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TERRY,C.D. Niagara Mohawk Power Corp.
RECIP.NAME RECIPIENT AFFILIATION
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SUBJECT: Forwards summary of 880426 meeting & responds to 880504 ltr re torus wall thinning & Rev 1 to TR-6801-2, "Mark I...."

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NIAGARA MOHAWK

NIAGARA MOHAWK POWER CORPORATION/301 PLAINFIELD ROAD, SYRACUSE, N.Y. 13212/TELEPHONE (315) 474-1511

May 27, 1988
NMP1L 0260

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D.C. 20555

Re: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Gentlemen:

On April 26, 1988, Niagara Mohawk met with members of the Nuclear Regulatory Commission staff to provide information regarding the Nine Mile Point Unit 1 torus wall thinning. Subsequent to that meeting, the Commission, in a May 4, 1988 letter, requested additional information (Attachment A, Item 4). The attachments to this letter provide a summary of the April 26, 1988 meeting and respond to the requests in your May 4, 1988 letter.

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

C. D. Terry
Vice President
Nuclear Engineering and Licensing

NJF/pns
5021G
Attachments

xc: Regional Administrator, Region I
Mr. R. A. Capra, Director
Mr. R. A. Benedict, Project Manager
Mr. W. A. Cook, Resident Inspector
Records Management

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ATTACHMENT A

Niagara Mohawk Power Corporation
Summary of April 26, 1988 Meeting

A presentation on torus wall thinning was given at an April 26, 1988 meeting with the Nuclear Regulatory Commission. This presentation included a discussion of past reports, investigations, inspection results and programs dating back to 1975. A copy of the visual aids used during the presentation is included as Attachment B.

A comparison was made of the past inspection results to the most recent inspection results and the results taken in April 1988 at four additional locations. The graphs depicting statistical analysis (reference Attachment D Niagara Mohawk Calculation S22-4-WW198-STAT01) of past as well as current inspection results show that even for the worst case or limiting torus area (bottom), that the defined minimum general area wall thickness of 0.447 inches is not projected to be reached until 1992 or later. Further, any local areas falling below that minimum wall thickness of 0.447 inches can be analyzed per Teledyne Report TR-6801-2, Rev. 1 (Attachment C). Graphs and several examples of how local areas falling below general area minimum wall can be analyzed were provided. For example, a local area approximately 9 1/2 inches in diameter and approximately 30 mils deep (or 30 mils less than 0.447) is acceptable according to Teledyne Report TR-6801-2, Rev. 1.

The minimum wall thicknesses defined by Teledyne Report TR-6801-2 are based on meeting ASME Code allowables without regard to mill certification properties. When the mill certification properties are accounted for, an additional margin of 27 mils could be justified. Niagara Mohawk has positive mill certification identification of approximately 85-90 percent of the plate material composing the torus.

Operation until 1990 is justified based on the above discussion of existing margins. To date, no credit has been taken for the additional margins relating to mill certification. Our current long-term program includes investigation of possible modifications such as installation of saddles at mid-bay, oxygen control, cathode protection, coatings, and increased surveillance of the torus. The new program will provide for consistency on how measurements will be taken and their location. This program will be in place by the end of July 1988, at which time we will inform you of the actions we plan to take.

The following questions were raised during the meeting:

1) What affect does the sludge created by corrosion have on the ability of the Emergency Core Cooling Systems (ECCS) pumps to perform during a Loss of Coolant Accident?

Niagara Mohawk Calculation M79-81-M001 (Attachment E) addresses this concern. This calculation shows that the specific gravity of a worst case slurry of water/sludge is 1.0058 and would not affect the function of the ECCS pumps. An investigation of this matter also reveals no plugging of the core spray strainers or nozzles will result.

2) Are there any plans to monitor the torus during mid-cycle?

Niagara Mohawk will take mid-cycle thickness measurements to confirm that the torus shell still meets required minimum wall thickness by June 30, 1989.

ATTACHMENT B

Presentation Outline/Viewgraphs From

April 26, 1988 Meeting

In The

Region I Office

Regarding

Torus Wall Thinning

5021G

NIAGARA MOHAWK POWER CORPORATION

PRESENTATION TO

NUCLEAR REGULATORY COMMISSION

CONCERNING

NINE MILE POINT UNIT 1

INSERVICE INSPECTION PROGRAM

AND

TORUS MONITORING PROGRAM

AGENDA

INTRODUCTION - G. Gresock

INSERVICE INSPECTION OF WELDS AND SUPPORTS - T. Lee

TORUS MONITORING PROGRAM - R. Oleck

REACTOR VESSEL BELT LINE INSPECTION - R. Pasternak

EROSION/CORROSION PROGRAM - R. Pasternak

CONCLUDING REMARKS - C. Terry

INTRODUCTION

- ROOT CAUSE ISI PROBLEMS
  - INADEQUATE MANAGEMENT ATTENTION
  - ROLES AND RESPONSIBILITIES NOT CLEARLY DEFINED
  - OVER RELIANCE ON CONTRACTOR

NMPC RESPONSE TO PROBLEM

- TRANSITION PLAN
  - DEFINE REQUIRED WORK FLOW
  - CLEARLY DEFINE NMPC GROUPS RESPONSIBLE
  - ASSURE THAT PROCEDURES AND POLICIES MATCH DEFINED RESPONSIBILITIES
- COMMITTED TO 100% OF FIRST AND SECOND INTERVAL REQUIREMENTS BEFORE STARTUP
- EXPAND STAFF TO ADDRESS ISI ISSUES

KEY TASKS FOR 1988 OUTAGE COMPLETION

- VERIFICATION OF PROGRAM PLAN REQUIREMENTS
- RESOLUTION OF NONCONFORMANCES
- DETERMINATION OF EXPANDED INSPECTIONS
- SCHEDULING/TRACKING/MONITORING INSPECTIONS

VERIFICATION OF 1ST AND 2ND INTERVAL PROGRAM

- IDENTIFY COMMITTED INSPECTIONS (PROGRAM PLAN)
- DEFINE LICENSING REQUIREMENTS
- QUALITY ASSURANCE VERIFICATION OF 1ST INTERVAL INSPECTIONS
- COMPARE PROGRAM PLAN AND LICENSING REQUIREMENTS
- COMPARE INSPECTIONS PERFORMED VERSUS PROGRAM PLAN

RESULTS OF 1ST INTERVAL VERIFICATIONS

- REVIEW OF PROGRAM PLAN IN PROCESS
  - INCLUDES REVIEW OF COMMITTED INSPECTIONS
  - INCLUDES IDENTIFYING CHANGES MADE
- LICENSING REQUIREMENTS ARE IDENTIFIED
- 7242 DATA SHEETS EVALUATED BY QUALITY ASSURANCE
  - APPROXIMATELY 700 BEING EVALUATED FURTHER
  - 208 DCA PACKAGES BEING CLOSED OUT/SUMMARIZED
- COMPARISON OF PROGRAM PLAN VERSUS LICENSING REQUIREMENTS - COMPLETE MAY 19
- QUALITY ASSURANCE COMPARISON OF INSPECTIONS PERFORMED VERSUS PROGRAM PLAN
  - INITIAL VERIFICATION IS COMPLETE
    - 700 - 1,200 UNRESOLVED ISSUES
    - ADDITIONAL INSPECTIONS MAY BE REQUIRED
  - FINAL VERIFICATION TO OCCUR WHEN PROGRAM PLAN REVIEW COMPLETE

RESULTS OF 2ND INTERVAL VERIFICATION

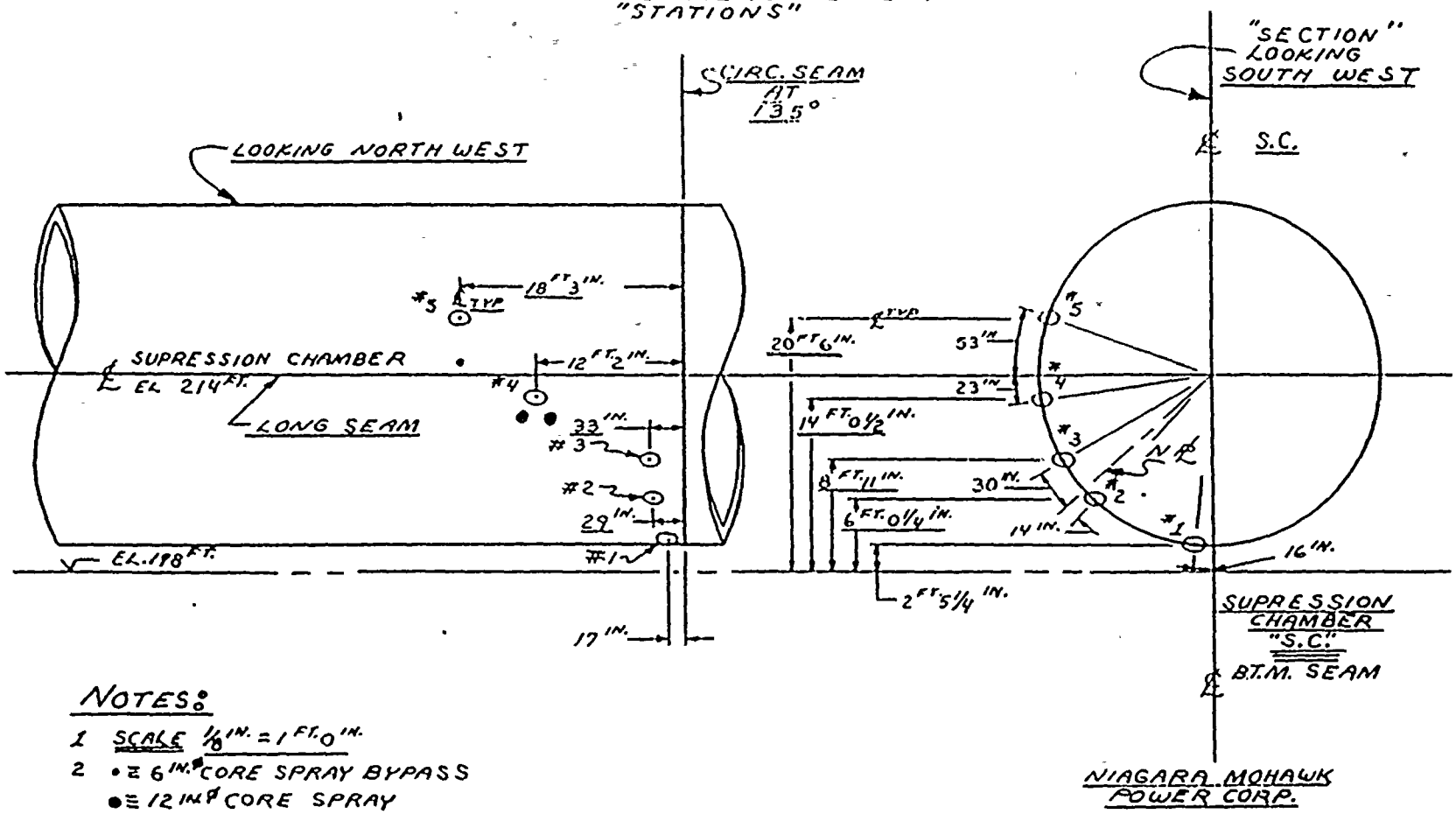
- ANII INITIALLY VERIFIED THE 1988 OUTAGE PLAN VERSUS THE ASME XI CODE REQUIREMENTS
  - 92 ADDITIONAL INSPECTIONS IDENTIFIED
- PLAN TO PERFORM 33% OF PROGRAM PLAN REQUIRED INSPECTIONS
  - RESOLVES ANII CONCERNS
- VERIFICATION OF 2ND INTERVAL PROGRAM PLAN IN PROCESS - COMPLETE MAY 19, 1988
  - INCLUDES QUALITY ASSURANCE VERIFICATION OF INSPECTION
  - COMPARISON OF PROGRAM PLAN VERSUS LICENSING REQUIREMENTS
  - COMPARISON OF INSPECTIONS PERFORMED VERSUS PROGRAM PLAN

TORUS WALL THICKNESS PROGRAM

I HISTORY/BACKGROUND

- C.B.I. (1/16" CORROSION)
- TORUS: ISI 1975-1988
  6x6 12x12
- MARK I PROGRAM 1975-1984
- WATER QUALITY (IRON-EATING BACTERIA) 1979/1980
  RCT REPORT
- CONTAINMENT COATING STUDY 1984
- 1987 - PART 21 - EVALUATION ---> NO CORROSION ALLOWANCE ---> NO IMMEDIATE PROBLEM
- T.E.S. ---> REPORT 9/87 - 1/88
- FURTHER TES EVALUATIONS - WELD REPAIR, PROPOSAL FOR LONG TERM 2/5/88
- 1988 ISI/NRC READINGS (UT)

LOCATION OF
NINE MILE PT
UNIT #1
SUPRESSION CHAMBER
THICKNESS MEASUREMENT
"STATIONS"



NOTES:

1 SCALE 1/8 IN. = 1 FT. 0 IN.

2 • ≡ 6 IN.ø CORE SPRAY BYPASS
● ≡ 12 IN.ø CORE SPRAY

NIAGARA MOHAWK
POWER CORP.

4-26-79

SE corner

MARK I TORUS SHELL AND VENT SYSTEM THICKNESS REQUIREMENT

TELEDYNE ENGINEERING SERVICES REPORT

TORUS SHELL ANALYSIS

CALCULATION OF MINIMUM TORUS SHELL THICKNESS REQUIREMENTS

CALCULATION OF PERMISSIBLE LOCAL REDUCTION IN TORUS SHELL THICKNESS FOR AN INDICATION

REVIEW OF CERTIFIED MATERIAL TEST REPORTS

VENT SYSTEM ANALYSIS

CALCULATION OF MINIMUM VENT SYSTEM THICKNESS REQUIREMENTS

CALCULATION OF PERMISSIBLE LOCAL REDUCTION IN VENT SYSTEM THICKNESS FOR AN INDICATION

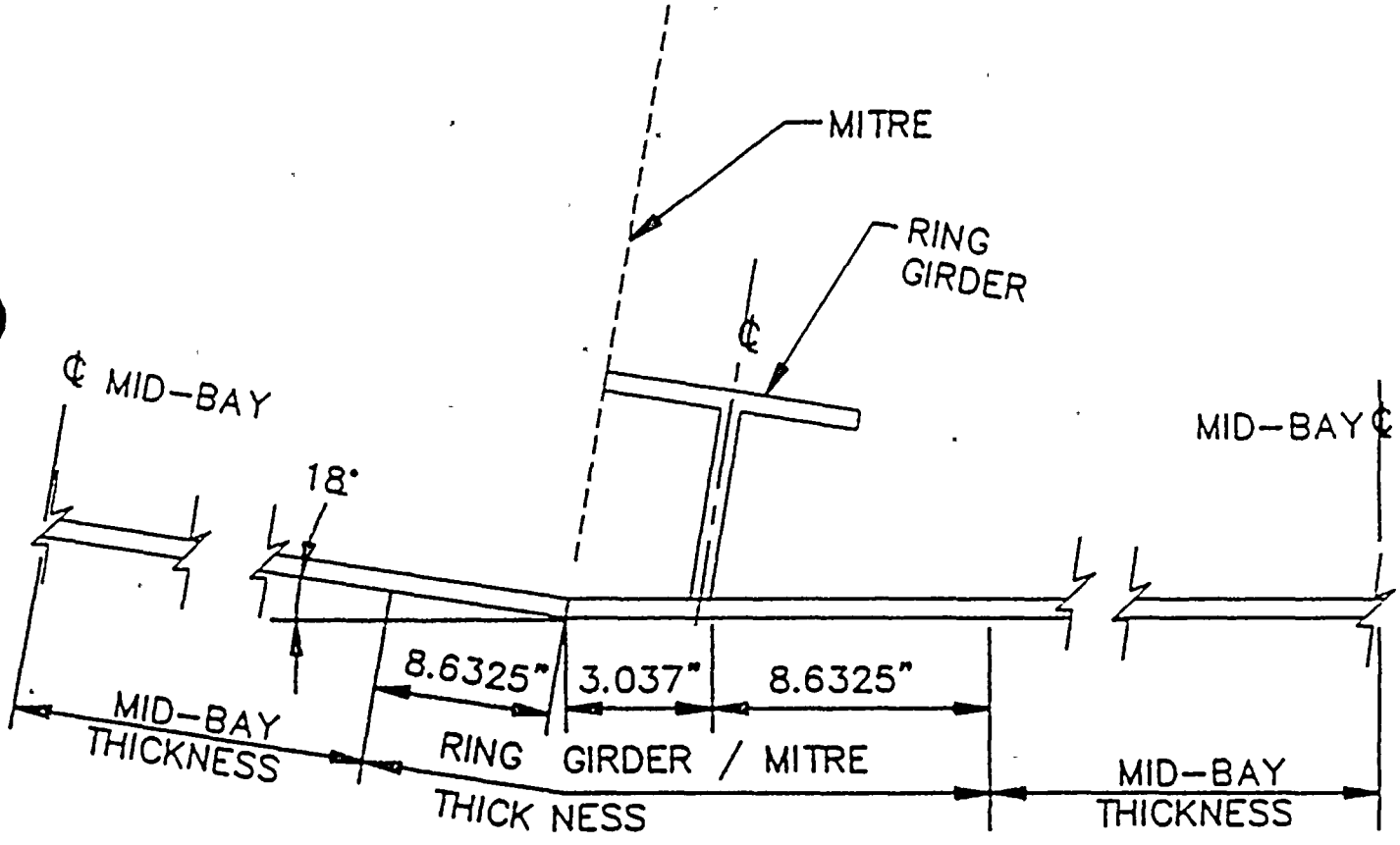
TORUS SHELL ANALYSIS

MINIMUM TORUS SHELL THICKNESS REQUIREMENTS

- TWO CRITICAL TORUS SHELL AREAS
  - MID-BAY BETWEEN RING GIRDERS
  - TORUS SHELL ADJACENT TO RING GIRDER
- CODE COMPLIANCE
  - BASED ON COMPARISON OF ACTUAL MARK I STRESS INTENSITY TO CODE ALLOWABLE STRESS

TORUS SHELL ANALYSIS

TORUS SHELL STRESS REGIONS
NINE MILE POINT UNIT 1 NUCLEAR STATION



TORUS SHELL ANALYSIS

MARK I PROGRAM EVENT COMBINATIONS

- 27 MARK I EVENT COMBINATIONS REDUCED TO 4 BOUNDING EVENT COMBINATIONS

- BOUNDING EVENT COMBINATIONS

NUMBER	TITLE
14	C.O., Chug, O.B.E., S.B.A, S.R.V.
18	Pool Swell, O.B.E., D.B.A.
20	C.O., Chug, O.B.E., D.B.A.
25	Pool Swell, S.S.E., D.B.A., S.R.V.

C.O. = CONDENSATION OSCILLATION LOADS
Chug = CHUGGING LOADS
SBA = SWELL BREAK ACCIDENT (SWELL DIAMETER PIPE BREAK)
DBA = DESIGN BASIS ACCIDENT
SRV = SAFETY RELIEF VALVE ACTUATION
OBE = OPERATING BASIS EARTHQUAKE
SSE = SAFE SHUTDOWN EARTHQUAKE

TORUS SHELL ANALYSIS

MINIMUM SHELL THICKNESS

- MARK I PROGRAM LOADS
  - PRESSURE LOADINGS
  - HOOP STRESS - PRIMARY STRESS
- BACK CALCULATE MINIMUM TORUS SHELL THICKNESS
  - MID-BAY (FREE SHELL)
  - AREA ADJACENT TO RING GIRDER (LOCAL SHELL)

TORUS SHELL ANALYSIS

TABLE 1

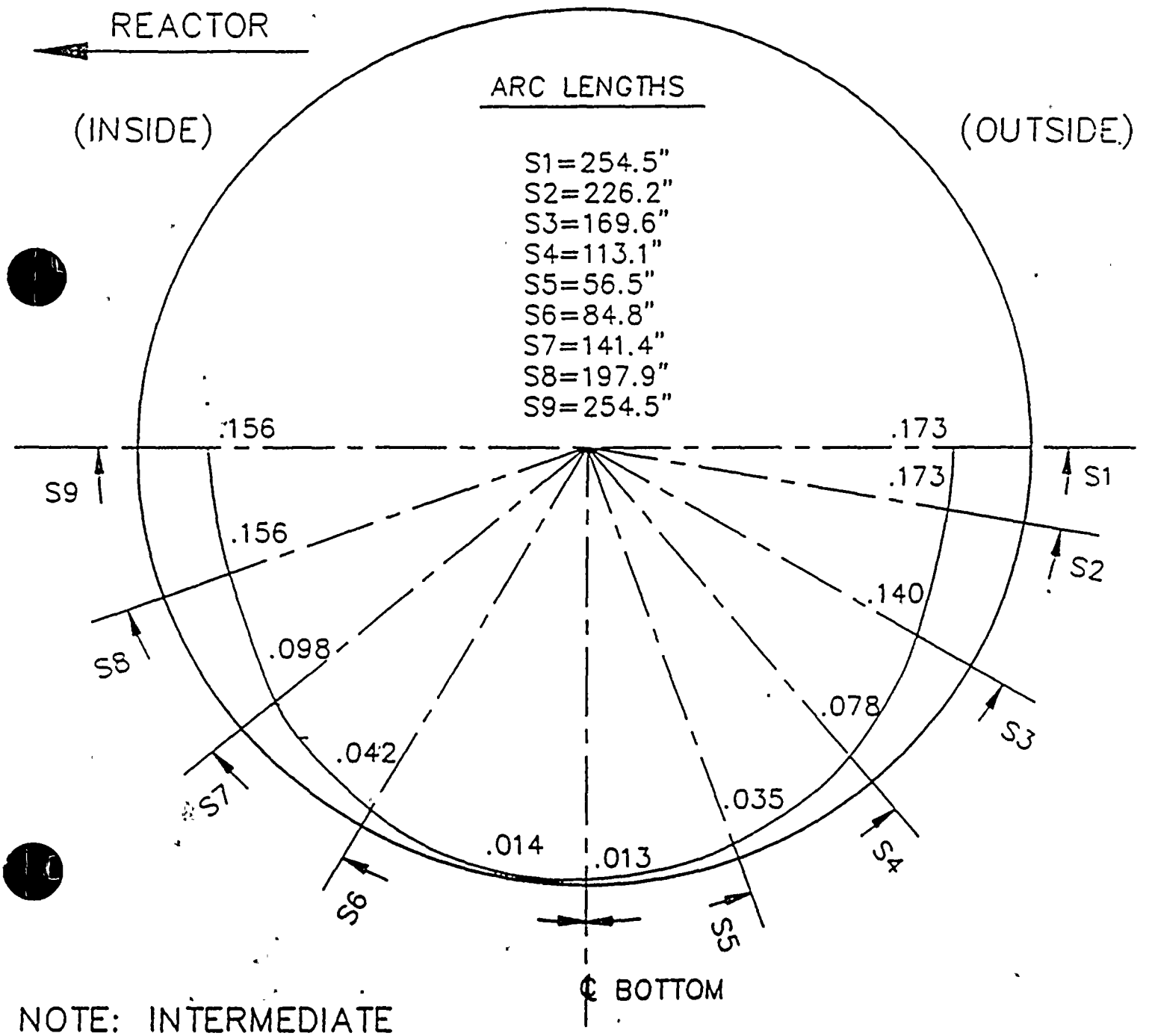
MINIMUM TORUS SHELL THICKNESS REQUIREMENTS
NINE MILE POINT UNIT 1 NUCLEAR STATION

Element No. (Midbay)	Required Thickness (inches)	Remaining Thickness (inches)	
11	.304	.156	
13	.362	.098	
15	.418	.042	
17	.446	.014	
19	.447	.013	← governs
21	.425	.035	
23	.382	.078	
25	.320	.140	
27	.287	.173	
(Ring Girder)			
123	.172	.288	
129	.191	.269	
135	.168	.292	
141	.173	.287	
147	.125	.335	
153	.139	.321	
159	.198	.262	

NOTE: Only lower shell elements are listed.

TORUS SHELL ANALYSIS

PERMISSIBLE CORRODED THICKNESS FOR THE TORUS CROSS-SECTION AT MID-BAY (FREE SHELL REGION) NINE MILE POINT UNIT 1 NUCLEAR STATION



NOTE: INTERMEDIATE VALUES MAY BE

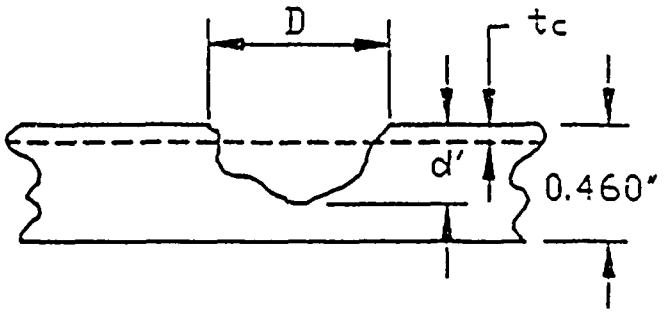
TORUS SHELL ANALYSIS

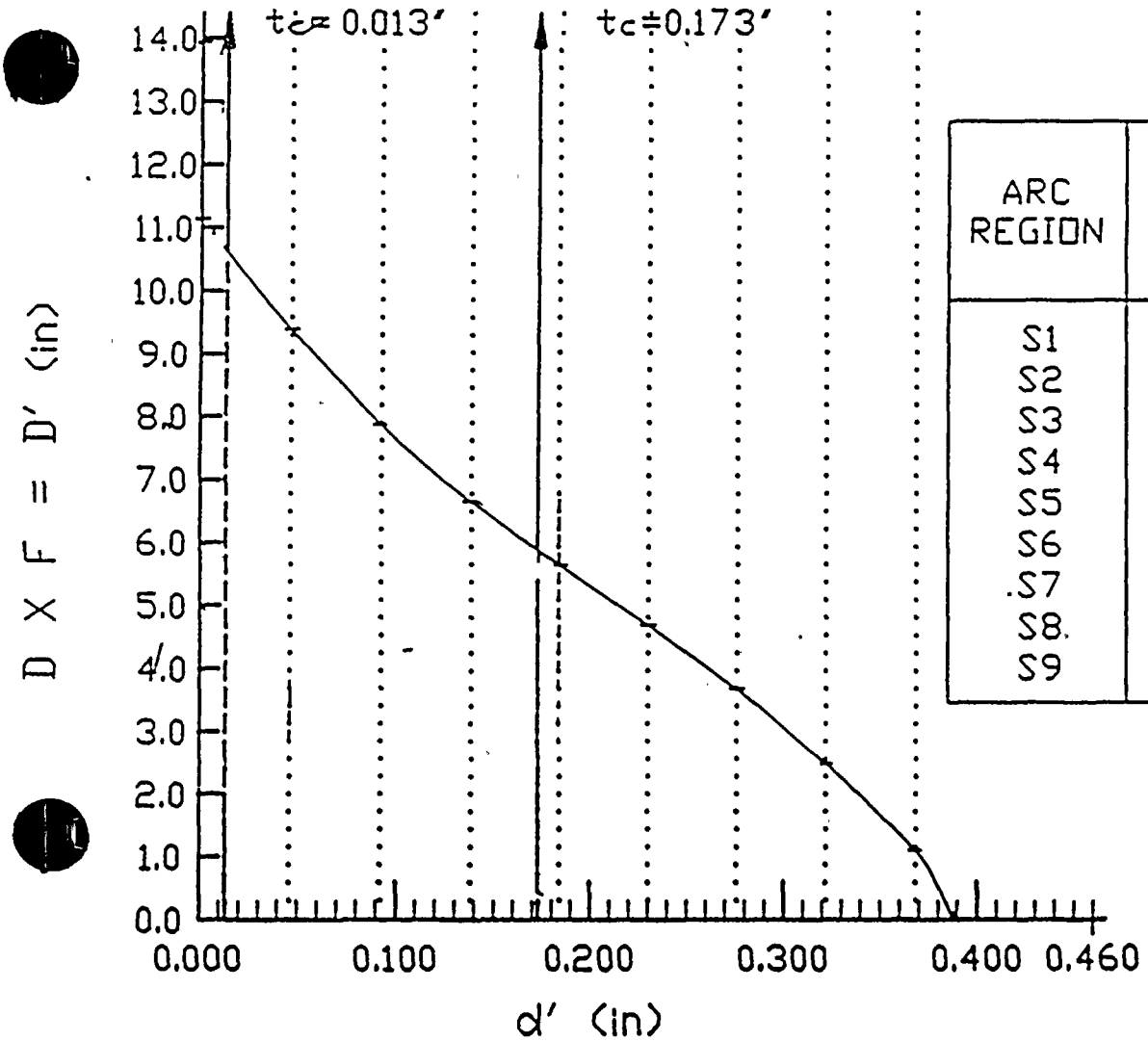
PERMISSIBLE LOCAL REDUCTION IN TORUS SHELL THICKNESS FOR AN INDICATION

- ANALYTICAL BASIS
  - EVALUATION OF CYLINDRICAL DEPRESSION EFFECTS ON
    - LARGE CIRCULAR PLATE
    - CONSTANT THICKNESS
    - UNIFORM STRESS
- CALCULATION OF PERMISSIBLE LOCAL REDUCTION
  - EQUIVALENT PRESSURE FOR A HOOP MEMBRANE STRESS EQUAL TO THE MARK I EVENT COMBINATION PRIMARY MEMBRANE (MID-BAY)
  - FOR LOCAL MEMBRANE (RING GIRDER REGION) STRESS INTENSITY

TORUS SHELL ANALYSIS

PERMISSIBLE SIZE RANGE FOR INDICATION
FREE SHELL REGION OF THE TORUS
NINE MILE POINT UNIT 1 NUCLEAR STATION





ARC REGION	FACTOR 'F'	GEN. CORR. tc
S1	0.800	0.173
S2	0.851	0.140
S3	0.930	0.078
S4	0.974	0.035
S5	1.000	0.013
S6	1.000	0.014
S7	0.965	0.042
S8	0.904	0.098
S9	0.824	0.156

TORUS SHELL ANALYSIS

CERTIFIED MATERIAL TEST REPORT REVIEW FOR TORUS SHELL

- STATISTICAL ANALYSIS OF TORUS SHELL CERTIFIED MATERIAL TEST REPORTS
  - LARGE SAMPLE
  - 99% CONFIDENCE LEVEL FOR MATERIAL MINIMUM YIELD ULTIMATE STRENGTH

- CODE ALLOWABLE STRESS INTENSITY 16,500 PSI

- CALCULATE ALLOWABLE STRESS INTENSITY BASED ON CERTIFIED MATERIAL TEST REPORTS (2σ) 17,600 PSI

- RESULT
  - 6% ADDITIONAL MARGIN IN MINIMUM TORUS SHELL THICKNESS REQUIREMENTS

VENT SYSTEM ANALYSIS

- COMPONENT ANALYZED FOR STRESS
  - VENT PIPE
  - VENT SPHERE
  - VENT HEADER
  - DOWNCOMERS
- CALCULATION OF MINIMUM THICKNESS REQUIREMENTS
  - TORUS SHELL METHODOLOGY
- PERMISSIBLE LOCAL REDUCTION IN VENT SYSTEM THICKNESS FOR AN INDICATION
  - TORUS SHELL METHODOLOGY

VENT SYSTEM ANALYSIS

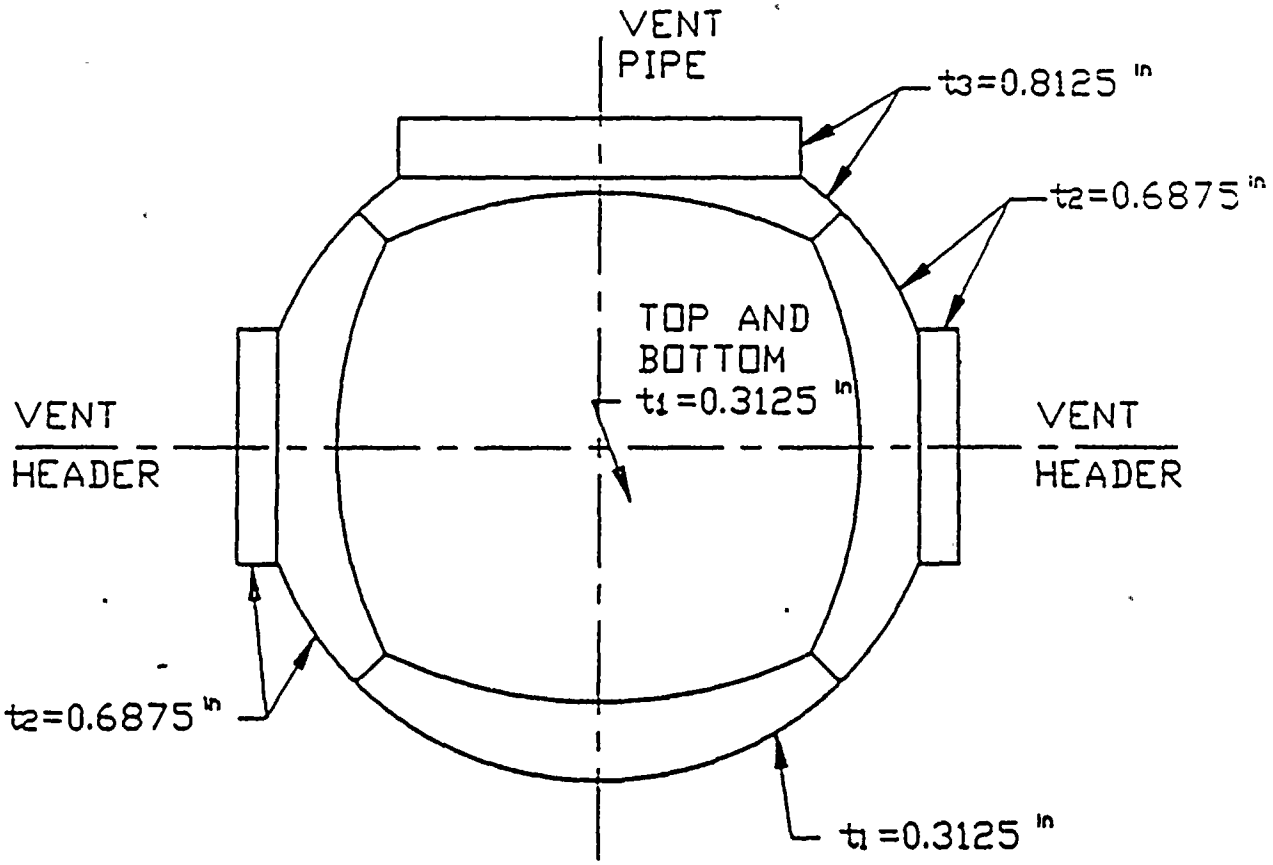
TABLE 2

MINIMUM VENT SYSTEM THICKNESS REQUIREMENTS
NINE MILE POINT UNIT 1 NUCLEAR STATION

Component Location	Shell Thickness (in)	Required Thickness (in)	Remaining Thickness (in)
Vent Pipe	.3125	.201	.1115
Vent Header	.3125	.159	.1535
Downcomer	.250	.222	.028
Vent Pipe at Drywell	.3125	.134	.1785
Vent Header at Mitre Joint	.3125	.203	.1095
Vent Header at Downcomer	.3125	.248	.0645
Downcomer at Mitre Joint	.250	.148	.102
Vent Sphere at t_1	.3125	.290	.0225
Vent Sphere at t_2	.6875	.637	.0505
Vent Sphere at t_3	.8125	.753	.0595

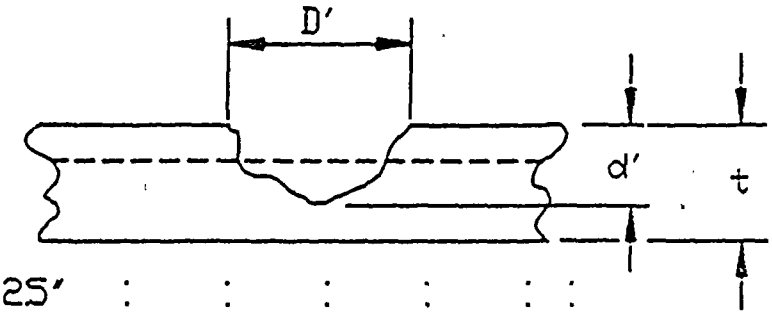
VENT SYSTEM ANALYSIS

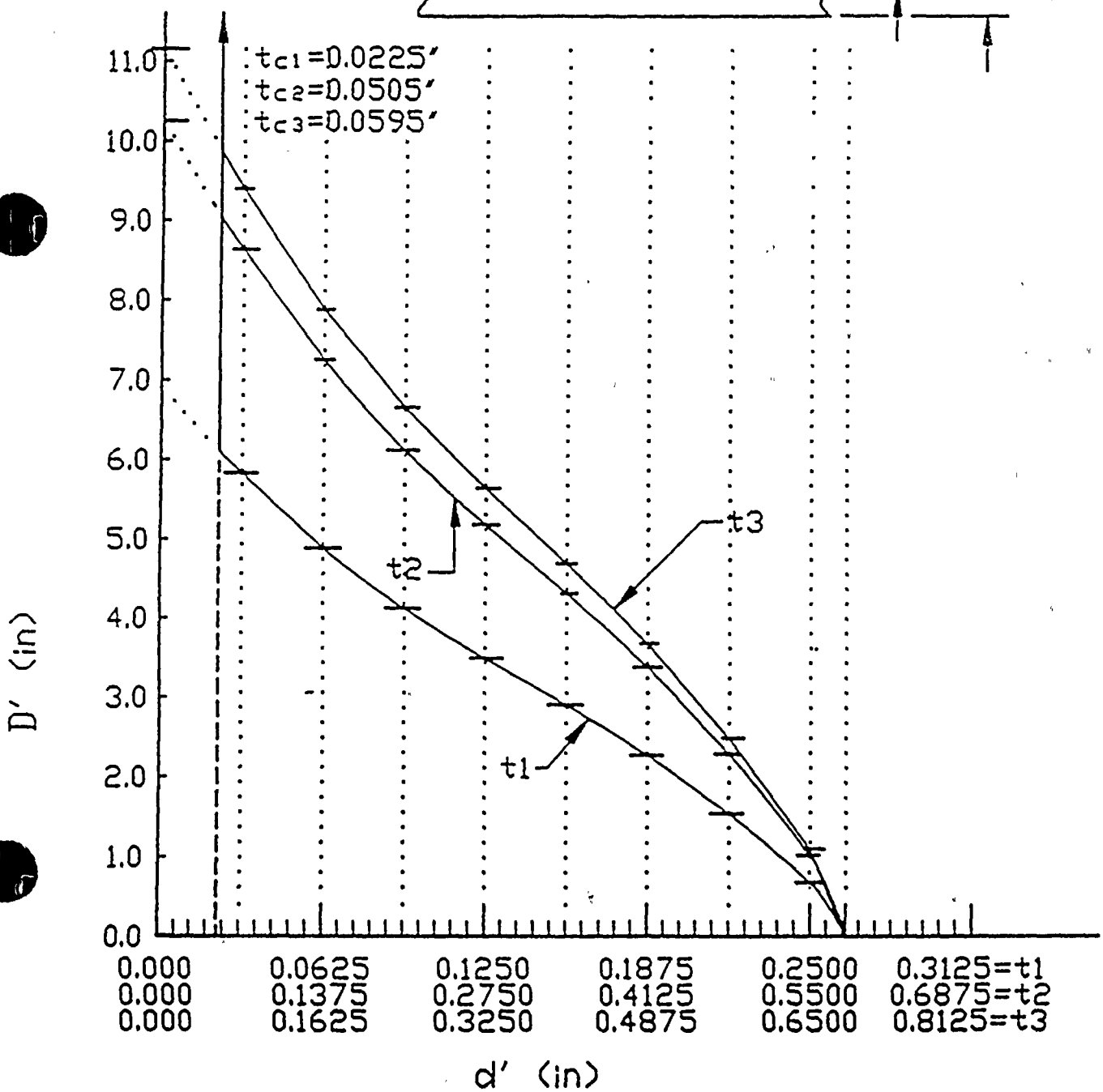
VENT SPHERE LOCAL THICKNESS REGIONS
NINE MILE POINT UNIT 1 STATION



VENT SYSTEM ANALYSIS

PERMISSIBLE SIZE RANGE FOR INDICATION VENT SPHERE
NINE MILE POINT UNIT 1 NUCLEAR STATION





TORUS SHELL ANALYSIS

ADDITIONAL MARGINS TO BE INVESTIGATED

° GOVERNING LOADS

- CONDENSATION OSCILLATIONS
- TORUS PRESSURE

° POTENTIAL REDUCTIONS IN MINIMUM TORUS SHELL THICKNESS

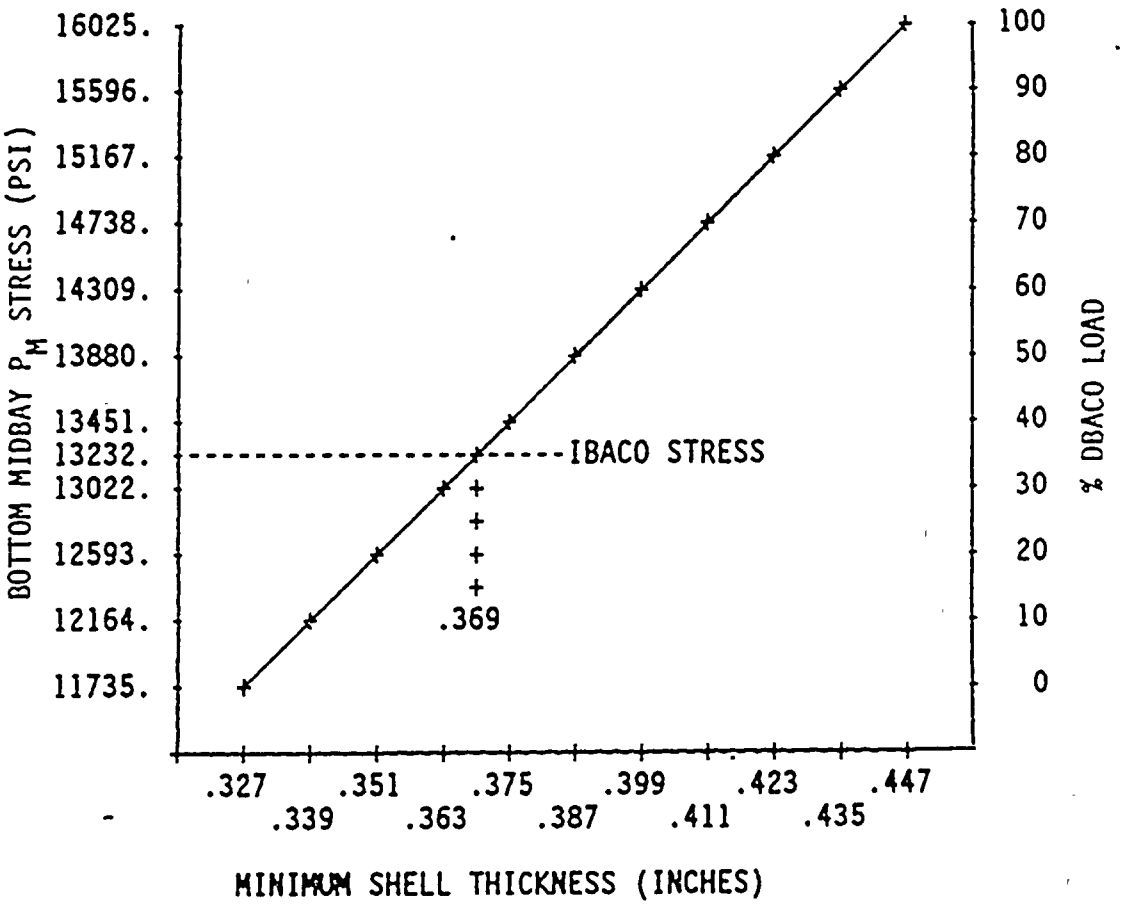
- CONDENSATION OSCILLATIONS

  12 MILLS/10% REDUCTION

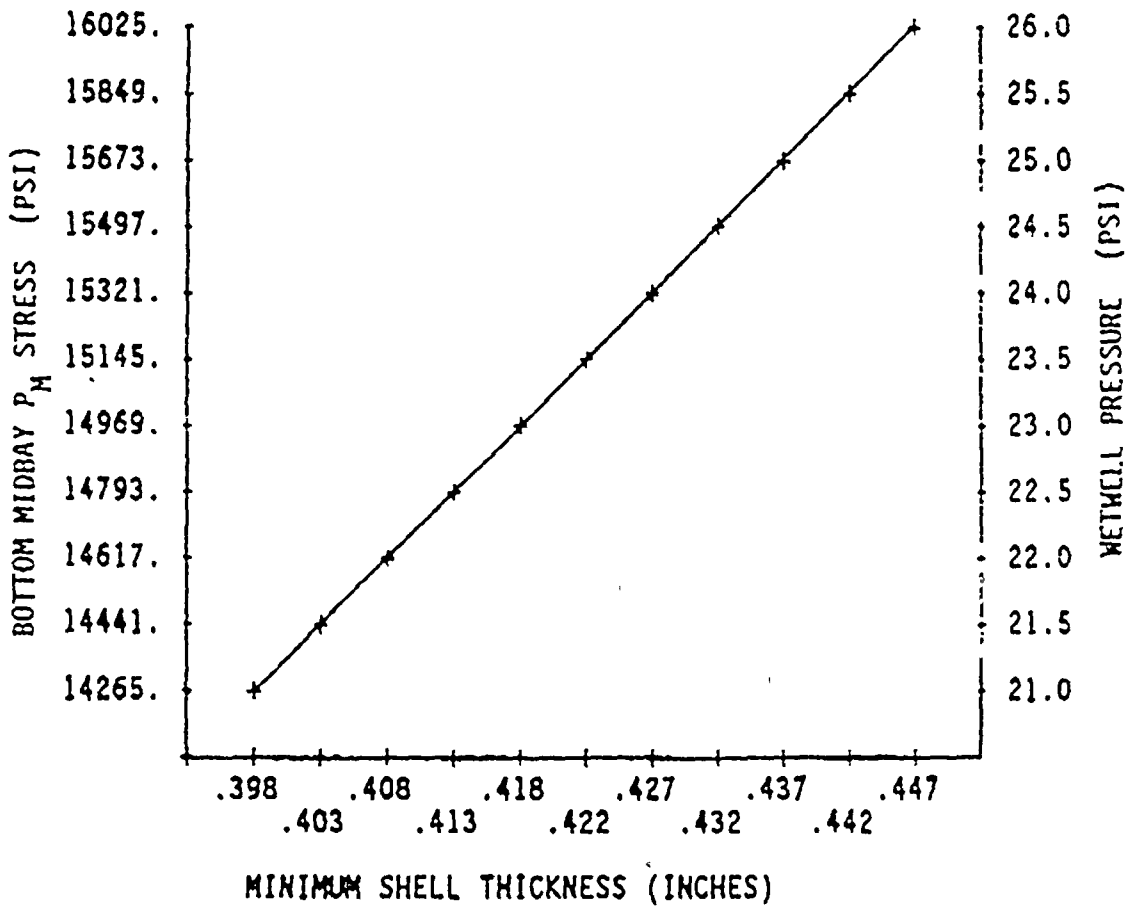
- TORUS PRESSURE

  8 MILLS/1 PSI REDUCTION

EVENT 20 COMBINATION AT BOTTOM MID-BAY
MINIMUM SHELL THICKNESS
VERSUS
P_M STRESS AND PERCENT DBACO LOAD



EVENT 20 COMBINATION AT BOTTOM MID-BAY
MINIMUM SHELL THICKNESS
VERSUS
P_M STRESS AND WETWELL PRESSURE



CONSERVATISM IN VENT SPHERE

MINIMUM THICKNESS

- LOADS WERE COMBINED BY ABSOLUTE SUMMATION
- RESULTANT STRESSES WERE CALCULATED WITHOUT REGARD TO LOCATION
- GENERAL ELECTRIC GENERIC VENT HEADER/VENT PIPE INTERSECTION (TYPE I) STRESS INTENSITY FACTORS WERE USED TO DETERMINE VENT SPHERE MAXIMUM STRESS
- CMTRs COULD BE USED TO DETERMINE HIGHER CODE ALLOWABLES

TORUS WALL THICKNESS PROGRAM

II DATA COLLECTION METHODS & EVALUATION

° UT METHOD/INSTRUMENT

- 1975-1979 ---› THICKNESS TRANSDUCERS; SINGLE CALIBRATION BLOCK - 6x6 MIN. THICK.

° STATISTICAL -----› TIME VARYING

-----› LOCATION VARYING

° VENT HEADER SPHERES ---› NEW AREA, NO PREVIOUS DATA

---› NO DETAILED STRESS ANALYSIS

- ANNUAL CORROSION (LINEAR/EXPONENTIAL?)

TORUS WALL THICKNESS PROGRAM

III PRESENT PLANS/PROGRAMS (FOR 1990)

- INCREASE SAMPLE SIZE/CONFIRM 1988 DATA
  - VISUAL INSPECTION VENT SPHERES
- FURTHER ANALYSIS
  - FULL SCALE TEST DATA
- O2 CONTROL
- COATINGS
- MID-BAY SADDLES

TORUS WALL THICKNESS PROGRAM

IV CONCLUSIONS

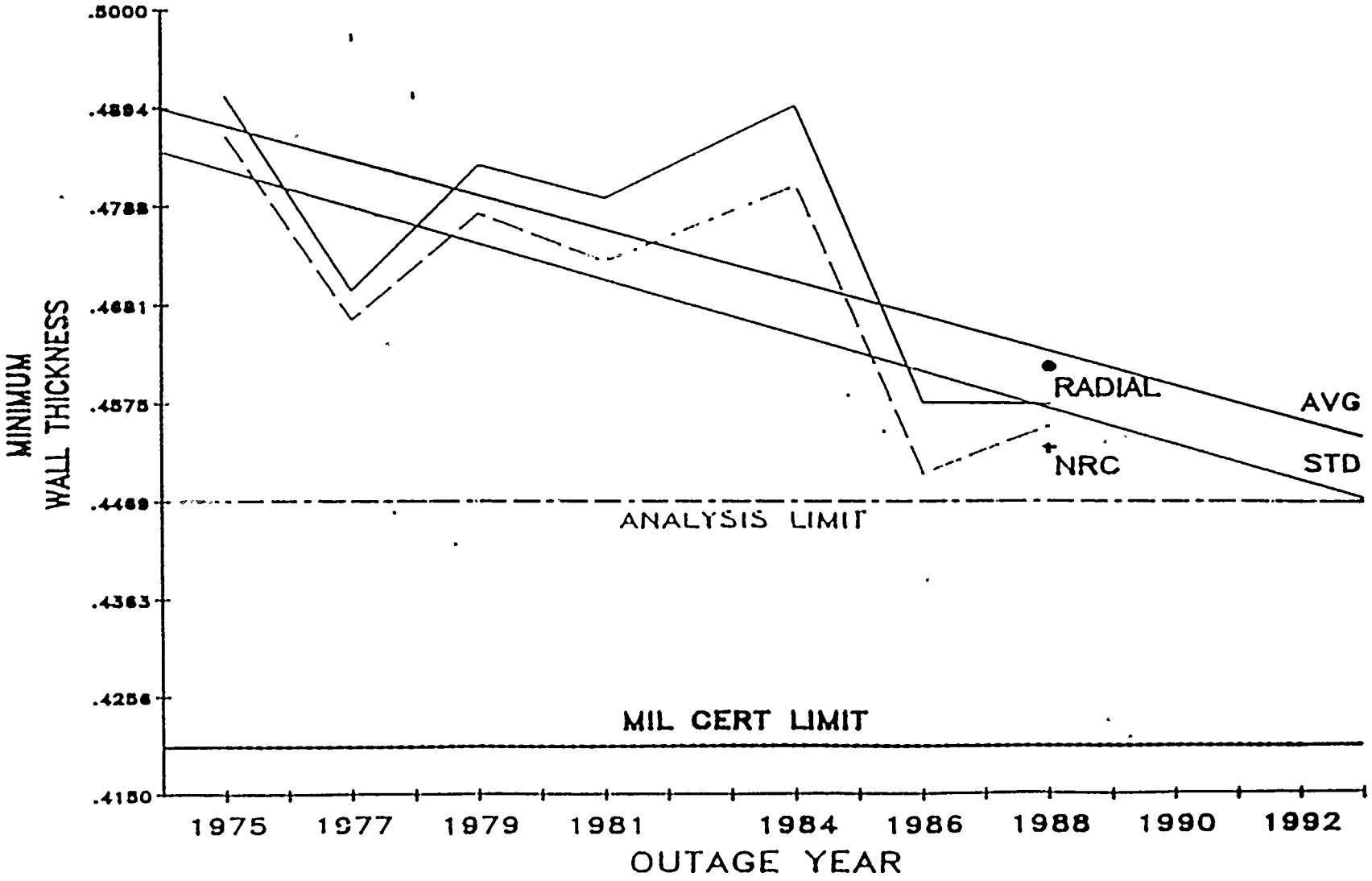
° WHY OK UNTIL 1990?

- LOCAL THICKNESS VS. OVERALL THICKNESS
- TORUS THICKNESS AT MID-BAY - ADJACENT
- CORROSION RATE = .002 in/year
- VENT SPHERE, THICKNESS - ADEQUATE
- CMTRs GIVE ADDITIONAL MARGIN
- FURTHER ANALYSIS TO INCREASE THICKNESS MARGIN

NINE MILE POINT UNIT 1

MINIMUM TORUS WALL THICKNESS

AREA NUMBER ONE



RPV BELT LINE WELD EXAMINATION

° 1ST TEN YEAR INTERVAL

- RELIEF GRANTED DUE TO ACCESS RESTRICTIONS

° 2ND TEN YEAR INTERVAL

- RELIEF REQUEST PENDING NRR APPROVAL
- NIAGARA MOHAWK WILL EXAMINE THE RPV WELDS ABOVE THE THERMAL SHIELD

  1988 DETERMINE ACCESSIBILITY AND INSULATION MODIFICATIONS REQUIRED

  1990 TENTATIVE SCHEDULE FOR EXAMINATION

° NRC INSPECTION 87-11

- NIAGARA MOHAWK COMMITTED TO PERFORM A FEASIBILITY STUDY ON RPV BELT LINE EXAMINATIONS

NMPC FEASIBILITY STUDY

- BWROG PLEX COMMITTEE
- PURSUING THIS TOPIC WITH EPRI/BWROG IGSCC
  - DEVELOPING A SUBMERSIBLE UNIT FOR UT EXAMINATION FROM INTERIOR
- COMBUSTION ENGINEERING
  - LOW PROFILE MAGNETIC CRAWLER
  - REQUIRES A THIN TRACK FOR ALIGNMENT
  - INSULATION MODIFICATIONS REQUIRED
- SOUTHWEST RESEARCH
  - LOW PROFILE DEVICE AVAILABLE
  - USED ON EUROPEAN BWR
  - TRACKLESS SYSTEM

EROSION/CORROSION MONITORING PROGRAM

- INITIAL PROGRAM DEVELOPMENT IN 1981 FOR TWO PHASE FLOW
- MONITORED TWO PHASE FLOW LOCATIONS DURING 1984 AND 1986 OUTAGES
- PROGRAM EXPANDED IN 1987 TO INCLUDE SINGLE PHASE FLOW
- NUMARC/EPRI GUIDELINES FOR HIGH-ENERGY SINGLE-PHASE FLOW EROSION/CORROSION REVIEW ARE INCLUDED IN PROGRAM
- NRC BULLETIN NO. 87-01 GUIDELINES AND RECOMMENDATIONS ARE INCLUDED IN PROGRAM

EROSION/CORROSION MONITORING PROGRAM (Continued)

- PROGRAM TASKS
  - DESIGN REVIEW
    - PIPING CONFIGURATION
    - BULK FLUID VELOCITIES
    - WATER CHEMISTRY
    - MATERIALS
    - PERCENT MOISTURE IN STEAM FOR TWO PHASE
  - OPERATING DATA REVIEW
    - TRANSIENT HISTORY
    - WATER CHEMISTRY
  - SAMPLE LOCATION

1988 REFUELING OUTAGE

- NMPC PROGRAM PLAN
- NMPC OUTAGE PLAN
- CBI SURFACE PREPARATION
- NES ULTRASONIC MEASUREMENT
- NMPC ENGINEERING REVIEW
  - ACTUAL DATA VERSUS MINIMUM WALL THICKNESS REQUIREMENTS
  - ACTUAL DATA INPUTTED TO "CHEC" COMPUTER PROGRAM
    - DEVELOPED BY EPRI

      MONITORS EROSION/CORROSION RATE

NINE MILE POINT UNIT 1

EROSION/CORROSION REVIEW STATUS

- PROGRAM LOCATIONS
  - SINGLE PHASE 34
  - TWO PHASE 37

- DATA
  - NES COMPLETED 44
  - NES TO BE COMPLETED 27
  - NES TURNOVER TO ENGINEERING 37
  - NMPC ENGINEERING DATA REVIEW COMPLETED 0

ATTACHMENT C

Teledyne Engineering Services

Technical Report TR-6801-2 Revision 1

January 29, 1988

Mark I Torus Shell and Vent System Thickness Requirements

Nine Mile Point Unit 1 Nuclear Station