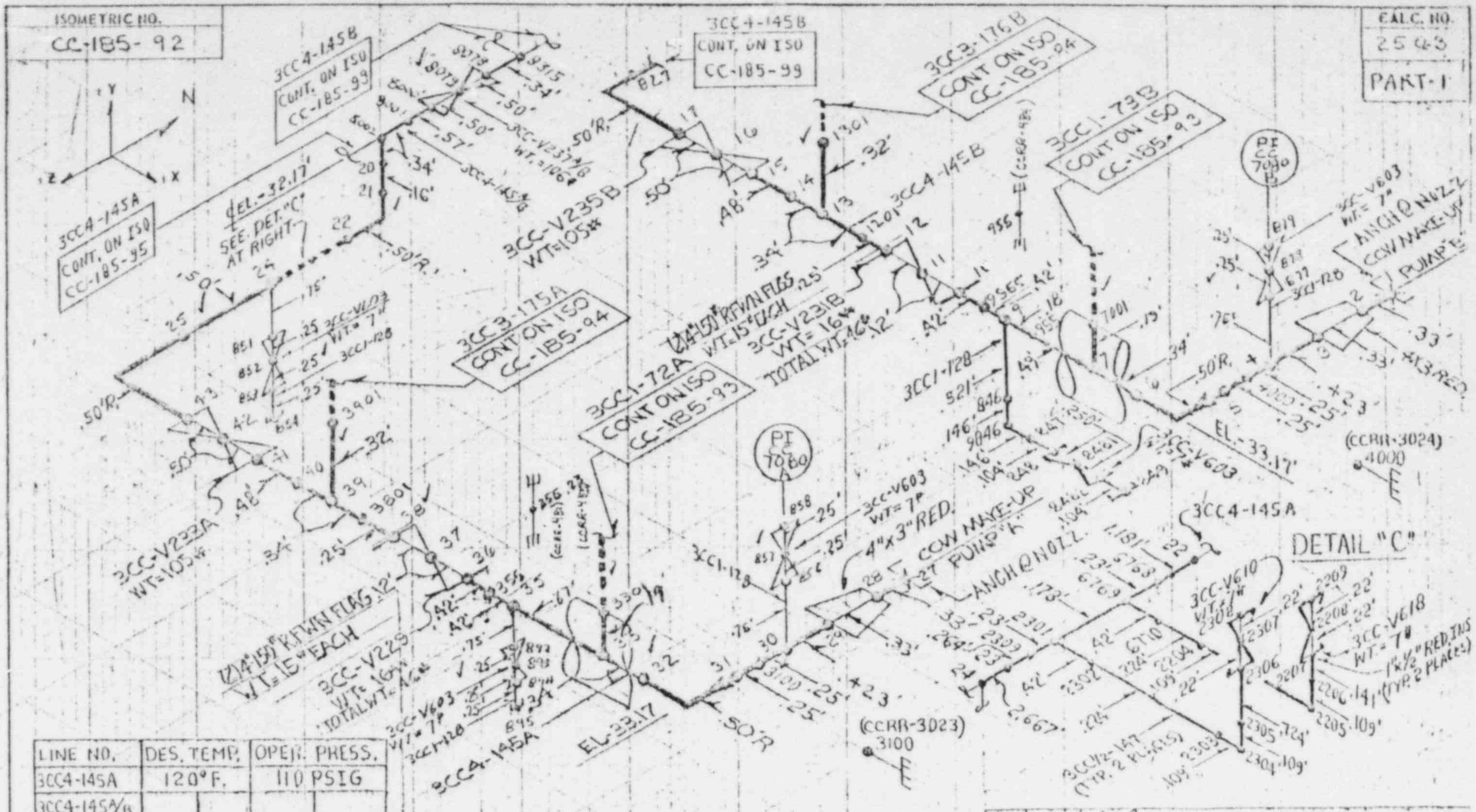
ISOMETRIC NO. CC 185-93

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G.FACTOR	REF. DWGS.	REV	DATE
3CC1-72A	1.315	.179	CS-1 A-106 GRB	104	.259	Ec=27.9×10⁶ Eh=27.89×10⁶	125			LOD-1564 G-199 SH.5	9	5-27-81
3CC1-73B	1.315	.179	↓	↓	↓	↓	↓	DYNAMIC ☐	HOR. X=.56			
3CC2-74A/B	2.375	.218						STATIC ☑	VERT. Y=.28			
								THERMAL ☑	HORIZ. Z=.40			

ISOMETRIC NO. CC-185- 92

CALC. NO. 2543

PART-1



LINE NO.	DES. TEMP.	OPER. PRESS.
3CC4-145A	120°F.	110 PSIG
3CC4-145A/B		
3CC4-145B		
3CC1-128		
3CC1/2-147		

FOR COORDINATES SEE ISO # CC-185-94

LINE NO.	PIPE O.D.	SCH. NOM. WL. THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS		G. FACTOR	REF. DWGS.	REV	DATE
3CC1/2-147	.840	.147	CSA-106 GRB				125	2	1-25-84	SEE ISO-CC-185-99			
3CC4-145A	4.500"	.237"	CSA-106 GRB	104	.259	Ec=27.9x10⁶ Eh=27.65x10⁶	125				LOU 1564 G-185 SH. 5	9	5-27-82
3CC4-145A/B								DYNAMIC ☐		HOR. X..EG			
3CC4-145B								STATIC ☑		VERT. Y..22			
3CC1-128	1.315"	.179"						THERMAL ☑		HORIZ Z..40			

REV.	DATE	BY		DESCRIPTION
1	12-20-83	RW	JJK	FINAL AS BUILT
0	10-16-84	EET	WHF	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD # 3

COMPONENT COOLING WATER PIPING
AUX BLDG.

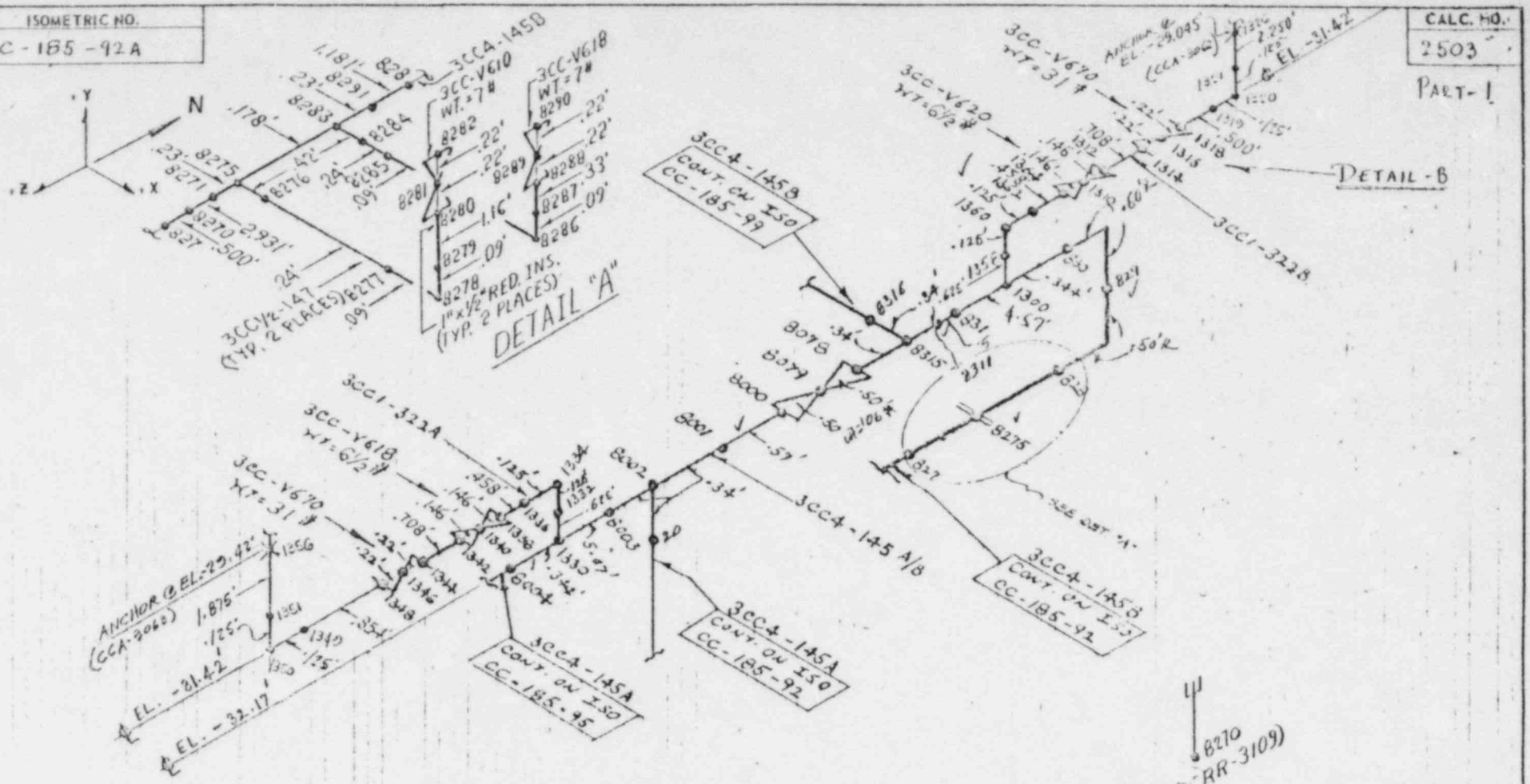
DR. J MCCLURE DATE 7-28-75
CH. WMF DATE 8-21-75

ISOMETRIC NO. CC-185- 92

ISOMETRIC NO.
CC-185-92A

CALC. NO.
2503

PART-1



PART NO.	℄ RPV	COORDINATES X	Y	Z
		0	0	0
1	132.6	-61.500'	-29.045'	118.946'
1	135.6	-61.500'	-29.42'	137.584'

REV.	DATE	BY	DESCRIPTION
2	1-25-84	KTN	SEE-1SO-CC-185-99
1	12-20-83	KTN HK	FINAL AS BUILT
0	10-13-82	CET	AS BUILT ADDED Y-RSET. @ PT 8270 DUE TO HIGH LOADS ON THE NOZZ. PER CCN 9941

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
								DYNAMIC ☐	HOR. X-.56	LOU SK4 G-185 58.5	2	5-27-82
3CC1-322B	1.315"	.133"	CSA-106,GRB	104	0.259	Ec = 27.9 x 10⁶ Eh = 27.85 x 10⁶	125	STATIC ☒	VERT. Y-.98			
3CC1-322A	1.315"	.133"	↓	↓	↓	↓	↓	THERMAL ☐	HORIZ. Z-.94			

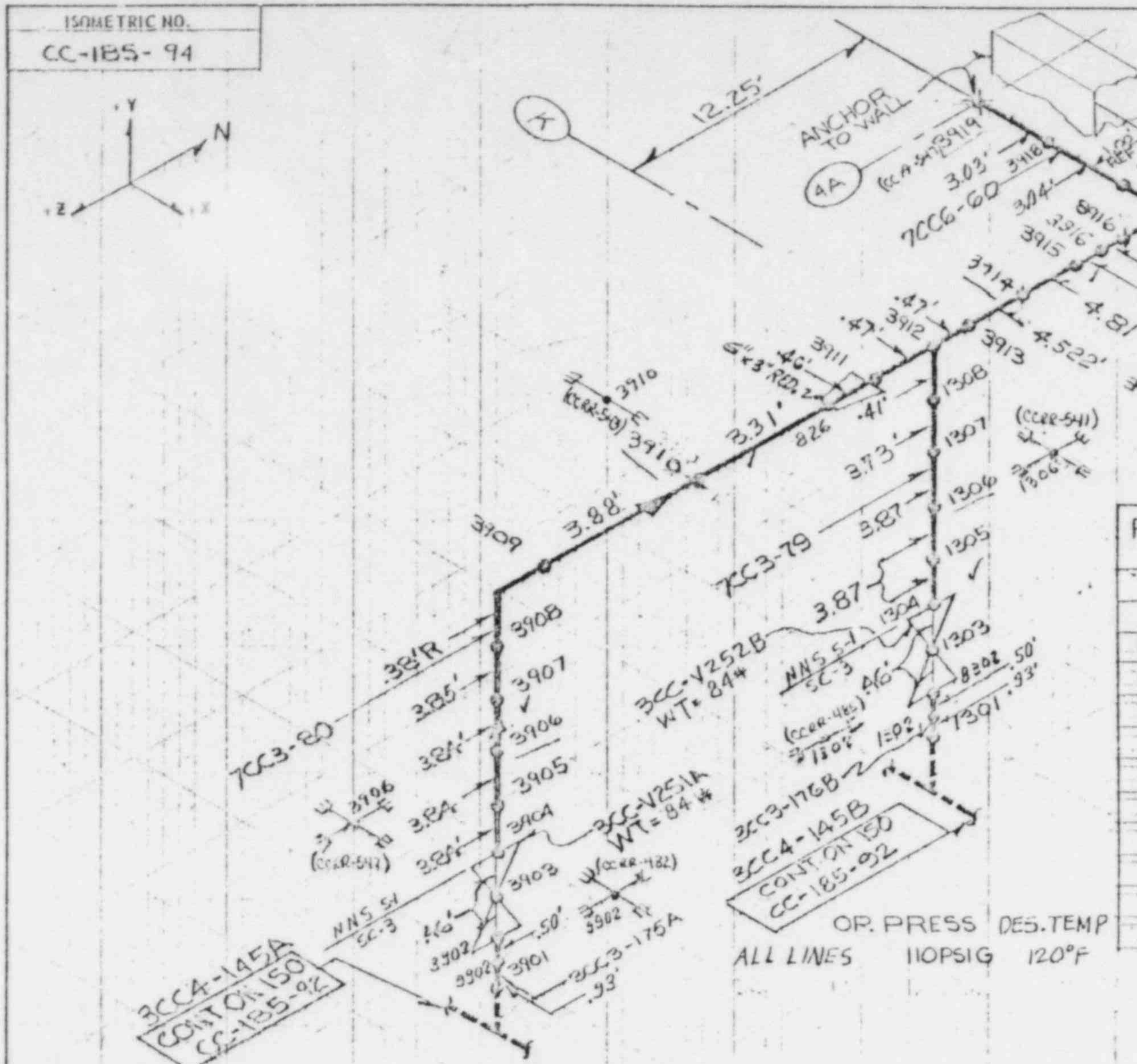
WATERFORD #3
COMPONENT COOLING WATER PIPING
AUX. BLDG.

DR. AJG DATE 2-1-80
CH. RP DATE 2-2-80

ISOMETRIC NO.
CC-185-92A

ISOMETRIC NO.
CC-185-94

CALC. NO.
250.3
PART-1



OP. PRESS DES. TEMP
ALL LINES 110PSIG 120°F

PART NO.	℄ RPV	X	Y	Z
		0	0	0
1	PT. # 9716	-63.75'	-4.00'	127.69'
1	3919	-66.00'	-14.75'	111.75'
1 & 2	4167	-61.50'	-17.25'	129.17'
1 & 4	9167	-62.50'	-16.75'	119.33'
1	1	-56.00'	-33.17'	124.917'
1	27	-56.00'	-33.17'	133.417'
1	3344	-20.50'	16.50'	107.00'
2	913	-49.50'	1.68'	85.50'
1	79	-63.52'	-4.00'	129.169'
1	6019	-80.75'	46.00'	126.00'
4	5	-74.00'	-7.84'	85.50'
1	2160	-80.00'	46.00'	126.00'

REV.	DATE	BY	DESCRIPTION
1	12-20-83		FINAL AS BUILT
0	10-16-82	EET	AS BUILT

LINE NO.	PIPE O.D.	SCH. NOM. WT. THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
7CC6-60	6.625	.280						2 1-25-84 SEE ISO CC-185-99				
7CC3-79	3.50	.216	CS-1A106GrB	104	.259	E_c= 27.9 x10⁶ E_H= 27.85 x10⁶	125	DYNAMIC ☐	Hor. X: .56	LOU-1564 G-186 SH.5	0	5-27-82
7CC3-80								STATIC ☑	VERT. Y: .28			
3CC3-175A								THERMAL ☑	HORIZ Z: .40			
3CC3-176B												

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD NO. 3

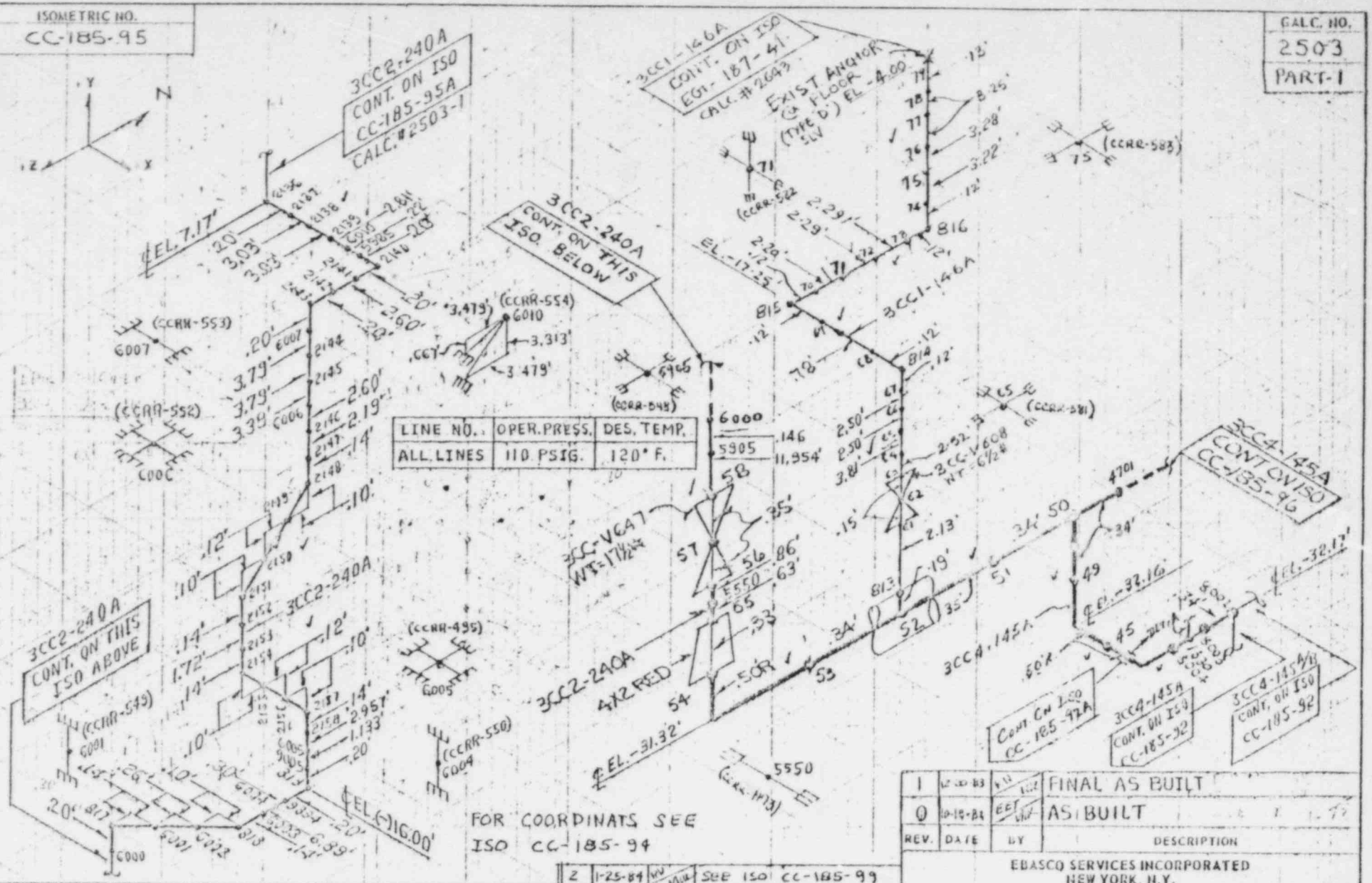
COMPONENT COOLING WATER PIPING
AUX. BLDG.

DR. JMCLURE DATE 8-7-75
CH. WMF DATE 8-27-75

ISOMETRIC NO. CC-185-94

ISOMETRIC NO.
CC-185-95

CALC. NO.
2503
PART-1



FOR COORDINATS SEE ISO CC-185-94

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS
3CC1-145A	4.500"	.237"	CSA-106 GRB	104	0.259	Ec=27.9X10⁶ En=27.8X10⁶	125
3CC1-146A	1.315"	.179"					
3CC2-240A	2.375"	.218"					

TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.
DYNAMIC ☐	1 br. X-.56	
STATIC ☑	VERT. Y-.18	
THERMAL ☑	HORIZ. Z-.40	

REV.	DATE	BY	DESCRIPTION
2	1-25-84	WJ	SEE ISO CC-185-99
1	12-30-83	WJ	FINAL AS BUILT
0	10-19-83	EET	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD #3

COMPONENT COOLING WATER PIPING
AUX. BLDG.

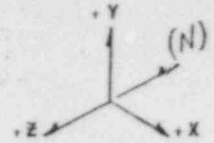
DR. J. MCGUIRE DATE: 7-25-75
CH. WMF DATE: 8-21-75

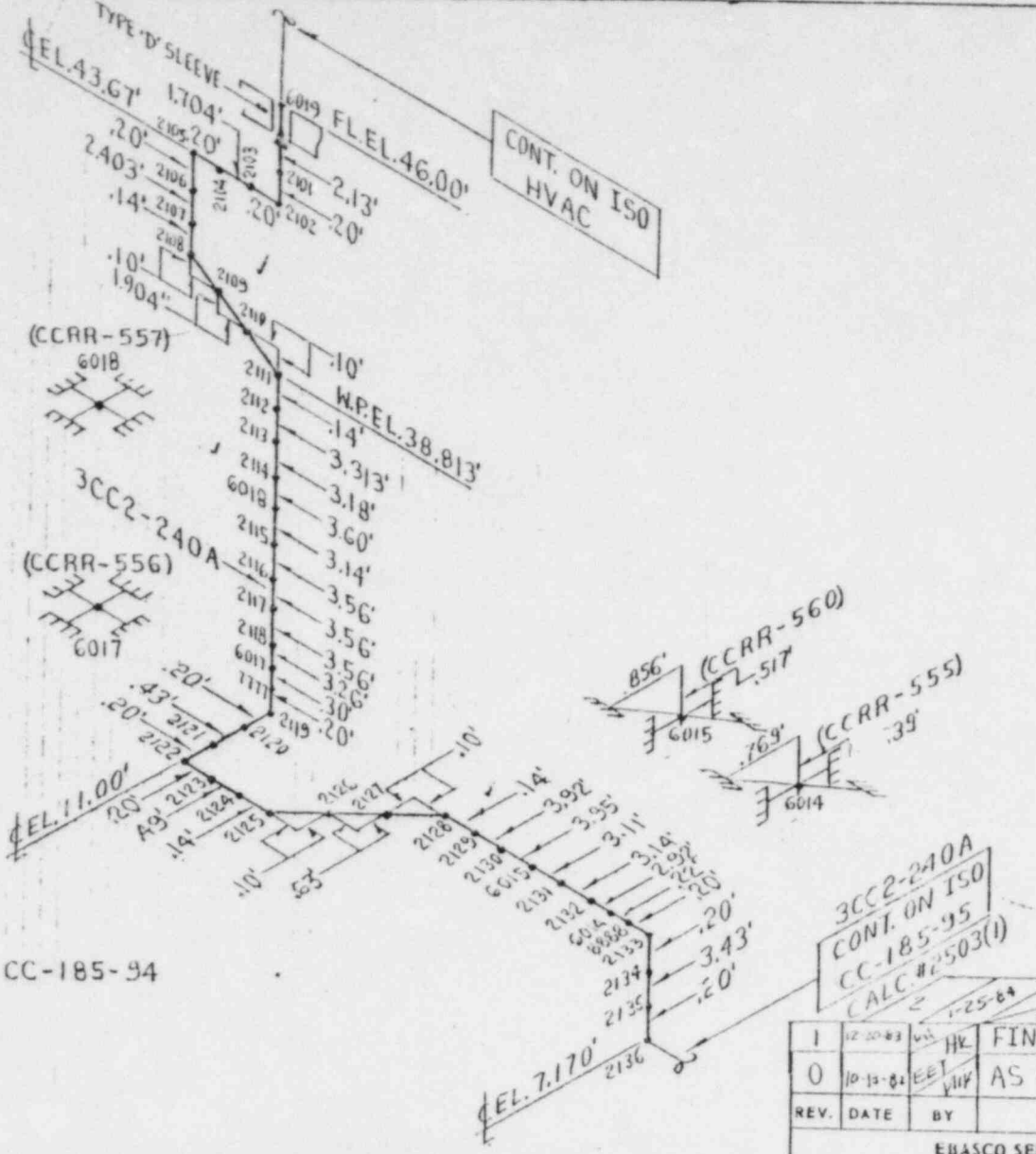
ISOMETRIC NO.
CC-185-95

FORM 478

ISOMETRIC NO.
CC-185-95A

CALC. NO.
2503
PART 1





FOR COORDINATES SEE ISO CC-185-94

ALL LINES:
DESIGN TEMP. = 120°F.
OPER. PRESS. = 110 P.S.I.G.

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CC2-240A	2.375	.218	CS-1A-106 GR.B	104			125	DYNAMIC ☐	Max X=.56	LOU 1SC4 G185 SH.5	3	5-27-82
								STATIC ☑	VERT. Y=.28			
								THERMAL ☑	HORIZ. Z=.4			

REV.	DATE	BY	DESCRIPTION
2	1-25-84	RN	SEE ISO. CC-185-99
1	12-20-83	HK	FINAL AS BUILT
0	10-13-81	EET	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD 3
AUXILIARY BLDG.
COMPONENT COOLING WATER PIPING

DR. R.PRONCIAK DATE: 3-12-81
CH. [illegible] DATE: 3-14-81

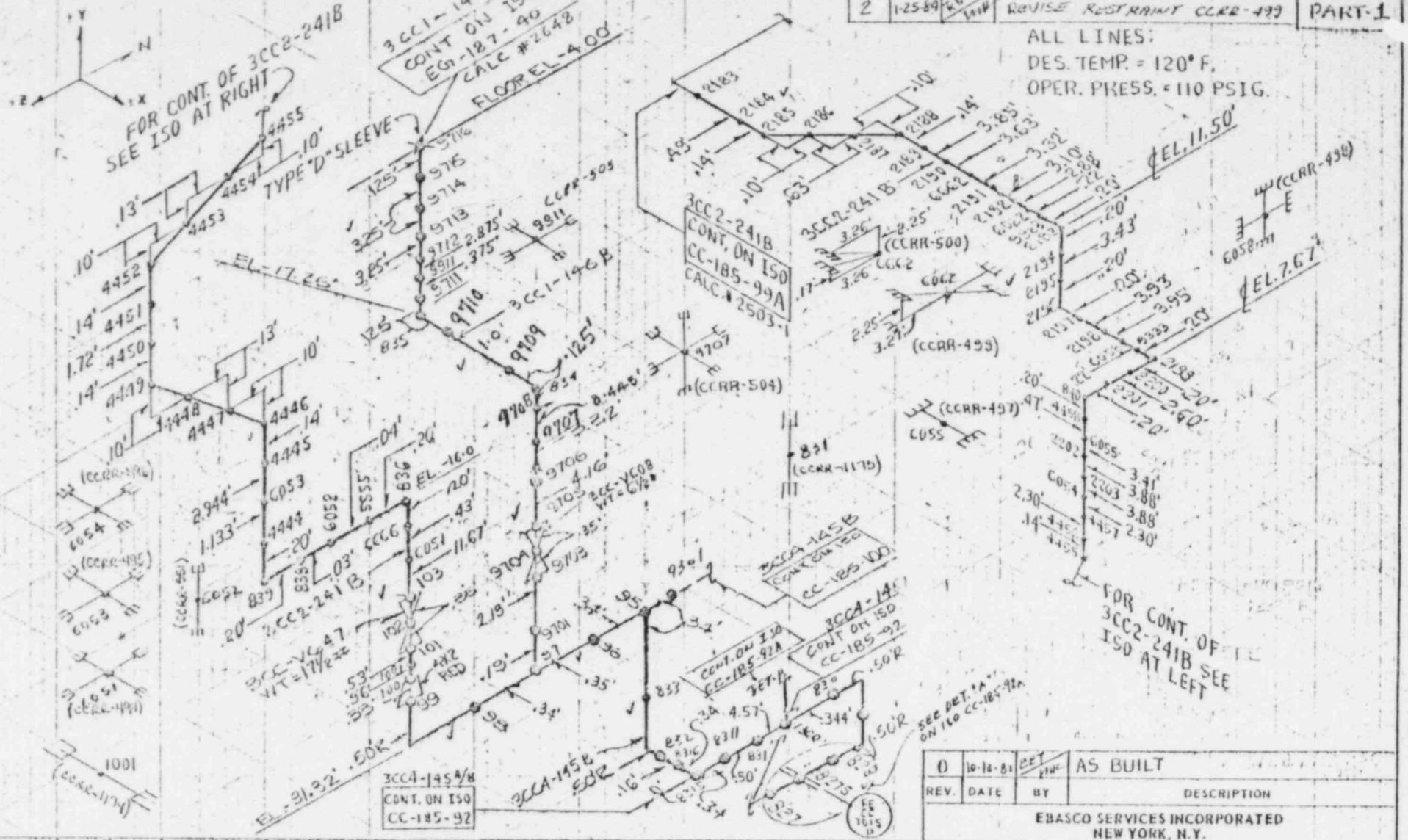
ISOMETRIC NO.
CC-185-95A

ISOMETRIC NO.
CC-185-99

FOR COORDINATES SEE ISO CC-185-94

REV.	DATE	BY	DESCRIPTION	CALC. NO.
1	12-20-83	RM / HK	FINAL AS BUILT - FCR-MP-2611	2503 -
2	1-25-84	EW / MH	REVISE RESTRAINT CCRR-499	PART-1

ALL LINES:
DES. TEMP. = 120° F.
OPER. PRESS. = 110 PSIG.



REV.	DATE	BY	DESCRIPTION
0	10-16-81	EET / [illegible]	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD #3

COMPONENT COOLING WATER PIPING
AUX BLDG

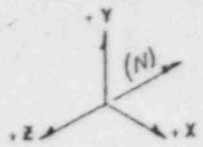
LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CC4-145B	4.500	.237	CS SA106 GRB	104	.259	Ec=27.9X10⁶ Em=27.6X10⁶	125	DYNAMIC ☐	Hor. X-.56	LDU 1564 G-185 Sh. 5	0	5-27-81
3CC1-146B	1.313	.179						STATIC ☑	VERT. Y-.28			1
3CC2-241B	2.375	.218						THERMAL ☑	HORIZ. Z-.40			

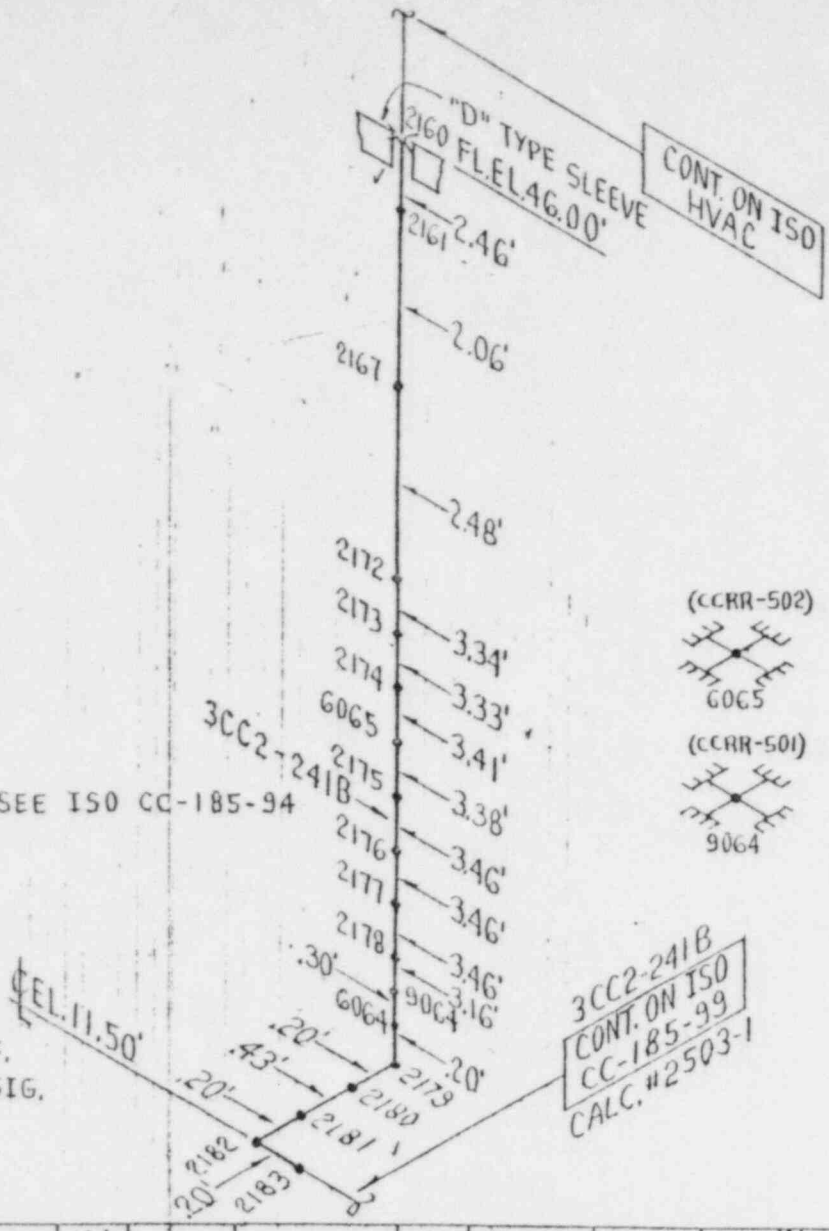
DR. G. TRUETT DATE: 7-25-75
CH. L. PETTI DATE: 7-25-75

ISOMETRIC NO.
CC-185-99

ISOMETRIC NO.
CC-185-99A

CALC. NO.
2503
PART. I





FOR COORDINATES SEE ISO CC-185-94

ALL LINES:
DESIGN TEMP. = 120°F.
OPER. PRESS. = 110 PSIG.

(CCRR-502)
6065

(CCRR-501)
9064

REV.	DATE	BY	DESCRIPTION
2	1-25-84	RN / VMC	SEE ISO CC-185-99
1	12-20-83	RN / HK	FINAL AS BUILT
0	10-13-81	EET / VMC	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD #3
AUXILIARY BLDG.
COMPONENT COOLING WATER PIPING

DR. R. PIRONCIAK DATE. 3-13-81
CH. [illegible] DATE. 3/4/81

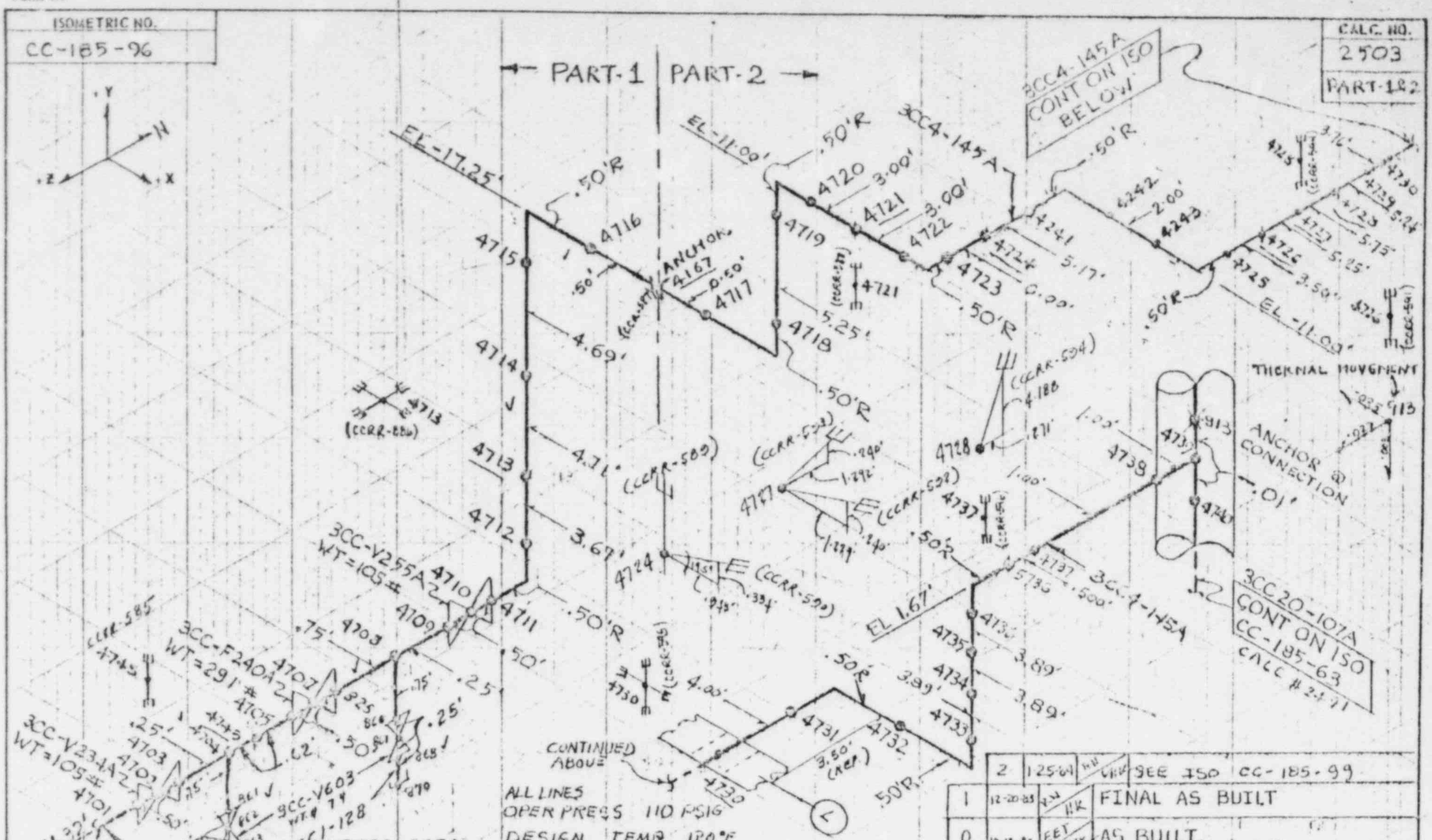
ISOMETRIC NO.
CC-185-99A

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CC2-241B	2.375	.218	CS-1A106 GR.B	104			125	DYNAMIC ☐		LOD 1564 G-185 SH. 5	2	5-27-81
								STATIC ☑	VERT. y=.28			
								THERMAL ☑	HORIZ. z=.40			

ISOMETRIC NO.
CC-185-96

CALC. NO.
2503
PART-1&2

PART-1 | PART-2



REV.	DATE	BY	DESCRIPTION
2	12-5-84	HB / CRH	SEE ISO CC-185-99
1	12-20-83	RM / HR	FINAL AS BUILT
0	10-13-82	EET / WMF	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD #3

COMPONENT COOLING WATER PIPING AUX BLDG

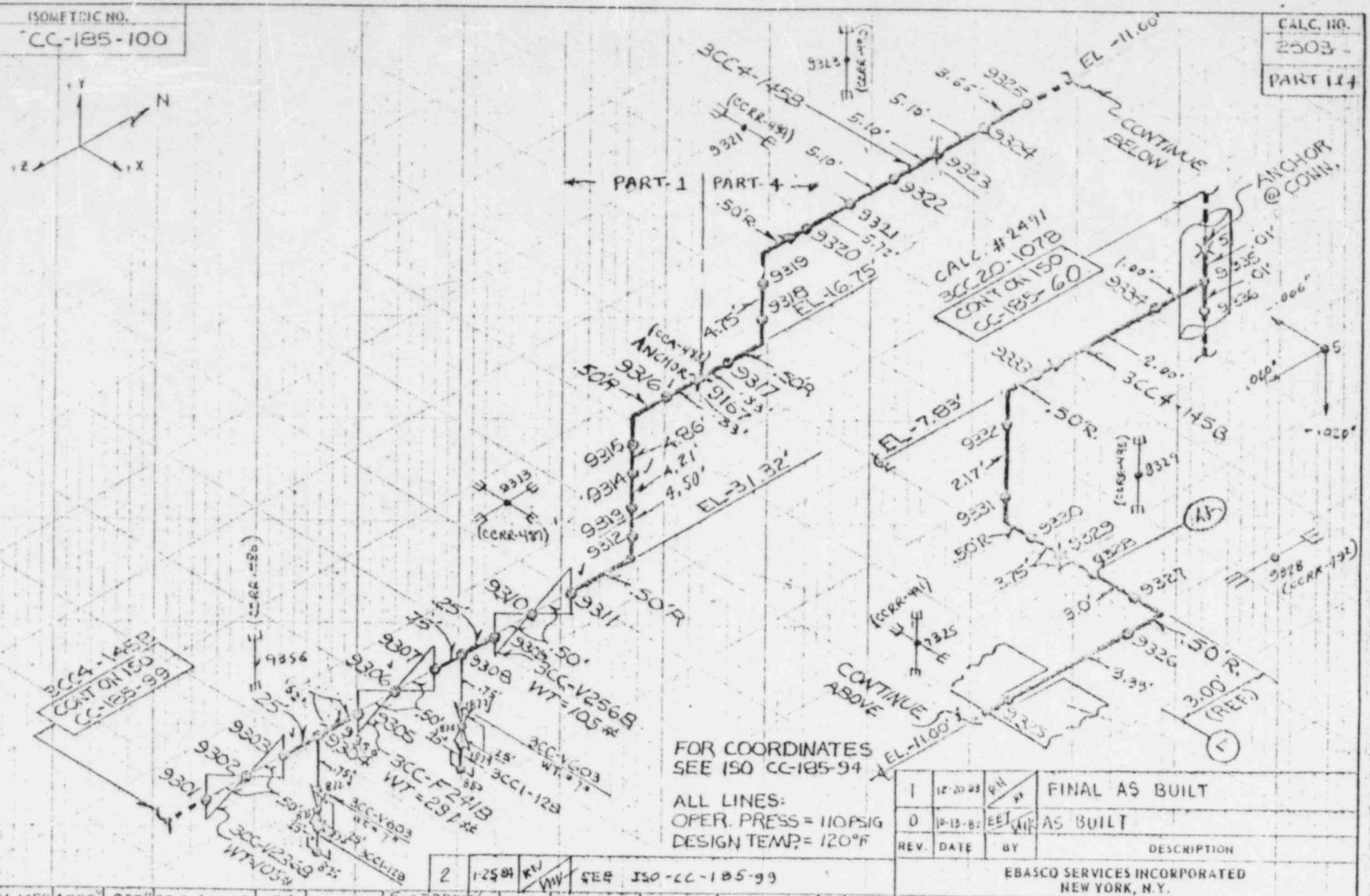
DR. CRH DATE 7-29-75
CH. WMF DATE 8-25-75

ISOMETRIC NO. CC-185-96

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CC4-145A	4.500	.237	CS-1 A106 GR B	104	.259	EC=27.9X10⁶ EH=27.85X10⁶	125	DYNAMIC ☐	2503-1 HOR. Y=.56	LOG-1564 & -185 SH 1,2,5 2503-2 HOR. X=.38	3	5-27-82
3CC1-128	1.315	.179						STATIC ☑	VERT. Y=.28	VERT. Y=.30		
								THERMAL ☐	HORIZ Z=.40	HOR. Z=.35		

ISOMETRIC NO.
CC-185-100

CALC. NO.
2503 -
PART 1 & 4



REV.	DATE	BY	DESCRIPTION
2	1-25-84	KH	SEE ISO-CC-185-99
1	12-20-83	KH	FINAL AS BUILT
0	10-13-83	EET	AS BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD 3
COMPONENT COOLING WATER PIPING
AUX BLDG.

DR. J.MCCLURE DATE: 7-28-75
CH. [illegible] DATE: 8-25-75

ISOMETRIC NO.
CC-185-100

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CC4-145B	1.500"	.237"	CS A106GRB	104	.259	Ec=27.9X10⁶ Ei=27.85X10⁶	125	DYNAMIC ☐	2503-1	LDW 1564 C-185 SH.5	2	5-27-81
3CC1-128	1.315"	.179"						STATIC ☑	HOR. Y=.56	2503-4 HOR X=.58		1
								THERMAL ☑	VERT. Y=.28	VERT. Y=.30		
									HORIZ. Z=.44	HOR. Z=.33		

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2503       TC    3   13R NAVRATIL       WATERFORD #3 REACTOR AUX BLDG COMPONENT
COOLING PIPING ISO CC-185-92 THRU 96,99,99A,100 REV 2 PART-1
2503       FA     1
2503       1LC    1                                          NORMAL OPERATING
2503  10 41LC    13                                         OPERATING WEIGHT
2503   1 51LC    1100          56                           X-STATIC
2503   1 52LC    11000                 28                   Y-STATIC
2503   1 53LC    1100                        40             Z-STATIC
2503  10101CC     14    1      51      53                   MAXIMUM OF X AND Z
2503  10102CC     111           101      52                 MAXIMUM OF HORIZONTAL PLUS Y
2503  10110CC      0    8        1      41                  THERMAL + WEIGHT
2503  10111CC    1 9    8       41     110                  HIGHER OF (TH+WT) OR WT
2503  10112CC    111    8      111     102                  OBE + HI (TH+WT) OR WT
2503  10113CC    121    8      111   2,102                  OBE + HI (TH+WT) OR WT
2503  10652CS     12    3       41     102                  DESIGN EQ 9
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GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
NOZZLE	1	1	-17	-61	-12	65	83	-5	-13	84	0.000	0.000	0.000	0.000
		41	15	7	8	19	53	4	-31	62	-0.000	-0.000	-0.000	0.000
		51	204	18	-76	219	-9	47	-5	48	-0.000	-0.000	0.000	0.000
		52	-4	-2	-2	5	-15	-1	9	17	0.000	0.000	0.000	0.000
		53	33	90	113	148	-26	8	-51	58	-0.000	-0.000	-0.000	0.000
		102	209	92	115	255	40	48	60	87	0.000	0.000	0.000	0.000
		111	15	-54	8	57	136	4	-44	143	-0.000	0.000	-0.000	0.000
		112	224	146	123	295	177	52	104	211	0.000	0.000	0.000	0.000
		113	433	238	239	549	217	99	164	289	0.000	0.000	0.000	0.000
ANCHOR	1326	1	-1	-26	34	43	-40	-1	-4	41	0.000	0.000	-0.000	0.000
		41	0	53	-19	55	7	0	1	7	-0.000	-0.000	0.000	0.000
		51	-37	-1	6	38	-11	-15	-67	70	0.000	0.000	-0.000	0.000
		52	0	-15	4	15	-2	0	0	2	0.000	0.000	-0.000	0.000
		53	7	11	-33	35	47	4	13	49	-0.000	-0.000	0.000	0.000
		102	37	26	37	58	49	15	68	85	0.000	0.000	0.000	0.000
		111	-1	53	19	56	-33	-1	-4	33	0.000	-0.000	-0.000	0.000
		112	39	78	56	104	82	16	71	110	0.000	0.000	0.000	0.000
		113	76	104	93	159	132	31	139	194	0.000	0.000	0.000	0.000
NOZZLE	27	1	128	155	91	220	-163	28	-23	167	-0.000	-0.000	-0.000	0.000
		41	103	-51	15	116	97	23	0	100	-0.000	0.000	-0.000	0.000
		51	127	-36	-53	142	51	29	1	58	-0.000	0.000	0.000	0.000
		52	-29	14	-4	33	-27	-6	0	28	0.000	-0.000	0.000	0.000
		53	-1	103	116	155	-21	1	-61	64	0.000	-0.000	-0.000	0.000
		102	156	117	120	229	78	35	61	105	0.000	0.000	0.000	0.000
		111	231	103	106	274	97	51	-23	113	-0.000	-0.000	-0.000	0.000
		112	387	220	226	499	175	86	84	212	0.000	0.000	0.000	0.000
		113	543	337	345	727	253	121	145	316	0.000	0.000	0.000	0.000
ANCHOR	3344	1	-6	-42	0	43	0	1	133	133	0.000	0.000	-0.000	0.000
		41	0	17	0	17	0	0	-13	13	0.000	-0.000	-0.000	0.000
		51	-40	-13	0	42	0	0	19	19	0.000	0.000	-0.000	0.000
		52	0	-5	0	5	0	0	4	4	0.000	0.000	0.000	0.000
		53	0	0	-25	25	7	-85	0	85	0.000	0.000	0.000	0.000
		102	40	17	25	50	7	85	22	88	0.000	0.000	0.000	0.000
		111	-7	-26	0	26	0	1	120	120	0.000	0.000	-0.000	0.000
		112	46	43	25	68	7	86	143	167	0.000	0.000	0.000	0.000
		113	86	60	51	117	13	171	165	238	0.000	0.000	0.000	0.000
ANCHOR	3919	1	32	-11	66	74	-82	-283	-81	305	-0.000	0.000	-0.000	0.000
		41	0	129	-2	129	8	12	151	152	0.000	-0.000	0.000	0.000
		51	-195	0	-3	195	-2	-22	0	22	0.000	-0.000	0.000	0.000
		52	0	-36	1	36	-2	-3	-42	43	-0.000	0.000	-0.000	0.000
		53	-53	-1	-324	328	0	1487	-3	1487	0.000	0.000	0.000	0.000
		102	195	37	324	380	4	1490	46	1491	0.000	0.000	0.000	0.000

GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	3919	111	31	129	64	148	-74	-271	151	319	-0.000	-0.000	-0.000	0.000
		112	227	167	388	480	78	1761	197	1773	0.000	0.000	0.000	0.000
		113	422	204	713	853	82	3251	243	3261	0.000	0.000	0.000	0.000
ANCHOR	1356	1	-1	-6	-24	24	31	1	-2	31	0.000	0.000	0.000	0.000
		41	1	32	12	34	-9	0	1	9	-0.000	-0.000	-0.000	0.000
		51	-21	-2	7	22	-13	9	-36	39	0.000	0.000	-0.000	0.000
		52	0	-9	-3	10	2	0	0	3	0.000	0.000	0.000	0.000
		53	0	-18	-52	55	64	0	0	64	0.000	0.000	0.000	0.000
		102	21	27	56	65	67	9	36	76	0.000	0.000	0.000	0.000
		111	1	32	12	34	22	0	1	22	-0.000	-0.000	0.000	0.000
		112	22	59	67	92	88	9	37	96	0.000	0.000	0.000	0.000
		113	43	86	123	156	155	18	73	172	0.000	0.000	0.000	0.000
ANCHOR	79	1	0	-2	0	2	1	0	0	1	0.000	0.000	0.000	0.000
		41	0	39	0	39	0	0	1	1	-0.000	-0.000	-0.000	0.000
		51	-7	0	0	7	0	1	-10	10	0.000	-0.000	-0.000	0.000
		52	0	-11	0	11	0	0	0	0	0.000	0.000	0.000	0.000
		53	0	4	-4	6	3	0	1	3	-0.000	-0.000	0.000	0.000
		102	7	15	4	17	3	1	10	11	0.000	0.000	0.000	0.000
		111	0	39	0	39	1	0	1	1	-0.000	-0.000	0.000	0.000
		112	7	55	4	55	4	1	11	11	0.000	0.000	0.000	0.000
		113	14	70	7	72	7	2	21	22	0.000	0.000	0.000	0.000
ANCHOR	6019	1	0	-4	0	4	0	0	3	3	0.000	0.000	-0.000	0.000
		41	-14	278	0	279	-1	0	-294	294	0.000	-0.000	-0.000	0.000
		51	-43	-3	0	43	0	-3	-112	112	0.000	0.000	-0.000	0.000
		52	4	-78	0	78	0	0	82	82	-0.000	0.000	0.000	0.000
		53	0	0	-30	30	7	-29	0	83	-0.000	-0.000	0.000	0.000
		102	47	81	30	99	19	29	194	212	0.000	0.000	0.000	0.000
		111	-14	278	0	279	-1	0	-294	294	0.000	-0.000	-0.000	0.000
		112	61	359	31	366	80	30	488	496	0.000	0.000	0.000	0.000
		113	108	440	61	458	158	59	683	703	0.000	0.000	0.000	0.000
ANCHOR	4167	1	-6	-368	-2	368	4	1	304	304	0.000	0.000	0.000	0.000
		41	5	365	-2	365	5	-4	-302	302	-0.000	-0.000	0.000	0.000
		51	31	-29	-19	47	43	-7	145	152	-0.000	0.000	0.000	0.000
		52	-1	-102	1	102	-1	1	85	85	0.000	0.000	-0.000	0.000
		53	-2	101	10	101	-74	9	-92	119	0.000	-0.000	-0.000	0.000
		102	33	203	20	206	75	11	230	242	0.000	0.000	0.000	0.000
		111	5	365	-4	365	9	-4	-302	302	-0.000	-0.000	0.000	0.000
		112	38	568	24	569	84	15	532	539	0.000	0.000	0.000	0.000
		113	79	770	44	775	150	26	762	779	0.000	0.000	0.000	0.000
ANCHOR	9716	1	2	-62	0	62	0	-1	8	8	-0.000	0.000	-0.000	0.000
		41	0	36	0	36	0	0	0	0	-0.000	-0.000	-0.000	0.000
		51	-9	-13	0	16	0	1	-19	19	0.000	0.000	0.000	0.000
		52	0	-10	0	10	0	0	0	0	0.000	0.000	0.000	0.000

GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	9716	53	0	0	-7	7	16	1	0	16	-0.000	0.000	0.000	0.000
		102	9	23	7	26	16	1	19	25	0.000	0.000	0.000	0.000
		111	2	36	0	36	0	0	8	8	-0.000	-0.000	-0.000	0.000
		112	11	59	7	61	16	1	27	32	0.000	0.000	0.000	0.000
		113	29	82	14	86	32	2	46	56	0.000	0.000	0.000	0.000
ANCHOR	2160	1	0	-5	0	5	0	0	-2	2	0.000	0.000	-0.000	0.000
		41	0	257	0	257	-2	0	2	2	-0.000	-0.000	-0.000	0.000
		51	-30	-3	0	30	-1	-3	-83	83	0.000	0.000	-0.000	0.000
		52	0	-72	0	72	0	0	-1	1	0.000	0.000	0.000	0.000
		53	0	0	-21	21	56	1	0	56	-0.000	-0.000	0.000	0.000
		102	30	75	21	84	86	3	84	101	0.000	0.000	0.000	0.000
		111	0	257	0	257	-2	0	2	3	-0.000	-0.000	-0.000	0.000
		112	31	332	21	334	58	3	86	104	0.000	0.000	0.000	0.000
		113	61	407	42	413	114	6	170	205	0.000	0.000	0.000	0.000
ANCHOR	9167	1	0	-371	-8	371	441	8	-1	441	-0.000	0.000	0.000	0.000
		41	0	392	-13	392	-422	0	-1	422	0.000	-0.000	0.000	0.000
		51	53	-76	-16	94	116	83	174	225	-0.000	0.000	0.000	0.000
		52	0	-110	4	110	118	0	0	118	-0.000	0.000	-0.000	0.000
		53	-13	92	-3	93	-146	-14	-25	149	0.000	-0.000	0.000	0.000
		102	54	201	19	209	264	83	174	327	0.000	0.000	0.000	0.000
		111	0	392	-21	393	-422	8	-1	422	0.000	-0.000	0.000	0.000
		112	54	593	40	597	696	92	176	713	0.000	0.000	0.000	0.000
		113	107	795	60	804	950	175	348	1027	0.000	0.000	0.000	0.000

GLOBAL

ACTION OF RESTRAINTS, SNUBBERS AND SUPPORTS ON PIPING

5

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.	ROTATIONS IN RADIANS X (10) THETA X	THETA Y	THETA Z	RES.
RESTRAINT	4000	1	-18	0	0	18	0.000	0.001	0.003	0.004	-7	-1	2	8
		41	-20	0	0	20	0.000	0.001	-0.000	0.001	-8	1	6	10
		51	-597	0	0	597	0.000	-0.000	0.000	0.000	0	9	1	9
		52	6	0	0	6	-0.000	-0.000	0.000	0.000	2	0	-2	3
		53	-45	0	0	45	0.000	-0.000	-0.000	0.000	-3	1	10	10
		102	603	0	0	603	0.000	0.000	0.000	0.000	5	9	11	15
		111	-38	0	0	38	0.000	0.002	0.003	0.004	-15	1	8	17
		112	641	0	0	641	0.000	0.002	0.003	0.004	21	10	20	30
		113	1244	0	0	1244	0.000	0.002	0.004	0.004	26	19	31	44
RESTRAINT	955	1	0	266	0	266	-0.004	-0.000	0.004	0.005	3	-16	15	22
		41	0	473	0	473	0.000	-0.000	0.001	0.001	-14	7	16	23
		51	0	6	0	6	0.002	-0.000	0.002	0.003	-7	8	0	10
		52	0	-132	0	132	-0.000	0.000	-0.000	0.000	4	-2	-5	6
		53	0	-107	0	107	0.000	0.000	0.003	0.003	42	26	4	50
		102	0	239	0	239	0.002	0.000	0.003	0.003	46	28	6	55
		111	0	739	0	739	-0.004	-0.000	0.004	0.006	-14	-10	31	35
		112	0	978	0	978	0.005	0.000	0.007	0.009	60	38	39	81
		113	0	1217	0	1217	0.007	0.000	0.010	0.012	106	66	47	134
RESTRAINT	8278	1	0	113	0	113	-0.009	-0.000	-0.013	0.015	39	151	2	59
		41	0	405	0	405	-0.001	-0.000	0.006	0.006	-45	7	-33	56
		51	0	-6	0	6	0.022	0.000	-0.012	0.025	-17	-282	-5	283
		52	0	-113	0	113	0.000	0.000	-0.002	0.002	13	-2	9	16
		53	0	3	0	3	-0.009	-0.000	0.037	0.038	-3	70	-23	74
		102	0	119	0	119	0.022	0.000	0.039	0.045	30	205	32	209
		111	0	518	0	518	-0.010	-0.000	-0.006	0.012	-45	-44	-33	71
		112	0	637	0	637	0.032	0.000	0.045	0.055	75	249	65	268
		113	0	757	0	757	0.054	0.000	0.084	0.100	104	453	97	475
RESTRAINT	831	1	0	446	0	446	0.015	-0.000	-0.009	0.018	44	-3	96	105
		41	0	380	0	380	0.000	-0.000	-0.003	0.003	-21	1	2	21
		51	0	-637	0	637	0.111	0.000	-0.012	0.111	-32	-59	28	72
		52	0	-107	0	107	-0.000	0.000	0.001	0.001	6	0	-1	6
		53	0	96	0	96	-0.019	-0.000	0.043	0.047	13	26	-16	33
		102	0	743	0	743	0.111	0.000	0.044	0.119	37	59	28	75
		111	0	827	0	827	0.015	-0.000	-0.013	0.020	22	-1	98	100
		112	0	1570	0	1570	0.126	0.000	0.056	0.138	60	60	126	152
		113	0	2313	0	2313	0.237	0.000	0.100	0.257	97	120	154	218
RESTRAINT	23	1	0	184	0	184	0.003	-0.000	0.005	0.006	-44	-51	13	68
		41	0	290	0	290	0.001	-0.000	-0.003	0.003	7	2	5	9
		51	0	-110	0	110	0.059	0.000	-0.012	0.060	23	-134	19	137
		52	0	-81	0	81	-0.000	0.000	0.001	0.001	-2	0	-1	2
		53	0	169	0	169	-0.013	-0.000	0.042	0.044	-9	9	-31	33
		102	0	250	0	250	0.059	0.000	0.043	0.073	25	134	32	140

EBASCO SERVICES INCORPORATED

BY RMM DATE 6-21-84 SHEET 1 OF 2

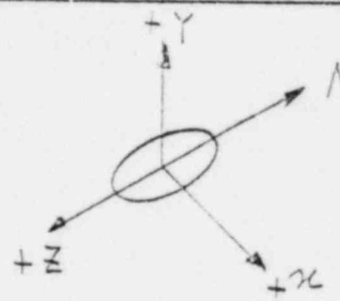
CHKD. BY J. CHOU DATE 6/21/84 OFS NO. 2965.140 DEPT. NO. 653

CLIENT L P & L

PROJECT WATERFORD SES # 3

SUBJECT ANALYSIS FOR NOZZLE PF-13

EQUIPMENT	CONDENSATE STORAGE POOL
NOZZLE	PF-13
LINE NUMBER	3CY8-653
CALC. NO.	2372
PORTION No	—
ISOMETRIC No	CD-178-4
POINT No	43
OUTPUT DATE	6/18/84



TYPE ANALYSIS	FORCES (lbs)			MOMENTS (FT-lbs)			RESULTANT OF BENDING MOMENTS
	Fx	FY	Fz	Mx	MY	Mz	
THERMAL	470	-396	-94	80	57	399	
WEIGHT	-33	379	5	-4	15	-32	
SEISMIC OBE MAX x COMPONENT	65	51	16	-11	0	69	
SEISMIC OBE MAX Y COMPONENT	10	-102	-1	1	-4	9	
SEISMIC OBE MAX Z COMPONENT	25	-9	349	-311	122	21	√(Mz²+My²)
THER. + WT + SEISMIC OBE MAX x + Y	507	532	106	91	76	445	454
THER + WT + SEISMIC OBE + MAX z + Y	467	490	439	353	198	397	353
THER + WT + SEISMIC DBE MAX x + Y	582	688	123	106	80	523	534
THER + WT + SEISMIC DBE MAX z + Y	502	601	789	700	324	427	820

EBASCO SERVICES INCORPORATED

BY R.N.H. DATE 6/21/84 SHEET 2 OF 2

CHKD. BY J. CHOU DATE 6/21/84 OFS NO. 2565.110 DEPT. NO. 655

CLIENT P.S.

PROJECT WATERFORD SES #3

SUBJECT STRESS ANALYSIS FOR NOZZLE P=.13

P=.13

CHECK BENDING STRESSES USING RESULTANT BENDING MOMENTS

FR STRESS ANALYSIS

OBE $M_R = 555^{FT\,lbs} = 6.66^{INS}$ (WORST CASE)

ANALYSIS

USE ROARK METHOD BY BLODGETT PG. T.2.8
CASE 5 EDGE SUPPORTED CENTRAL COURSE
(TRUNNION LOADING)

$r = 2.375$ IN
$r_1 = 3.3125$ IN
$t = 0.4375$ IN
$K = .283$ (SEE OTHER 6" ϕ NOZZLE)

$$M_{AX}\ S_T = \frac{6q\,M}{40\pi r_1 t^2} \log_{12}\frac{(r - r_1)}{K r}$$

$$= \frac{69 \times 6.66}{40\pi \times 3.3125 \times 0.4375^2} \log_{12}\left(\frac{2.375 - 3.3125}{0.283\,(2.375}\right)$$

$= 5.8$ KSI $\angle$ 26.5 KSI

NO USED TO CHECK DBE THE ALLOW. BAR EXCEED OBE/DBE

581/8-81

EBASCO SERVICES INCORPORATED

BY RMM DATE 6-21-84 SHEET 1 OF 1

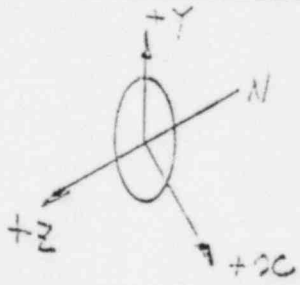
CHKD. BY J CHOU DATE 6/21/84 OFS NO. 2365.140 DEPT. NO. 653

CLIENT L P & L

PROJECT WATERFORD SES #3

SUBJECT STRESS ANALYSIS FOR NOZZLE P2-15

EQUIPMENT	CONDENSATE STORAGE POOL
NOZZLE	P2-15
LINE NUMBER	3CD6-61A
CALC NO.	2372
PORTION NO	—
ISOMETRIC NO	CD-178-5
POINT NO	62
OUTPUT DATE	



TYPE ANALYSIS	FORCES (lbs)			MOMENTS (ft-lbs)			RESULTANT OF BENDING MOMENTS
	Fx	Fy	Fz	Mx	My	Mz	
THERMAL	-105	-328	12	-75	-7	-584	
WEIGHT	-2	588	-7	13	-11	1	
SEISMIC OBE MAX X COMPONENT	-93	27	2	-3	2	-214	
SEISMI OBE MAX Y COMPONENT	1	-159	2	-3	3	0	
SEISMIC OBE MAX Z COMPONENT	3	7	-95	285	96	16	$\sqrt{M_x^2+M_z^2}$
THER + WT + SEISMIC OBE MAX X +Y	201	774	11	63	23	797	780
THER + WT + SEISMIC OBE + MAX Z +Y	111	754	100	350	117	599	694
THER + WT + SEISMIC OBE MAX X +Y	295	960	15	74	29	1011	1014
THER + WT + SEISMIC OBE MAX Z +Y	115	920	201	638	216	615	336

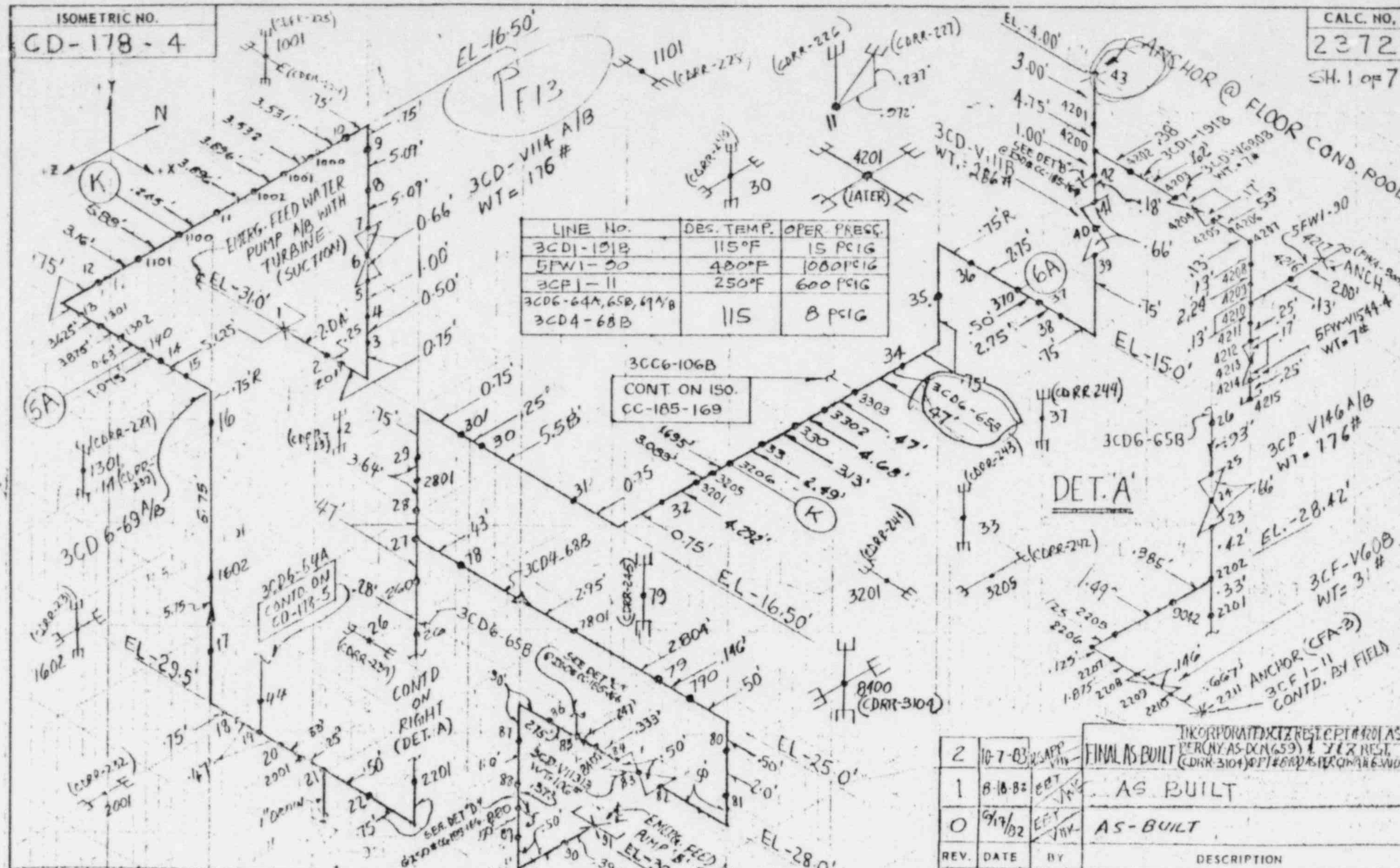
LOADS HAVE BEEN REDUCED PER STRESS CALC REV #1 (C.T.S)

RESULTANT MOMENTS ARE LESS THAN MOMENTS USED IN ORIGINAL CALCS NO NEED FOR FURTHER ANALYSIS.

ISOMETRIC NO. CD-178 - 4

CALC. NO. 2372

SH. 1 of 7



LINE No.	DES. TEMP.	OPER. PRESS.
3CD1-191B	115°F	15 PSIG
5FW1-30	480°F	1080 PSIG
3CF1-11	250°F	600 PSIG
3CD6-64A, 65B, 69A/B 3CD4-68B	115	8 PSIG

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G. FACTOR	REF. DWGS.	REV	DATE
3CD1-191B	1.315	.133	CS-1	100			25					
5FW1-30	1.315	.179	CS-1	100			1400					
3CD6-69A/B	6.625"	0.280"	CS-1, A-106B	100	.228	Ec = 27.9 x 10⁶ Eh = 27.95 x 10⁶	50			LOU-1564 G-176 SH. 2	5	4-23-82
3CD6-64A, 65B							50	DYNAMIC ☐	Hor. Y = .30			
3CF1-11	1.315"	.179"		135			1000	STATIC ☑	VERT. Y = .27			
3CD4-68B	4.500"	.237"		100			50	THERMAL ☑	HORIZ. Z = .38			

REV.	DATE	BY	DESCRIPTION
2	10-7-83		FINAL AS BUILT — INCORPORATED CTZ REST. @ PT #4201 AS PER (NY-AS-DCN 659) & "Z" REST. (CDRR-3104) @ PT #8100 AS PER ...
1	8-18-82		AS BUILT
0	6/17/82		AS-BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD # 3

AUX. BLDG. CONDENSATE PIPING SYSTEM

DR. G.S. DATE: 1-22-76
CH. SC DATE: 1-23-76

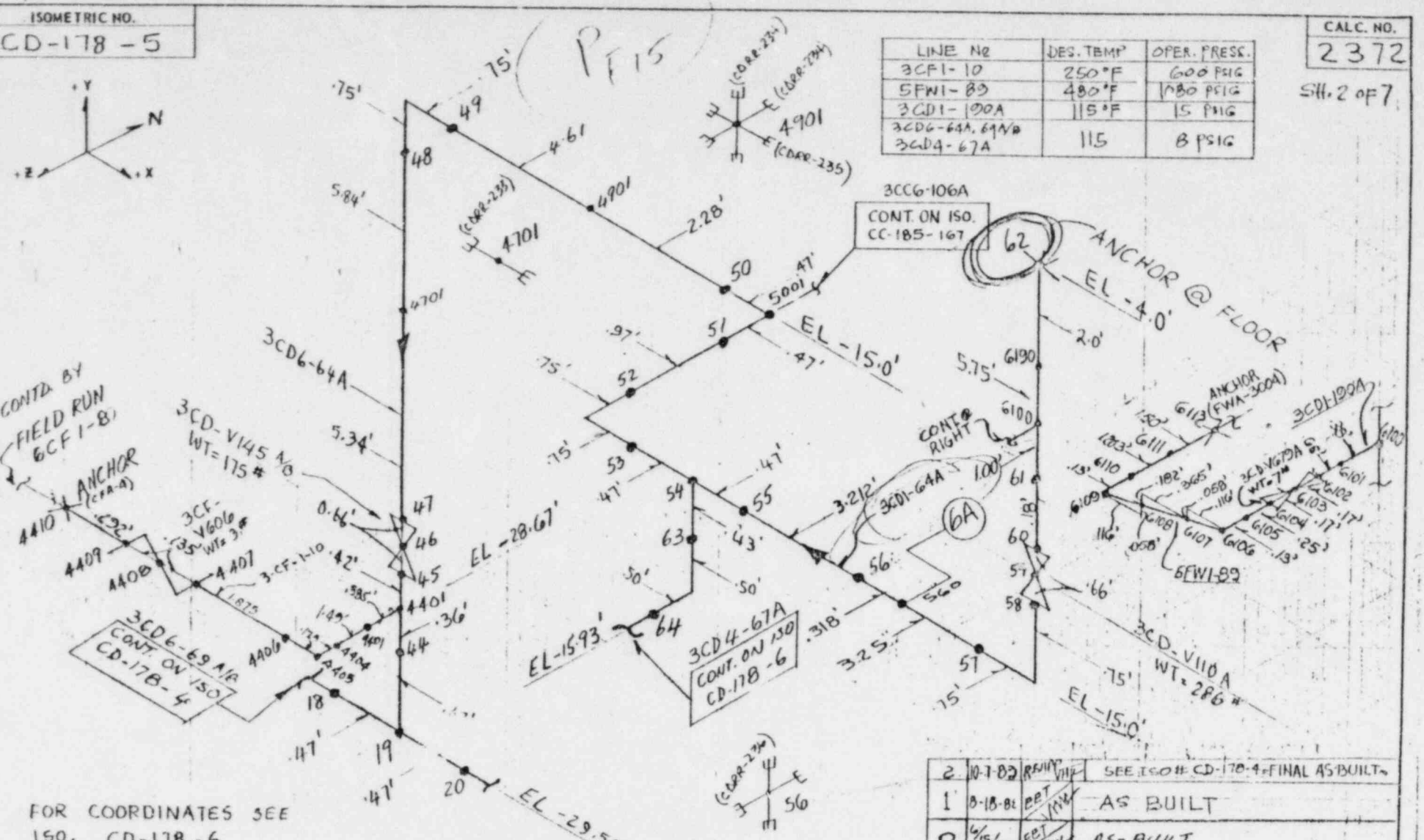
ISOMETRIC NO. CD-178 - 4

ISOMETRIC NO.
CD-178-5

CALC. NO.
2372

SH. 2 OF 7

LINE Nº	DES. TEMP	OPER. PRESS.
3CF1-10	250°F	600 PSIG
5FW1-89	480°F	1080 PSIG
3CD1-100A	115°F	15 PSIG
3CD6-64A, 69A/B 3CD4-67A	115	8 PSIG



FOR COORDINATES SEE
ISO. CD-178-6
WELDING TEES @ PTS. 19,54

REV.	DATE	BY	DESCRIPTION
2	10-7-82	RFW/VHF	SEE ISO # CD-178-4 = FINAL AS BUILT
1	8-18-82	EBT/VHF	AS BUILT
0	4/15/82	EBT/VHF	AS-BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD #3

AUX. BLDG. CONDENSATE PIPING SYSTEM

DR. G.S. DATE: 1-22-76
CH. S.C. DATE: 1-23-76

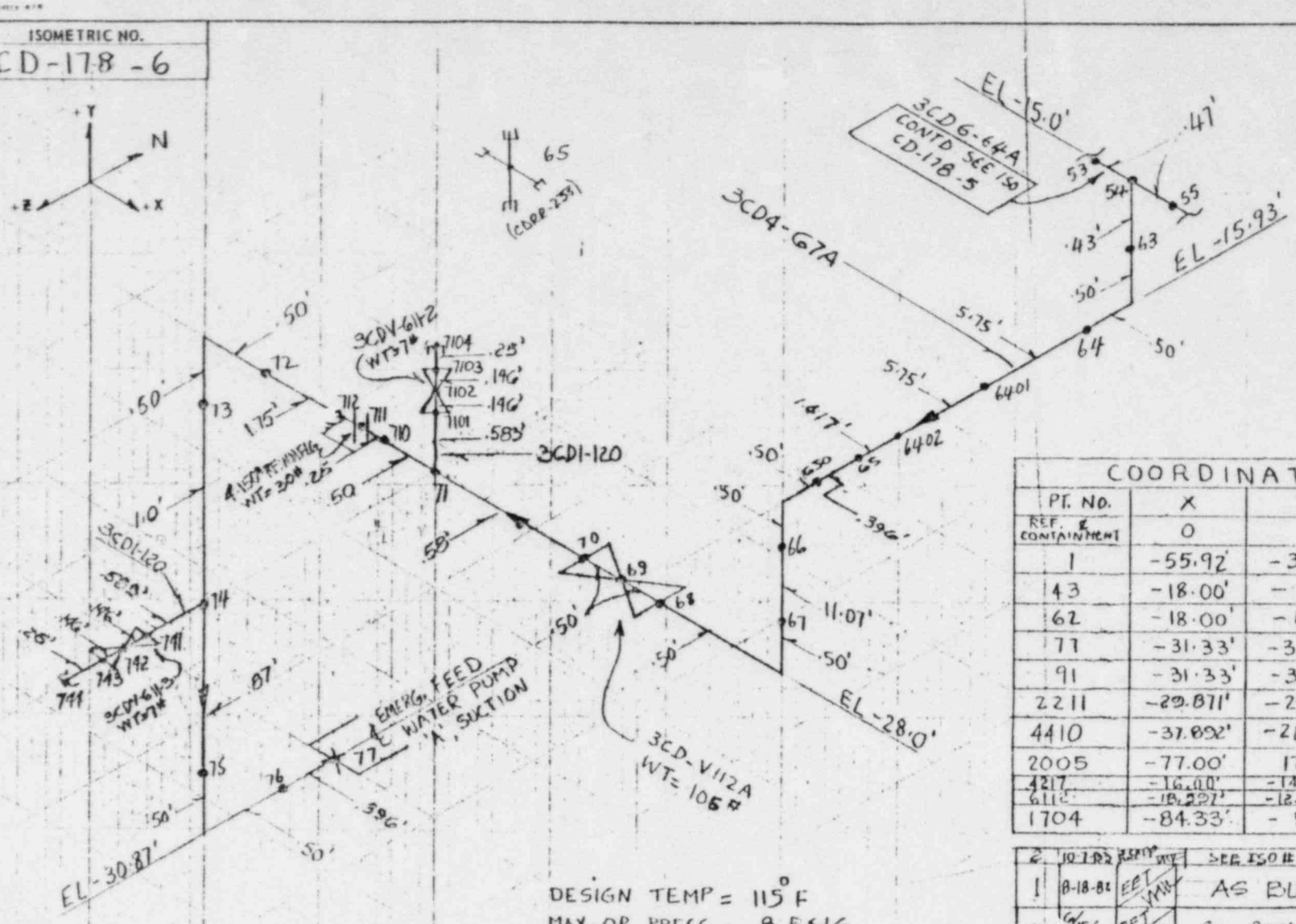
ISOMETRIC NO.
CD-178-5

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CD6-69A/B, 64A	6.625"	0.280"	CS-1, A-106B	100	.228	Cc = 27.9 x 10⁶ Eh = 27.85 x 10⁶	50			LDW-1564 G-178 SH. 2	2	4-23-82
3CP1-10	1.315"	.179"		135			1000	DYNAMIC ☐	HOR. X-.38			
3CD1-61A	4.500"	0.237"		100			50	STATIC ☑	VERT. Y-.27			
3CD1-100A 5FW1-89	1.315	.133 .179	CS	100			25 1400	THERMAL ☑	HOF Z-.38			

ISOMETRIC NO.
CD-178-6

CALC. NO.
2372

SH. 3 of 7



DESIGN TEMP = 115° F
MAX. OP. PRESS = 8 P.S.I.G

COORDINATES			
PT. NO.	X	Y	Z
REF. & CONTAINMENT	0	0	0
1	-55.92'	-31.00'	112.16'
43	-18.00'	-4.00'	116.00'
62	-18.00'	-4.00'	140.00'
77	-31.33'	-30.87'	153.42'
91	-31.33'	-30.87'	136.92'
2211	-29.811'	-28.42'	139.81
4410	-37.892'	-28.67'	139.81
2005	-77.00'	17.51'	91.00'
4217	-16.00'	-14.25'	113.67'
6112	-18.227'	-12.948'	138.207'
1704	-84.33'	-5.66'	91.00'

REV.	DATE	BY	DESCRIPTION
2	10-1-82	EET YMK	SEE ISO # CD-178-4 = FINAL AS-BUILT
1	8-18-82	EET YMK	AS BUILT
0	6/15/82	EET YMK	AS. BUILT

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CD6-69A/64	6.625"	0.280"	C5-1, A-106B	100	.228	$E_c = 27.9 \times 10^6$ $E_m = 27.85 \times 10^6$	50			LDU-1564' G-176 SH.2	0	4-23-82
3CD4-67A	11.500"	0.237"	↓	↓	↓	↓	50	DYNAMIC ☐	$[108 \cdot X + .38]$			
3CD1-120	1.315	.179	C5-1	100			50	STATIC ☑	VERT. Y+.27			
								THERMAL ☑	HORIZ. Z+.38			

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD # 3

AUX. BLDG. CONDENSATE PIPING SYSTEM.

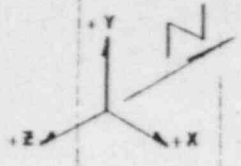
DR. G.S. DATE 1-22-76
CH. S.C. DATE 1-23-76

ISOMETRIC NO.
CD-178-6

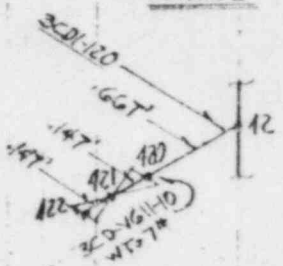
ISOMETRIC NO.
CC-185-166

PT. 1702, CALC 2507 DATE 7-1-77

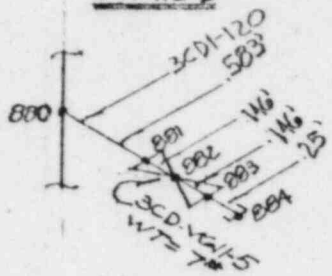
D(x)	D(y)	D(z)	R(x)	R(y)	R(z)
0	-.013	.022	-.00029	.00017	0



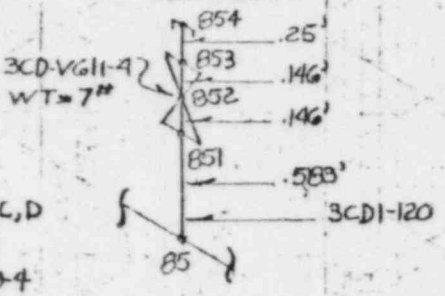
DETAIL "B"



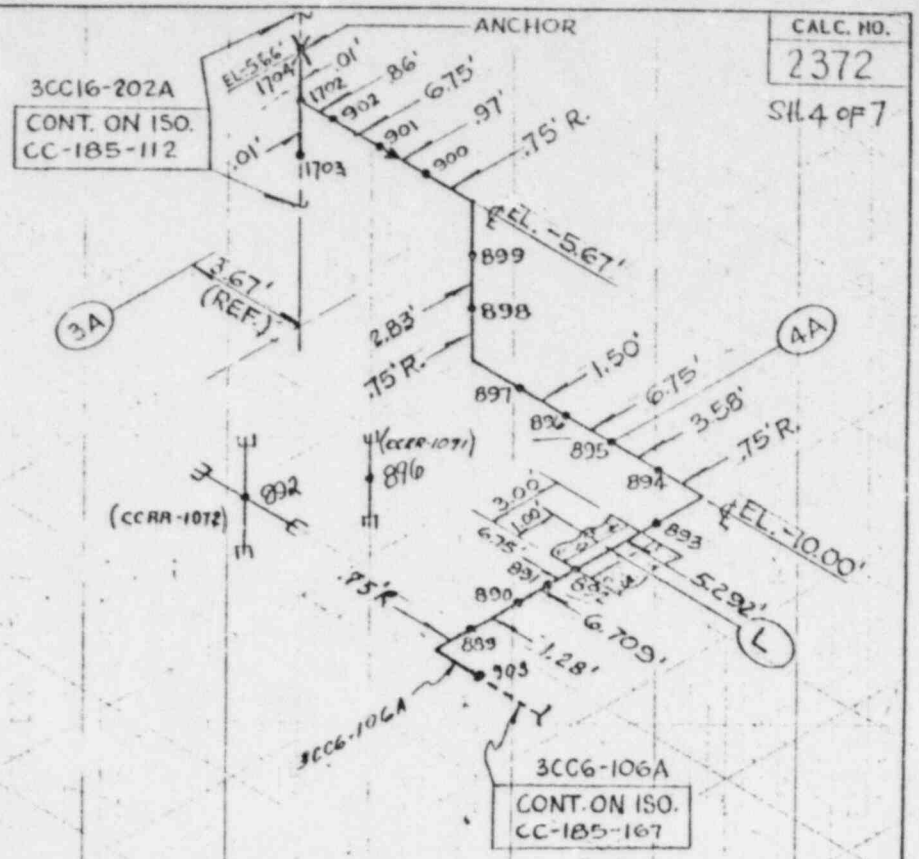
DETAIL "D"



DETAIL "C"



NOTE: DETAILS; B, C, D COME FROM I60 # CD-178-4



CALC. NO.
2372

SH. 4 OF 7

FOR COORDINATES SEE ISO: CD-178-6

FOR LINES: (202A & 106A)

DES. TEMP. = 125 °F

OP. PRESS. = 60 PSIG

LINE 3CD1-120

DES. TEMP. = 115 °F

OPER. PRESS. = 8 PSIG

REV.	DATE	BY	DESCRIPTION
2	11-7-83	RSAHP	SEE ISO # CD-178-4 = FINAL AS BUILT
1	8-10-82	EET	AS BUILT
0	6-15-82	EET	AS-BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD #3
AUXILIARY BLDG.
COMPONENT COOLING PIPING

W. TOMACHECK DRN. DATE: 8-18-76
R. SAHI CH. DATE: 8-19-76

ISOMETRIC NO.
CC-185-166

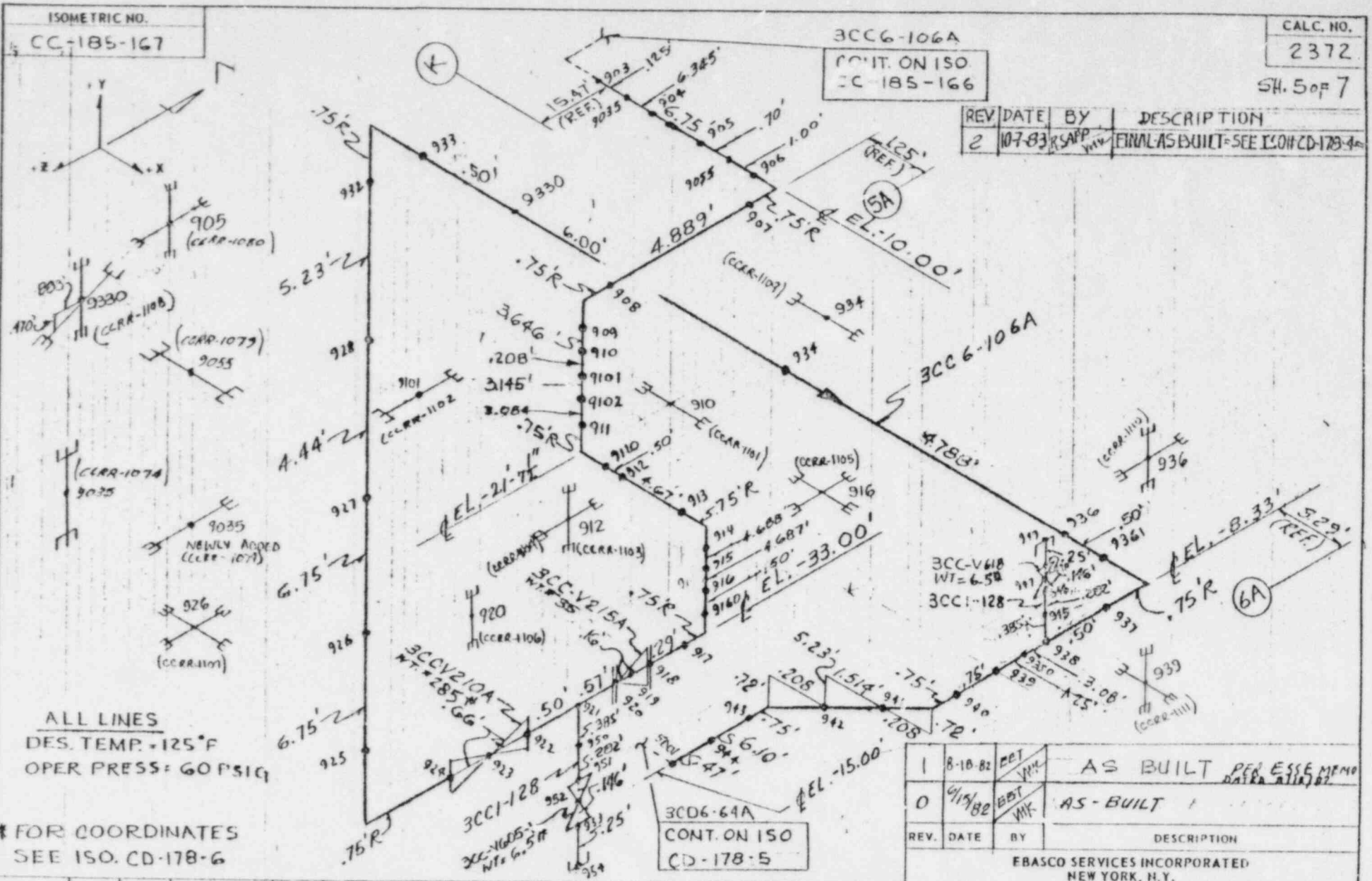
LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CC16-202A	16.000	.375"	CS1 A106 Gr B	95			75			CCD-1584 & 185 SHT. 2, 5, 6	2	5-27-82
3CC6-106A	6.625	.28"	"	"			"	DYNAMIC ☐	Ho R. X. .38			
3CD1-120	1.315	.179	CS-1	100			60	STATIC ☑	VERT. Y .27			
								THERMAL ☑	HORIZ Z .38			

ISOMETRIC NO.
CC-185-167

CALC. NO.
2372

SH. 5 OF 7

REV	DATE	BY	DESCRIPTION
2	10-7-83	RSAPP VMK	FINAL AS BUILT - SEE ISO CD-178-4



ALL LINES
DES. TEMP. = 125°F
OPER PRESS = 60 PSIG

* FOR COORDINATES SEE ISO. CD-178-6

REV.	DATE	BY	DESCRIPTION
1	8-10-82	EBT VMK	AS BUILT PER ESSE MEMO DATED 8/18/82
0	6/15/82	EBT VMK	AS-BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD 3
AUXILIARY BLDG.
COMPONENT COOLING PIPING

DR. L.B DATE 2-22-77
CH. G. KRISHNAN DATE 3-3-77

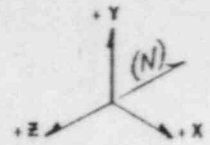
ISOMETRIC NO.
CC-IE 5-167

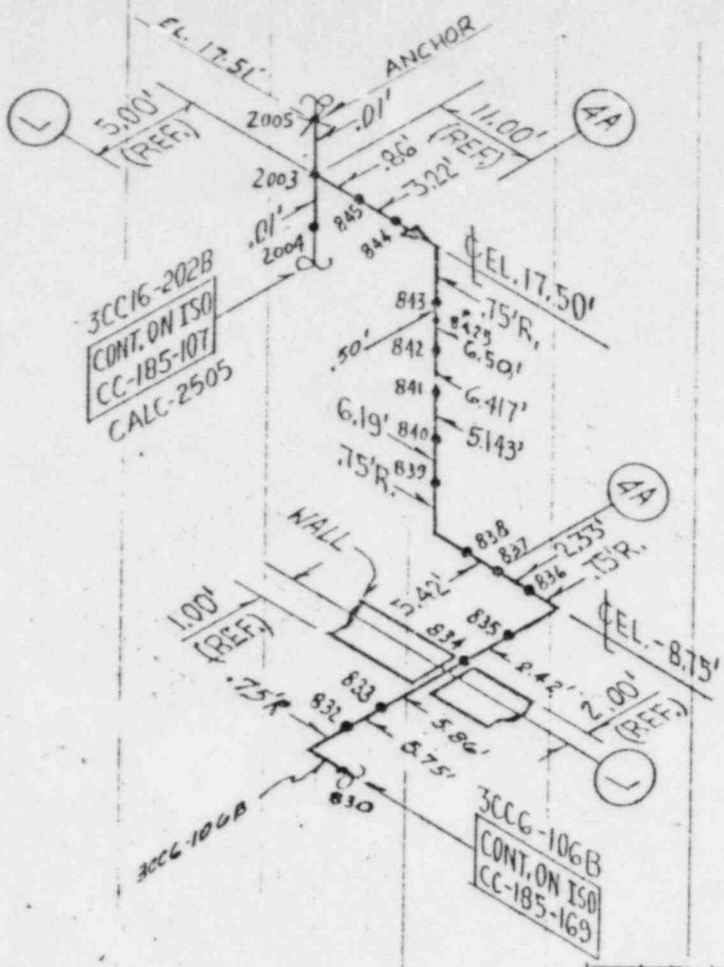
LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
								DYNAMIC ☐	HOR. X-.38	LOU-1664 C-185 SH. 5	9	5-27-82
3CC1-128	1.315	.179	SS-1A106GRB	95			75	STATIC ☒	VERT. Y-.27			
3CC6-106A	6.625	.280	↓	↓			↓	THERMAL ☒	HORIZ. Z-.35			

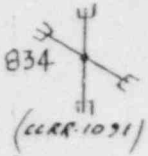
ISOMETRIC NO.
CC-185-168

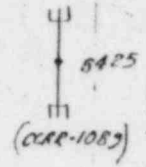
CALC. NO.
2372

SH. 6 OF 7









ALL LINES } FOR COORDINATES SEE ISO: CD-178-6
DESIGN TEMP.= 125°F
OPER. PRESS.= 60 PSIG

PT. 2003, CALC 2505, DATE - 9-23-77

D(X)	D(Y)	D(Z)	R(X)	R(Y)	R(Z)
-.001	-.032	.01	-.0002	.00031	-.00004

REV.	DATE	BY	DESCRIPTION
2	10-7-83	RSAPR WW	FINAL AS BUILT - SEE ISO# CD-178-4
1	8-18-82	EET VHK	AS BUILT
0	4/15/82	EET VHK	AS-BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD #3
AUXILIARY BLDG.
COMPONENT COOLING PIPING

DR. R. PIRONIC:AK DATE: 8-19-76
CH. R. SAHI DATE: 8-19-76

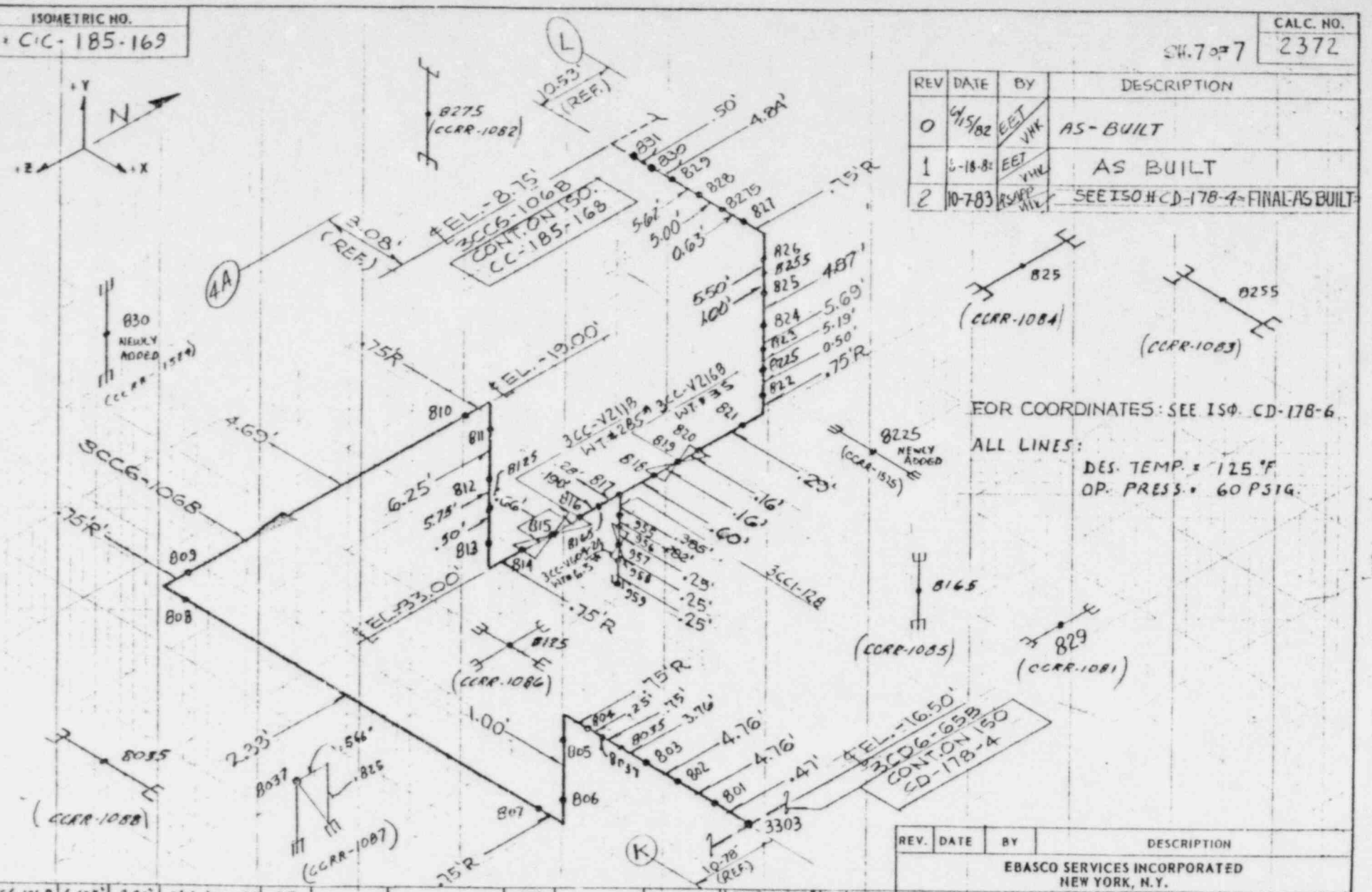
ISOMETRIC NO.
CC-185-168

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CC6-106B	6.625	.280"	CS-1A 106 GR.B	95			75	DYNAMIC ☐	HOR-X-.38	LOU 1564 G-185 SHTS. 1,2,5&6	0	5-27-81
3CC16-202B	16.000"	.375"	↓	↓			↓	STATIC ☒	VERT-Y-.27			
								THERMAL ☒	HORIZ-Z-.38			

ISOMETRIC NO.	CALC. NO.
CC-185-169	2372

SH. 7 OF 7

REV	DATE	BY	DESCRIPTION
0	6/15/82	EET / VHK	AS-BUILT
1	6-18-82	EET / VHK	AS BUILT
2	10-7-83	RSWP / VHK	SEE ISO # CD-178-4 - FINAL AS BUILT



LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CC6-106B	6-.625"	.280"	CS-1 A-106 GR B	95			75			LOU-1564, G-185 SH. 5	0	5-27-82
3CC1-12B	1.315"	.179"	CS-1 A-106 GR B	95			75	DYNAMIC ☐	|bR.X+.38			
								STATIC ☒	VERT. y=.27				
								THERMAL ☒	HORIZ. Z=.38				

REV.	DATE	BY	DESCRIPTION

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD #3
AUXILIARY BLDG.
COMPONENT COOLING PIPING.

P.Colaneri

DR. P.COLANERI DATE: 8-19-76
CH. R. SAHI DATE: 8-20-76

ISOMETRIC NO.
CC-185-169

```
2372       TC    3   13       R SAPP     WATERFORD #3 REACTOR AUX BLDG CONDENSATE
 & CC PIPING ISO CD-178-4,5,6  CC-185-166,167,168,169  REV 2 (FINAL AS-BUILT)
2372       FA    1
2372       1LC   1                                              NORMAL OPERATING
2372       1LC   1                                              OPERATING WEIGHT
2372  10 41LC    13                                             X-STATIC
2372   1 51LC     98        58                                  Y-STATIC
2372   1 52LC     98                  27                      Z-STATIC
2372   1 53LC  11000                             38            MAXIMUM OF X AND Z
2372  10101CC    14    1     51      53                       MAXIMUM OF HORIZONTAL PLUS
2372  10102CC   111          101      52                       THERMAL + WEIGHT
2372  10110CC     0    B       1      41                       HIGHER OF (TH+WT) OR WT
2372  10111CC   1 4    B      41     110                       OBE + HI (TH+WT) OR WT
2372  10112CC   111    B     111     102                       DBE + HI (TH+WT) OR WT
2372  10113CC   121    B     111   2.102                       DESIGN EQ 9
2372  10652CS    12    3      41     102
```

*GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
NOZZLE	1	1	4	-32	34	47	175	-83	-10	194	-0.000	0.000	-0.000	0.000
		41	7	-296	3	296	9	2	-117	118	-0.000	0.000	-0.000	0.000
		51	-194	-245	3	312	41	185	-112	220	0.000	0.000	-0.000	0.000
		52	-2	80	-1	80	-2	-1	32	32	0.000	-0.000	0.000	0.000
		53	0	-9	-166	167	-194	411	-3	435	0.000	0.000	0.000	0.000
		102	196	325	167	414	147	411	144	460	0.000	0.000	0.000	0.000
		111	11	-328	37	330	184	-81	-127	233	-0.000	0.000	-0.000	0.000
		112	207	653	284	715	331	492	271	652	0.000	0.000	0.000	0.000
		113	403	978	371	1121	478	903	415	1103	0.000	0.000	0.000	0.000
ANCHOR	4217	1	-11	16	8	21	-20	-18	6	27	0.000	-0.000	-0.000	0.000
		41	5	17	4	18	-20	10	0	23	-0.000	-0.000	-0.000	0.000
		51	-10	-2	0	10	3	-17	-3	17	0.000	0.000	0.000	0.000
		52	-1	-5	-1	5	6	-3	0	6	0.000	0.000	0.000	0.000
		53	1	-5	-21	22	2	1	0	2	-0.000	0.000	0.000	0.000
		102	11	10	22	27	9	19	3	21	0.000	0.000	0.000	0.000
		111	-6	33	12	36	-40	10	6	42	0.000	-0.000	-0.000	0.000
		112	18	43	34	58	49	29	9	57	0.000	0.000	0.000	0.000
		113	29	53	56	82	58	48	12	76	0.000	0.000	0.000	0.000
ANCHOR	43	1	470	-396	-94	622	80	57	399	411	-0.000	0.000	0.000	0.000
		41	-38	379	5	381	-4	15	-32	36	0.000	-0.000	-0.000	0.000
		51	65	51	16	84	-14	0	69	70	-0.000	-0.000	-0.000	0.000
		52	10	-102	-1	103	1	-4	9	10	-0.000	0.000	0.000	0.000
		53	25	-9	349	350	-311	122	21	335	-0.000	0.000	-0.000	0.000
		102	75	153	350	389	312	126	78	345	0.000	0.000	0.000	0.000
		111	433	379	-89	582	76	71	367	381	-0.000	-0.000	0.000	0.000
		112	508	533	439	857	388	196	445	622	0.000	0.000	0.000	0.000
		113	583	686	789	1197	700	324	522	931	0.000	0.000	0.000	0.000
ANCHOR	6112	1	-8	10	19	23	-15	-17	2	23	0.000	-0.000	-0.000	0.000
		41	1	5	8	9	-6	0	-1	6	-0.000	-0.000	-0.000	0.000
		51	-4	-1	-8	9	0	-5	0	5	0.000	0.000	0.000	0.000
		52	0	-1	-2	3	2	0	0	2	0.000	0.000	0.000	0.000
		53	-3	-2	-37	37	1	2	0	2	0.000	0.000	0.000	0.000
		102	5	4	39	40	3	5	0	6	0.000	0.000	0.000	0.000
		111	-7	15	27	31	-21	-18	1	27	0.000	-0.000	-0.000	0.000
		112	11	19	66	70	23	23	1	33	0.000	0.000	0.000	0.000
		113	16	22	106	109	26	28	2	38	0.000	0.000	0.000	0.000
ANCHOR	62	1	-105	-322	12	339	-75	-7	-584	589	0.000	0.000	-0.000	0.000
		41	-2	588	-7	588	13	-11	1	17	0.000	-0.000	0.000	0.000
		51	-93	27	2	97	-3	2	-214	214	0.000	-0.000	-0.000	0.000
		52	1	-159	2	159	-3	3	0	5	-0.000	0.000	-0.000	0.000
		53	3	7	-95	95	295	96	16	302	-0.000	-0.000	0.000	0.000
		102	93	186	96	229	289	99	214	373	0.000	0.000	0.000	0.000

GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	62	111	-107	588	-7	597	-62	-18	-582	586	0.000	-0.000	0.000	0.000
		112	200	773	103	805	351	117	796	878	0.000	0.000	0.000	0.000
		113	293	959	200	1022	640	216	1010	1215	0.000	0.000	0.000	0.000
NOZZLE	77	1	13	45	-4	47	-64	29	68	97	-0.000	-0.000	0.000	0.000
		41	-3	138	3	138	-106	-13	26	109	0.000	-0.000	-0.000	0.000
		51	+141	-29	0	144	23	-111	218	246	0.000	0.000	-0.000	0.000
		52	1	-37	-1	37	28	4	-7	30	-0.000	0.000	0.000	0.000
		53	-2	-2	-118	118	-143	260	15	297	0.000	0.000	0.000	0.000
		102	142	66	119	197	171	264	225	387	0.000	0.000	0.000	0.000
		111	10	183	3	183	-169	16	94	194	-0.000	-0.000	-0.000	0.000
		112	152	249	122	317	340	280	319	544	0.000	0.000	0.000	0.000
		113	294	315	240	494	512	544	544	924	0.000	0.000	0.000	0.000
NOZZLE	91	1	-3	-17	5	17	18	-7	22	30	0.000	0.000	-0.000	0.000
		41	9	83	2	84	-58	4	-12	59	-0.000	-0.000	-0.000	0.000
		51	-68	-22	-4	71	11	-43	88	98	0.000	0.000	0.000	0.000
		52	-2	-23	0	23	16	-1	3	16	0.000	0.000	0.000	0.000
		53	0	-1	-1	1	-14	-21	-4	26	-0.000	0.000	0.000	0.000
		102	70	44	4	83	30	44	91	105	0.000	0.000	0.000	0.000
		111	9	83	6	84	-58	4	-12	59	-0.000	-0.000	-0.000	0.000
		112	79	128	10	151	88	48	102	143	0.000	0.000	0.000	0.000
		113	149	172	14	228	118	92	193	244	0.000	0.000	0.000	0.000
ANCHOR	4410	1	47	7	-26	54	2	29	14	33	-0.000	-0.000	0.000	0.000
		41	-5	9	2	11	-1	-2	7	8	0.000	-0.000	-0.000	0.000
		51	-25	0	8	26	0	-7	1	8	0.000	-0.000	-0.000	0.000
		52	1	-3	-1	3	0	1	-2	2	-0.000	0.000	0.000	0.000
		53	6	2	-4	8	0	3	3	4	-0.000	-0.000	0.000	0.000
		102	26	4	9	28	1	8	5	10	0.000	0.000	0.000	0.000
		111	42	16	-24	51	-1	27	21	35	-0.000	-0.000	0.000	0.000
		112	69	21	33	79	2	35	27	44	0.000	0.000	0.000	0.000
		113	95	25	42	107	3	43	32	54	0.000	0.000	0.000	0.000
ANCHOR	2211	1	-43	8	-19	48	2	-24	-17	29	0.000	-0.000	0.000	0.000
		41	-3	8	-1	9	-2	-1	-5	6	0.000	-0.000	0.000	0.000
		51	-19	-1	-5	20	0	+5	2	5	0.000	0.000	0.000	0.000
		52	1	-2	0	2	1	0	1	2	-0.000	0.000	-0.000	0.000
		53	2	1	-6	6	0	-7	-3	7	-0.000	-0.000	0.000	0.000
		102	20	3	6	21	1	7	4	8	0.000	0.000	0.000	0.000
		111	-46	16	-20	52	-2	-24	-22	33	0.000	-0.000	0.000	0.000
		112	66	19	26	73	3	31	26	40	0.000	0.000	0.000	0.000
		113	86	23	31	94	4	38	30	48	0.000	0.000	0.000	0.000
CONNECTION	2005	1	56	-920	-8	922	-39	47	-3772	3773	-0.001	-0.032	0.010	0.034
		41	3	99	1	99	0	-14	103	104	-0.000	-0.000	-0.000	0.000
		51	-134	35	3	139	-9	-5	80	81	0.000	-0.000	-0.000	0.000
		52	-1	-27	0	27	0	4	-28	28	0.000	0.000	0.000	0.000

GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	JNT NO.	CASE NO.	FORCES IN LBS Fx	Fy	Fz	RES.	MOMENTS IN FT-LBS Mx	My	Mz	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
CONNECTION	2005	53	-2	2	-73	73	-60	151	5	162	0.000	-0.000	0.000	0.000
		102	135	61	73	165	60	155	.08	198	0.000	0.000	0.000	0.000
		111	59	-822	-7	824	-39	33	-3669	3669	-0.001	-0.032	0.010	0.034
		112	194	883	81	908	99	188	3777	3783	0.001	0.032	0.010	0.034
		113	329	944	154	1012	159	343	3885	3904	0.001	0.032	0.010	0.034
CONNECTION	1704	1	114	-98	26	153	-112	-234	-607	660	-0.000	-0.013	0.022	0.026
		41	14	174	6	175	104	-86	187	230	-0.000	-0.000	-0.000	0.000
		51	-276	68	9	285	-35	-72	299	309	0.000	-0.000	-0.000	0.000
		52	-4	-47	-2	47	-28	23	-50	62	0.000	0.000	0.000	0.000
		53	39	-23	-208	213	219	1081	-111	1109	-0.000	0.000	0.000	0.000
		102	280	115	210	368	247	1104	349	1184	0.000	0.000	0.000	0.000
		111	126	174	32	218	104	-320	-420	538	-0.000	-0.013	0.022	0.026
		112	408	289	242	555	351	1424	769	1656	0.000	0.013	0.022	0.026
		113	688	404	451	916	598	2528	1118	2828	0.000	0.013	0.022	0.026

X

EBASCO SERVICES INCORPORATED

BY RMH DATE 6/17/92

CHKD. BY J. CHOU DATE 6/21/94

SHEET 1 OF 1

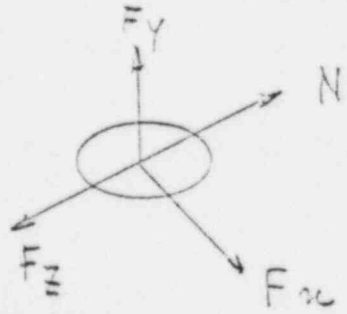
CLIENT L P & L

OFS NO. 7865.120 DEPT. NO. 553

PROJECT WATERFORD SES # 3

SUBJECT STRESS ANALYSIS FOR NOZZLE P.16

EQUIPMENT	CONTAINMENT PENETRATION
NOZZLE	P= 16
LINE NUMBER	3003-125 A1A
CALC NO.	7690
PORTION NO	-
ISOMETRIC NO	07.203.13
POINT NO	1
OUTPUT DATE	

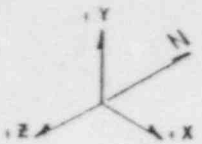


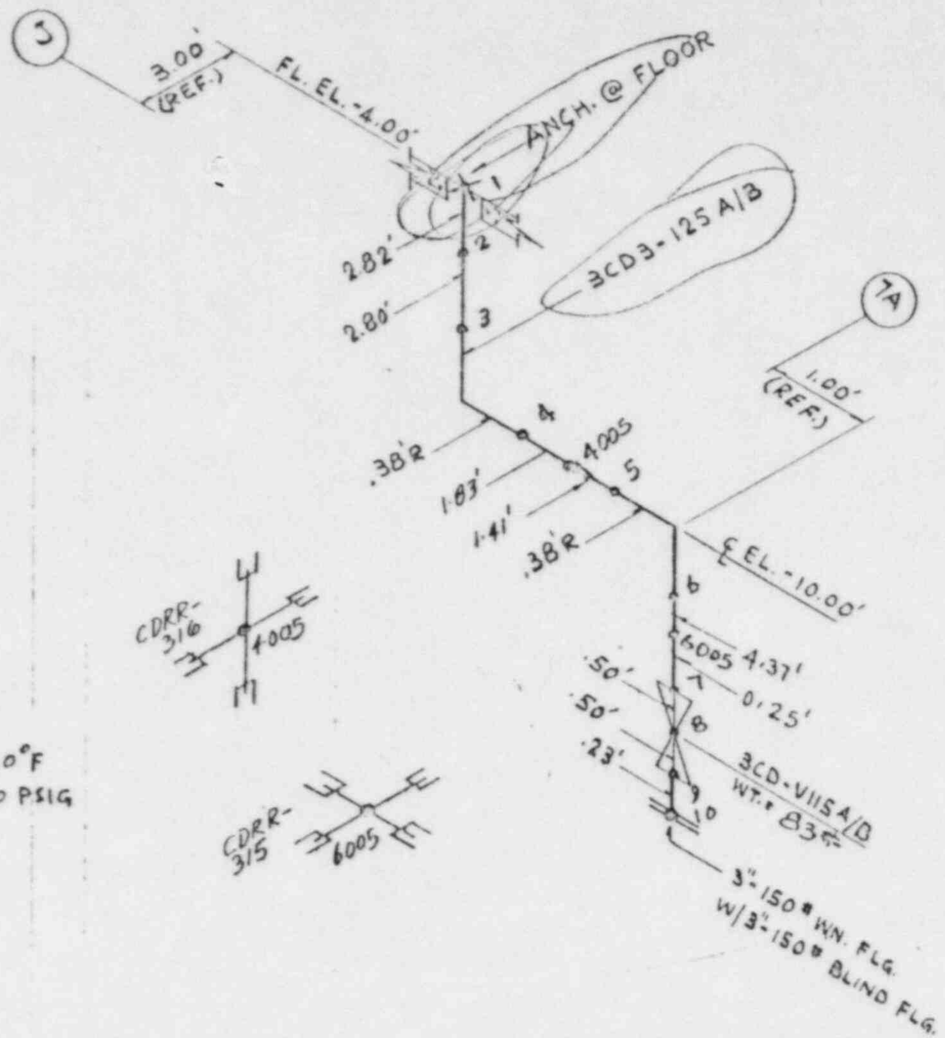
TYPE ANALYSIS	FORCES (LBS)			MOMENTS (FT-LBS)			RESULTANT OF BENDING MOMENTS
	FX	FY	FZ	MX	MY	MZ	
THERMAL	17	-70	0	0	0	24	
WEIGHT	-13	-15	0	0	0	-59	
SEISMIC OBE MAX X COMPONENT	-45	+10	0	0	0	-125	
SEISMI OBE MAX Y COMPONENT	4	3	0	0	0	13	
SEISMIC OBE MAX Z COMPONENT	0	0	-16	30	-10	0	$\sqrt{MX^2+MY^2}$
THER. +WT+SEISMIC OBE MAX X +Y	62	93	0	0	0	205	203
THER +WT + SEISMIC OBE +MAX Z +Y	17	93	16	30	10	77	33
THER + WT + SEISMIC DBE MAX X +Y	111	106	0	0	0	351	351
THER + WT + SEISMIC DBE MAX Z +Y	21	86	32	60	20	95	111

NO NEED TO CHECK, RESULTANT MOMENTS SAME AS THE GREATER OF THE TWO BENDING MOMENTS

ISOMETRIC NO.
CD-204-13

CALC. NO.
2690





COORDINATES			
℄	X	Y	Z
RPV	0	0	0
PT. # 1	-3.00'	-4.00'	153.00'
" 10	1.00'	-16.23'	153.00'

DESIGN TEMP. = 120°F
OPER. PRESS. = 20 PSIG

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3CD3-125A/B	3.500	.216"	CS-1 A-106 GR.B	100	.228"	Ec = 27.9 x 10⁶ Eh = 27.9 x 10⁶	50	DYNAMIC ☐ STATIC ☒ THERMAL ☒	VERT. .30 HORIZ. X = .45 Z = .35	LOU 1564 G-204 SH. 4	2	1-14-77

REV.	DATE	BY	DESCRIPTION

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD NO. 3
REACTOR AUXILIARY BLDG.
MISCELLANEOUS PIPING.

DR. P. SHARDA DATE: 2-11-77
CH. G. KRISHNAN DATE: 3-3-77

ISOMETRIC NO.
CD-204-13

CASE	LOADING CASE TITLE	ANALYSIS TYPE	EQ	STRESS OUTPUT	REFERENCE CASE	GX	GY	GZ	EST. WT. STRESS
1	NORMAL OPERATING	EXPANSION	10	THERMAL EXPANSION	1				0
41	OPERATING WEIGHT ANALYSIS	OPER. WEIGHT	8	SUSTAINED LOAD	1		-1.0		0
51	X-INERTIA OBE STATIC	SEISMIC	9	OCCASIONAL LOAD UPSET	1	0.45			0
52	Y-INERTIA OBE STATIC	SEISMIC	9	OCCASIONAL LOAD UPSET	1		0.3		0
53	Z-INERTIA OBE STATIC	SEISMIC	9	OCCASIONAL LOAD UPSET	1			0.35	0

****

CASE	COMBINATION CASE TITLE	METHOD	EQ	STRESS OUTPUT	PRES CASE	FACT	CASE	FACT	CASE	FACT	CASE	FACT	CASE	E.WT STRS
254	MAXIMUM OF X AND Z	MAX COMPO	9	OCCASIONAL LOAD UPSET	1	1.0	51	1.0	53					0
255	MAXIMUM OF HORIZONTAL PLUS Y	ADD ABS VALS	9	OCCASIONAL LOAD UPSET	1	1.0	254	1.0	52					0

PERFORM FREQUENCY ANALYSIS

ACTION OF PIPING ON ANCHORS,SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	-17.	70.	0.	0.	0.	-24.	72.	24.
RESTRAINT	4005	0.	-70.	0.				70.	
RESTRAINT	4005	0.	0.	0.				0.	
RESTRAINT	6005	17.	0.	0.				17.	
RESTRAINT	6005	0.	0.	0.				0.	
TOTAL		-0.	-0.	0.					

ACTION OF PIPING ON ANCHORS,SUPPORTS AND RESTRAINTS

	POINT NO.	----- FORCES IN POUNDS ----- FX	FY	FZ	----- MOMENTS IN FOOT POUNDS ----- MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	13.	10.	0.	0.	0.	59.	16.	59.
RESTRAINT	4005	0.	-253.	0.				253.	
RESTRAINT	4005	0.	0.	0.				0.	
RESTRAINT	6005	-13.	0.	0.				13.	
RESTRAINT	6005	0.	0.	0.				0.	
TOTAL		-0.	-244.	0.					

ACTION OF PIPING ON ANCHORS,SUPPORTS AND RESTRAINTS

	POINT NO.	----- FORCES IN POUNDS ----- FX	FY	FZ	----- MOMENTS IN FOOT POUNDS ----- MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	45.	-10.	0.	0.	0.	128.	46.	128.
RESTRAINT	4005	0.	10.	0.				10.	
RESTRAINT	4005	0.	0.	0.				0.	
RESTRAINT	6005	64.	0.	0.				64.	
RESTRAINT	6005	0.	0.	0.				0.	
TOTAL		110.	-0.	0.					

ACTION OF PIPING ON ANCHORS,SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	-4.	-3.	0.	0.	0.	-18.	5.	18.
RESTRAINT	4005	0.	76.	0.				76.	
RESTRAINT	4005	0.	0.	0.				0.	
RESTRAINT	6005	4.	0.	0.				4.	
RESTRAINT	6005	0.	0.	0.				0.	
TOTAL		0.	73.	0.					

ACTION OF PIPING ON ANCHORS,SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	0.	0.	16.	-30.	10.	0.	16.	31.
RESTRAINT	4005	0.	0.	0.				0.	
RESTRAINT	4005	0.	0.	24.				24.	
RESTRAINT	6005	0.	0.	0.				0.	
RESTRAINT	6005	0.	0.	45.				45.	
TOTAL		0.	0.	85.					

ACTION OF PIPING ON ANCHORS,SUPPORTS AND RESTRAINTS

	POINT NO.	FORCES IN POUNDS FX	FY	FZ	MOMENTS IN FOOT POUNDS MX	MY	MZ	RESULTANT FORCE	RESULTANT MOMENT
ANCHOR	1	49.	13.	16.	30.	10.	146.	53.	149.
RESTRAINT	4005	0.	86.	0.				86.	
RESTRAINT	4005	0.	0.	24.				24.	
RESTRAINT	6005	68.	0.	0.				68.	
RESTRAINT	6005	0.	0.	45.				45.	

EBASCO SERVICES INCORPORATED

BY RMH DATE 6-21-94 SHEET 1 OF 1

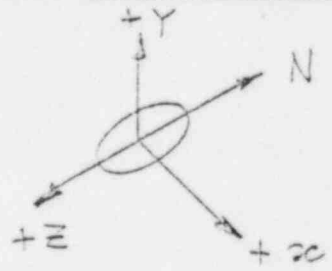
CHKD. BY J. CHOU DATE 6/21/94 OFS NO. 2355.140 DEPT. NO. 655

CLIENT L P & L

PROJECT WATERFORD SES # 3

SUBJECT STRESS ANALYSIS FOR NOZZLE PF-12

EQUIPMENT	CONDENSATE STORAGE POOL
NOZZLE	PF-12
LINE NUMBER	3006-12"-S
CALC. NO.	2502
PORTION NO	-
ISOMETRIC NO	CC-123-91
POINT NO	1
OUTPUT DATE	6/15/94

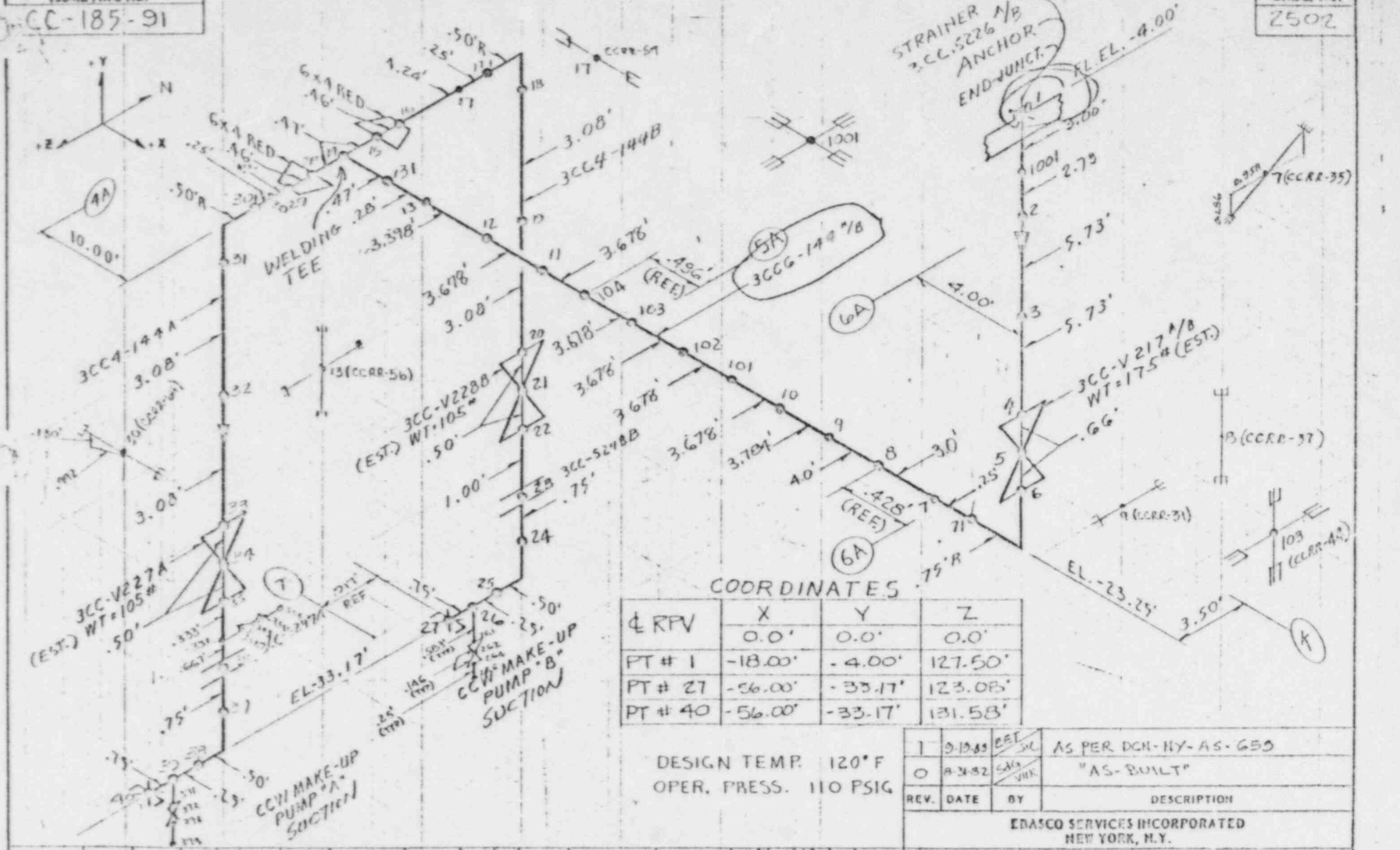


TYPE ANALYSIS	FORCES (lbs)			MOMENTS (Ft-lbs)			RESULTANT SUSTAINED MOMENTS
	Fx	Fy	Fz	Mx	My	Mz	
THERMAL	412	-503	22	-19	33	351	
WEIGHT	13	599	1	-1	-1	11	
SEISMIC OBE MAX X COMPONENT	141	30	-1	1	-1	132	
SEISMIC OBE MAX Y COMPONENT	-4	-180	0	0	0	-3	
SEISMIC OBE MAX Z COMPONENT	-1	35	119	-113	16	-1	$\sqrt{Mx^2+Mz^2}$
THER + WT + SEISMIC OBE MAX X + Y	570	809	24	21	33	499	500
THER + WT + SEISMIC OBE + MAX Z + Y	430	814	142	133	15	366	390
THER + WT + SEISMIC OBE MAX X + Y	715	1019	28	22	34	636	636
THER + WT + SEISMIC OBE MAX Z + Y	435	1029	261	246	64	370	444

RESULTANT MOMENTS SHALL BE THE GREATER OF THE TWO SUSTAINED MOMENTS TO BE USED FOR PIPE STRESS ANALYSIS.

ISOMETRIC NO.
CC-185-91

CALC. NO.
2502



COORDINATES

℄ RPV	X	Y	Z
	0.0'	0.0'	0.0'
PT # 1	-18.00'	-4.00'	127.50'
PT # 27	-56.00'	-33.17'	123.08'
PT # 40	-56.00'	-33.17'	131.58'

DESIGN TEMP. 120° F
OPER. PRESS. 110 PSIG

REV.	DATE	BY	DESCRIPTION
1	9-19-83	EET	AS PER DCN-NY-AS-659
0	8-31-82	SAG	"AS-BUILT"

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD 3
REACTOR AUXILIARY BLDG
COMPONENT COOLING WATER PIPING

DR. W.P.B. DATE 8-6-75
CH. WMF DATE 8-15-75

ISOMETRIC NO. CC 185-91

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G.FACTOR	REF. DWGS.	REV	DATE
3CC4-144	4.500	.237	CS-1 A-106 B	104	.721	Ec=27.9x10^6 Eh=27.?x10^6	125			LOU-1364 G-185 SH 5	9	5/27/82
[illegible]	1.500	.237						DYNAMIC ☐				
[illegible]	5.625	.280						STATIC ☑	VERT 0.30			
								THERMAL ☑	HORIZ [illegible]			

```
2502       TC    3   13ED TRINIDAD      WATERFORD #3 REACTOR AUX BLDG COMPONENT
COOLING PIPING ISO CC-185-91  REV 1   (AS BUILT)
2502       FA    1
2502       HLC   1                                  FREQUENCY ANALYSIS
2502       HLC   1                                  NORMAL OPERATING.
2502    10 41LC  13                                 OPERATING WEIGHT
2502     1 51LC  1100       38                      X-STATIC
2502     1 52LC  110                30              Y-STATIC
2502     1 53LC  1100                       33      Z-STATIC
2502    10161CC   14    1     51     53             MAXIMUM OF X AND Z
2502    10162CC   111         101     52            MAXIMUM OF HORIZONTAL PLUS Y
2502    10105CC    8          1      41            THERMAL + WEIGHT
2502    10111CC   1 4         41     105           HI OF (TH +WT) OR WT
2502    10112CC   111    8    111    102           OBE + HI (TH+WT) OR WT
2502    10113CC   121    8    111   2.102          OBE + HI (TH+WT) OR WT
2502    10652CS   12     3    41     102           DESIGN EQ 9
```

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	1	1	412	-582	22	650	-19	33	351	353	-0.000	0.000	-0.000	0.000
		41	13	599	1	599	-1	-1	11	11	-0.000	-0.000	-0.000	0.000
		51	141	34	-1	145	1	-1	134	134	-0.000	-0.000	0.000	0.000
		52	-9	-180	0	180	0	0	-3	3	0.000	0.000	0.000	0.000
		53	-1	35	119	124	-113	16	-1	114	0.000	-0.000	-0.000	0.000
		102	145	215	119	285	113	17	137	179	0.000	0.000	0.000	0.000
		111	425	599	22	734	-19	32	362	364	-0.000	-0.000	-0.000	0.000
		112	570	814	141	1003	132	49	500	519	0.000	0.000	0.000	0.000
		113	715	1028	260	1279	245	65	637	685	0.000	0.000	0.000	0.000
NOZZLE	27	1	6	156	19	157	251	-1	-12	251	-0.000	-0.000	-0.000	0.000
		41	2	297	-10	297	350	-1	-4	350	-0.000	-0.000	0.000	0.000
		51	-72	6	1	72	13	59	56	83	0.000	-0.000	-0.000	0.000
		52	-1	-89	3	89	-105	0	1	105	0.000	0.000	-0.000	0.000
		53	8	10	-60	60	-26	-2	0	26	-0.000	-0.000	0.000	0.000
		102	73	99	63	138	131	60	58	155	0.000	0.000	0.000	0.000
		111	6	453	-10	453	601	-3	-17	601	-0.000	-0.000	0.000	0.000
		112	80	552	73	562	732	63	74	738	0.000	0.000	0.000	0.000
		113	153	651	135	682	863	122	132	882	0.000	0.000	0.000	0.000
NOZZLE	88	1	8	415	-43	418	452	-25	-9	453	-0.000	-0.000	0.000	0.000
		41	5	238	-3	238	286	-6	-6	286	-0.000	-0.000	0.000	0.000
		51	-71	-44	3	83	-50	131	37	145	0.000	0.000	-0.000	0.000
		52	-1	-71	1	71	-86	2	2	86	0.000	0.000	-0.000	0.000
		53	8	3	-62	63	-37	1	-1	37	-0.000	-0.000	0.000	0.000
		102	72	115	63	150	135	133	39	194	0.000	0.000	0.000	0.000
		111	11	653	-46	655	738	-31	-15	739	-0.000	-0.000	0.000	0.000
		112	83	768	110	781	874	164	54	891	0.000	0.000	0.000	0.000
		113	154	884	173	914	1009	297	94	1056	0.000	0.000	0.000	0.000

EBASCO SERVICES INCORPORATED

BY RMH DATE 6/17/84 SHEET 1 OF 1

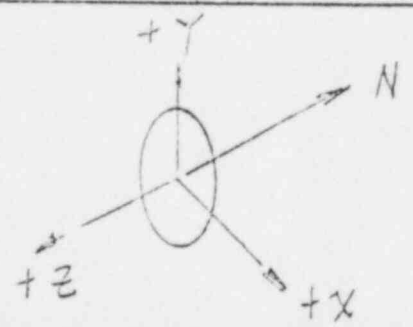
CHKD. BY J. CHOU DATE 6/21/84 OFS NO. 7865.142 DEPT. NO. 453

CLIENT L P & L

PROJECT WATERFORD SES #3

SUBJECT STRESS ANALYSIS FOR NOZZLE PW 19

EQUIPMENT	CONTAINMENT SPRAY PUMP
NOZZLE	PW 19
LINE NUMBER	3001-96 A/B
CALC. NO.	2688
PORTION NO	-
ISOMETRIC NO	CD-204-11
POINT NO	1
OUTPUT DATE	6/18/84



TYPE ANALYSIS	FORCES (LBS)			MOMENTS (FT-LBS)			RESULTANT OF BENDING MOMENTS
	FX	FY	FZ	MX	MY	MZ	
THERMAL	8	-41	-1	25	13	-158	
WEIGHT	1	81	-1	-126	7	11	
SEISMIC OBE MAX X COMPONENT	-185	15	18	-12	-209	15	
SEISMIC OBE MAX Y COMPONENT	0	22	0	31	-2	-12	
SEISMIC OBE MAX Z COMPONENT	0	-2	-23	23	2	-9	$\sqrt{MX^2+MY^2}$
THER + WT + SEISMIC OBE MAX X +Y	194	118	20	172	271	141	321
THER + WT + SEISMIC OBE MAX Z +Y	9	105	30	183	24	133	183
THER + WT + SEISMIC DBE MAX X +Y	379	155	38	218	522	171	566
THER + WT + SEISMIC DBE MAX Z +Y	9	129	58	240	28	156	242

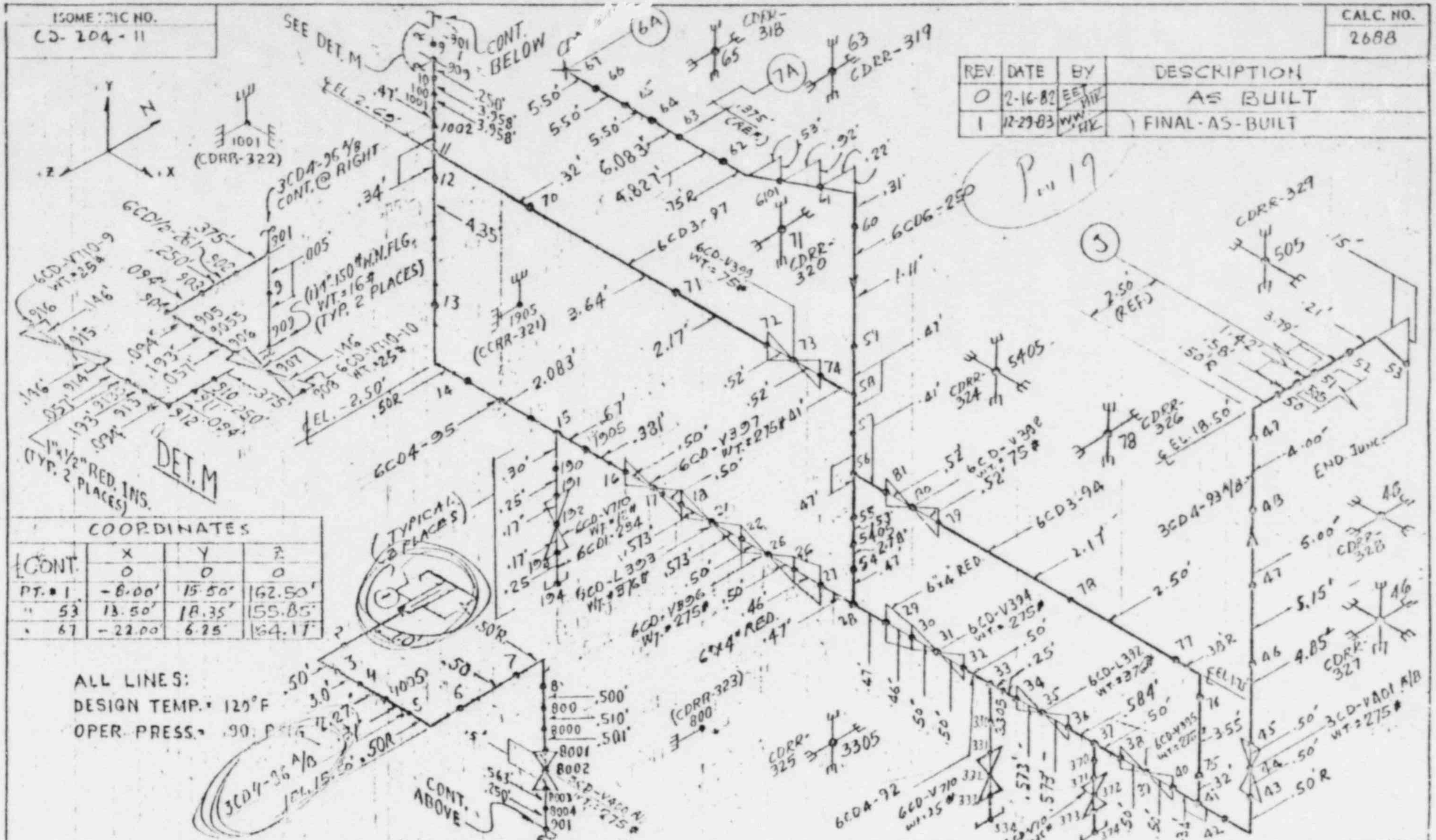
LOADS HAVE BEEN REDUCED PER STRESS CALC KEN 4-12-23-55

RESULTANT MOMENTS ARE LESS THAN MOMENTS USED IN ORIGINAL CALCS. NO NEED FOR FURTHER ANALYSIS.

ISOMETRIC NO. CD-204-11

CALC. NO. 2688

REV.	DATE	BY	DESCRIPTION
0	2-16-82	EET / MHZ	AS BUILT
1	12-29-83	WW / HK	FINAL-AS-BUILT



CONT.	X	Y	Z
	0	0	0
PT. 1	-8.00'	15.50'	162.50'
" 53	13.50'	18.35'	155.85'
" 67	-22.00'	6.25'	164.17'

ALL LINES:
DESIGN TEMP. = 120°F
OPER. PRESS. = 90 PSIG

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
6CD6-250	6.625	.280	3S-1 3S-TP-304	109			150			LOU 1564 G-204 SH. 4	6	7.15.82
6CD1/2-261	0.840	.109		109						LOU 1564 G-169	13	10.28.83
3CD4-93 A/B, 36 A/B	4.500	.237		100								
6CD4-92												
6CD4-95								DYNAMIC ☐				
6CD3-94	3.500	.216						STATIC ☒	VERT. y=.27			
6CD3-97	3.500	.216										
6CD1-234	1.315	.133		109				THERMAL ☒	HORIZ. x=.38 z=.38			

REV.	DATE	BY	DESCRIPTION

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD NO 3
REACTOR AUXILIARY BLDG.
MISCELLANEOUS PIPING

DR. P. SHARDA DATE: 2-10-77
CH. G. KRISHNAN DATE: 3-3-77

ISOMETRIC NO. CD-204-11

```
2688       TC    2  123WW                WATERFORD #3 REACTOR AUX BLDG COMPONENT
MISC. PIPING ISO#CD-204-11,REV.1          CALC.#2688  (FINAL-AS-BUILT)
2688   1   CA     1
2688       1LC    1                                   NORMAL OPERATING
2688  10 41LC    13                                   OPERATING WEIGHT
2688   1 51LC    11          38                       X STATIC
2688   1 52LC    11                    27             Y STATIC
2688   1 53LC    11                                38 Z-STATIC
2688  10101CC    14    1      51      53             MAXIMUM OF X AND Z
2688  10102CC   111           101      52             MAXIMUM OF HORIZONTAL PLUS Y
2688  10110CC     0    8        1      41             THERMAL + WEIGHT
2688  10111CC     1    8        8      91     110     HIGHER OF (TH+WT) OR WT
2688  10112CC   111    8      111      91     102     OBE + HI (TH+WT) OR WT
2688  10113CC   121    0      111   2.102     102     OBE + HI (TH+WT) OR WT
2688  10652CS    12    3       41     102             DESIGN EQ-7
```

GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
ANCHOR	1	1	8	-41	-1	42	25	13	-158	160	-0.000	0.000	0.000	0.000
		41	1	81	-1	81	-126	7	44	133	-0.000	-0.000	0.000	0.000
		51	-185	15	18	186	-12	-249	18	250	0.000	-0.000	-0.000	0.000
		52	0	-22	0	22	34	-2	-12	36	0.000	0.000	-0.000	0.000
		53	0	-2	-28	28	23	2	-9	25	-0.000	0.000	0.000	0.000
		102	185	37	29	191	57	251	30	260	0.000	0.000	0.000	0.000
		111	9	81	-2	82	-126	20	-114	171	-0.000	-0.000	0.000	0.000
		112	194	118	31	229	182	272	144	358	0.000	0.000	0.000	0.000
		113	379	155	59	414	239	523	175	601	0.000	0.000	0.000	0.000
ANCHOR	67	1	1328	-30	-3	1328	-63	12	-108	126	-0.000	0.000	0.000	0.000
		41	7	171	-2	171	-13	7	226	227	-0.000	-0.000	0.000	0.000
		51	-312	0	0	312	0	-1	-1	2	0.000	0.000	-0.000	0.000
		52	-2	-46	1	46	4	-2	-61	61	0.000	0.000	-0.000	0.000
		53	8	1	-69	70	-6	101	3	101	-0.000	-0.000	0.000	0.000
		102	314	47	70	325	9	103	64	122	0.000	0.000	0.000	0.000
		111	1335	171	-5	1346	-76	19	226	240	-0.000	-0.000	0.000	0.000
		112	1649	218	75	1665	86	122	290	326	0.000	0.000	0.000	0.000
		113	1963	285	144	1986	95	224	354	430	0.000	0.000	0.000	0.000

EBASCO SERVICES INCORPORATED

BY RMM DATE 6/20/84 SHEET 1 OF 1

CHKD. BY J. CHOU DATE 6/21/84 OFS NO. 2865.140 DEPT. NO. 653

CLIENT L P & L

PROJECT WATERFORD SES #3

SUBJECT STRESS ANALYSIS FOR NOZZLE PN 18

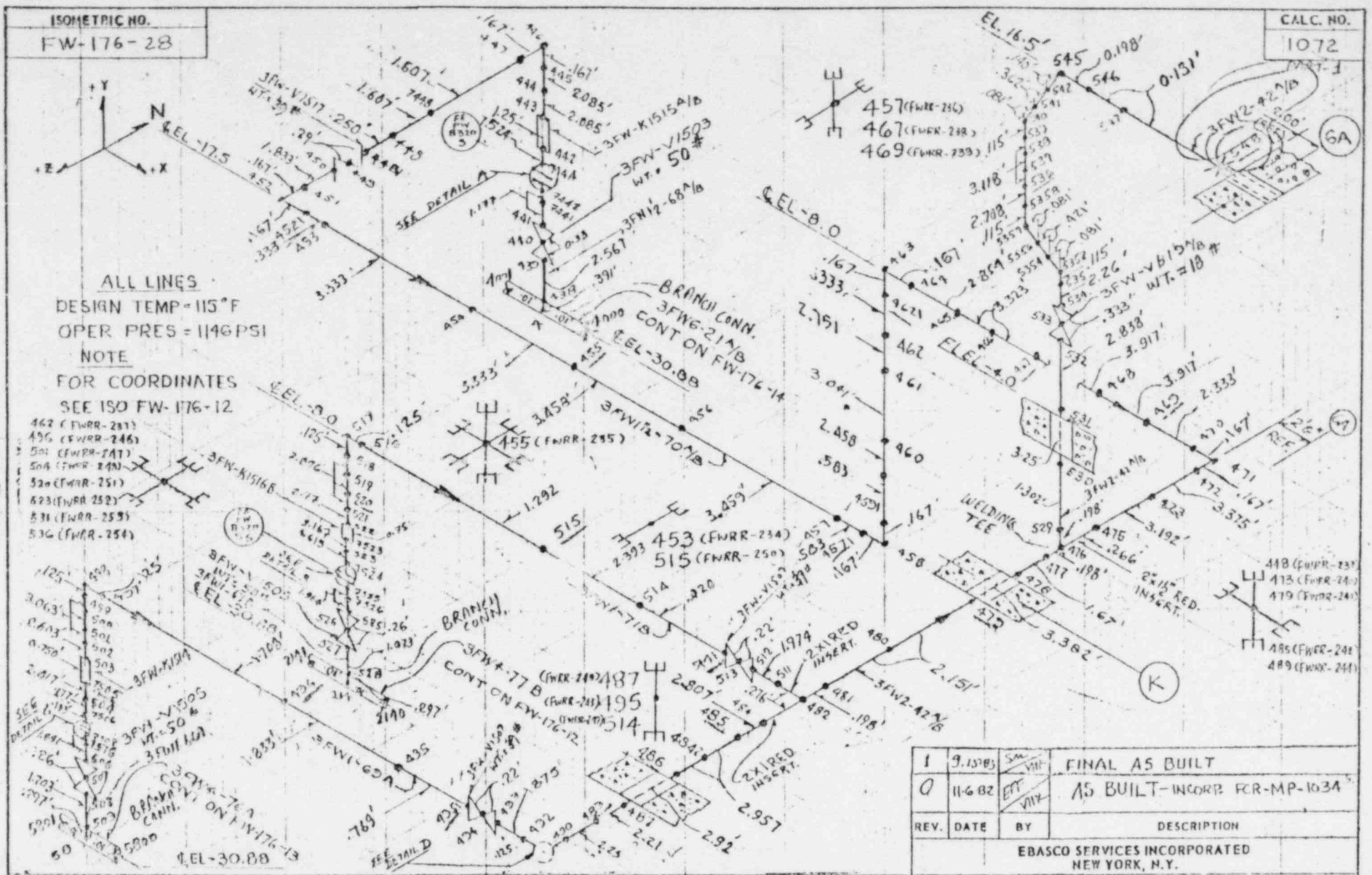
EQUIPMENT	CONTAINMENT SPRAY PIPE
NOZZLE	PN 18
LINE NUMBER	3"-SI-12"-3
CALC. NO.	1072
PORTION NO	1
ISOMETRIC NO	FN-176-23
POINT NO	948
OUTPUT DATE	6/19/84

TYPE ANALYSIS	FORCES (lbs)			MOMENTS (FT-lbs)			RESULTANT RESULTANT OF BENDING MOMENTS
	FX	FY	FZ	MX	MY	MZ	
THERMAL	0	-79	0	38	0	37	
WEIGHT	1	185	3	-80	-1	-84	
SEISMIC OBE MAX X COMPONENT	-17	0	0	0	-17	-17	
SEISMIC OBE MAX Y COMPONENT	0	-35	1	24	0	25	
SEISMIC OBE MAX Z COMPONENT	0	1	-16	22	-8	-1	$\sqrt{M_Y^2+M_Z^2}$
THER + WT + SEISMIC OBE MAX X +Y	16	238	4	104	6	126	126
THER + WT + SEISMIC OBE + MAX Z +Y	1	239	20	126	9	110	112
THER + WT + SEISMIC DBE MAX X + Y	31	293	17	128	11	169	169
THER + WT + SEISMIC DBE MAX Z + Y	33	295	37	172	17	136	137

OK BY INSPECTION, RESULTANT MOMENTS ARE LESS THAN THOSE OF NOZZLE PN 20 SEE CALCS FOR PN 20.

ISOMETRIC NO.
FW-176-28

CALC. NO.
1072



REV.	DATE	BY	DESCRIPTION
1	9-15-83	SM / VIK	FINAL AS BUILT
0	11-6-82	ETT / VIK	AS BUILT-INCORP FCR-MP-1034

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT "3"
FEEDWATER PIPING
AUXILIARY BLDG

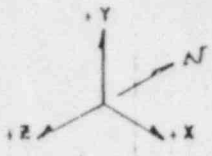
LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
SFW1-6A	1.315	.179	A106-GR-1	100			1400			LOU-1564 G-176 SH-1	10	10/13/83
SFW1-6B	1.315	.179						DYNAMIC ☐	WPTA X: 3A	LOU-1564 G-176 SH-2	9	10/13/83
SFW1-6C	1.315	.179						STATIC ☒	VERT. Y: 3D			
SFW1-6D	1.900	.200					1300	THERMAL ☒	HORIZ. Z: 3B			
SFW1-6E	2.375	.218										

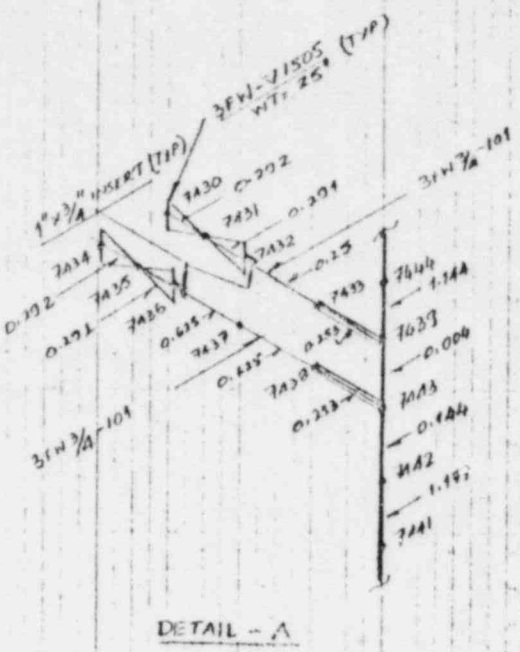
DR. FAC DATE: 1-23-76
CH. JH DATE: 5-6-76

ISOMETRIC NO.
FW-176-28

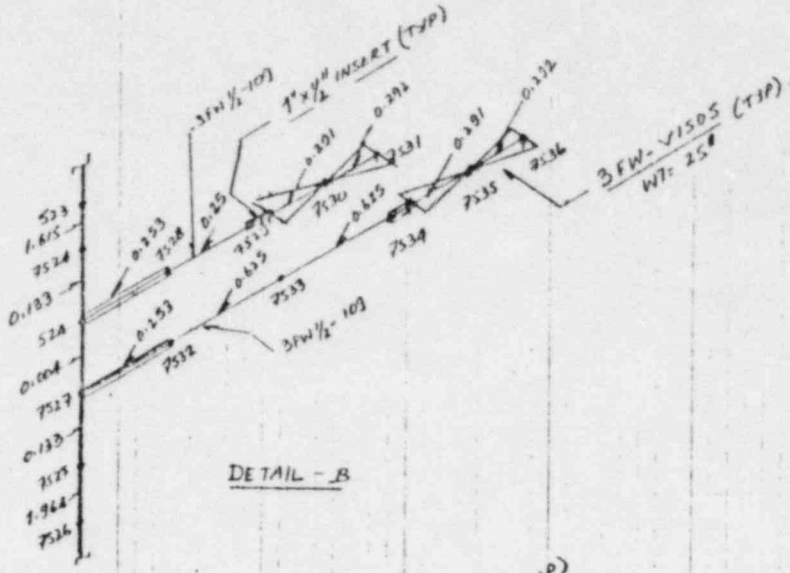
ISOMETRIC NO.

CALC. NO. 1072 PART-1

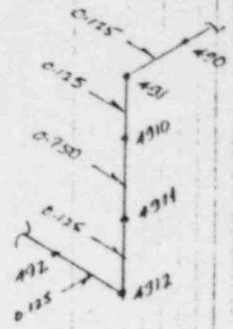




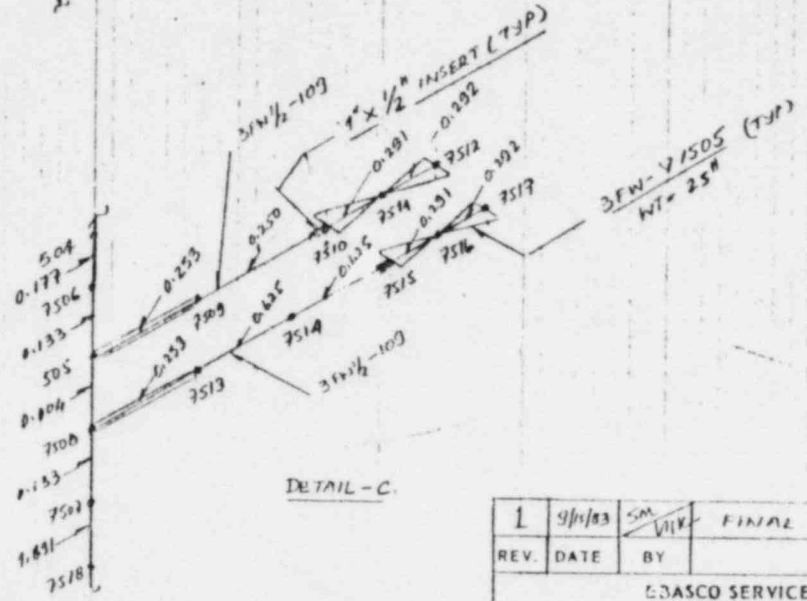
DETAIL - A



DETAIL - B



DETAIL - D



DETAIL - C

ALL LINES

DESIGN TEMP = 115°F
OVER. PRESSURE = 1146 PSI

REV.	DATE	BY	DESCRIPTION
1	9/15/83	SM VHK	FINAL AS-BUILT

EBASCO SERVICES INCORPORATED
NEW YORK, N.Y.

WATERFORD UNIT # 3
FEEDWATER PIPING
AUXILIARY BLDG

DR. SM DATE: 9/13/83
CH. VHK DATE: 9/13/83

ISOMETRIC NO. FW-176-32

LINE NO.	PIPE O.D.	SCH. NOM. WL THK.	MATERIAL	OPER. TEMP. °F	THERMAL EXPANSION INCH/100'	MODULUS OF ELASTICITY	DES. PRESS	TYPE OF ANALYSIS	G-FACTOR	REF. DWGS.	REV	DATE
3FW3/4-103	1.05	0.154	A106-GR.1	100			1400			LOU-1564 G176 SHT 1	10	10/13/82
3FW1/2-103	0.84	0.147	A106 GR.1	100			1400	DYNAMIC ☐	Horiz X=0.38	LOU-1564 G176 SHT 2	9	10/13/82
								STATIC ☑	VERT. Y=0.3			
								THERMAL ☑	HORIZ. Z=0.42			

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1072        IC    2 0 13 S MURTHY        WATERFORD UNIT 3 AUXILIARY BLDG FEEDWATE
R PIPING ISOS FW 176-28  PART-1   *AS-BUILT*   REV.1
1072        FA    5
1072        1LC   1000000                              NORMAL OPERATING
1072   10 91LC    13                                   OPERATING WEIGHT
1072    1 51LC    1100        300                      X-STATIC
1072    1 52LC    110                 300              Y-STATIC
1072    1 53LC    1100                          80     Z-STATIC
1072  10101CC     14    1      51      53              MAXIMUM OF X AND Z (OBE)
1072  10102CC     111           101     52              MAX. HORIZONTAL + Y (OBE)
1072  10110CC     0             1       41              THERMAL + WEIGHT
1072  10111CC     1 4           41      110             HIGHER OF (TH+WT) OR WT
1072  10112CC     111   6       111     102             ABS OF OBE + HI(T  +WT) OR WT
1072  10113CC     121   8       111     2.102           ABS OF DBE + HI(T  +WT) OR WT
1072  10652CS     12    3       41      102             DESIGN EQ 9
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GLOBAL

ACTION OF ANCHORS, NOZZLES AND CONNECTIONS ON PIPING

NAME	POINT NO.	CASE NO.	FORCES IN LBS FX	FY	FZ	RES.	MOMENTS IN FT-LBS MX	MY	MZ	RES.	DISPLACEMENTS IN INCHES DEL.X	DEL.Y	DEL.Z	RES.
CONNECTION	4000	1	-1	7	2	8	12	2	6	13	-0.002	-0.001	-0.000	0.002
		41	-6	189	-1	189	-4	-3	5	7	0.000	-0.000	0.000	0.000
		51	-57	-2	0	57	-1	10	169	169	0.000	0.000	0.000	0.000
		52	2	-57	0	57	1	1	-1	2	-0.000	0.000	-0.000	0.000
		53	8	18	-51	54	-140	-16	-1	141	-0.000	-0.000	0.000	0.000
		102	59	74	52	108	141	17	170	222	0.000	0.000	0.000	0.000
		111	-7	196	1	196	8	-3	10	13	-0.002	-0.001	-0.000	0.002
		112	65	271	53	283	149	19	180	235	0.002	0.001	0.000	0.002
		113	124	345	105	381	290	36	351	456	0.002	0.001	0.000	0.002
CONNECTION	5900	1	0	5	0	5	0	1	2	3	-0.003	-0.002	-0.001	0.004
		41	0	179	-10	179	-24	-1	-2	24	0.000	-0.000	0.000	0.000
		51	-19	1	0	19	0	19	28	34	0.000	-0.000	-0.000	0.000
		52	0	-54	3	54	7	0	0	7	-0.000	0.000	-0.000	0.000
		53	0	1	-19	19	-28	1	0	28	-0.000	-0.000	0.000	0.000
		102	19	55	22	63	35	19	28	49	0.000	0.000	0.000	0.000
		111	0	184	-10	184	-24	-1	-2	24	-0.003	-0.002	-0.001	0.004
		112	20	239	32	242	59	26	30	69	0.003	0.002	0.001	0.004
		113	39	294	55	302	94	39	58	117	0.003	0.002	0.001	0.004
CONNECTION	2140	1	0	9	0	9	1	1	0	2	-0.003	-0.000	-0.000	0.003
		41	7	188	-10	188	-26	0	-2	26	0.000	-0.000	0.000	0.000
		51	-27	0	0	27	0	19	50	54	0.000	0.000	-0.000	0.000
		52	0	-56	3	56	8	0	1	8	-0.000	0.000	-0.000	0.000
		53	0	0	-27	27	-50	0	0	50	-0.000	0.000	0.000	0.000
		102	27	57	30	70	57	19	51	79	0.000	0.000	0.000	0.000
		111	0	197	-10	197	-26	1	-2	26	-0.003	-0.000	0.000	0.003
		112	27	253	40	258	84	20	53	101	0.003	0.000	0.000	0.003
		113	55	310	70	323	141	39	103	179	0.003	0.000	0.000	0.003
ANCHOR	548	1	0	-79	0	79	38	0	37	53	-0.000	0.000	-0.000	0.000
		41	1	183	-3	183	-80	-1	-84	116	-0.000	-0.000	0.000	0.000
		51	-15	0	0	15	0	-5	-17	18	0.000	0.000	0.000	0.000
		52	0	-55	1	55	24	0	25	35	-0.000	0.000	-0.000	0.000
		53	0	1	-16	16	22	-8	-1	23	-0.000	-0.000	0.000	0.000
		102	15	56	17	61	46	8	43	63	0.000	0.000	0.000	0.000
		111	1	183	-3	183	-80	-1	-84	116	-0.000	-0.000	0.000	0.000
		112	16	239	20	241	125	9	127	179	0.000	0.000	0.000	0.000
		113	31	296	37	299	171	17	170	242	0.000	0.000	0.000	0.000