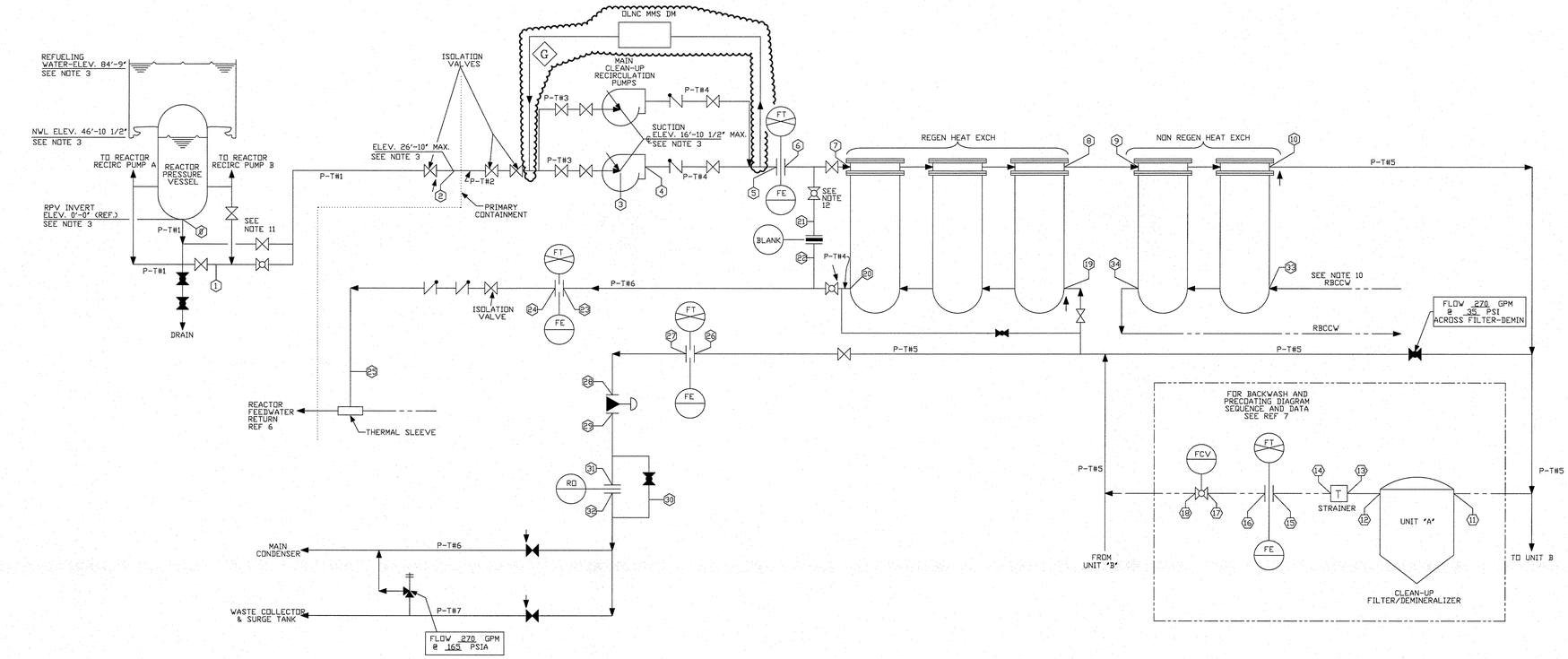

NOTES:

1. * THIS IS THE MAXIMUM RBCCW OUTLET TEMPERATURE.
   ** THIS IS THE MAXIMUM FLOW RATE POSSIBLE FOR THIS MODE WITH THESE HEAT EXCHANGERS.
   *** TEMP 9 MINUS TEMP 10 IS THE MAXIMUM TEMP DIFFERENCE ACROSS THE NRH_x. THIS OPERATING MODE SHOULD BE LIMITED DURING THE LIFE OF THE PLANT TO THE NUMBER OF CYCLES PERMITTED BY PARA. N-415.1 OF SECTION III OF THE ASME CODE (100 MAX.)
2. THE MINIMUM REQUIRED NPSH OF THE CLEANUP RECIRCULATION PUMPS IS 13 FEET.
3. THE ELEVATIONS SHOWN ARE NOT INDICATIVE OF AN ARRANGEMENT FOR ANY PARTICULAR PLANT. THESE ELEVATIONS ARE REFERENCES FROM REACTOR PRESSURE VESSEL INVERT. THE PRESSURES UNDER POSITIONS '3' AND '4' INCLUDE CHANGES IN STATIC HEAD DUE TO THESE ASSUMED ELEVATIONS.
4. FOR BACKWASH AND PRECOAT FREQUENCY SEE RADWASTE SYSTEM PROCESS DIAGRAM, REF. 3.
5. THE PRESSURE SHOWN AT POSITION 25 IN MODE 'A' IS THE ASSUMED MINIMUM PRESSURE REQUIRED TO ENTER THE FEEDWATER LINE DURING POWER OPERATION BASED ON FEEDWATER ARRANGEMENT PER REF. 4.
6. VALVES ARE SHOWN IN THEIR NORMAL OPERATING POSITION.
7. FOR THE REACTOR VESSEL BOTTOM DRAIN CONNECTION, SEE REF. 5.
8. THE MINIMUM ALLOWABLE PIPE FRICTION DROP FOR THE SIZING OF THE CLEANUP RECIRCULATION PUMPS SUCTION PIPING FROM POSITIONS '0' THROUGH '3' SHALL BE CONTROLLED BY MODE 'F' AND SHALL NOT EXCEED 5.5 PSI FOR THE CONDITIONS SHOWN. MODE 'A' SHALL CONTROL THE SIZING OF THE DISCHARGE PIPING FROM POSITIONS '4' THROUGH '25' AND SHALL NOT EXCEED 34 PSI FOR THE CONDITIONS SHOWN.
9. DELETED
10. COOLING WATER FLOW VALUES NOT TO BE EXCEEDED BY MORE THAN 6%.
11. FLOWS AT NODE (8) WILL INCREASE FROM THE VALUES SHOWN AS A RESULT OF KEEPING THE BOTTOM HEAD DRAIN VALVE OPEN AND REMOVING THE 1" NPS BYPASS. TOTAL FLOW (NODE (2)) WILL REMAIN APPROXIMATELY THE SAME.
12. A PERMANANT BLANK HAS BEEN INSTALLED IN THE HEAT EXCHANGER BYPASS LINE ((21) TO (22)). FOR MODE F, THE RWCU SYSTEM FLOW PASSES THROUGH THE HEAT EXCHANGERS AND FILTER / DEMINERALIZERS.

PIPING PRESSURE-TEMPERATURE (P-T) INDEX

PT NO.	DESIGN TEMP (°F)	DESIGN PRESS. (PSIG)	MIN. TEMP (°F)
1	575	1250	70
2	575	1250	40
3	575	1150	40
4	575	1300	40
5	150	1300	40
6	BY OTHERS	BY OTHERS	40
7	150	150	40

MODE 'A' - NORMAL OPERATION — R.S.S. 1060 PSIA

POSITION ○	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
FLOW GPM	63	146	354	177	177	354	354	354	280	280	270	135	◄						►	135	318				318	318	318							516	524
TEMPERATURE °F	535	◄		►	535	536	◄		►	536	233	233	120	◄					►	120	439				439	439	439							95	154
PRESS PSIA					1065	1249																				1100									ΔP =16
MAXIMUM PRESSURE DROP PSI	⟵ΔP⟶ ⟵164⟶ TDH ⟵34⟶ ALLOWABLE PIPE FRICTION DROPS NOTE 8																																		

OPERATING PROCEDURES:
1. MAIN CLEAN-UP PUMPS IN OPERATION
2. RH_x UNDER FULL LOAD
3. NRH_x UNDER FULL LOAD
4. FILTER-DEMINERALIZERS IN OPERATION
5. DELETED
6. NO BLOWDOWN FLOW
7. (G) DLNC MMS IN OPERATION

MODE 'A' DESIGN BASIS FOR HEAT EXCHANGERS AND SIZING OF THE MAIN CLEAN-UP PUMPS DISCHARGE PIPING

MODE 'B' - STARTUP OPERATION — R.S.S. 200 PSIA

POSITION ○	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
FLOW GPM	14	146	306	153	153	306	306	306	284	284	272	136	◄						►	136	146	162			62	162	162	126	126	←	126	TOTAL	◄	126	126	428	438
TEMPERATURE °F	381	◄		►	381	382	◄		►	382	258	258	130	◄					►	130	365				365	365	365	130	◄				►	130	95	175
PRESS PSIA					205	395																				225								40	ΔP =10
MAXIMUM PRESSURE DROP PSI	⟵ΔP⟶ ⟵190⟶ TDH ⟵ΔP⟶ ⟵190⟶ ⟵5⟶ ALLOWABLE PIPE FRICTION DROPS																																		

OPERATING PROCEDURES:
1. MAIN CLEAN-UP PUMPS IN OPERATION
2. RH_x UNDER PARTIAL LOAD
3. NRH_x UNDER MAX START UP LOAD
4. FILTER-DEMINERALIZERS IN OPERATION
5. FCV IN OPERATION
6. CRD & SWELL WATER ARE DISCHARGED TO RADWASTE OR CONDENSER
7. (G) DLNC MMS IN OPERATION

MODE 'B' OPERATIONAL INFORMATION

MODE 'C' - BLOWDOWN OPERATION — R.S.S. 1003 PSIA

POSITION ○	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
FLOW GPM	6	59	124	62	62	124	◄		►	124	92	46	◄						►	46							92	◄		►	92		92	92	516	528
TEMPERATURE °F	545	◄		►	545	546	◄		►	546	546	104	◄						►	104							104	◄		►	104		104	104	95	180*
PRESS PSIA																																			ΔP =10
MAXIMUM PRESSURE DROP PSI	⟵ΔP⟶ ⟵180⟶ TDH ⟵ΔP⟶ ⟵1⟶ ⟵2⟶ ⟵2⟶ ⟵4⟶ ⟵1⟶ ⟵1⟶ ⟵1⟶ ⟵575⟶ ⟵560⟶ ALLOWABLE PIPE FRICTION DROPS																																		

OPERATING PROCEDURES:
1. MAIN PUMPS IN OPERATION
2. RH_x UNDER NO LOAD
3. NRH_x UNDER FULL LOAD
4. FILTER-DEMINERALIZERS IN OPERATION
5. FCV IN OPERATION
6. ENTIRE FLOW IS DISCHARGED TO RADWASTE OR CONDENSER
7. (G) DLNC MMS IN OPERATION

MODE 'C' OPERATIONAL LIMITATIONS & DESIGN BASIS FOR BLOWDOWN ORIFICE - SEE NOTE 1

MODE 'D' - REFUELING OPERATION (MAX. BYPASS) — R.S.S. 15 PSIA

POSITION ○	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
FLOW GPM	12	129	270	135	135	270	◄		►	270	135	◄							►	135							270	270	←	270	TOTAL	←	270	270		
TEMPERATURE °F	125	◄		►	125	126	◄												►	126							126	◄					►	126		
PRESS PSIA				38	280																												40		
MAXIMUM PRESSURE DROP PSI	⟵ΔP⟶ ⟵242⟶ TDH ⟵4⟶ ⟵10⟶ ⟵10⟶ ⟵25⟶ ⟵5⟶ ⟵4⟶ ⟵25⟶ ⟵4⟶ ⟵115⟶ ⟵5⟶ ⟵ΔP⟶ ALLOWABLE PIPE FRICTION DROPS																																		

OPERATING PROCEDURES:
1. MAIN PUMPS IN OPERATION
2. NO RH_x LOAD
3. NO NRH_x LOAD
4. FILTER-DEMINERALIZERS IN OPERATION
5. FCV IN OPERATION
6. ENTIRE FLOW IS DISCHARGED TO RADWASTE OR CONDENSER

MODE 'D' DUMPING REFUELING WATER AND SIZING OF BLOWDOWN FCV AND RELIEF VALVE

MODE 'E' - REFUELING — R.S.S. 15 PSIA

POSITION ○	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
FLOW GPM	12	129	270	135	135	270	◄		►	270	135	◄							►	135	270	270			270	270	270									
TEMPERATURE °F	125	◄		►	125	126	◄												►	126					126	126	126									
PRESS PSIA				38	280																					50									
MAXIMUM PRESSURE DROP PSI	⟵ΔP⟶ ⟵242⟶ TDH ⟵4⟶ ⟵10⟶ ⟵10⟶ ⟵25⟶ ⟵5⟶ ⟵4⟶ ⟵120⟶ ⟵10⟶ ⟵4⟶ ALLOWABLE PIPE FRICTION DROPS																																		

OPERATING PROCEDURES:
1. MAIN PUMPS IN OPERATION
2. NO RH_x LOAD
3. NO NRH_x LOAD
4. FILTER-DEMINERALIZERS IN OPERATION
5. DELETED
6. NO BLOWDOWN FLOW

MODE 'E' CONTINUOUS CLEANING OF REACTOR WATER DURING REFUELING

MODE 'E1' - REFUELING

POSITION ○	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
FLOW GPM	12	139	270	135	135	270	◄		►	270	266	133	◄						►	133	266	266			266	266	266									
TEMPERATURE °F (NOMINAL)	125	◄		►	125	126	◄		►	126	92	◄							►	92					92	92	92									
TEMPERATURE °F (MAXIMUM)	140	◄		►	140	141	◄		►	141	83	◄							►	83					83	83	83									
PRESS PSIA				38	280																					50									
MAXIMUM PRESSURE DROP PSI	⟵ΔP⟶ ⟵242⟶ TDH ⟵4⟶ ⟵10⟶ ⟵10⟶ ⟵25⟶ ⟵5⟶ ⟵4⟶ ⟵120⟶ ⟵(10*)⟶ ⟵4⟶ ALLOWABLE PIPE FRICTION DROPS																																		

OPERATING PROCEDURES:
1. MAIN PUMPS IN OPERATION
2. RH_x BYPASS LINE OPEN AND RH_x INLET ISOLATED
3. NORMAL RBCCW FLOW TO NRH_x
4. FILTER-DEMINERALIZERS IN OPERATION
5. FCV IN OPERATION
6. NO BLOWDOWN FLOW

MODE 'E1' CONTINUOUS CLEANING OF REACTOR WATER DURING REFUELING WITH REGENERATIVE HEAT EXCHANGER BYPASSED AT NOMINAL DESIGN & MAXIMUM OPERATING TEMPERATURES

* PRESSURE DROP ESTABLISHED ACROSS THE MANUALLY-OPERATED BYPASS LINE Y-GLOBE ISOLATION VALVE

** AT NOMINAL CONDITIONS THE RBCCW TEMPERATURE IS 85°F, AND AT MAXIMUM REFUELING CONDITIONS THE RBCCW TEMPERATURE IS ASSUMED TO BE AT ITS DESIGN MINIMUM 70°F.

MODE 'F' - HOT SHUTDOWN OPERATION (WITH LOSS OF RPV RECIRC. PUMPS) — R.S.S. 1003 PSIA — SEE NOTES 2, 8 AND 12

POSITION ○	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
FLOW GPM	162	99	360	180	180	360	360															360	360	360	360	360									
TEMPERATURE °F	540	545	543	543	544	544	544															544	544	544	544	544									
PRESS PSIA				1007	1168																					1028									
MAXIMUM PRESSURE DROP PSI	⟵ΔP⟶ ⟵161⟶ TDH ⟵4⟶ ⟵130⟶ ⟵4⟶ ALLOWABLE PIPE FRICTION DROPS																																		

OPERATING PROCEDURES:
1. MAIN PUMPS IN OPERATION
2. RH_x AND NRH_x BYPASSED
3. VALVE BETWEEN THE RH_x AND NRH_x CLOSED
4. ENTIRE FLOW IS RETURNED DIRECTLY TO THE REACTOR
5. GATE VALVE (ZONE G-7) ON DRAIN LINE IS OPEN

MODE 'F' DESIGN BASIS FOR MAIN CLEAN-UP PUMP (MAXIMUM CAPACITY AND MINIMUM NPSH) AND SIZING OF THE MAIN PUMPS SUCTION PIPING

REFERENCE DOCUMENTS: — MPL ITEM NO.
1. REACTOR WATER CLEANUP P & ID G33-1010
2. RWCU DESIGN SPEC. G33-4010
3. RADWASTE SYSTEM P.D. G33-1020
4. REACTOR SYSTEM OUTLINE DWG. A61-2050
5. REACTOR RECIRC. SYSTEM P & ID B31-1010
6. NUCLEAR BOILER SYSTEM P & ID B21-1010
7. FILTER/DEMINERALIZER P.D. G33-2002
8. DELETED
9. DELETED
10. (G) DLNC MMS P & ID M-2038

LEGEND:
RSS REACTOR STEAM SPACE
RH_x REGENERATIVE HEAT EXCHANGER
NRH_x NON REGENERATIVE HEAT EXCHANGER

6M721-5858
LATEST REVISION G

NUCLEAR SAFETY RELATED

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TC | CHANGE DOCUMENT

PREPARED BY: W.J. ADLER — DATE: 5/03/11 — CHECKED BY: [signature] — DATE: 6-2-11
APPROVED BY: [signature] Bill Mass for Bill Mass for TMPE 11-0012 — DATE: 6-2-2011

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OTHER APPROVALS — DATE

INC.CODE: U

Detroit Edison — Fermi 2

TITLE: REACTOR WATER CLEANUP SYSTEM

APERTURE CARD TITLE: RX WTR CLEANUP SYS PROCESS DIAG

PLANT IDENTIFICATION SYSTEM NUMBER: G3300 — ARMS RECIPIENT #

DOCUMENT TYPE CODE: DDDMEC — NUC OPS FILE NO.: 1801 — DATE ISSUED TO IS: 6-3-11

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