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JUNE 14, 1979

U.S. NUCLEAR REGULATORY COMMISSION
DOCKETING & SERVICE BRANCH
1717 H STREET, N.W.
ROOM 1141
WASHINGTON, D.C.
ATTN: MR. CHASE R. STEPHENS

DEAR CHASE:

PLEASE FIND ENCLOSE COPIES OF SLIDES WHICH SHOULD BE INSERTED
IN THE TRANSCRIPT IN THE MATTER OF ACRS SUBCOMMITTEE ON REACTOR
OPERATIONS - POWER LEVEL INCREASE HELD ON WEDNESDAY, JUNE 13, 1979.

SORRY FOR ANY INCONVENIENCE THIS MAY HAVE CAUSED YOU.

VERY TRULY YOURS,

ACE-FEDERAL REPORTERS, INC.
Mary A. Simpson
(MISS) MARY A. SIMPSON

550 246

7907310474

Richard H. ...
Millstone 2
6/13-79

MILLSTONE UNIT NO. 2
POWER UPGRATING TO 2700 MWT

NO PUBLIC DOCUMENT ROOM
NRG PUBLIC DOCUMENT ROOM

AUTS SUB-COMMITTEE MEETING ON REACTOR OPERATIONS

WEDNESDAY, JUNE 13, 1979

ITE AND PLANT DESCRIPTION

SENSING AND OPERATING HISTORY

REVIEW OF POWER INCREASE

3 CORE DESIGN

INCREASE METHODOLOGY CHANGES

IDENT/ACCIDENT ANALYSES

3/POWER INCREASE MODIFICATIONS

CHARGING PUMPS
REACTOR COOLANT PUMP SPEED SENSING SYSTEM
NEUTRON SHIELD

GENERIC LIST

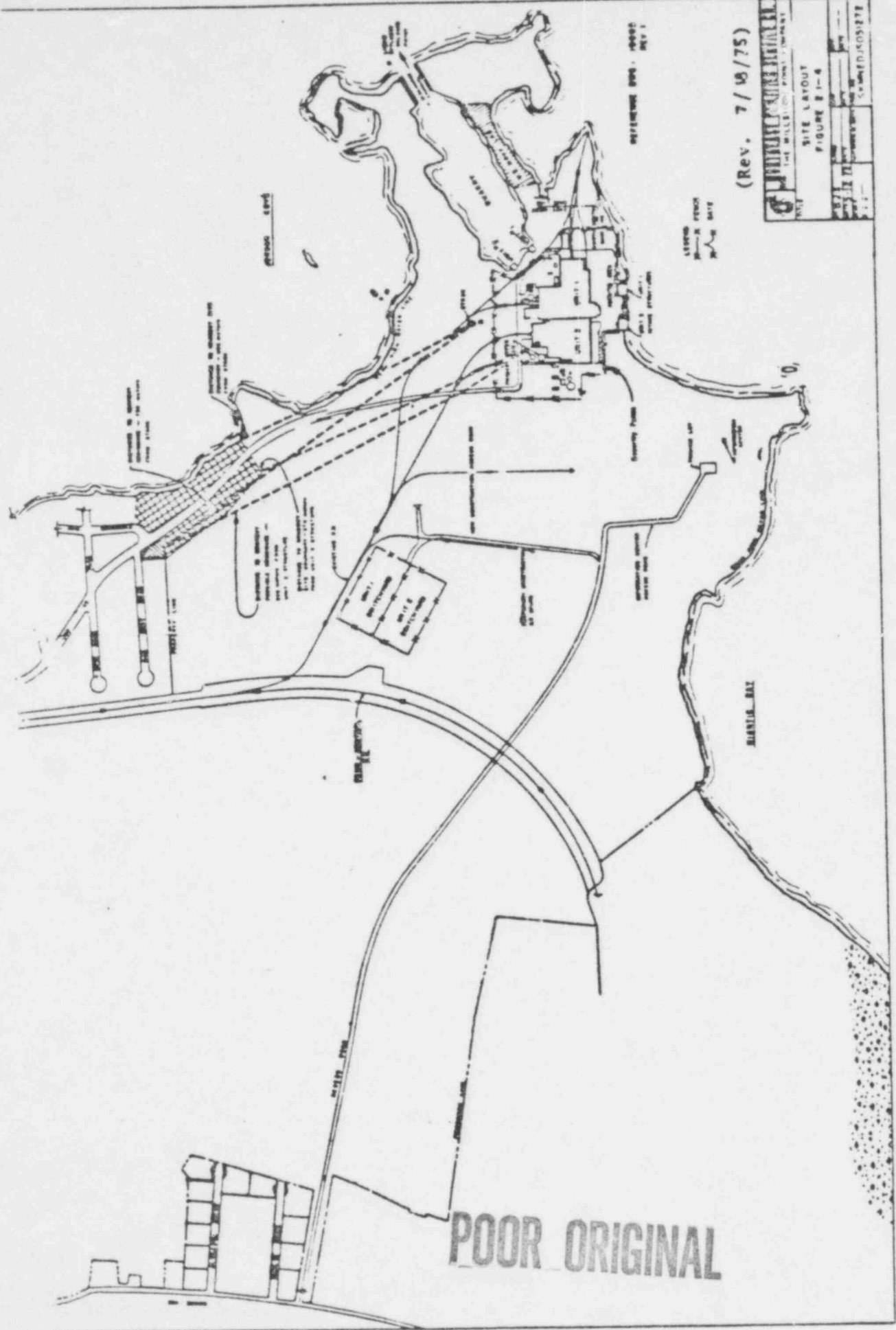
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154



POOR ORIGINAL

SITE MAP

FIGURE 2.1-3

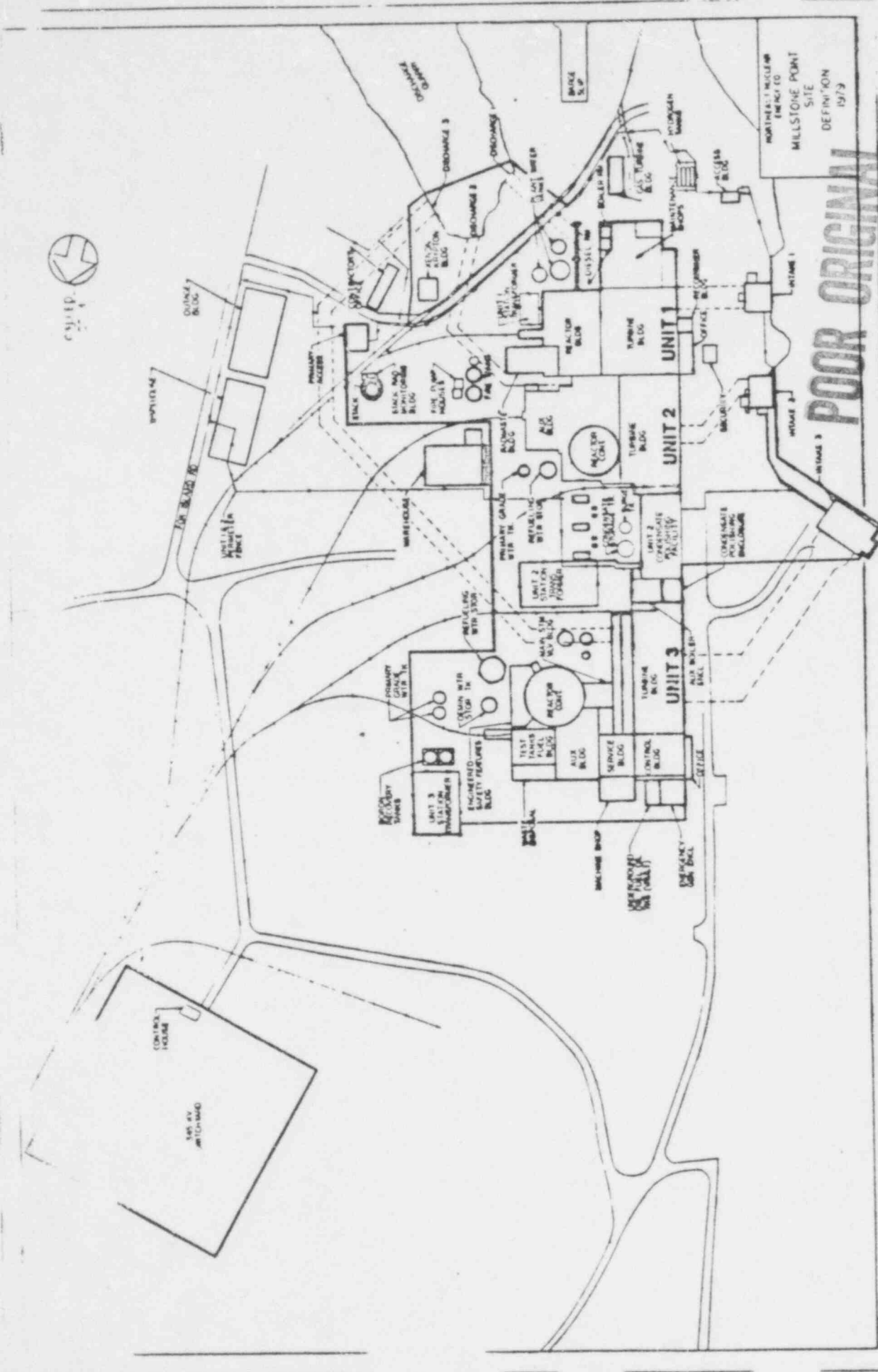


(Rev. 7/18/75)

SITE LAYOUT
FIGURE 2-4



UNITED STATES



MILLSTONE UNIT NO. 2
ACRS MEETING - JUNE 13, 1979
LICENSING AND OPERATING HISTORY

CONSTRUCTION PERMIT APPLICATION -- FEBRUARY 12, 1969.

CONSTRUCTION PERMIT ISSUED -- DECEMBER 11, 1970.

MAJOR NSSS COMPONENTS DELIVERED -- FEBRUARY/MARCH 1972.

FSAR SUBMITTED -- AUGUST 15, 1972.

ACRS SUBCOMMITTEE SITE TOUR -- JANUARY 26, 1974.

SER ISSUED -- MAY 10, 1974.

ACRS SUBCOMMITTEE MEETING -- MAY 22, 1974.

ACRS FULL COMMITTEE MEETING -- JUNE 6, 1974.

OPERATING LICENSE ISSUED -- AUGUST 1, 1975.

MILLSTONE UNIT NO. 2 OPERATING HISTORY

(CYCLE 1) (MDC CAPACITY FACTOR, BASED ON 796 MDC NET = 66.6%)

- 1 OPERATING LICENSE ISSUED -- AUGUST 1, 1975
- 2 INITIAL CRITICALITY -- OCTOBER 17, 1975
- 3 COMMERCIAL OPERATION -- DECEMBER 26, 1975
- 4 DIESEL GENERATOR REPLACEMENT OUTAGE (3.5 WEEKS)
DECEMBER 20, 1976 - JANUARY 13, 1977
- 5 TUBE MAIN CONDENSER (6.5 WEEKS)
MAY 7, 1977 - JUNE 21, 1977
- 6 1ST REFUELING/STEAM GENERATOR TUBE PLUGGING (35.5 WEEKS)
NOVEMBER 20, 1977 - APRIL 27, 1978

(CYCLE 2) (MDC CAPACITY FACTOR, BASED ON 810 MDC NET = 94.4%)

- 1 CRITICALITY -- APRIL 21, 1978
- 2 POWER -- MAY 8, 1978
- 3 2ND REFUELING (10.5 WEEKS)
MARCH 10, 1979 - MAY 22, 1979

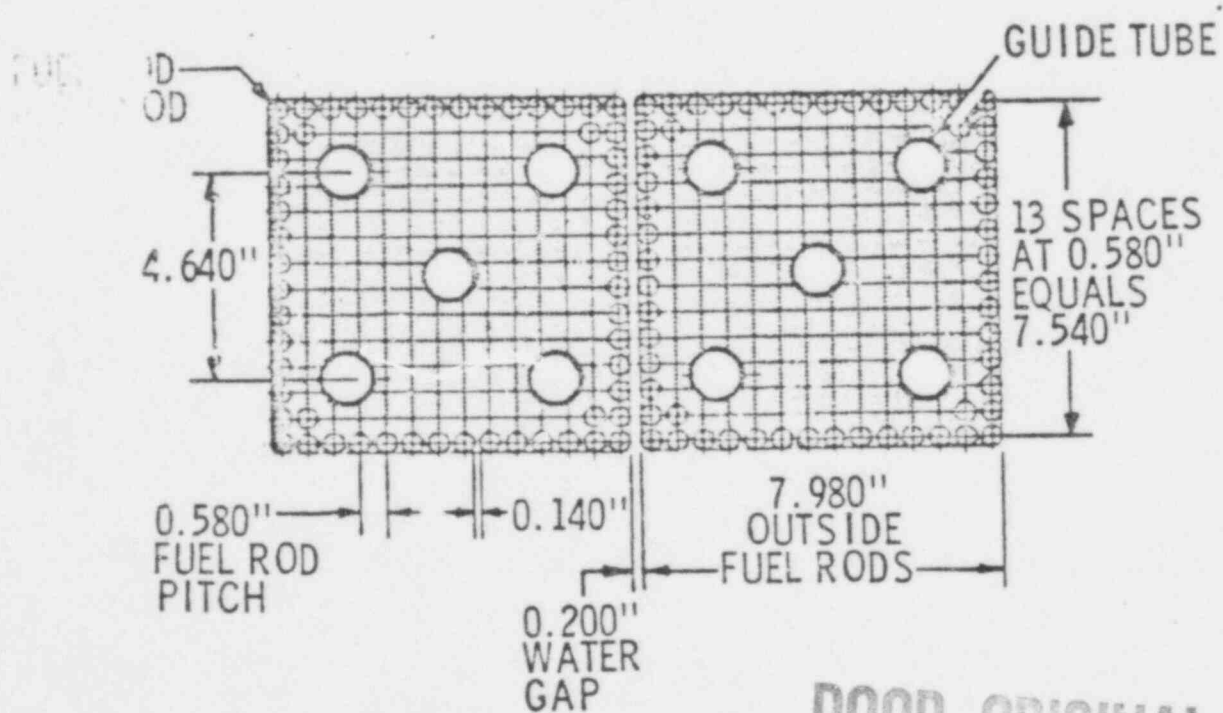
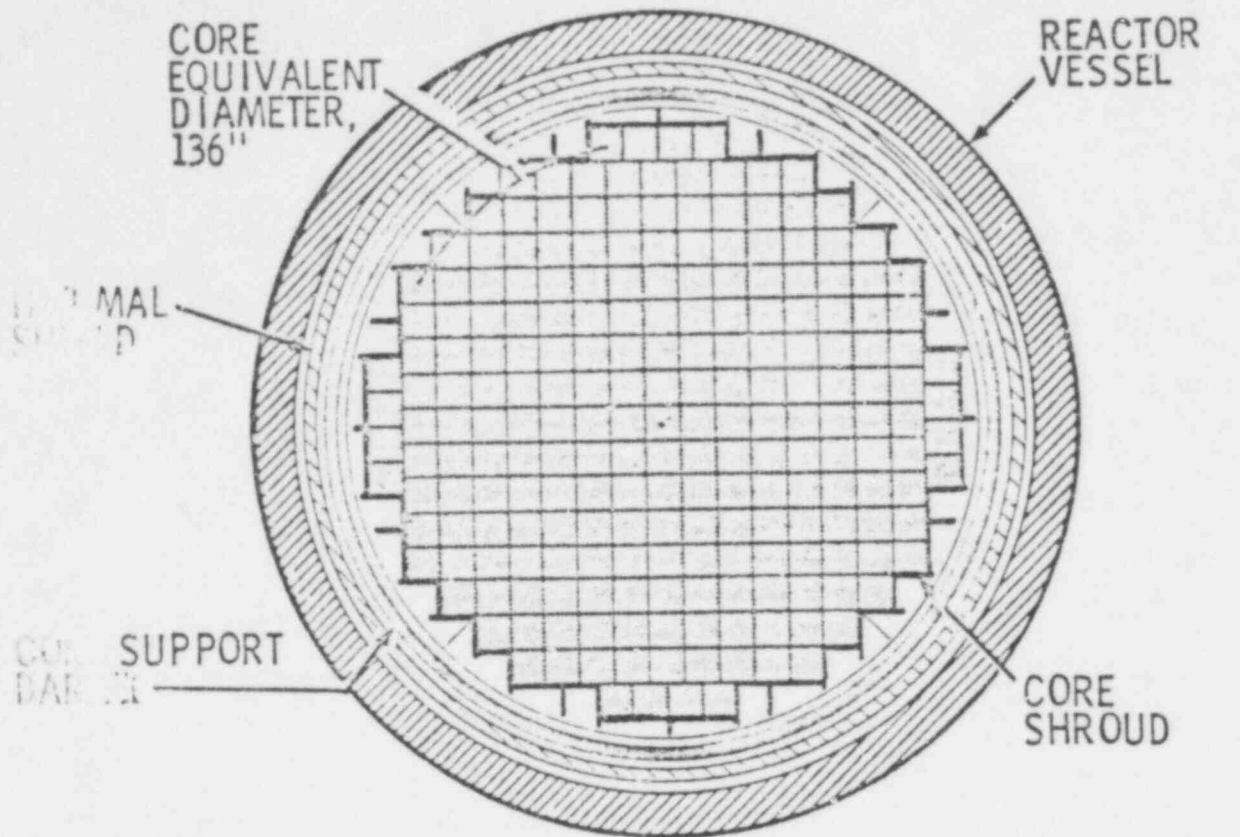
(CYCLE 3)

- 1 CRITICALITY -- MAY 18, 1979
- 2 MWT POWER -- MAY 31, 1979

TABLE 2 - EXPECTED STEAM CYCLE PARAMETERS AT DIFFERENT CORE THERMAL CONDITIONS

PARAMETER	CYCLE		
	2560 MWt/542°F	2560 MWt/549°F	2700 MWt/549°F
STEAM GENERATOR OUTLET FLOW	11,135,500 LBS/HR	11,151,200 LBS/HR	11,834,700 LBS/HR
STEAM GENERATOR OUTLET PRESSURE	839 PSIA	880 PSIA	875 PSIA
STEAM GENERATOR SATURATION TEMPERATURE	523.7°F	529.3°F	528.6°F
STEAM GENERATOR OUTLET MOISTURE CONTENT	0.2%	0.2%	0.2%
TURBINE INLET STEAM PRESSURE	802 PSIA	841 PSIA	836 PSIA
FEEDWATER FLOW TO STEAM GENERATOR	11,151,000 LBS/HR	11,166,700 LBS/HR	11,849,800 LBS/HR
FINAL FEEDWATER TEMPERATURE	430°F	429.5°F	435.2°F
CONDENSATE FLOW	7,927,000 LBS/HR	7,893,300 LBS/HR	8,367,700 LBS/HR
TOTAL HEAT REJECTED	5.83×10^9 BTU/HR	5.82×10^9 BTU/HR	6.13×10^9 BTU/HR
EXPECTED GENERATOR OUTPUT	851.9 MWE	854.8 MWE	901.4 MWE

550 253



POOR ORIGINAL

Reactor Core Cross-Section

MP2 CORE PHYSICAL PARAMETERS

NUMBER OF FUEL ASSEMBLIES	217
FUEL ASSEMBLY ARRAY	14 x 14
ASSEMBLY DIMENSIONS	7.98 in. x 7.98 in.
OUTSIDE DIAMETER	.3765 in.
OUTSIDE DIAMETER	.440 in.
THICKNESS	.028 in.
LEAD PITCH	.580 in.
FUEL HEIGHT	136.7 in.
EQUIVALENT DIAMETER	136.0 in.
OF CONTROL ELEMENT ASSEMBLIES	73

MILLSTONE POINT II CYCLE 3
CORE LOADING

ASSEMBLY POSITION	NUMBER OF ASSEMBLIES	INITIAL ENRICHMENT WT% U-235	AVERAGE BURNUP* MWD/MTU	NUMBER OF SHIMS	INITIAL SHIM LOADING WT% B ₄ C	TOTAL SHIMS	TOTAL FUEL RODS
1	5	2.33	25,400	12	2.7	60	820
2	40	2.82	19,700	0	---	0	7,040
3	16	2.82	24,800	12	.83	192	2,624
4	12	2.82	24,900	12	.46	144	1,968
5	48	3.03	7,600	0	---	0	8,448
6	24	2.73	10,600	0	---	0	4,224
7	48	3.24	0	0	---	0	8,448
8	24	2.73	0	0	---	0	4,224
	217					396	37,796

NOTE:

ASSEMBLY POSITION 2 CYCLE 2 LENGTH OF 8,700 MWD/T.

ASSEMBLY POSITION 3 CYCLE 3 LENGTH: 10200 MWD/MT.

MP2 PHYSICS CHARACTERISTICS

		<u>CYCLE 2</u>	<u>CYCLE 3</u>
DISSOLVED BORON	ppm	660	830
HFP, BOC			
BORON WORTH	ppm/% $\Delta\rho$		
HFP, BOC		88	93
HFP, BOC		77	82
MODERATOR TEMPERATURE COEFFICIENT	$10^{-4}\Delta\rho/^{\circ}\text{F}$		
HFP, BOC		-.6	-.2
HFP, EOC		-2.0	-1.8
AVAILABLE CEA WORTH	% $\Delta\rho$		
BOC		9.0	9.7
EOC		10.0	11.0
STUCK CEA WORTH	% $\Delta\rho$		
BOC		3.0	3.1
EOC		3.1	3.5
EJECTED CEA WORTH	% $\Delta\rho$		
HFP		.31	.29
HZP		.74	.65
PEAKING FACTORS			
F _R		1.440	1.598
F _{xy}		1.540	1.584

MP2 LOW POWER PHYSICS TEST RESULTS

	<u>MEASURED</u>	<u>PREDICTED</u>
CBC (PPM)		
ARO	1212 (7@ 135)	1205 (ARO)
ARI	888	861
ITC ($\times 10^{-4} \Delta \rho / ^\circ F$)		
BANK 7 THRU 2 INSERTED	-.686	-.721
ARO	+.269	+.372
BANK WORTHS ($\% \Delta \rho$)		
BANK 7	.637	.64
BANK 6	.250	.25
BANK 5	.172	.16
BANK 4	.875	.95
BANK 3	.671	.72
BANK 2	1.139	1.08
OVERLAP	3.743	3.80

POWER DISTRIBUTION CHECK AT 50% POWER MEASURED: POWER DISTRIBUTIONS
AGREED TO WITHIN 5% OF PREDICTED.

MP2 THERMAL HYDRAULIC PARAMETERS

<u>PARAMETER</u>	<u>UNITS</u>	<u>CYCLE 2</u>	<u>CYCLE 3</u>
CORE POWER	Mwt	2560	2700
INLET TEMPERATURE	°F	542	549
CORE FLOW RATE	$\times 10^6$ LBM/HR	135.0	133.7
CORE AVERAGE HEAT FLUX	BTU/HR-FT ²	177,700	183,000
TOTAL HEAT TRANSFER AREA	FT ²	47,940	49,100
AVERAGE LINEAR HEAT RATE	KW/FT	5.99	6.17
AVERAGE ENTHALPY RISE	BTU/LBM	65	69

KEY CHANGES FROM CYCLE 2

MODEL CHANGES:

1. T-H MODEL - TORC/CE1 (CYCLE 2 - COSMO/W3)
 - TORC MULTICHANNEL CODE T-H CODE
 - CE-1 CHF CORRELATION (LIMIT 1.19)
2. SMALL BREAK MODEL - MODELING CHANGES TO CEFLASH - 4AS
3. RMS STATISTICAL COMBINATION OF UNCERTAINTIES:
 - SETPOINTS
 - THERMAL MARGIN

INPUT SYSTEM CREDIT CHANGES:

- | | | |
|-----------------------|--|----------------------|
| 1. CORE POWER | 2700 MWt | (CYCLE 2 - 2560 MWt) |
| 2. T INLET | 549°F | (CYCLE 2 - 542°F) |
| 3. SCRAM TIME | 3.1 SEC | (CYCLE 2 - 2.75 SEC) |
| 4. UNCERTAINTIES | 6% ON Fr | |
| | 7% ON Fq | |
| 5. RCP SPEED SENSING: | CREDIT FOR RCPSS TRIP IN 4 PUMP LOF INCIDENT | |

550 260

NORTHEAST UTILITIES MILLSTONE POINT UNIT 2, CYCLE 3
DESIGN BASIS EVENTS (DBEs) CONSIDERED IN STRETCH POWER ANALYSIS

<u>ANTICIPATED OPERATIONAL OCCURRENCES FOR WHICH THE RPS ASSURES NO VIOLATION OF SAFDLs:</u>	<u>ANALYSIS STATUS</u>
CONTROL ELEMENT ASSEMBLY WITHDRAWAL	REANALYZED
BORON DILUTION	REANALYZED
STARTUP OF AN INACTIVE REACTOR COOLANT PUMP	NOT ANALYZED
EXCESS LOAD	REANALYZED
LOSS OF LOAD	REANALYZED
LOSS OF FEEDWATER FLOW	REANALYZED
EXCESS HEAT REMOVAL DUE TO FEEDWATER MALFUNCTION	NOT ANALYZED
REACTOR COOLANT SYSTEM DEPRESSURIZATION	REANALYZED
LOSS OF COOLANT FLOW	REANALYZED
<u>ANTICIPATED OPERATIONAL OCCURRENCES WHICH ARE DEPENDENT ON INITIAL OVERPOWER MARGIN FOR PROTECTION AGAINST VIOLATION OF SAFDLs:</u>	
LOSS OF COOLANT FLOW	REANALYZED
FULL LENGTH CEA DROP	REANALYZED
PART LENGTH CEA DROP	NOT ANALYZED
PART LENGTH CEA MALPOSITIONING	NOT ANALYZED
TRANSIENTS RESULTING FROM MALFUNCTION OF ONE STEAM GENERATOR	REANALYZED
<u>POSTULATED ACCIDENTS:</u>	
CEA EJECTION	REANALYZED
STEAM LINE RUPTURE	REANALYZED
STEAM GENERATOR TUBE RUPTURE	REANALYZED
SEIZED ROTOR	REANALYZED

SUMMARY OF MP2 CYCLE 3 TRANSIENT ANALYSIS RESULTS

CEA WITHDRAWAL

MIN DNBR - 1.58

MAX PRESSURE - 2358 PSIA

TM/LP TRIP PRESSURE BIAS - 45 PSIA

BORON DILUTION

10 MINUTES EXISTS FOR OPERATOR ACTION

EXCESS LOAD

MIN DNBR - 1.41

LOSS OF LOAD

MIN DNBR - 1.33

MAX PRESSURE - 2555 PSIA

LOSS OF FEEDWATER

MIN DNBR - 1.33

MAX PRESSURE - 2476 PSIA

15 MINUTES TO INITIATE AUX FEED.

EXCESS HEAT REMOVAL DUE TO FEEDWATER MALFUNCTION
BOUNDED BY PREVIOUS ANALYSIS

RCS DEPRESSURIZATION

TM/LP TRIP PRESSURE BIAS - 35 PSIA

LOSS OF FLOW

MIN DNBR - 1.19

MAX PRESSURE - 2301 PSIA

CEA DROP

MIN DNBR - 1.21

ASYMMETRIC STEAM GENERATOR TRANSIENTS

LOSS OF LOAD TO ONE STEAM GENERATOR

MIN DNBR - 1.24

CEA EJECTION

NO CLAD DAMAGE

STEAMLINE BREAK

FULL LOAD

SUBCRITICAL BY $.15\% \Delta \rho$

BRIEF POWER INCREASE - 8% TO 12%

NO LOAD

BRIEF CRITICALITY - $.21\% \Delta \rho_{MAX}$

STEAM GENERATOR TUBE RUPTURE

SITE BOUNDARY DOES ACCEPTABLE

SIEZED ROTOR

1% FAILED FUEL

SITE BOUNDARY DOES ACCEPTABLE

MP2 CYCLE 3 LARGE BREAK LOCA ANALYSIS

<u>BREAK</u>	<u>CYCLE 2</u>	<u>CYCLE 3</u>
	PCT	
1.0 DES/PD	2110°F	2079°F
.8 DES/PD	2160°F	2077°F
.6 DES/PD		1950°F
1.0 DEG/PD	2105°F	2080°F
.8 DEG/PD	2111°F	2081°F
.6 DEG/PD		1948°F
PLHR	15.6 KW/FT	15.6 KW/FT
MAXIMUM LOCAL CLAD OXIDATION	<10.7%	<16.0%
MAXIMUM CORE WIDE OXIDATION	<.58%	<.73%

MP2 SMALL BREAK LOCA RESULTS

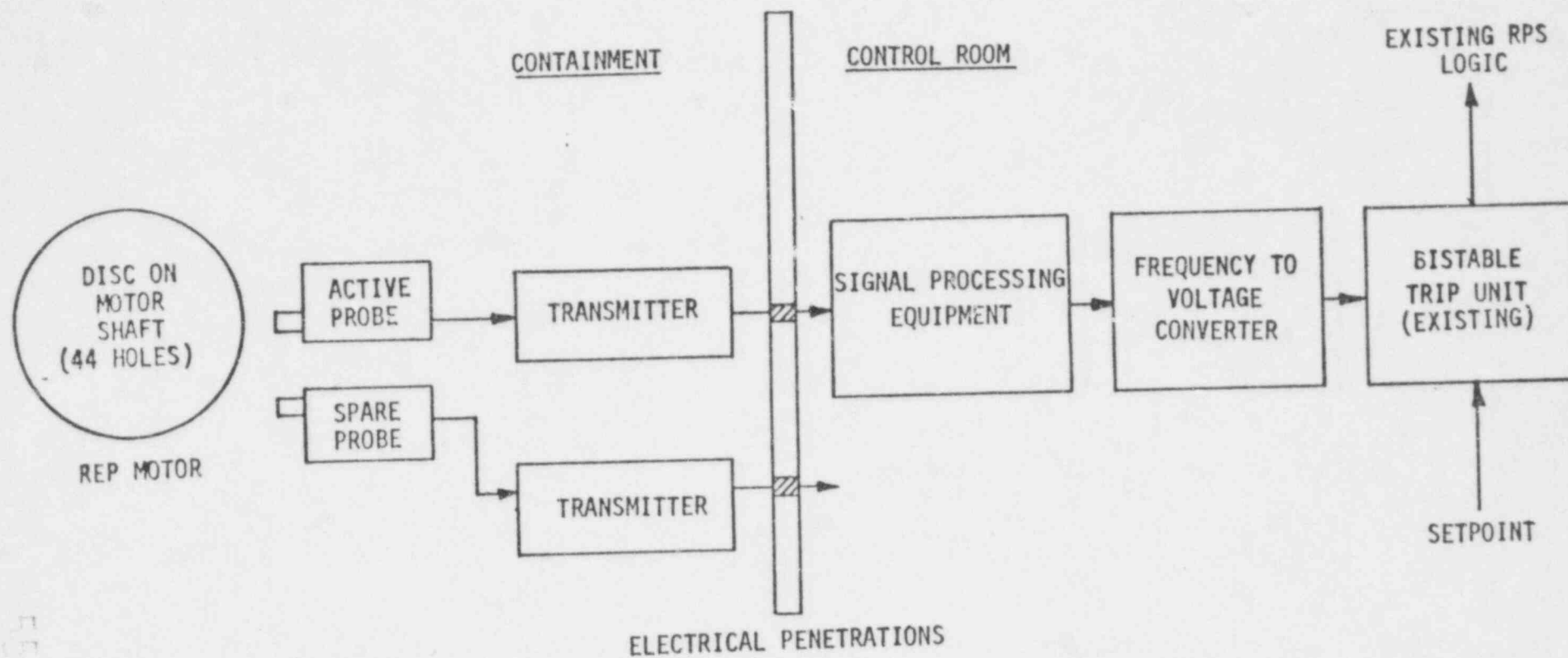
<u>BREAK AREA</u>	<u>CYCLE 2 PCT</u>	<u>CYCLE 3 PCT</u>
.5	1075°F	1629°F
.2	1562°F	1612°F
.1		1971°F
.05	1931°F	1824°F
.02	662°F	558°F

TABLE I

LOW FLOW TRIP FUNCTION NOMINAL CHARACTERISTICS

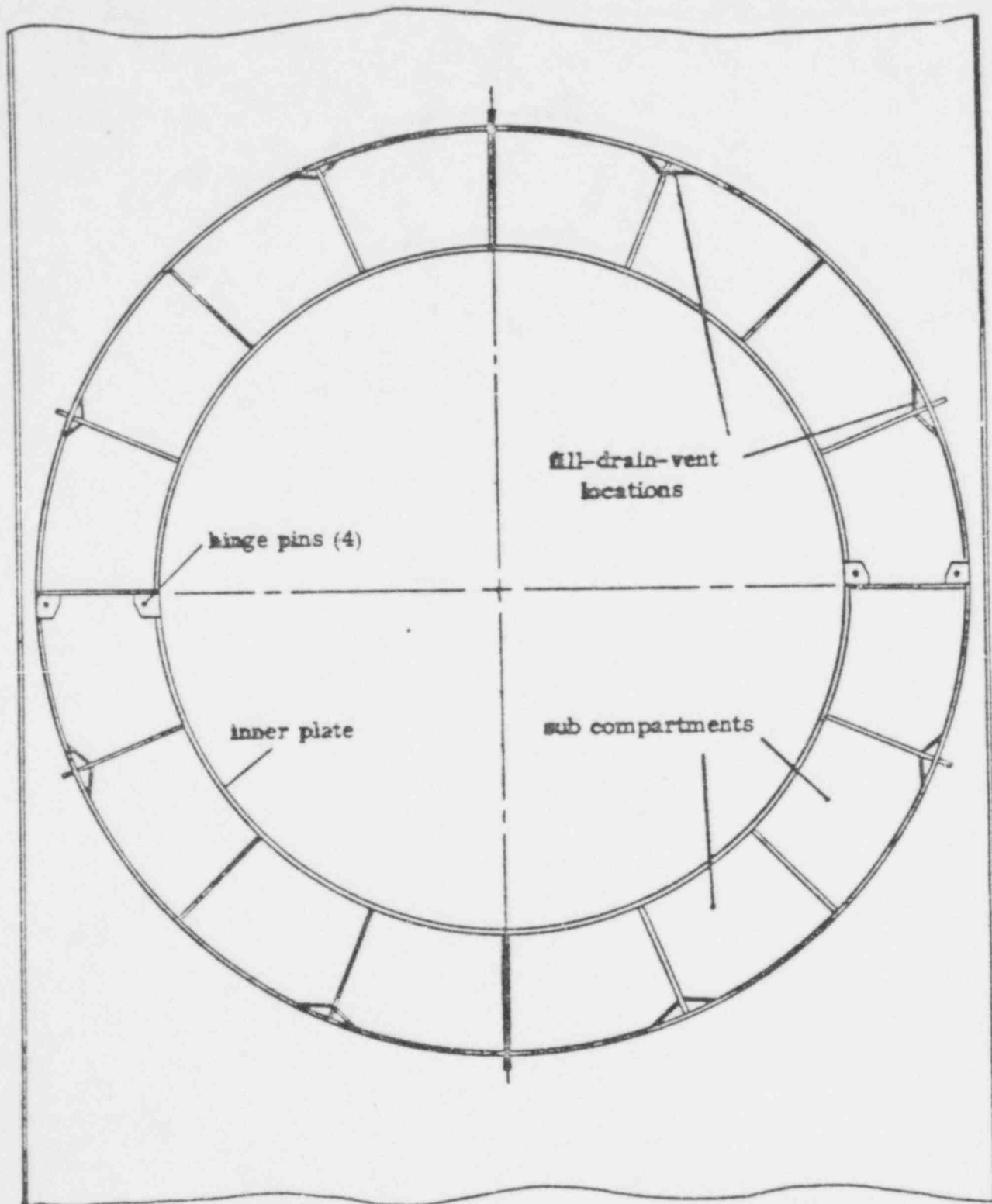
PERFORMANCE CHARACTERISTICS	LOW FLOW TRIP FUNCTION (STEAM GENERATOR ΔP)	RCPSS TRIP FUNCTION
System Overall Accuracy	2.7%	1.5%
Bistable Drift Allowance	0.8%	0.8%
System Noise	2.25%	1.0%
Nominal Trip Setpoint	91.7%	93%
Overall System Response Time	650 msec	450 msec

REACTOR COOLANT PUMP SHAFT SPEED SENSING SYSTEM
(TYPICAL CHANNEL)



POOR ORIGINAL

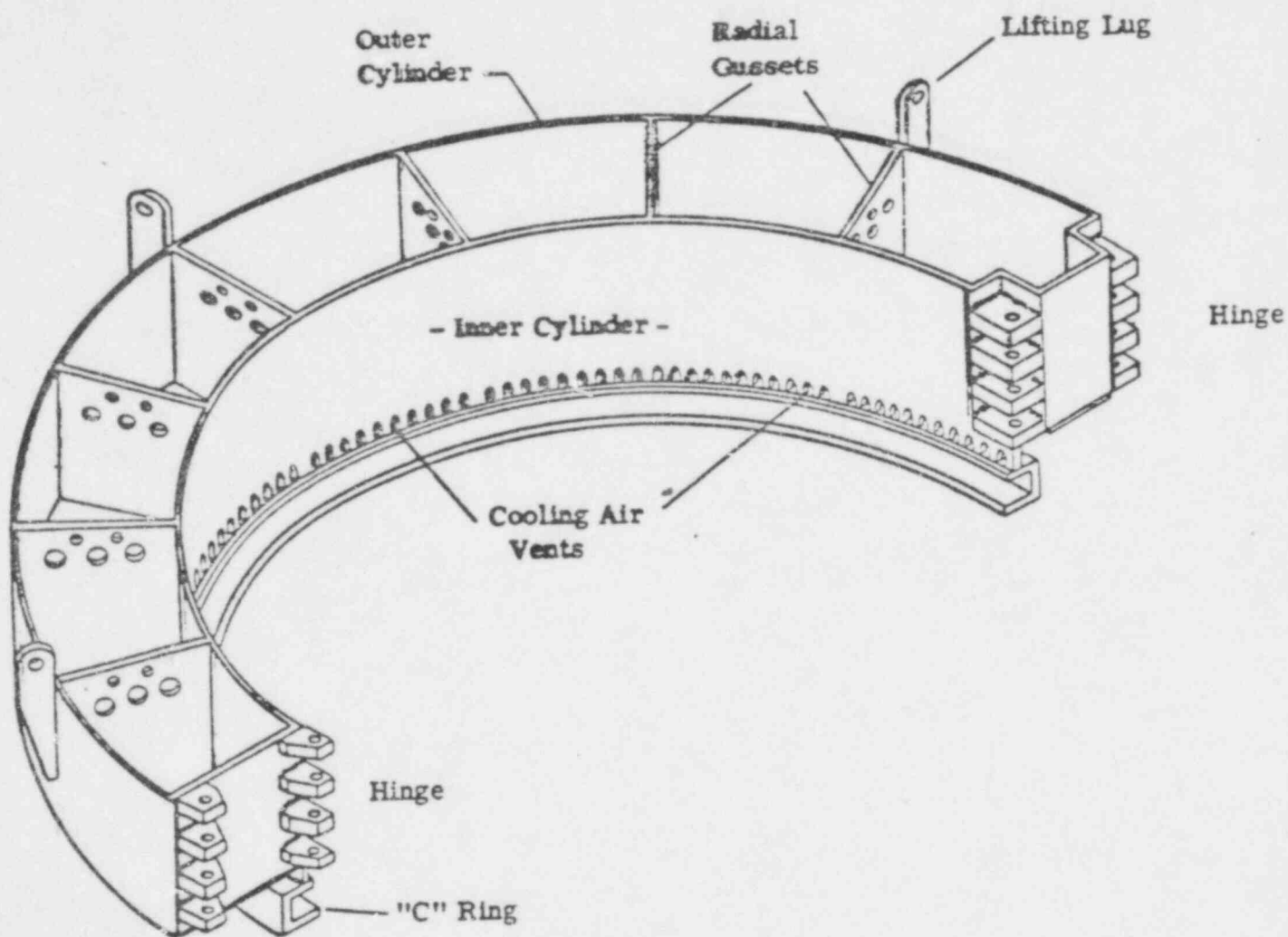
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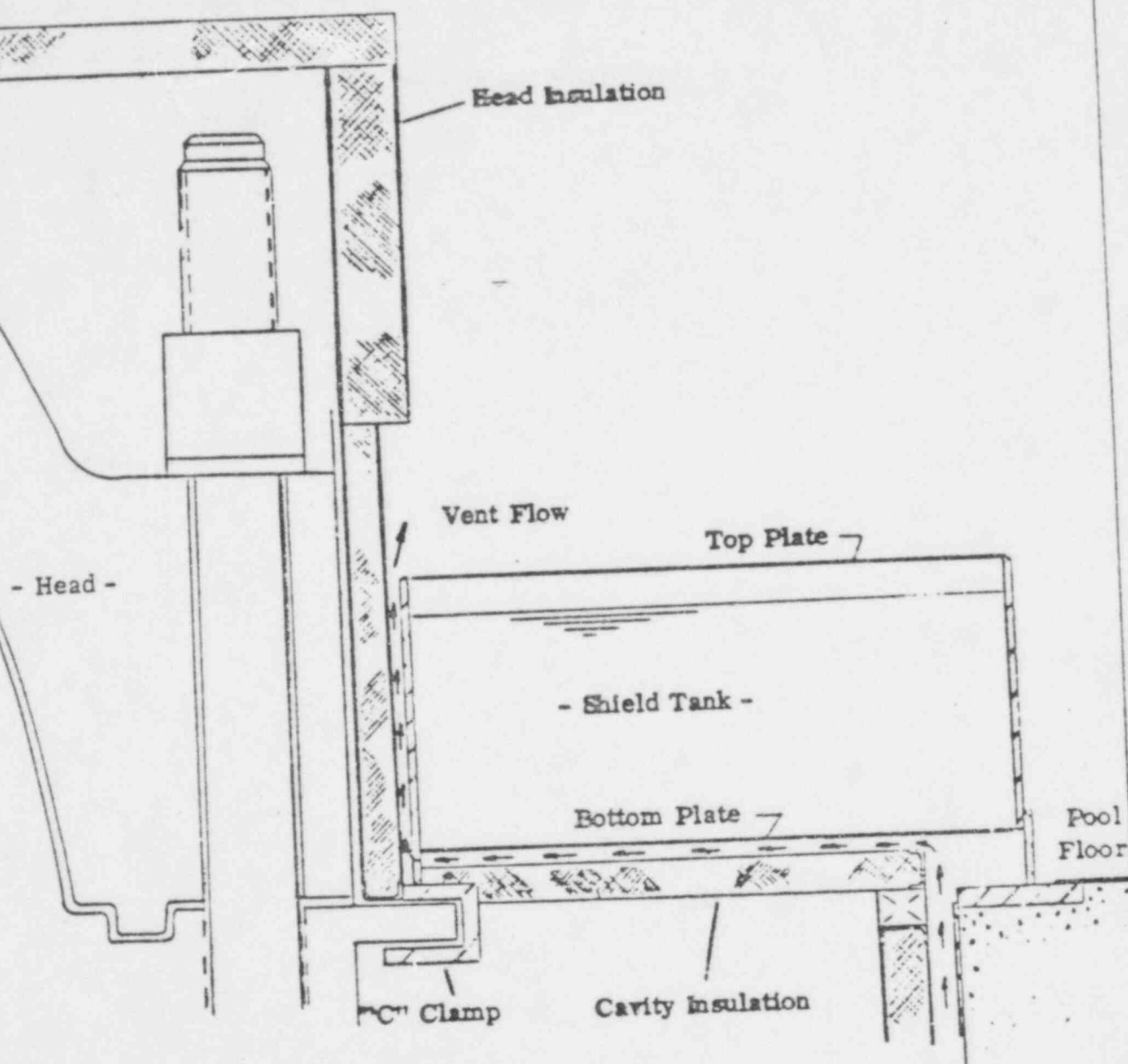
shield tank layout arrangement.

POOR ORIGINAL

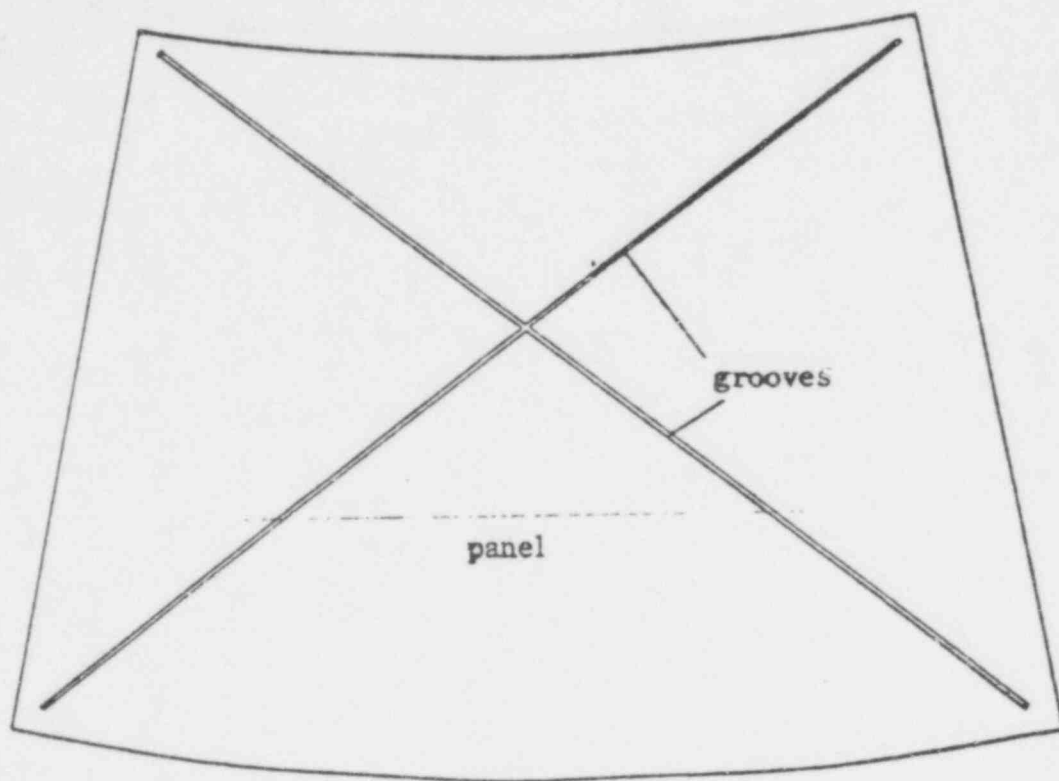
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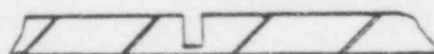
SHIELD TANK ASSEMBLY (LESS TOP COVER AND THERMAL INSULATION).



SHIELD TANK CROSS SECTION ARRANGEMENT



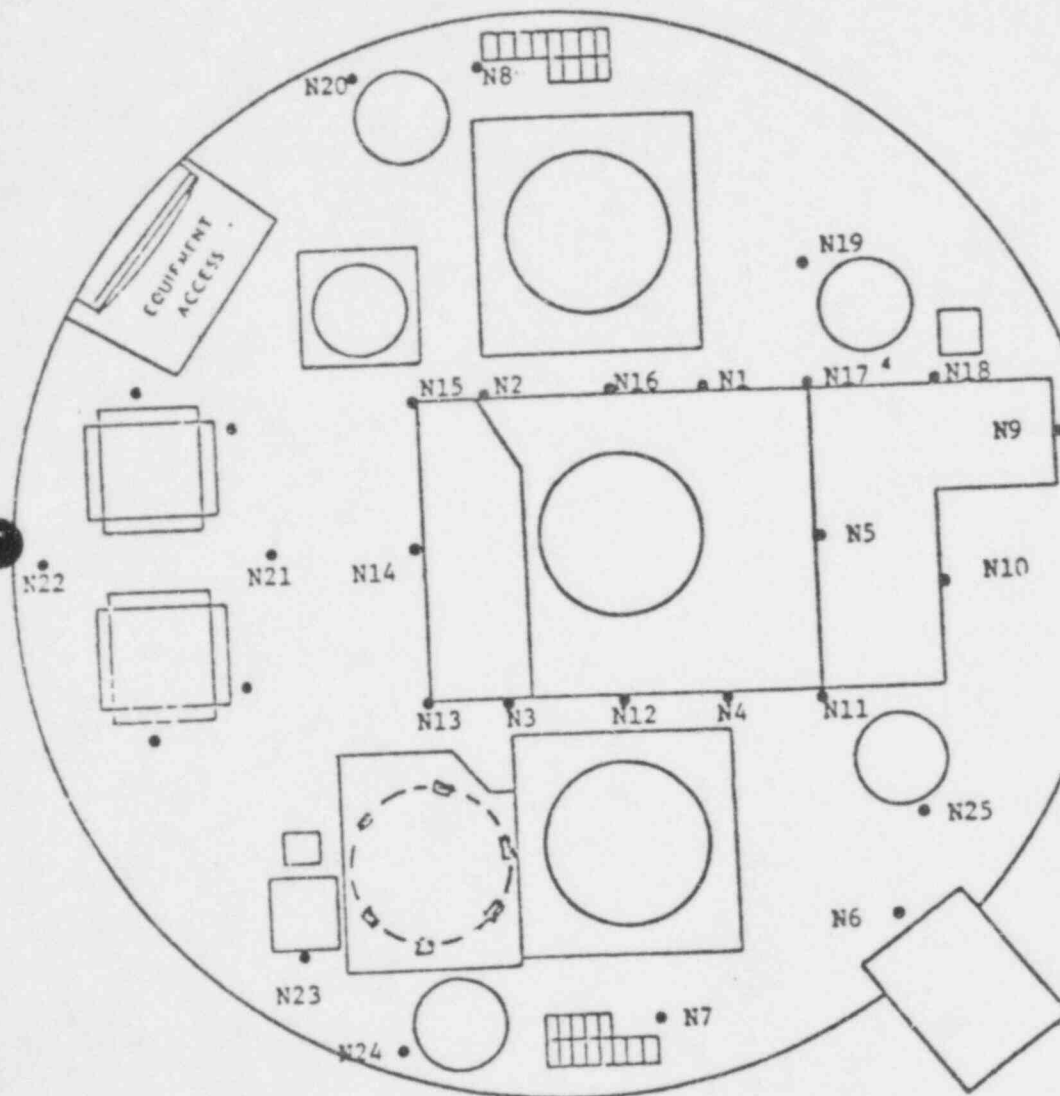
groove cross section



Rupture panel layout

MILLSTONE UNIT NO. 2
NEUTRON SURVEY
ELEVATION 38'6"

B = Before Shield
A = After Shield
RF = Reduction Factor
R = Thousands (R/hr)



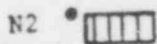
mrem/hr			
RESULTS			
POINT	B	A	RF
N1	60R	1R	60
N2	60R	1R	60
N3	60R	-	-
N4	60R	1R	60
N5	65R	1R	65
N6	4R	40	100
N7	1.5R	10	150
N8	1.5R	10	150
N9	5R	150	33
N10	20R	600	33
N11	10R	400	25
N12	6R	-	-
N13	10R	-	-
N14	10R	400	25
N15	10R	-	-
N16	6R	-	-
N17	10R	400	25
N18	6R	-	-
N19	5R	60	83
N20	1.4R	15	93
N21	7R	80	88
N22	2R	30	67
N23	2R	30	67
N24	2R	30	67
N25	3R	40	75

EXTRAPOLATED TO 100% POWER (2700 MWTH)
BASED ON 13% AND 50% SURVEYS

POOR ORIGINAL

550 272

ELEVATION 14'6"



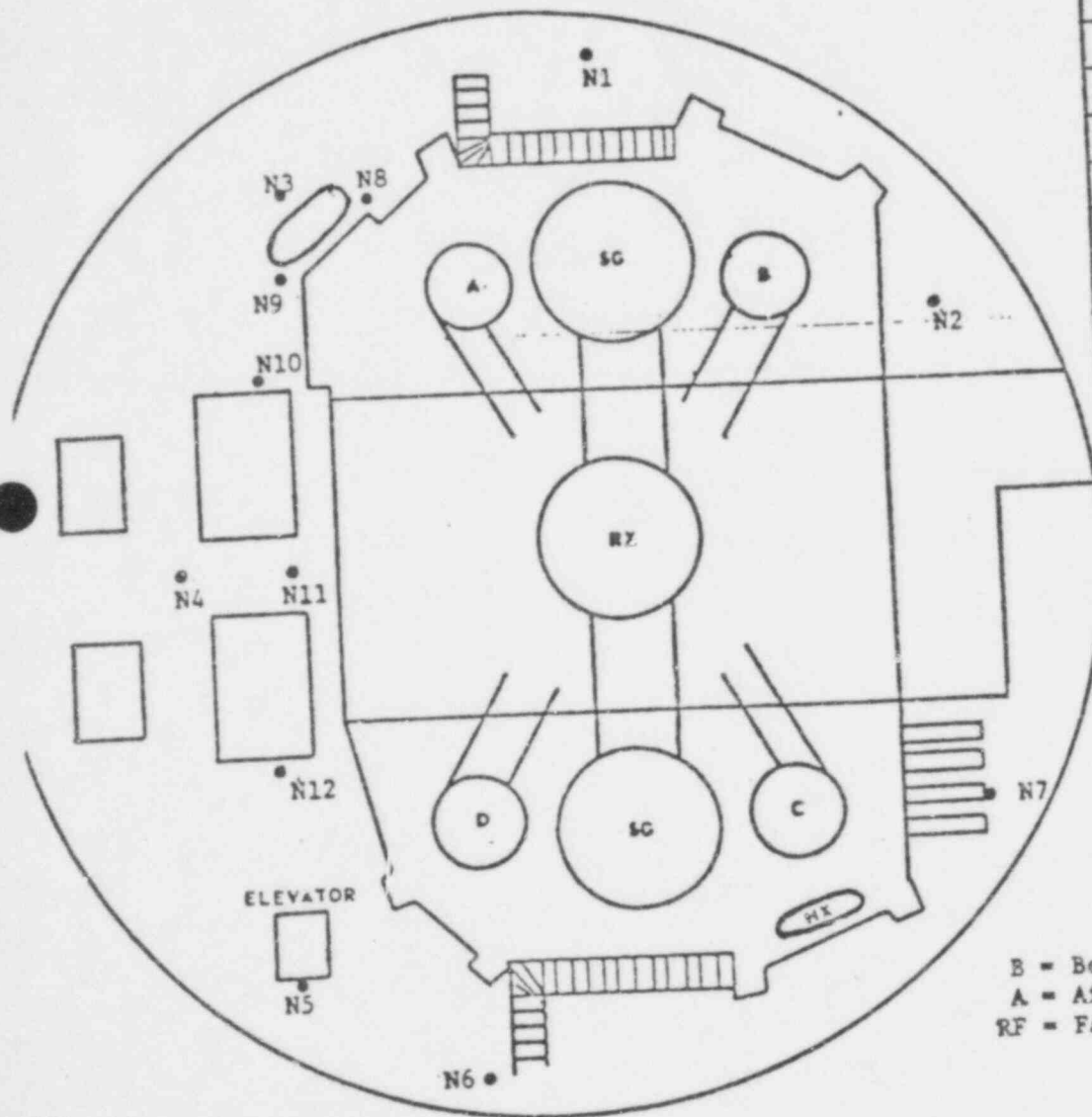
POINT	B	A	RF
N1	400		
N2	300	6	50
N3	300	6	50
N4	800		
N5	900	10	90
N6	300		
N7	300		
N8	-	10	-
N9	-		

B = Before Shield
A = After Shield
RF = Factor of Reduction

EXTRAPOLATED TO 100% POWER (2700 MWTH)
BASED ON 13% AND 50% SURVEYS

POOR ORIGINAL

ELEVATION -3'6"

[illegible]

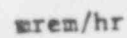
B = Before Shield
A = After Shield
RF = Factor of Reduction

EXTRAPOLATED TO 100% POWER (2700 MWTH)
BASED ON 13% AND 50% SURVEYS

POOR ORIGINAL

550 274

ELEVATION 38'6"

[illegible]

B = Before Shield
A = After Shield
RF = Factor of Reduction

EXTRAPOLATED TO 100% POWER (2700 MATH)
BASED ON 13% AND 50% SURVEYS

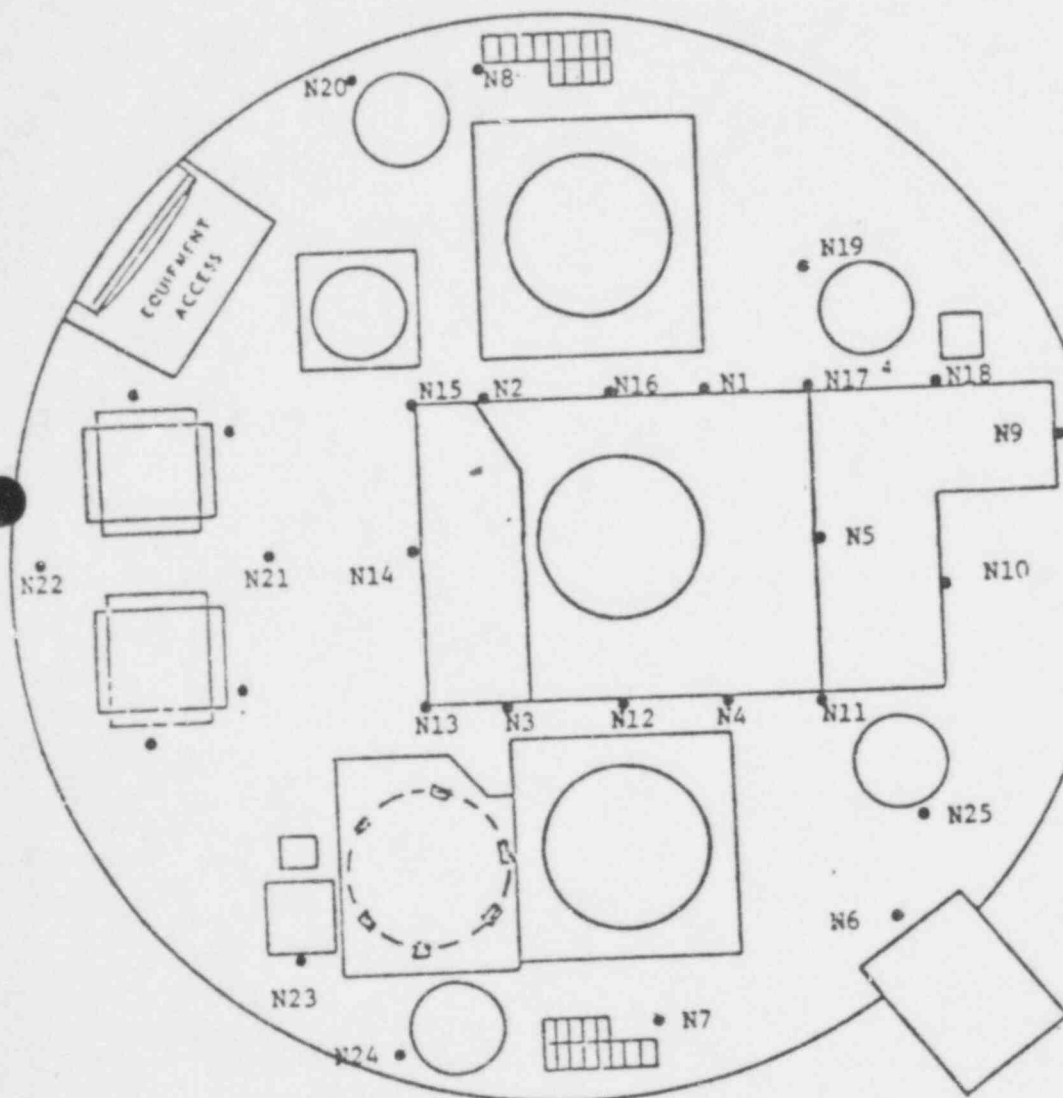
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MILLSTONE UNIT NO. 2

GAMMA SURVEY

ELEVATION 28'6"

B = Before Shield
A = After Shield
RF = Reduction Factor
R = Rem/hr



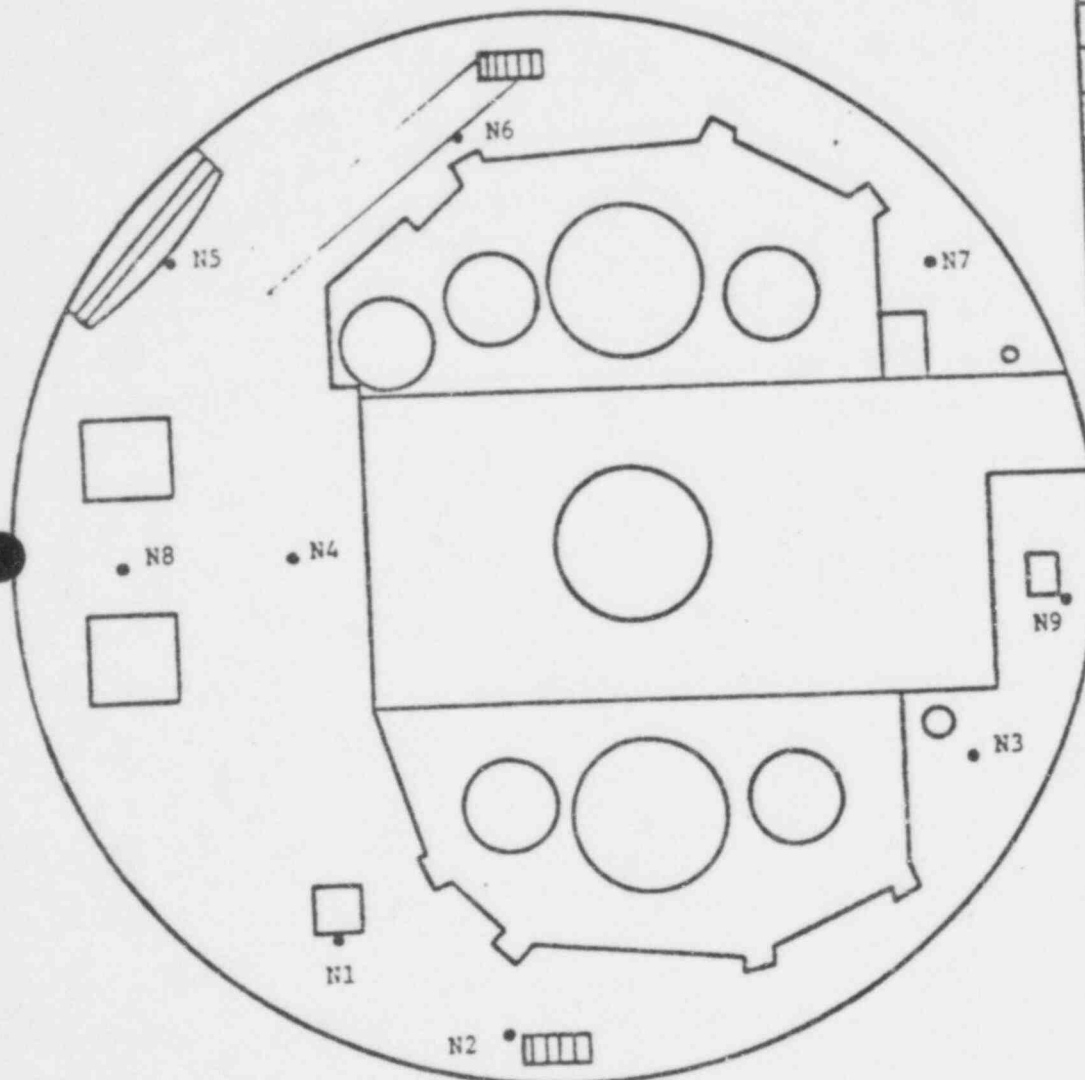
RESULTS			
POINT	B	A	RF
N1	8R	1.7R	5
N2	8R	1.7R	5
N3	8R	-	-
N4	8R	1.7R	5
N5	10R	1.7R	6
N6	450	20	22
N7	225	10	22
N8	225	10	22
N9	1R	200	5
N10	4R	600	7
N11	2.5R	400	6
N12	1.5R	-	-
N13	2.5R	-	-
N14	3.2R	250	13
N15	2.5R	-	-
N16	1.5R	-	-
N17	2.5R	400	6
N18	1.5R	-	-
N19	1R	50	20
N20	180	20	9
N21	1.1R	40	27
N22	400	20	20
N23	350	15	23
N24	450	17	26
N25	450	25	18

EXTRAPOLATED TO 100% POWER (2700 MWTH)
BASED ON 13% AND 50% SURVEYS

POOR ORIGINAL

550 276

B = Before Shield
A = After Shield
RF = Reduction Factor

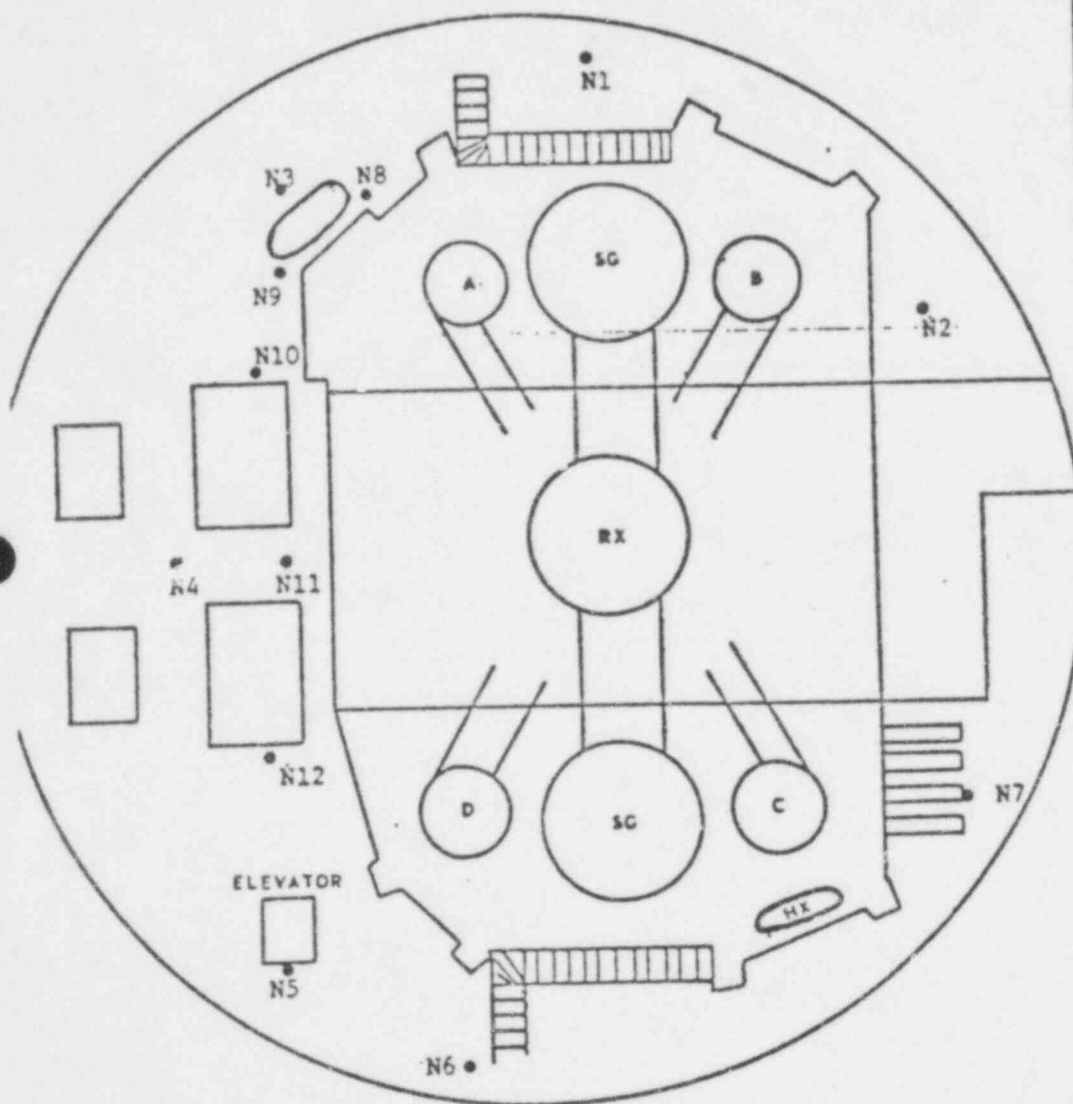
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EXTRAPOLATED TO 100% POWER (2700 MWTS)
BASED ON 13% AND 50% SURVEYS

PCOR ORIGINAL

ELEVATION -3'6"

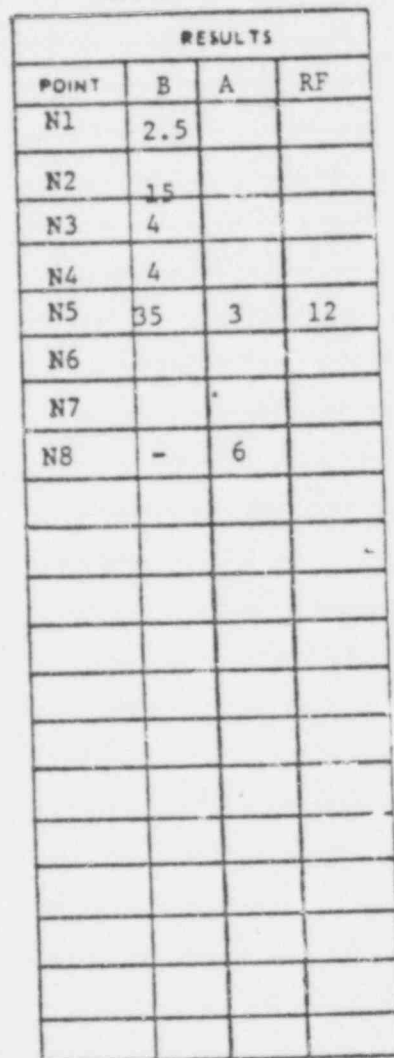
B = Before Shield
A = After Shield
RF = Reduction
Factor

[illegible]

EXTRAPOLATED TO 100% POWER (2700 MWTH)
BASED ON 13% AND 50% SURVEYS

POOR ORIGINAL

mm/hr



B = Before Shield
A = After Shield
RF = Reduction Factor

POOR ORIGINAL

EXTRAPOLATED TO 100% POWER (2700 MWTH)
BASED ON 13% AND 50% SURVEYS .