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	Design Change Package		
Form 5	Document Change Notice (DCN)		Page 1 of 1

DCP No.: 96-2843-2 Supp.: 0 Page 3277 of _____

DCN No.: 9800678 Page 1 of 20

DOC No. RC9585 SHT. _____ REV. 0

KEY DRAWING: YES [ ] NO [X] INCORPORATION REQUIRED: YES [X] NO [ ]

DESCRIPTION OF CHANGE: AFFECTED UNIT [ ] 0 [X] 1 [ ] 2 [ ] Both

CB 3/3/98

The existing Main feedwater & Aux feedwater lines for loop A, B, C, D inside containment ~~has~~ have been reanalyzed due to reroute of the steam generator nozzle in conjunction with the replacement of steam generator "A", "B", "C" & "D".

Supplement the existing calculation RC9585 REV 0, with the DCN 9800678, analyzed for the Unit-1 system. Unit-2 continues as is in the existing calculation.

Add pages 1 THRU 20 of this DCN to existing calculation.

No other DCN is outstanding to this calculation.

C Balavarapu 3/3/98 — DESIGN ENG. / DATE

R. Gan 3/3/98 — REVIEWER / DATE

Calculation No. RC9585 ~~P-906~~ Rev. ~~0~~ 0
KR 9.21.98
Page ia

List of Effective Pages

Page No.	Latest Rev.	Page No.	Latest Rev.	Page No.	Latest Rev.	Page No.	Latest Rev.	Page No.	Latest Rev.	Page No.	Latest Rev.	Page No	Latest Rev.
i	0												
ia*	-												
ii-iv	0												
1-181	0												
181a,b	0												
182-183	0												
A1-A3	0												
* Bechtel Calc. RC9585-P-906 Rev. 0 (18 pgs)													

*affected by DCN 9800678

Total Number of Calculation Pages: 207

Title: EVALUATION OF GENERIC IWA CALCULATION

1.0 OBJECTIVE

This evaluation is to assess the fatigue effects on new and existing IWAs for the main feedwater (MFW) and aux feedwater (AFW) lines (4 loops each). The pipe stress calculation revision is due to the SGR pipe modifications and the evaluation is in accordance with the commitments and requirements of reference 4.2 GB 3/3/98

2.0 SUMMARY OF RESULTS

Based on the results of this evaluation, it is concluded that the modifications made to the MFW and aux feedwater (AFW) lines (4 loops each) due to the SGR modifications have no significant impact on the generic calculation (reference 4.1) performed to comply with the commitment made in reference 4.2, in regard to the elimination of arbitrary intermediate breaks. GB 3/3/98

3.0 METHOD OF EVALUATION

The fatigue effects on piping systems are evaluated with EQ10 and EQ11 of ASME Section III NB3600 (see reference 4.2, 3 & 4) based on thermal range and OBE range loads. GB 3/3/98

3.1 MAIN FEEDWATER CALCULATIONS (see pages 5-14)

Based on a review of all the supports with IWAs (see attached tables) and a comparison of thermal/ OBE loads and stresses between:

a. the existing analysis (pre-SGR)
b. the new analysis (post-SGR)
c. the loads for feedwater support FW-9012-HL5010 selected in reference 4.1 for fatigue evaluation (see reference 4.1);

GB 3/3/98

the following two supports of Loop A are selected for evaluation: HL5001 and HL5006.

3.2 AUX FEEDWATER CALCULATIONS

For evaluation of aux feedwater, see pages 15-20

4.0 REFERENCES:

4.1 Calculation 2L029RC-9585, Rev 0; Fatigue Analysis for ASME 2/3 Piping with Integral Attachments.
4.2 Safety Evaluation Report Related to the Operation of South Texas Projects, Unit1 and 2, NUREG 0781.
4.3 ASME B&PV Code Case N-122, 1983.
4.4 ASME B&PV Code Case N-391, 1983.
4.5 ASME B&PV Code Case N-318-4, 1989.
4.6 ASME B&PV Code Case N-392-1, 1989.
4.7 Stress Analysis of the Feedwater "FW" System from Steam Generator 1D thu FW-1018-GA2 to Penetration M-5, Calculation No. RC5037, Rev 5 (DCN# 9704763).
4.8 Stress Analysis of the Feedwater "FW" System from Steam Generator 1B thu FW-1014-GA2 to Penetration M-7, Calculation No. RC5035, Rev 5 (DCN# 9704761).
4.9 "FW" Piping (FW-1016-GA2) from Steam Generator 1C to Penetration M-8, Calculation No. RC5036, Rev 5 (DCN# 9704762).

4.0 REFERENCES (cont'd):

4.10 "FW" Piping (FW-1012-GA2) from Steam Generator 1A to Penetration M-6, Calculation No. RC5034, Rev 5 (DCN# 97047620.

4.11 AFW Feedwater Piping from PEN M-94 to Steam Generator 1A (1R121NSG101A), Calculation No. RC5049, Rev 6 (DCN# 9704764).

4.12 AFW Feedwater Piping from PEN M-95 to Steam Generator 1B (1R121NSG101B), Calculation No. RC5050, Rev 7 (DCN# 9704765).

4.13 AFW Feedwater Piping from PEN M-84 to Steam Generator 1C (1R121NSG101C), Calculation No. RC5051, Rev 5 (DCN# 9704766).

4.14 AFW Feedwater Piping from PEN M-83 to Steam Generator 1D (1R121NSG101D), Calculation No. RC5020, Rev 6 (DCN# 9704767).

EVALUATION OF GENERIC IWA CALCULATION
Support No.: HL5006 (Data Point 85)
Code Case N-391 Methodology

Pipe/ Stanchion Properties

$D_o := 18.0 \cdot in$ $T := 0.937 \cdot in$ Pipe OD & thickness

$d_o := 8.625 \cdot in$ $t := 0.5 \cdot in$ Stanchion OD & thickness

$h := 8.968 \cdot in$ Moment arm length

$r_o := \frac{d_o}{2}$ $r_i := \frac{d_o - 2 \cdot t}{2}$ Stanchion outside & inside radius

$A_T := \frac{\pi}{2} \cdot (r_o^2 - r_i^2)$ $A_T = 6.381 \cdot in^2$

$Z_T := \frac{\pi}{4} \cdot \frac{(r_o^4 - r_i^4)}{r_o}$ $Z_T = 24.5 \cdot in^3$

Calculate C_N coefficent

$\gamma := \frac{D_o}{2 \cdot T}$ $\gamma = 9.605$ $\tau := \frac{t}{T}$ $\tau = 0.534$ $\beta := \frac{d_o}{D_o}$ $\beta = 0.479$

$A_{op} := 0.51$ $n_1 := 1.01$ $n_2 := 0.79$ $n_3 := 0.89$ Run pipe properties

$C_{Npipe} := A_{op} \cdot (2 \cdot \gamma)^{n_1} \cdot \beta^{n_2} \cdot \tau^{n_3}$ $C_{Npipe} = 3.227$

$A_{oa} := 0.84$ $n_1 := 0.85$ $n_2 := 0.80$ $n_3 := 0.54$ Stanchion properties

$C_{Natt} := A_{oa} \cdot (2 \cdot \gamma)^{n_1} \cdot \beta^{n_2} \cdot \tau^{n_3}$ $C_{Natt} = 4.096$

$C_N := 4.096$ Maximum of 2 values

Based on Reanalysis

Support Loads

$R_1 := 7725 \cdot lbf$ Thermal positive load

$R_2 := -11909 \cdot lbf$ Thermal negative load

$R_{obe} := 1833 \cdot lbf$ OBE load

$R_{sam} := 328 \cdot lbf$ SAM load

Pipe Stresses

$S_{10} := 8840 \cdot psi$ $\left(i \cdot \frac{M}{Z}\right)$ Thermal + SAM range (EQ10 with SIF=1.0)

$S_{th} := 6856 \cdot psi$ $\left(i \cdot \frac{M}{Z}\right)$ Thermal Normal (with SIF=1.0)

$S_9 := 1062 \cdot psi$ $\left(i \cdot \frac{2 \cdot M}{Z}\right)$ OBE range (with SIF=1.0)

EVALUATION OF GENERIC IWA CALCULATION
Support No.: HL5006 (Data Point 85)
Code Case N-391 Methodology

EQ10: Reference 1, page 152 &153
Reference 4

$$S_n = \frac{C_1 \cdot P_o \cdot D_o}{2 \cdot T} + C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i + S_{NT}$$

$$S_{NT} = \frac{Q_1}{A_T} + \frac{C_N M_N}{Z_T} + 1.7 \cdot E \cdot \alpha \cdot \left| T_T - T_w \right|$$

$\frac{C_1 \cdot P_o \cdot D_o}{2 \cdot T}$ = 4985psi Not affected, use same value

$1.7 \cdot E \cdot \alpha \cdot (T_T - T_w)$ = 32071psi Conservative, use same value

$C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i$ = $S_{10} + S_9$ = 8840psi + 1062psi = 9902psi

$$Q_1 := \left[\frac{(R_1 - R_2) + 2 \cdot (R_{obe} + R_{sam})}{2} \right] \qquad Q_1 = 11978 \cdot lbf$$

$M_N := Q_1 \cdot h$ $M_N = 107419 \cdot in \cdot lbf$

$\frac{Q_1}{A_T} = 1877 \cdot psi$

$\frac{C_N M_N}{Z_T} = 17948 \cdot psi$

$S_n := 4985 \cdot psi + 32071 \cdot psi + 9902 \cdot psi + 1877 \cdot psi + 17948 \cdot psi$ $S_n = 66783 \cdot psi$ > 3Sm = 51900psi

EQ12:

$C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i$ = S_{10} = 8840psi < 3Sm - O.K.

EQ13:

$\frac{C_1 \cdot P_o \cdot D_o}{2 \cdot T} + C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i$ = 4985psi + S_9 = 4985psi + 1062psi = 6047psi < 3Sm - O.K.

$\Delta T \le \frac{y \cdot S_y}{0.7 \cdot E \cdot \alpha} \cdot C_u$ Check for ratcheting

$164.7 \le \frac{0.8 \cdot 29000}{0.7 \cdot 28 \cdot 6.07} \cdot 1.1$ = 214.5 - O.K.

EVALUATION OF GENERIC IWA CALCULATION
Support No.: HL5006 (Data Point 85)
Code Case N-391 Methodology

EQ11 (Calculated for load pair 2:4, Highest usage factor)
Reference 1, page 153 - 155
Reference 4

$$S_P = \frac{K_1 \cdot C_1 \cdot P_o \cdot D_o}{2 \cdot T} + \left(K_2 \cdot C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i\right) + \frac{1}{2 \cdot (1 - \nu)} \cdot K_3 \cdot E\alpha \cdot \left|\Delta T_1\right| + \frac{1}{1 - \nu} \cdot E \cdot \alpha \cdot \left|\Delta T_2\right| + S_{PT}$$

$$S_{NT} = \frac{Q_1}{A} + \frac{C_N M_N}{Z_T} + 1.7 \cdot E \cdot \alpha \cdot \left|T_T - T_w\right|$$

$S_{PT} = K_T S_{NT}$

$\frac{K_1 \cdot C_1 \cdot P_o \cdot D_o}{2 \cdot T}$ = 1172psi Not affected, use same value

$\frac{1}{2 \cdot (1 - \nu)} \cdot K_3 \cdot E\alpha \cdot \left|\Delta T_1\right|$ = 7284psi Conservative, use same value

$\frac{1}{1 - \nu} \cdot E \cdot \alpha \cdot \left|\Delta T_2\right|$ = 2719psi Conservative, use same value

$1.7 \cdot E \cdot \alpha \cdot (T_T - T_w)$ = 11846psi Conservative, use same value

$K_2 \cdot C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i$ = $0.76 S_{th}$ = 0.76(6856psi) = 5211psi

{0.76 = [(440 - 300)/(440 - 70)]^2 : load factor for transient for pair 2:4}

$Q_1 := 0.76 \cdot \frac{R_1}{2}$ $Q_1 = 2936 \cdot lbf$

$M_N := Q_1 \cdot h$ $M_N = 26326 \cdot in \cdot lbf$

$\frac{Q_1}{A_T} = 460 \cdot psi$

$\frac{C_N M_N}{Z_T} = 4399 \cdot psi$

$S_{NT} = \frac{Q_1}{A_T} + \frac{C_N M_N}{Z_T} + 1.7 \cdot E \cdot \alpha \cdot (T_T - T_w)$ = 460psi + 4399psi + 11846psi = 16705psi

$K_T := 2.0$

$S_{PT} = K_T S_{NT}$ $S_{PT} := 2.0 \cdot 16706 \cdot psi$ $S_{PT} = 33412 \cdot psi$

$S_P := 1172 \cdot psi + 7284 \cdot psi + 2719 \cdot psi + 5211 \cdot psi + 33412 \cdot psi$ $S_P = 49798 \cdot psi$

$S_{ALT} = \frac{K_e}{2} \cdot (S_P)$ $S_{ALT} := \frac{1.0}{2} \cdot (49798 \cdot psi)$ $S_{ALT} = 24899 \cdot psi$ < 30809psi from Ref 1, sheet 155

Usage factor < 0.635

EVALUATION OF GENERIC IWA CALCULATION
Support No.: HL5001 (Data Point 95B)
Code Case N-122 Methodology

Pipe/ Rectangular Attachment Properties

$D_o := 18.0 \cdot in$ $t := 0.937 \cdot in$ Pipe OD & thickness

$r := \frac{D_o - t}{2}$ $r = 8.532 \cdot in$ Mean pipe radius

$L_1 := \frac{9.5}{2} \cdot in$ $L_1 = 4.75 \cdot in$

$L_2 := \frac{8}{2} \cdot in$ $L_2 = 4 \cdot in$ Dimensions for 5/8" x 8" x 9.5" Wrapper Plate

Calculate C_T coefficent

$\gamma := \frac{r}{t}$ $\gamma = 9.105$ $\beta_2 := \frac{L_2}{r}$ $\beta_2 = 0.469$ $\beta_1 := \frac{L_1}{r}$ $\beta_1 = 0.557$

$\beta_1 \cdot \beta_2 = 0.261 > 0.075$ $\beta_1 x \beta_2 < 0.075$: Calculate reduced L_1, L_2

$\beta_1 := \sqrt{0.075}$ $\beta_1 = 0.274$ $\beta_2 := \beta_1$

$L_1 := \beta_1 \cdot r$ $L_1 = 2.336 \cdot in$ $L_2 := \beta_2 \cdot r$ $L_2 = 2.336 \cdot in$

$A_o := 2.2$ $\theta := 40 \cdot deg$ $X_o := 0$ $Y_o := 0.05$ Thrust load constants

$Y_1 := Y_o + \log(\beta_2)$ $Y_1 = -0.512$

$X_1 := X_o + \log(\beta_1)$ $X_1 = -0.562$

$\eta := -\left(X_1 \cdot \cos(\theta) + Y_1 \cdot \sin(\theta)\right) - \frac{1}{A_o} \cdot \left(X_1 \cdot \sin(\theta) - Y_1 \cdot \cos(\theta)\right)^2$ $\eta = 0.76$

$C_T := 7.64 \cdot \gamma^{1.64} \cdot \beta_1 \cdot \beta_2 \cdot \eta^{1.54}$ $C_T = 14.051$

$A_1 := 4 \cdot L_1 \cdot L_2$ $A_1 = 21.836 \cdot in^2$

Based on Reanalysis

Support Loads

$R_1 := 17511 \cdot lbf$ Thermal maximum load

$R_2 := 8418 \cdot lbf$ Thermal minimum load

$R_{obe} := 3702 \cdot lbf$ OBE load

$R_{sam} := 4244 \cdot lbf$ SAM load

Pipe Stresses

$S_{10} := 5549 \cdot psi$ $\left(i \cdot \frac{M}{Z}\right)$ Thermal + SAM range (EQ10 with SIF=1.0)

$S_{th} := 2913 \cdot psi$ $\left(i \cdot \frac{M}{Z}\right)$ Thermal Normal (with SIF=1.0)

$S_9 := 886 \cdot psi$ $\left(i \cdot \frac{2 \cdot M}{Z}\right)$ OBE range (with SIF=1.0)

EVALUATION OF GENERIC IWA CALCULATION
Support No.: HL5001 (Data Point 95B)
Code Case N-122 Methodology

EQ10: Reference 1, page 152, 153 & 161, 162
Reference 3

$$S_n = \frac{C_1 \cdot P_o \cdot D_o}{2 \cdot T} + C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i + S_{ni}$$

$$S_{ni} = \frac{C_T \cdot W}{A_1}$$

$$\frac{C_1 \cdot P_o \cdot D_o}{2 \cdot T} = 4985\text{psi}$$ Not affected, use same value

$$C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i = S_{10} + S_9 = 5549\text{psi} + 886\text{psi} = 6435\text{psi}$$

$$W := [(R_1 - R_2) + 2 \cdot (R_{obe} + R_{sam})] \qquad W = 24985 \cdot \text{lbf}$$

$$S_{ni} = \frac{C_T \cdot W}{A_1} = 16077 \cdot \text{psi}$$

$$S_n := 4985 \cdot \text{psi} + 6435 \cdot \text{psi} + 16077 \cdot \text{psi} \qquad S_n = 27497 \cdot \text{psi} \quad < 3Sm = 51900\text{psi}$$

O.K.

EVALUATION OF GENERIC IWA CALCULATION
Support No.: HL5001 (Data Point 95B)
Code Case N-122 Methodology

EQ11 (Calculated for load pair 2:4, Highest usage factor)
Reference 1, page 152, 153 & 161, 162
Reference 3

$$S_p = \frac{K_1 \cdot C_1 \cdot P_o \cdot D_o}{2 \cdot T} + \left(K_2 \cdot C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i\right) + \frac{1}{2 \cdot (1 - \nu)} \cdot K_3 \cdot E\alpha \cdot |\Delta T_1| + \frac{1}{1 - \nu} \cdot E \cdot \alpha \cdot |\Delta T_2| + S_{pl}$$

$$S_{pl} = \left[K_1 \cdot \left(1.5 + 0.537 \cdot \beta_1 \cdot \beta_2 \cdot \gamma\right) - 1\right] \cdot P_o \cdot \frac{D_o}{2 \cdot t} + K_1 \cdot (S_{nl}) + K_1 \cdot E \cdot \alpha \cdot |T_1 - T_w|$$

$\frac{K_1 \cdot C_1 \cdot P_o \cdot D_o}{2 \cdot T}$ = 1172psi Not affected, use same value

$\frac{1}{2 \cdot (1 - \nu)} \cdot K_3 \cdot E\alpha \cdot |\Delta T_1|$ = 7284psi Conservative, use same value

$\frac{1}{1 - \nu} \cdot E \cdot \alpha \cdot |\Delta T_2|$ = 2719psi Conservative, use same value

$E \cdot \alpha \cdot |T_1 - T_w|$ = $\frac{11846\text{psi}}{1.7}$ = 6968psi Conservative, use same value

$K_2 \cdot C_2 \cdot \frac{D_o}{2 \cdot I} \cdot M_i$ = $0.76 S_{th}$ = 0.76(2913psi) = 2214psi
{0.76 = [(440 - 300)/(440 - 70)]*2 : load factor for transient for pair 2:4}

$K_1 := 2.0$ for fillet weld on four sides (as-welded)

$\left[K_1 \cdot \left(1.5 + 0.537 \cdot \beta_1 \cdot \beta_2 \cdot \gamma\right) - 1\right] \cdot P_o \cdot \frac{D_o}{2 \cdot t}$

$\left[K_1 \cdot \left(1.5 + 0.537 \cdot \beta_1 \cdot \beta_2 \cdot \gamma\right) - 1\right] \cdot 1172 \cdot \text{psi} = 3204 \cdot \text{psi}$

$W := 0.76 \cdot R_1$ $W = 13308 \cdot \text{lbf}$

$S_{nl} = \frac{C_T \cdot W}{A_1} = 8564 \cdot \text{psi}$

$K_1 \cdot \frac{C_T \cdot W}{A_1} = 17127 \cdot \text{psi}$

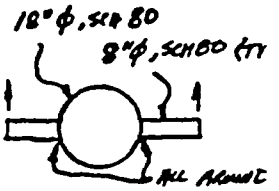
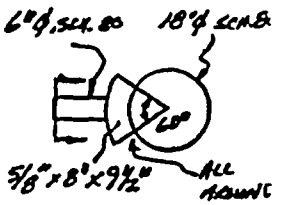
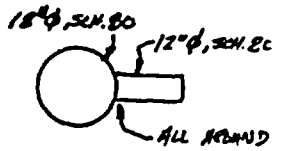
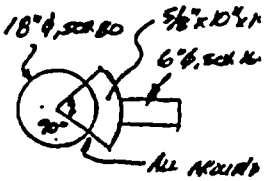
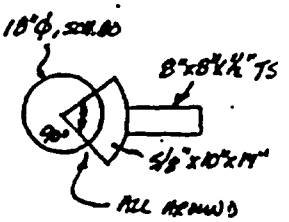
$K_1 \cdot E \cdot \alpha \cdot |T_1 - T_w|$ = 2 x 6968psi = 13936psi

$S_p := 1172 \cdot \text{psi} + 2214 \cdot \text{psi} + 7284 \cdot \text{psi} + 2719 \cdot \text{psi} + 3204 \cdot \text{psi} + 17127 \cdot \text{psi} + 13936 \cdot \text{psi}$ $S_p = 47656 \cdot \text{psi}$

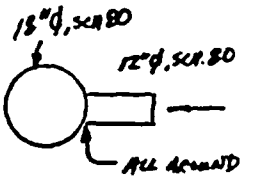
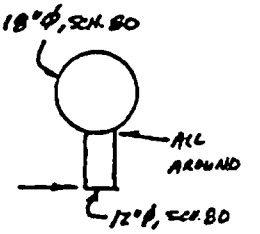
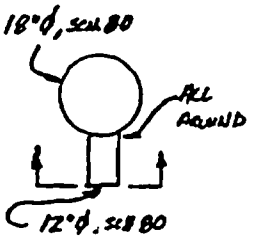
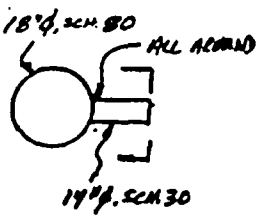
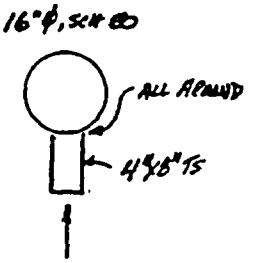
$S_{ALT} = \frac{K_e}{2} \cdot (S_p)$ $S_{ALT} := \frac{1.0}{2} \cdot (47656 \cdot \text{psi})$ $S_{ALT} = 23828 \cdot \text{psi}$ < 30809psi from Ref 1, sheet 155

Usage factor < 0.635

STP-1 SGR ASSESSMENT OF IMPACT ON IWA GENERIC CALC. # RC9585
MFW SYSTEM: MFWA

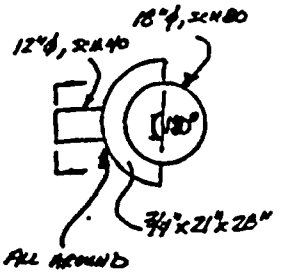
IWA#	CASE	PREVIOUS LOADS	NEW LOADS	CASE	PREVIOUS STRESS	NEW STRESS	COMMENT
		LB	LB		PSI	PSI	
HL5006 (85 Y RGD)	WT	-4364	-5824	EQ.8		6413	
	THMAX	1612	7725*	EQ.10/11	14712	18563*	
	THMIN	1475	-11909*				
	OBESAM	419	328				
	OBE	1594	1833	EQ.9B	6531	7202	
HL5001 (95B X RGD)	WT	-595	-976	EQ.8		5765	
	THMAX	11745	17511*	EQ.10/11	6906	11652	
	THMIN	-6186	8418*				
	OBESAM	4173	4244				
	OBE	3971	3702	EQ.9B	7680	6926	
HL5010 (10A ZRGD)	WT	-224	-276	EQ.8		6292	
	THMAX	11289	5714	EQ.10/11	19617	20608	
	THMIN	1808	1336				
	OBESAM	2902	3600				
	OBE	2914	3008	EQ.9B	6563	6938	
HL5002 (50 X SNB)	WT			EQ.8		5687	
	THMAX			EQ.10/11	7061	12202*	
	THMIN						
	OBESAM	1569	1380				
	OBE	1561	2110	EQ.9B	6523	6310	
HL5005 (80 Z SNB) INCLUDED IN GENERIC STUDY CALC# RC9585	WT			EQ.8		6140	
	THMAX			EQ.10/11	13882	16371	
	THMIN						
	OBESAM	1668	1257				
	OBE	2974	2634	EQ.9B	6531	7014	

MFW SYSTEM: MFWB

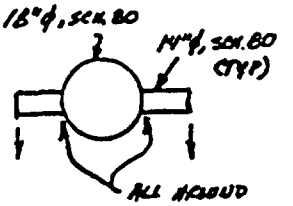
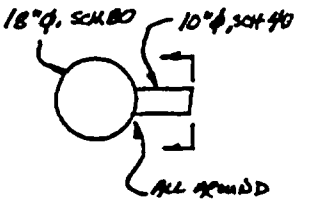
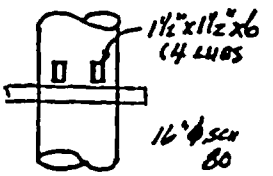
IWA#	CASE	PREVIOUS LOADS	NEW LOADS	CASE	PREVIOUS STRESS	NEW STRESS	COMMENT
		LB	LB		PSI	PSI	
HL5011 (10A Z RGD)	WT	-211	101	EQ.8		5798	
	THMAX	-1599	651	EQ.10/11	9500	9916	
	THMIN	-9213	-10023				
	OBESAM	2085	3312				
	OBE	2415	2308	EQ.9B	6096	6288	
HL5012 (027 SK SNB)	WT			EQ.8		5650	
	THMAX			EQ.10/11	11254	10382	
	THMIN						
	OBESAM	756	499				
	OBE	1003	1622	EQ.9B	6364	6724	
HL5001 (050 X SNB)	WT			EQ.8		6022	
	THMAX			EQ.10/11	5404	5615	
	THMIN						
	OBESAM	1516	1493				
	OBE	1957	2977	EQ.9B	6594	7212	
HL5003 (080 Z SNB)	WT			EQ.8		5781	
	THMAX			EQ.10/11	13775	14797	
	THMIN						
	OBESAM	1222	1245				
	OBE	2951	2581	EQ.9B	6643	7014	
HL5014 (009 Y SPD) NEW IWA	WT		-14523	EQ.8		6328	
	THMAX			EQ.10/11		6360	
	THMIN						
	OBE			EQ.9B		6516	

MFW SYSTEM: MFWC

IWA#	CASE	PREVIOUS LOADS	NEW LOADS	CASE	PREVIOUS STRESS	NEW STRESS	COMMENT
		LB	LB		PSI	PSI	
HL5012 (102 X RGD)	WT	155	773	EQ.8		6290	
	THMAX	23809	18872	EQ.10/11	3031	2850	
	THMIN	7315	3136				
	OBESAM	4075	3820				
	OBE	2463	2523	EQ.9B	6485	6719	



MFW SYSTEM: MFWD

IWA#	CASE	PREVIOUS LOADS LB	NEW LOADS LB	CASE	PREVIOUS STRESS PSI	NEW STRESS PSI	COMMENT
HL5007 (050 Z SNB)	WT			EQ.8		6106	
	THMAX THMIN			EQ.10/11	2442	5841*	
	OBESAM	693	207				
	OBE	2015	4187*	EQ.9B	6523	7483	
HL5006 (097 Z SNB)	WT			EQ.8		6469	
	THMAX THMIN			EQ.10/11	2396	1445	
	OBESAM	2318	1409				
	OBE	2084	2590	EQ.9B	6506	7211	
HL5014 (009 Y SPD)	WT		-9528	EQ.8		5689	
NEW IWA	THMAX THMIN			EQ.10/11		5914	
	OBE			EQ.9B		6157	

* : INCREASES
THMAX & THMIN : MAX. OR MIN. OF NORMAL & UPSET THERMALS ONLY (THRM1,2,3,4,&7)

ASSESSMENT OF IMPACT OF AFW CHANGES ON GENERIC IWA CALC# RC9585:

INTRODUCTION: THE GENERIC IWA CALCULATION NOTED ABOVE EVALUATED THE (a) PRIMARY STRESSES (DUE TO DESIGN CONDITION: PRESSURE, WEIGHT, OBE ; DUE TO FAULTED OR LEVEL-D CONDITION : PRESSURE, WEIGHT, SSE/LOCA/WATER HAMMER TRANSIENT) ; (b) PRIMARY+SECONDARY STRESS (DUE TO PRESSURE, OBE, OBESAM, THERMAL & THERMAL TRANSIENTS); (c) CUMULATIVE USAGE FACTOR DUE TO FATIGUE (DUE TO PRESSURE, OBE, OBESAM, THERMAL & THERMAL GRADIENT EFFECTS FROM THERMAL TRANSIENTS). THE NOTED GENERIC CALCULATION IS A SAMPLING STUDY BASED ON AN ENVELOPING TYPE OF APPROACH. THE FOLLOWING ASSESSMENT IS TO ADDRESS THE IMPACT OF REVISIONS DUE TO STEAM GENERATOR REPLACEMENT ON THE GENERIC IWA CALCULATION.

- THE MODIFICATIONS TO AFW DUE TO STEAM GENERATOR REPLACEMENT ARE VERY MINOR AND LOCALIZED TO THE SGR NOZZLE AREA ONLY.
- THE THERMAL MODES , RESPONSE SPECTRA, AND THE OTHER DESIGN PARAMETERS REMAINED THE SAME.
- THE CALCULATION REVISIONS DUE TO SGR INCORPORATED THE NEW SEISMIC MOVEMENTS AT SGR NOZZLE, AND CHANGES TO WATER HAMMER FORCING FUNCTIONS DUE TO PIPE BREAK OUTSIDE CONTAINMENT & CHECK VALVE SLAM
- IN ADDITION, THE CALCULATION REVISIONS DUE TO SGR ALSO INCORPORATED CHANGES IN SEISMIC ANALYSIS METHODOLOGY BY NOT USING CONCURRENTLY MRS & CC #N411 DAMPING (IT MAY BE NOTED THAT MRS & CC# N411 WERE CONCURRENTLY USED IN THE DESIGN BASIS CALCULATION). THE REVISED CALCULATIONS USED ONLY REG. GUIDE 1.61 DAMPING ALONG WITH MRS.
- THE AFW IWA SAMPLE USED IN IWA GENERIC STUDY (CALC. # RC9585) IS NOT FROM AFW SYSTEM INSIDE CONTAINMENT.
- A COMPARISON OF LOADS AND STRESSES FROM THE PREVIOUS ANALYSIS AND REVISIONS DUE TO SGR IS PRESENTED IN THE ATTACHED TABLE FOR ALL OF THE IWA LOCATIONS FOR THE 4 LOOPS.
- A REVIEW OF THE TABLE INDICATES THE FOLLOWING. IN GENERAL, THE LOAD AND STRESS CHANGES ARE NOT SIGNIFICANT (VERY MARGINAL) EXCEPT FOR TRANSIENT WATER HAMMER (PRIMARY FAULTED) LOAD ON IWA# HL5041 IN AFWA (LOOP A) WHERE THE LOAD INCREASE IS ABOUT 52%. ALL THE IWAs INCLUDING HL5041WERE EVALUATED FOR DESIGN AS WELL AS FAULTED CONDITIONS USING THE REVISED LOADS AND FOUND TO BE WITHIN THE APPLICABLE ALLOWABLES. THE RESULTS ARE DOCUMENTED IN THE PIPE SUPPORT CALCULATIONS . SINCE THE WATER HAMMER LOAD IS ONLY AN OCCASIONAL (LEVEL-D) PRIMARY LOAD, IT DOES NOT CONTRIBUTE TO FATIGUE.
- THERE EXIST PLENTY OF MARGINS IN THE EXISTING LEVELS IN THE GENERIC IWA CALCULATION FOR THE AFW IWA USED AS SUMMARIZED BELOW TO ACCOMMODATE ANY MARGINAL INCREASES IN SUPPORT LOADS & GENERAL PIPING STRESSES.

DESIGN (PRIMARY): 7160/29340=0.244 RATIO
EMERGENCY(PRIMARY):15624/44020=0.355 RATIO
FAULTED (PRIMARY):8120/58680=0.138 RATIO
PRIMARY+SECONDARY (LEVELS A&B): 17632/58680=0.300
FATIGUE USAGE FACTOR: U=0.4385

- CONCLUSION: BASED ON THE ABOVE ASSESSMENT, IT IS CONCLUDED THAT THE MODIFICATIONS MADE TO THE AFW SYSTEM DUE TO SGR HAVE NO SIGNIFICANT IMPACT ON THE GENERIC IWA CALCULATION PERFORMED TO COMPLY WITH THE COMMITMENTS MADE IN NUREG-0781 IN REGARD TO THE ELIMINATION OF ARBITRARY INTERMEDIATE BREAKS.

- REFERENCES:

1. SAFETY EVALUATION REPORT RELATED TO THE OPERATION OF SOUTH TEXAS PROJECT, UNITS 1 AND 2, NUREG-0781, APRIL 1986
2. FATIGUE ANALYSIS FOR ASME CLASS 2/3 PIPING WITH INTEGRAL ATTACHMENT, CALC.# 2L029RC9585, REV. 0

AFW SYSTEM: AFWA

IWA#	CASE	PREVIOUS LOADS	NEW LOADS	CASE	PREVIOUS STRESS	NEW STRESS	COMMENT
		LB	LB		PSI	PSI	
HL5041 (44 Y SNB)	WT			EQ.8		5030	
	THMAX THMIN			EQ.10/11	6254	6188	
	OBESAM	677	1024				
	OBE	715	1058	EQ.9B	9504	11792	

Originator: Date:

AFW SYSTEM: AFWB

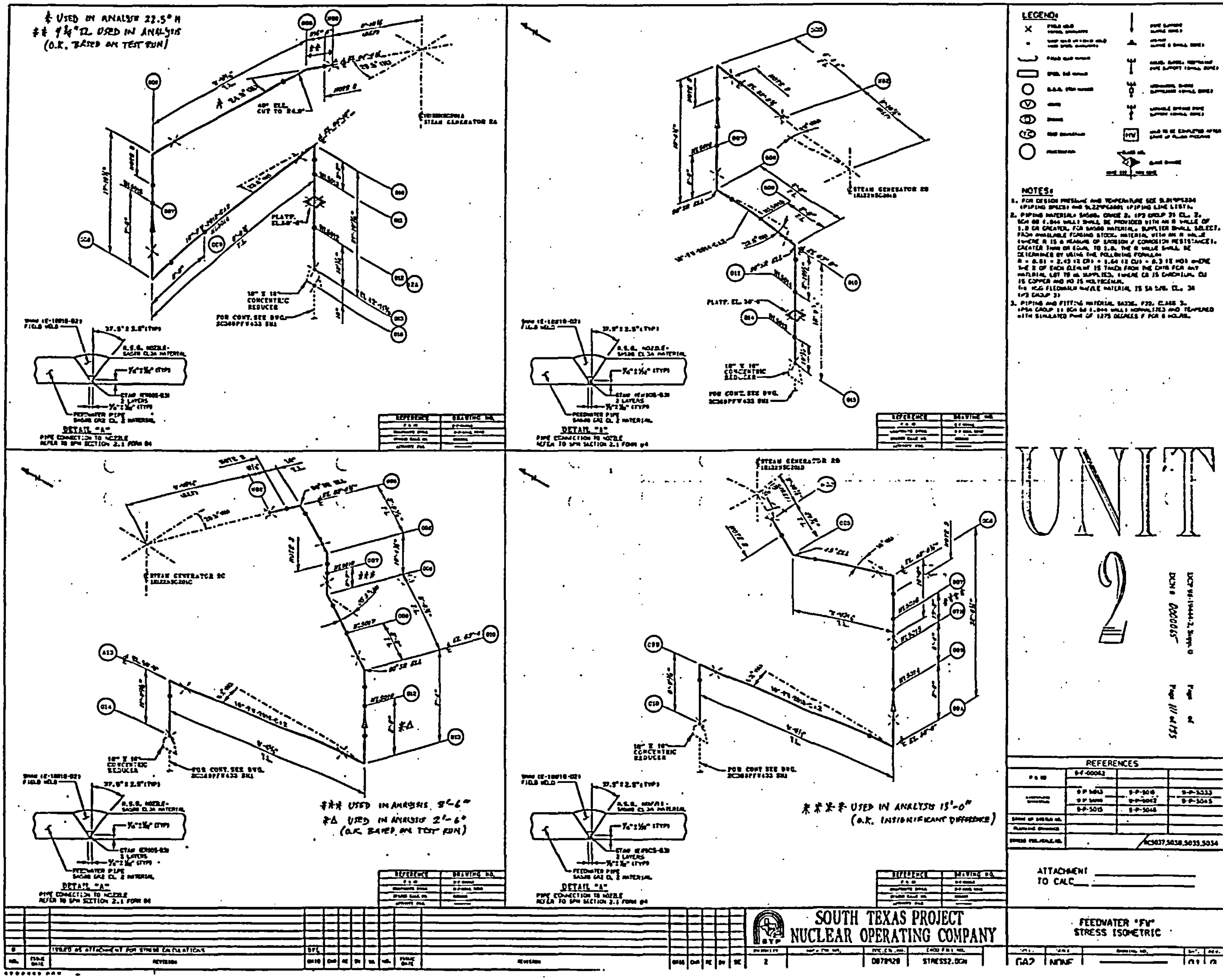
IWA#	CASE	PREVIOUS LOADS	NEW LOADS	CASE	PREVIOUS STRESS	NEW STRESS	COMMENT
		LB	LB		PSI	PSI	
HL5002 (7A SK SNB)	WT			EQ.8		5029	
	THMAX THMIN			EQ.10/11	3614	4031	
	OBESAM	1743	2180				
	OBE	1291	1038	EQ.9B	6612	6472	
HL5007 (31A Y SNB)	WT			EQ.8		6608	
	THMAX THMIN			EQ.10/11	13342	12477	
	OBESAM	197	170				
	OBE	646	599	EQ.9B	7860	8166	
HL5008 (54 YSNB)	WT			EQ.8		7038	
	THMAX THMIN			EQ.10/11	11912	8203	
	OBESAM	1071	1638				
	OBE	281	252	EQ.9B	7190	7331	

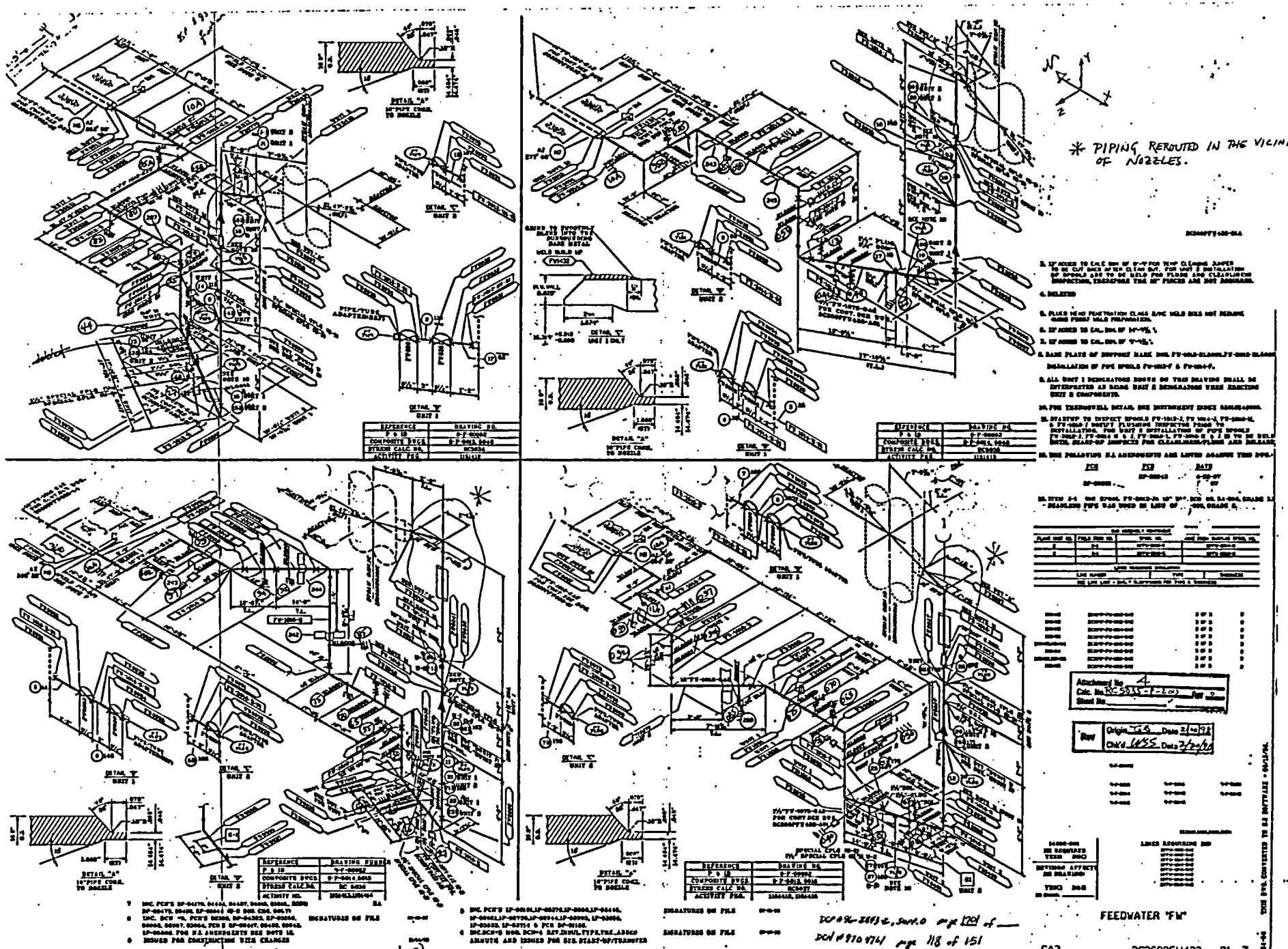
AFW SYSTEM: AFWC

IWA#	CASE	PREVIOUS LOADS	NEW LOADS	CASE	PREVIOUS STRESS	NEW STRESS	COMMENT
		LB	LB		PSI	PSI	
HL5027 (6L SK SNB)							
NOT IWA ANYMORE							
HL5009 (23A X RGD)	WT	-197	-183	EQ.8		7515	
	THMAX	291	729	EQ.10/11	3074	3488	
	THMIN	-666	0				
	OBESAM	77	426				
	OBE	1038	947	EQ.9B	8086	8650	
HL5014 (37B SK SNB)	WT			EQ.8		5465	
	THMAX			EQ.10/11	6524	9412	
	THMIN						
	OBESAM	113	493				
	OBE	990	1088	EQ.9B	5962	6037	
HL5038 (38 Y SNB)	WT			EQ.8		4953	
	THMAX			EQ.10/11	6704	9159	
	THMIN						
	OBESAM	1372	1328				
	OBE	352	434	EQ.9B	5850	5723	

AFW SYSTEM: AFWD

IWA#	CASE	PREVIOUS LOADS	NEW LOADS	CASE	PREVIOUS STRESS	NEW STRESS	COMMENT
		LB	LB		PSI	PSI	
HL5007 (79 X RGD)	WT	-94	-76	EQ.8		5409	
	THMAX	880	690	EQ.10/11	6143	3983	
	THMIN	0	0				
	OBE	40	125				
	OBE	2714	1234	EQ.9B	5798	5865	
HL5035 (25 Y SNB)	WT			EQ.8		5091	
	THMAX			EQ.10/11	15841	14541	
	THMIN						
	OBESAM	816	1569				
	OBE	904	918	EQ.9B	6865	7467	


* USED IN ANALYSIS 22.5° H
** 9 3/4" EL USED IN ANALYSIS
(O.K. BASED ON TEST RUN)
DETAIL "A"
*** USED IN ANALYSIS 8'-6"
*Δ USED IN ANALYSIS 2'-6"
(O.K. BASED ON TEST RUN)
**** USED IN ANALYSIS 13'-0"
(O.K. INSIGNIFICANT DIFFERENCE)
LEGEND:
NOTES:
UNIT 2
REFERENCES
9-F-00042
9-P-5013
9-P-5014
9-P-5015
9-P-5016
9-P-5042
9-P-5046
9-P-5333
9-P-5045
2C5037,5038,5033,5034
ATTACHMENT
TO CALC
SOUTH TEXAS PROJECT
NUCLEAR OPERATING COMPANY
FEEDWATER "FW"
STRESS ISOMETRIC
2
0078920
STRESS2.DGN
GA2
NONE
01
0
ISSUED AS ATTACHMENT FOR STRESS CALCULATIONS
Page 111 of 175
STI: 31617697 Att A



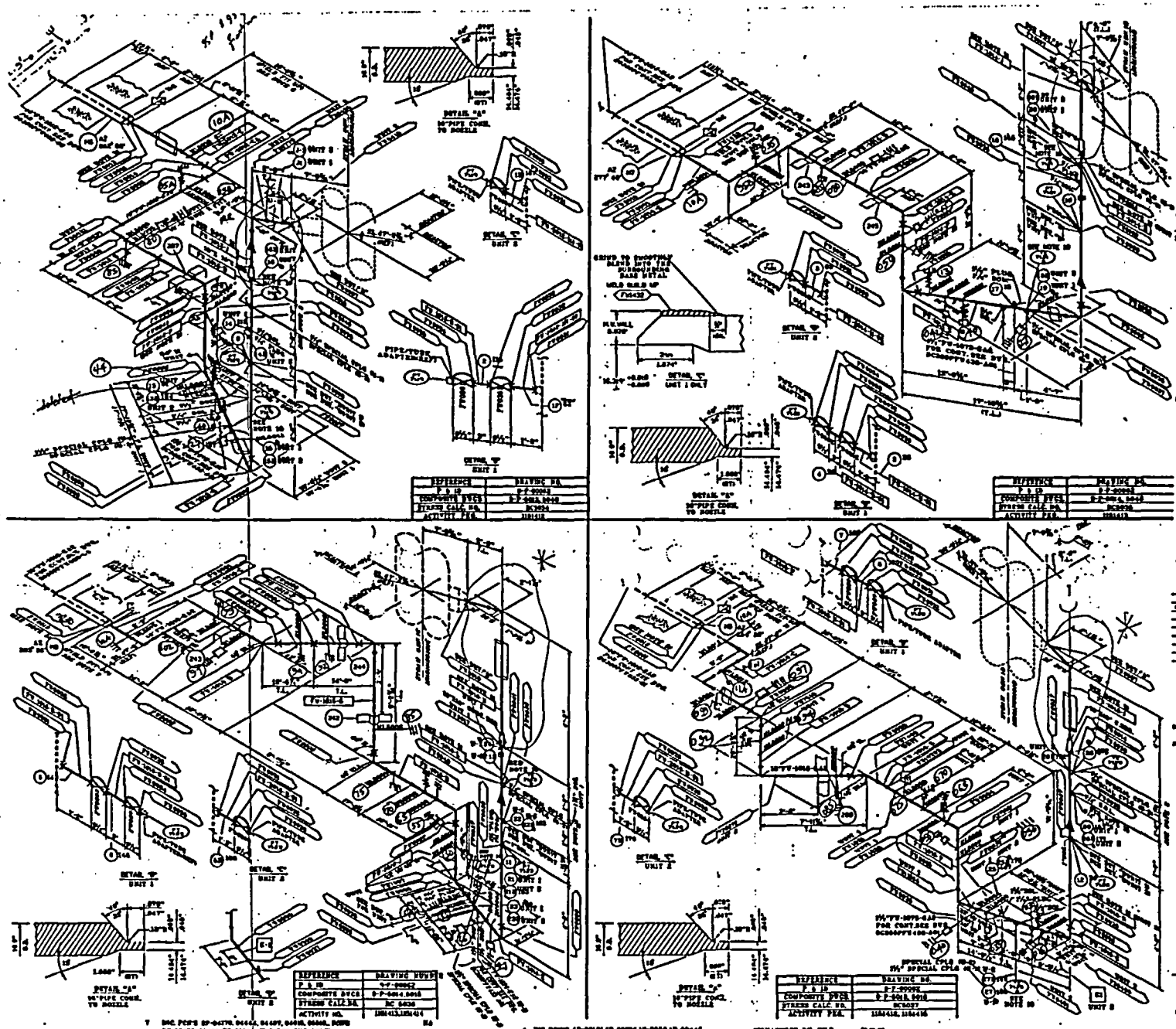
DCP # 98-19444-2, SUP 0, Page 9

SN: 310176A7 AH B

DCN# 0000065 Page 1149 135

DCN #9704741 page 118 of 151

DCP #98-19444-2, SUP 0 page 120 of ___



DCP # 98-194A4-2, SUMP 0, Page 9

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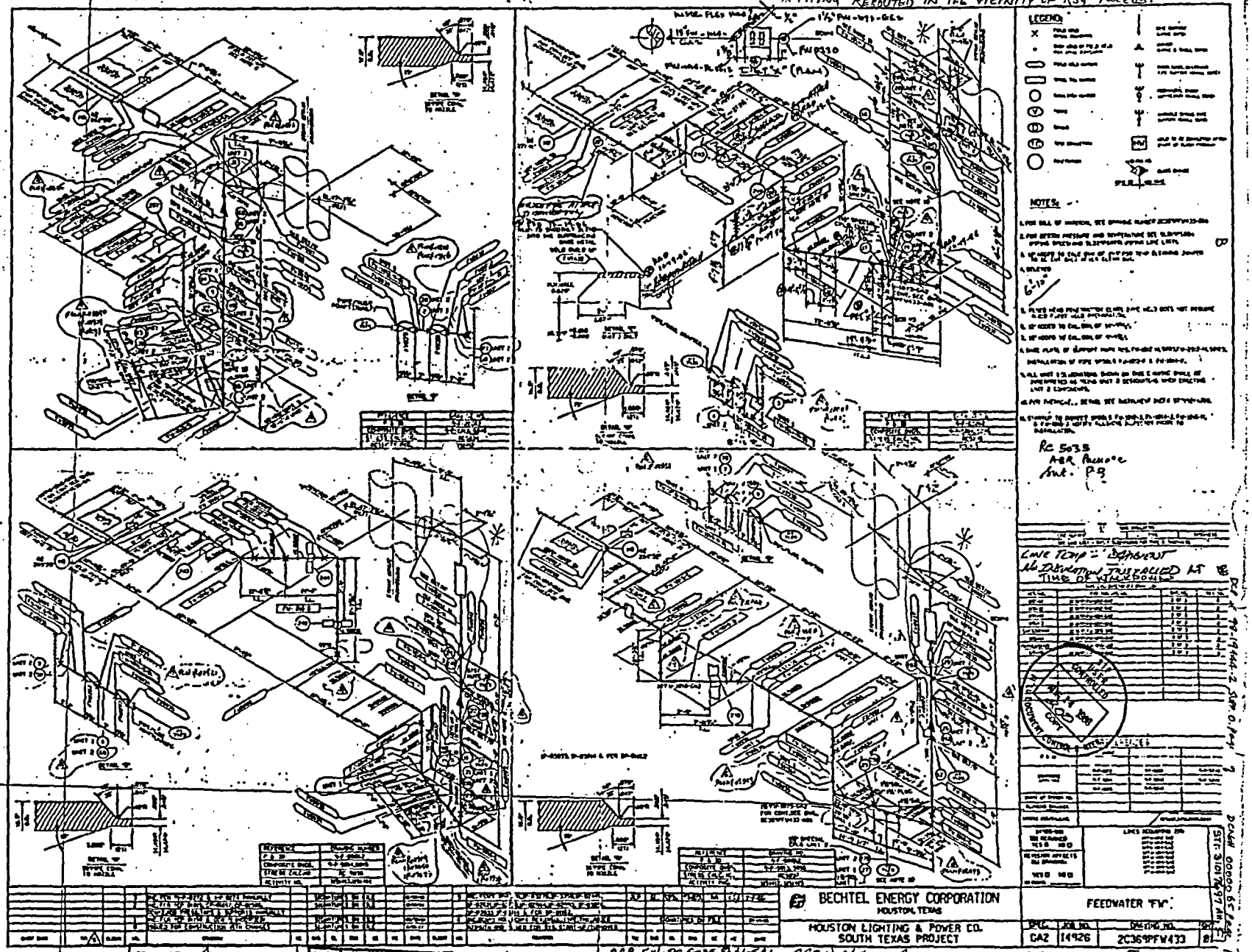
DCN# 0000065 Pag 114 of 195


* PIPING REROUTED IN THE VICINITY OF RSG NOZZLES.
LEGEND
NOTES:
RC 5035
ABR Remove
Inst. P9
BECHTEL ENERGY CORPORATION
HOUSTON, TEXAS
HOUSTON LIGHTING & POWER CO.
SOUTH TEXAS PROJECT
FEEDWATER "FW"
ABR-FW-RC6035-B41-SA1
ASE Walkdown By: