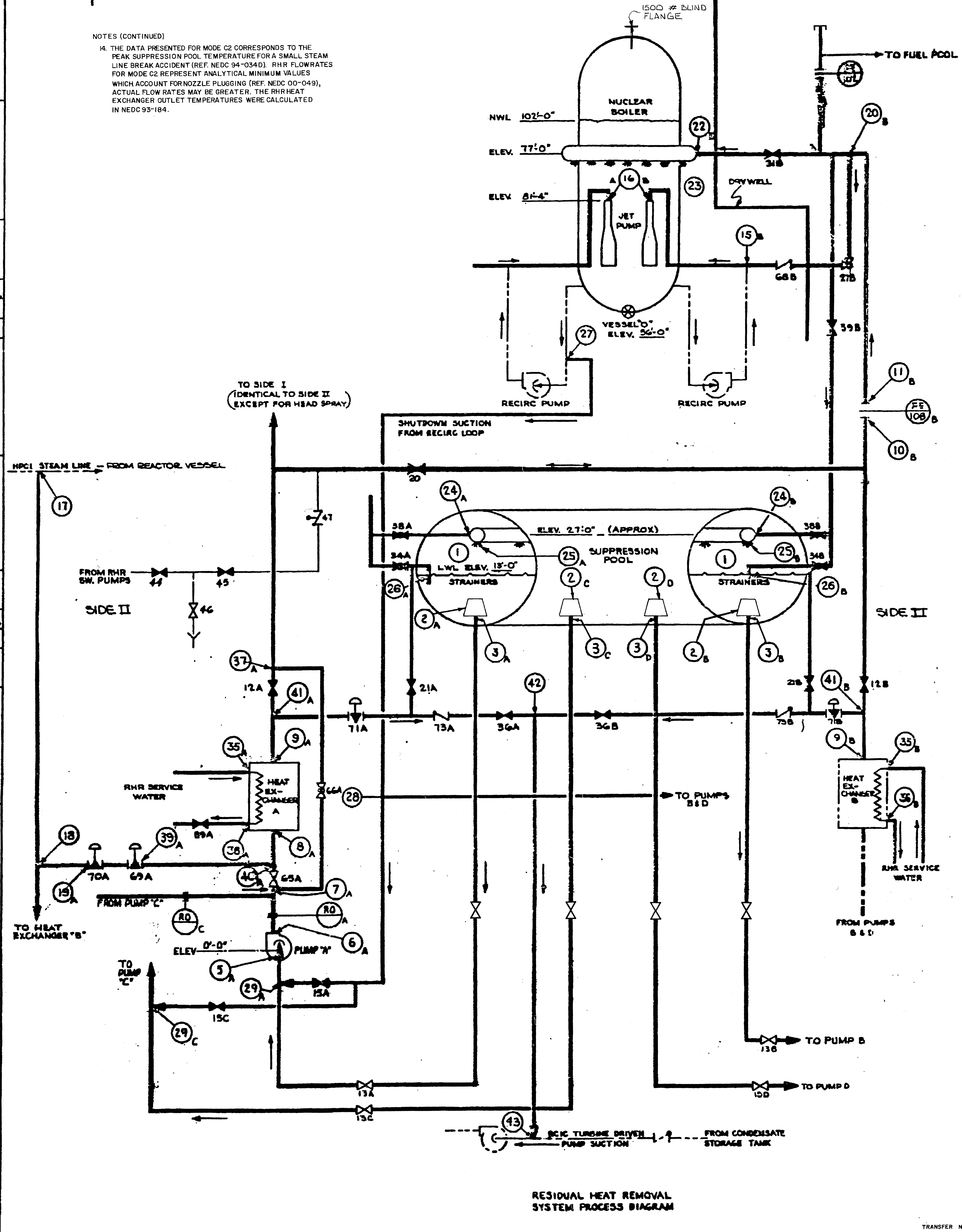
GENERAL ELECTRIC 729E211BB

PROCESS DIAGRAM
RESIDUAL HEAT REMOVAL SYS (RHR)
COOPER

FCF: 238X100BB, 10-201

NOTES (CONTINUED)

14. THE DATA PRESENTED FOR MODE C2 CORRESPONDS TO THE PEAK SUPPRESSION POOL TEMPERATURE FOR A SMALL STEAM LINE BREAK ACCIDENT (REF. NEDC 94-034D). RHR FLOWRATES FOR MODE C2 REPRESENT ANALYTICAL MINIMUM VALUES WHICH ACCOUNT FOR NOZZLE PLUGGING (REF. NEDC 00-049), ACTUAL FLOW RATES MAY BE GREATER. THE RHR HEAT EXCHANGER OUTLET TEMPERATURES WERE CALCULATED IN NEDC 93-184.



RESIDUAL HEAT REMOVAL SYSTEM PROCESS DIAGRAM

MODE A (SEE NOTES 12 & 13) — Rx PRESS = 20 PSID ABOVE DRYWELL PRESSURE

POSITION ○	1	2	3	5	6	7A	37A			10A	11A	20A	15A	16A	34
FLOW GPM	←								7700					→	—
PRESS PSIA	14.7														36.7
TEMP °F	—	130	←											→ 130	—
MAX PRESS DROP PSI				PTDH 175 ←						ΔP 0.8 ←			ΔP ←		

MODE B (SEE NOTES 12 & 13) — Rx PRESS = 20 PSID ABOVE DRYWELL PRESS

POSITION ○	1	2 A,C	3 A,C	5 A,C	6 A,C	7A	37A	10A	11A	20A	15A	16A	34
FLOW GPM	—	7500	←	→	7500	15000 ←						→ 15000	—
PRESS PSIA	14.7												36.7
TEMP °F	—	130	←									→ 130	—
MAX PRESS DROP PSI				PTDH=180 ←									

MODE C1 — TYP EITHER SIDE

POSITION ○	1	2	3		5	6	7B	8B	9B		10B	11B		20B	21B	22B	23	24B	25B	1		35B	36B
FLOW GPM	—	5750	5750		5750	5750	11500	11500	11500		11500	←		→	11500	10900	—	600	600	—		8000	8000
PRESS PSIA	25.5																25			25.5			
TEMP °F	—	187	←				→	187	173.7		173.7	←		→		173.7	—	173.7	173.7	—		90	109.1
MAX PRESS DROP PSI					PTDH=237 ←											ΔP 50 ←	ΔP 50					ΔP 10 ←	

DUTY PER HEAT EXCHANGER 76.3×10^6 BTU/HR — TOTAL HEAT EXCHANGER DUTY 76.3×10^6 BTU/HR (SEE NOTE 6)

MODE C2 (SEE NOTE 14) — TYP EITHER SIDE

POSITION ○	1	2B	3B		5B	6B	7B	8B	9B		10B	11B		20B	21B	22B	23	24B	25B	1		35B	36B
FLOW GPM	—	6500	←											→	6500	6100	—	400	400	—		4000	4000
PRESS PSIA	27.1																26.6			27.1			
TEMP °F	—	211.4	←				→	211.4	187		←				→	187	—	187	187	—		95	132.4
MAX PRESS DROP PSI					PTS,D 175 ←																		

DUTY PER HEAT EXCHANGER 77.5×10^6 BTU/HR — HEAT EXCHANGER DUTY 77.5×10^6 BTU/HR

MODE D1 (2Hx)

POSITION ○	34	17	18	19 A18	39 A18	40 A18	41 A18	26 A18	1	42	43	35 A18	36 A18
FLOW LBS/HR	—	138×10^3	138×10^3	69×10^3	←			→ 69×10^3	—	138×10^3	138×10^3	4×10^6	4×10^6
PRESS PSIA	2014.7				214.7				14.7		64.7		
TEMP °F	346	←	→	546	390	390	140	140	—	140	140	85	103.6
MAX PRESS DROP PSI	ΔP=800			ΔP=200	ΔP=125								

DUTY PER HEAT EXCHANGER 74.5×10^6 BTU/HR (2Hx OPERATING)

MODE D2 (1Hx)

POSITION ○	34	17	18	19A	39A	40A	41A	42	43	35A	36A
FLOW LBS/HR	—	59×10^3	←					→	44×10^3	4×10^6	4×10^6
PRESS PSIA	2014.7				214.7				64.7		
TEMP °F	346	←	→	546	390	390	140	140	140	85	111.8
MAX PRESS DROP PSI	ΔP=800			ΔP=125							

DUTY PER HEAT EXCHANGER 107×10^6 BTU/HR (1Hx OPERATING)

MODE E — Rx PRESS = 50 PSIA

POSITION ○	34	27	28	29 A13	5 A13	6 A18	8 A18	9 A18	10B	11B	20B			15B	16B	34							34	35 A13	36 A13
FLOW GPM	—	15400	15400	7700	←		→	7700	15400	15400	15400			15400	15400	—							—	8000	8000
PRESS PSIA	50															50							50		
TEMP °F	—	281	←				→	281	241.2	←				→	241.2	—							—	75	113.8
MAX PRESS DROP PSI					PTDH=175 ←																				

DUTY PER HEAT EXCHANGER 155×10^6 BTU/HR — TOTAL HEAT EXCHANGER DUTY 310×10^6 BTU/HR

MODE F — Rx PRESS = 0 PSIG — Rx TEMP = 125° F < 20 HR AFTER SCRAM

POSITION ○	34	27	28	29 A13	5 A18	6 A18	8 A18	9 A18			10B	11B	20B			15B	16B	34						35 A13	36 A13
FLOW GPM	—	15400	15400	7700	←		→	7700			15400	←				→	15400	—						8000	8000
PRESS PSIA	14.7																	14.7							
TEMP °F	—	125	←				→	125	115.7	←						→	115.7	—						75	83.9
MAX PRESS DROP PSI					PTDH=125 ←																				

DUTY PER HEAT EXCHANGER 35.7×10^6 BTU/HR — TOTAL HEAT EXCHANGER DUTY 71.4×10^6 BTU/HR

MODE G. (SEE NOTE 12) — Rx PRESS = 0 PSID

POSITION ○	1	2A	3A		5A	6A	7A	37A	10A	11A	20A			15A	16A	34
FLOW GPM	—	←					8400								→	—
PRESS PSIA	14.7															14.7
TEMP °F	—	130	←												→ 130	—
MAX PRESS DROP PSI					PTDH=[illegible] ←											

MODE H — TYP EITHER SIDE

POSITION ○	1	2A	3A		5A	6A	7A	37A	10A	11A	20A	21A	26A	1
FLOW GPM	—	←						7700					→	—
PRESS PSIA	14.7													14.7
TEMP °F	—	90	←										→ 90	—
MAX PRESS DROP PSI					PTDH=125 ←									

MODE I — TYP EITHER SIDE

POSITION ○	34	27	28	29	5A	6A	8A	9A	10A	11A	20A			15A	16A	34
FLOW GPM	—	←						7700							→	—
PRESS PSIA	14.7															14.7
TEMP °F	—	125	←												→ 125	—
MAX PRESS DROP PSI					PTDH=125 ←											

PRIMARY MODES

A. ACCIDENT W/RECIRC LINE BREAK IN SIDE II WITH ONE PUMP OPERATION (20 PSID).

B. ACCIDENT W/RECIRC LINE BREAK IN SIDE II WITH TWO PUMP OPERATION (20 PSID).

C.1 POST ACCIDENT CON'T. SPRAY W/HEAT REJECTION WITH TWO PUMP OPERATION (NORMAL SUPP POOL TEMP).

C.2 POST ACCIDENT CON'T SPRAY W/HEAT REJECTION WITH ONE PUMP OPERATION (PEAK SUPP POOL TEMP).

D.1 REACTOR ISOLATION - STM. COND - 2Hx
REACTOR ISOLATION - STM. COND - 1Hx
POOL COOLING (1Hx) NOT SHOWN.

E. NORMAL SHUTDOWN AFTER BLOWDOWN TO MAIN CONDENSER. (35 PSIG). SEE NOTE 9

F. CONTINUATION OF NORMAL SHUTDOWN FROM PLANT MODE E. (0 PSIG)

G. ACCIDENT W/RECIRC LINE BREAK IN SIDE II WITH SAME PUMP OPERATION. (0 PSID) MAX. RUNOUT CONDITIONS.

H. R.H.R. SYSTEM TEST DURING PLANT OPERATION.

I. FUNCTIONAL TEST FOLLOWING SHUTDOWN.

NOTES:

1. A/E IS TO FILL IN VALUES (BASED ON HIS ANALYSIS) FOR ALL EMPTY DATA BLANKS AND SUBMIT TO SMRSD FOR REVIEW. IF SIDE I AND SIDE II ARE NOT SYMETRICALLY ARRANGED, VALUES FOR BOTH SHALL BE SUBMITTED.

2. ALL ELEVATIONS ARE WITH RESPECT TO RHR PUMP ELEVATION WHICH IS ASSUMED TO BE 0'-0".

3. REFERENCE NEDC 97-041 AND 97-044 FOR NPSH MARGIN.

4. ALLOWANCE FOR SYSTEM PIPE FRICTION, VALVE & FITTING LOSSES ETC. ARE REFLECTED BY THE PRESSURES REPORTED IN THIS TABULATION. THIS ALLOWANCE IS BASED ON PRELIMINARY LAYOUTS & THE DATA & METHODS PRESENTED IN CRANE TECHNICAL PAPER 410 ASSUMING CLEAN PIPE EXCEPT FOR CARBON STEEL PIPE. FOR RUNS OF CARBON STEEL PIPE (NOT CARBON STEEL VALVES & FITTINGS) A MARGIN OF 20% ABOVE THE CLEAN FRICTION LOSS IS INCLUDED. PIPE FRICTION, VALVE & FITTING LOSSES ETC. MAY BE DISTRIBUTED THROUGHOUT SYSTEM AS REQUIRED BY FINAL SYSTEM LAYOUT CONSIDERATIONS AS LONG AS THE TOTAL DOES NOT EXCEED THAT INDICATED ON THIS DIAGRAM.

5. ELEVATIONS ARE NOT INCLUDED IN G.E. EQUIPMENT ΔP VALUES GIVEN. ELEVATIONS SHALL BE INCLUDED WHEN DETERMINING FINAL VALUES FOR THE EMPTY DATA BLANKS. PUMP HEAD & OVERALL ΔP ARE BASED ON ELEVATIONS SHOWN. PUMP HEAD WILL NOT CHANGE, THEREFORE, ANY ELEVATION CHANGES MUST BE REFLECTED IN THE OVERALL PRESSURE DROP.

6. THE ΔP LISTED IS THE PRESSURE DROP ACROSS THE NOZZLES ONLY.

7. DASHED LINES INDICATE FLOW DOES NOT PASS THROUGH THESE POINTS FOR ΔP SHOWN.

8. LINE SIZE 12 TO 31 TO BE BASED ON FLOW TO FUEL POOL SHOWN ON FUEL POOL PROCESS DIAGRAM.

9. SHUTDOWN OPERATION MAY BE INITIATED AT A MAXIMUM REACTOR VESSEL PRESSURE OF 75 PSIG.

10. SERVICE WATER CROSS TIE SHALL BE SIZED TO FLOW 4000 GPM, REF NEDC 97-086.

11.

12. FLOWS SHOWN FOR MODE A AND B ARE THE MINIMUM ALLOWABLE (TRUE) FLOW. FOR MODE G IS THE MAXIMUM ALLOWABLE MEASURED FLOW.

13. DESIGN FLOWS WITH THE MINIMUM FLOW VALVE OPEN AND Rx PRESSURE AT 0 PSID ABOVE DRYWELL PRESSURE ARE 6,871 GPM FOR MODE A, AND 11,290 GPM FOR MODE B. SEE DC 94-332.

REFERENCE DRAWINGS & SPECIFICATIONS:

1. NPL 1C - - - - RESIDUAL HEAT REMOVAL SYS P&ID

2. NPL 10-200 - - DESIGN SPEC. RHR SYSTEM

NOTE: RHR STEAM CONDENSING MODE IS NO LONGER AN OPERATIONAL MODE.

LIMITING LINE LOSSES

MODE A	6-16
MODE B	NONE
MODE C1	21-23 & 24-25-1
MODE C2	1-5 (NPSH AVAILABLE)
MODE D	17-40 (41-POOL) & 41-43
MODE E	12-31 (SEE NOTE 8) 31-34
MODE F	27-29 (NPSH AVAILABLE)
MODE G	STRAINER DESIGN 1-5 (NPSH AVAILABLE)
MODE H	21-26
MODE I	NONE

AS BUILT 454004886 — SCAN/CADD DWG — DO NOT REVISE MANUALLY — CADD FILE: C0103609

TRANSFER NOTE: NPPD TRANSFERRED ISSUERS REVISION NO3 TO A MORE LEGIBLE COPY OF THE DRAWING.
TRANSFERRED BY SPB
DATE 2-17-89
CHECKED J. Wells 2-20-89
APPROVED MAH 2/24/89

FOR PREVIOUS REVISIONS, SEE SUPERSEDED CARDS.

REVISIONS BY N.P.P.D.

NO.	REVISIONS	DFT	CKD	APP	DATE
N12	EE 12-003 (DCN 12-0997)	RAC	KPB	DJB	1-23-13

CHKD: W.B. JONES
NE 33553 CHK BY
NH26757
PER ECN NE 37040
CHANGE DC CRK VALUES OR RCIC & L.S. MODES A & C1, C2, E, F, G, H, I PER SCA
REV. N12
729E211BB
SAN JOSE, CALIF.
E.I.S.

A.M. BROCCHINI MAIL CODE - 723 JOB N