

PIPE RUPTURE ANALYSIS CRITERIA  
OUTSIDE THE REACTOR BUILDING  
CRYSTAL RIVER UNIT 3

Prepared for:

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Job Number: 0920-125

Impell Report: 03-0920-1186  
Revision 2

April 1992



### REPORT APPROVAL COVER SHEET

CLIENT: FLORIDA POWER CORPORATION

PROJECT: CR-3 HELB Outside Containment

JOB NUMBER(S): 0920-125

REPORT TITLE: Pipe Rupture Analysis Criteria Outside the Reactor  
Building - Crystal River, Unit 3

REPORT NUMBER: 03-0920-1186

#### REVISION RECORD

REV.	PREPARED	VERIFIED	REVIEWED	APPROVED	DATE
0	DW Peltola	Jeffry R Dargis	Amar Saini	KN Kassam	March 27, 1989
1	MA Likly	DW Peltola	Amar Saini	KN Kassam	December 7, 1989
2	<i>MA Likly</i>	<i>Jeffry R. Dargis</i>	<i>[Signature]</i>	<i>DW Peltola</i>	April 1, 1992

REVISION STATUS

<u>PAGE NO.</u>	<u>REV.</u>	<u>PAGE NO.</u>	<u>REV.</u>	<u>PAGE NO.</u>	<u>REV.</u>
i	2	16	1	32	0
ii	2	17	0	33	0
iii	1	18	0	34	0
1	0	19	0	35	0
2	1	20	1	36	0
3	1	20A	2	37	0
4	0	21	1	38	0
5	0	21A		39	0
v	1	22	1	40	0
7	0	23	0	41	0
8	0	24	0	42	0
9	1	25	1	43	1
10	0	26	0	44	1
11	0	27	1	45	1
12	0	28	0	46	0
13	1	29	0	47	1
14	0	30	0	47A	1
15	0	31	0	48	1

APPENDIX A

ALL PAGES REMAIN AT REVISION LEVEL 0

APPENDIX B

<u>PAGE NO.</u>	<u>REV.</u>	<u>PAGE NO.</u>	<u>REV.</u>	<u>PAGE NO.</u>	<u>REV.</u>
B-1	0	B-3	2	B-5	0
B-2	0	B-4	0	B-6	0

APPENDIX C

<u>PAGE NO.</u>	<u>REV.</u>	<u>PAGE NO.</u>	<u>REV.</u>	<u>PAGE NO.</u>	<u>REV.</u>
C-1	0	C-9	1	C-17	1
C-2	1	C-10	1	C-18	1
C-3	1	C-11	1	C-19	1
C-4	2	C-12	1	C-20	1
C-5	2	C-13	2	C-21	1
C-6	1	C-14	1		
C-7	1	C-15	1		
C-8	1	C-16	1		

APPENDIX D

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APPENDIX E

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APPENDIX F

<u>PAGE NO.</u>	<u>REV.</u>	<u>PAGE NO.</u>	<u>REV.</u>	<u>PAGE NO.</u>	<u>REV.</u>
F-1	1	F-2	1	F-3	1

combination is equivalent in the later ASME Codes to developing faulted loadings and comparing them to upset allowables, a very conservative approach.

The stresses from each loading component identified above were calculated separately, and the stress results absolutely summed. Due to the absolute summing process used, this is equivalent to absolutely summing the moment components, determining the resultant bending moment, and applying the component dependent SIF to produce the required local stress value used to determine pipe stress acceptability. This process meets the requirements of Reference 12.

The break stress development for this Criteria included only the OBE seismic stresses (not the SSE stresses), and the resultant stresses were compared to the Giambusso break stress threshold values. Cracks were assumed at one-half the break stress threshold.

A review of the SIF values used at CR-3 was performed per Reference 11.G, and the results show justifiable and appropriate individual SIF values were used for components, based on the piping code methods at the time of CR-3 piping design.

Breaks, in accordance with Section 4.1.6, shall be postulated to occur at the following locations of B31.1 (N2 and N3) piping. All piping outside containment is analyzed for and rupture locations postulated on the requirements of this section. Break locations for the systems evaluated to this criteria are identified in Appendix C.

- a) The terminal ends of the run. The section properties of the terminal end components will be considered to assure that the terminal end break is selected at the location having the highest potential for failure.
- b) At intermediate locations selected by either one of the following methods:
  - 1) At each intermediate weld location of potential high stress or fatigue; or

Table B-1

CR-3 High Energy Lines Outside Containment\*  
(for Protection per the Intent of the SRPs)

<u>Line Description</u>	<u>Nom. Pipe Size (In.)</u>	<u>Normal Operating</u>		<u>System Flow Diagram No.</u>	<u>Remarks</u>
		<u>Temp(°F)</u>	<u>Press (PSIG)</u>		
1 Main Steam:					
a. Steam Generator (R/B Interface) thru MSIV's to T/B Wall	24	590	925	D-302-011 SH 1/4	
b. Thru MSV-55 -56 to EFP Turbine Inlet isol. vlvs ASV-5, -23, ASV-204 (ASV-5 bypass)	6	590	925	D-302-011 SH 1/4; D-302-051 SH 1/1	Actual TE Break at 3" End of 6 x 3 Reducer
c. to MSDT-1, also Chem. Cleaning Lines	1 1/2	590	925	D-302-011 SH 1/4 D-302-114	
d. to Atmos. Relief Valves	6	590	925	D-302-011 SH 1/4	
e. to MS Safety Valves	6	590	925	D-302-011 SH 1/4	
f. RB Pen.No 427 & 428 to reducing tee on blowdown line	3	535	925	D-302-011 SH 2/4	Operating temp. and pressure from B&W document 1.(). 51-1153540-01, HELB Analysis for OTSG Blowdown Piping
g. Reducing tee on blowdown line to Turbine Bldg. Wall	4	535	925	D-302-011 SH 2/4	Same as 1-f.

\* Includes "nuclear island" only (i.e.; intermediate, auxiliary, fuel handling, control, and diesel generator buildings). Excludes Reactor & Turbine Buildings.

Table C-2

Crack Summary

<u>System</u>	<u>Calculation</u>	<u>Node Numbers</u>
FW	CR-25 CR-23	110, 620, 65, 615 569
MS	CR-3 CR-4 CR-5 CR-6	72, 81, 90, 62, 92 53, 54, 63, 72, 73, 82 103, 112, 121, 122, 131, 88, 97, 106, 107, 116
MS(OTSG)	CR-187	599, 601-602, 634-636 639-641, 660, 5, 24, 25, 611
CC*	0920-125-C004A 0920-125-C004B	10, 15, 148, 152, 155, 160 10, 15, 148, 152, 155, 160
MSDT**	0920-125-C007	20, 25, 32, 48, 52, 58, 62
AS	CR-4A	100, 103

\* Ref. 11.0 (D) and (G)

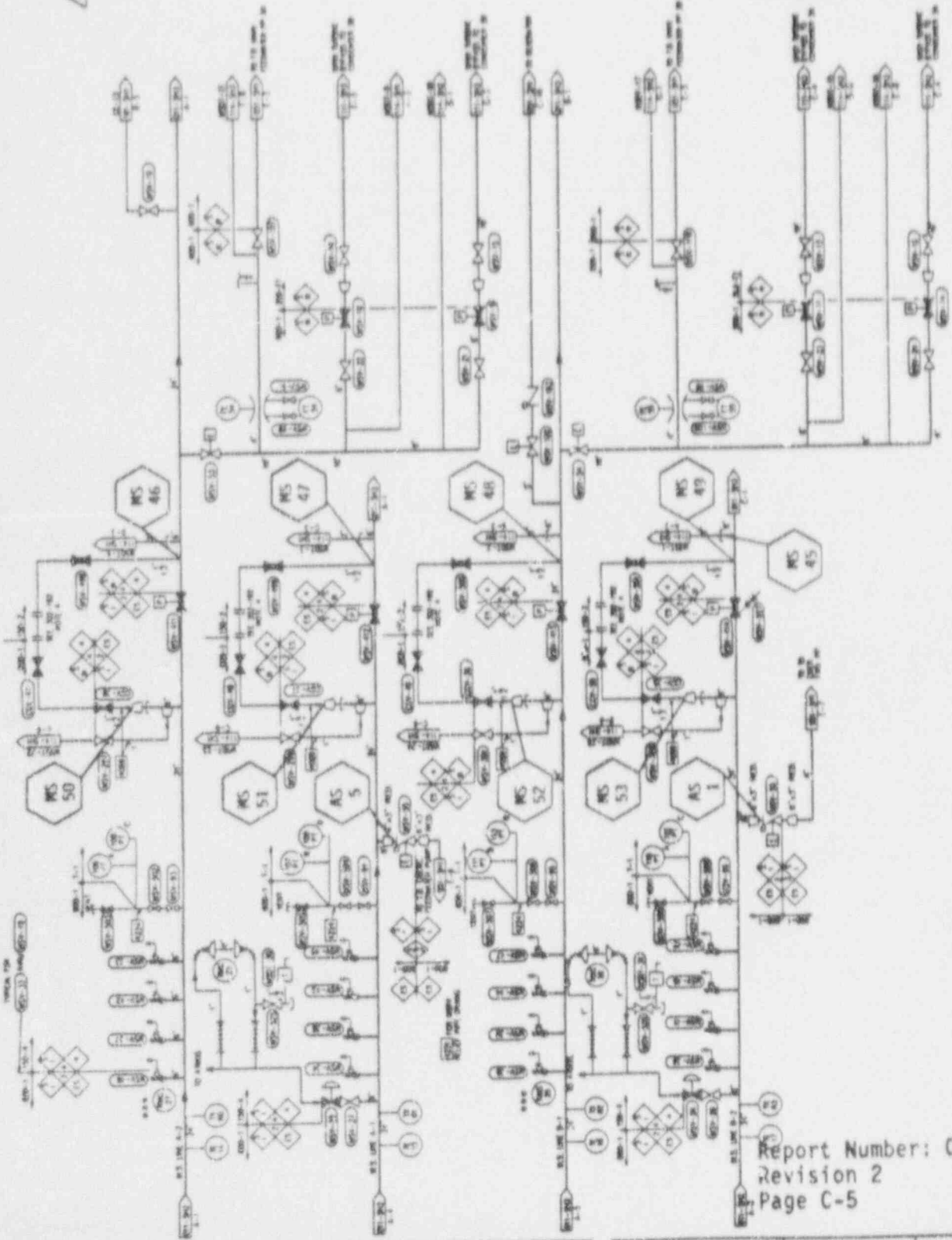
\*\* Ref. 11.0 (E) and (G)

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FLORIDA POWER CORPORATION  
 CENTRAL POWER PLANT  
 UNIT # 1 & 2 STEAM GENERATORS  
 WOOD & BECKETT  
 2700 N.W. 10th Ave.  
 MIAMI, FLORIDA 33135  
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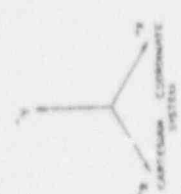
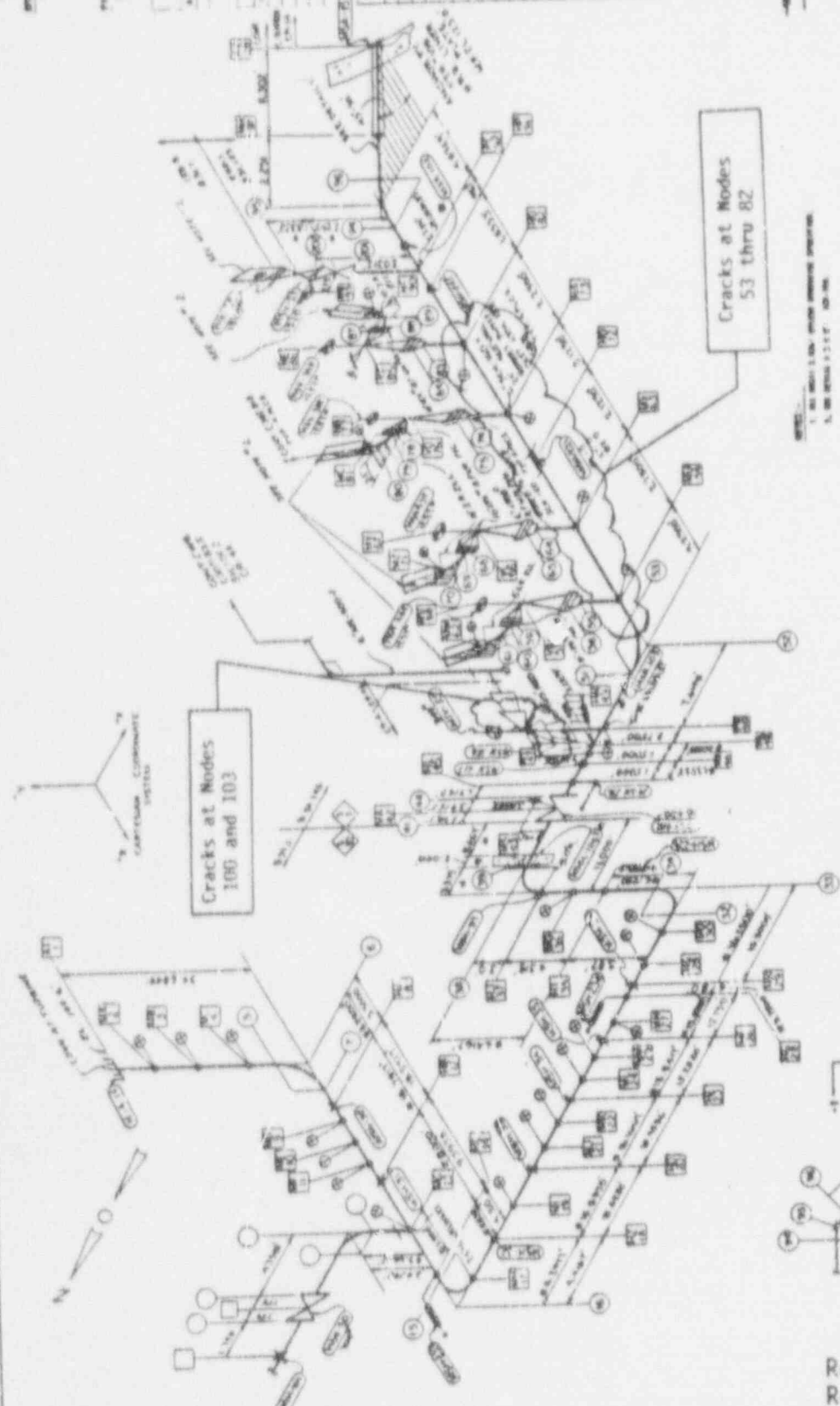
CR-4  
REV. 1.0 P. 2

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PROPOSED TO THE STATE OF FLORIDA BY  
 FLORIDA POWER CORPORATION  
 100 W. 11th St., Miami, Florida 33136  
 DEWITT H. BROWN, President  
 JOHN STEAR FARM DEVELOPMENT #188  
 TO: TROUBLE

APPROVED  
 DEWITT H. BROWN, President

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Cracks at Nodes  
100 and 103

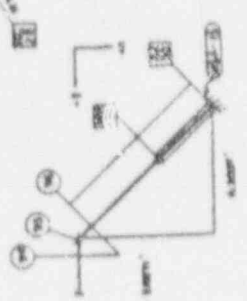
Cracks at Nodes  
53 thru 82

NOTES:  
 1. SEE SHEET 1.0 FOR GENERAL INFORMATION.  
 2. SEE SHEET 1.1 FOR CRACK DATA.

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 DEWITT H. BROWN, President

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DETAIL C