REACTOR CONTAINMENT BUILDING INTEGRATED LEAKAGE RATE TEST

TYPES A, B, AND C PERIODIC TEST

IOWA ELECTRIC LIGHT AND POWER COMPANY DUANE ARNOLD ENERGY CENTER

DOCKET No. 50-331 OPERATING LICENSE No. DPR-49

AUGUST 1990

Prepared by

STONE & WEBSTER ENGINEERING CORPORATION
BOSTON, MASSACHUSETTS

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REFERENCES

1. 10CFR Part 50 , Appendix J, Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors, January 1, 1989.

2. STP No. 47A002, Primary Containment Leakage Rate Test, Duane Arnold Energy Center, Surveillance Test Procedure.

3. ANSI N45.4, American National Standard, Leakage-Rate Testing of Containment Structures for Nuclear Reactors, March 16, 1972.

4. ANSI/ANS-56.8, Containment System Leakage Testing Requirements,January 20, 1987.[1]

5. Bechtel Corporation's Testing Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants, BN-TOP-1, Revision 1, November 1, 1972.

6. STP No. 47A003, Containment Leak Tightness Test - Type B Penetrations, Duane Arnold Energy Center, Surveillance Test Procedure.

7. STP No. 47A004, Airlock Local Leak Rate Test, Duane Arnold Energy Center, Surveillance Test Procedure.

8. STP No. 47A005, Containment Isolation Valve Leak Tightness Test - Type C Penetrations, Duane Arnold Energy Center, Surveillance Test Procedure.

[1] This document used only as a guidelIne and any reference to said document in no way implies compliance.

SECTION 1

1.0 PURPOSE

The purpose of this report is to present a description and analysis of the August 1990 Periodic Type A Primary Containment Integrated Leakage Rate Test (ILRT) and a summary of the Periodic Types B and C Local Leakage Rate Tests (LLRT) conducted since December 1988 at the Duane Arnold Energy Center (DAEC). DAEC is operated by the Iowa Electric Light and Power Company (IE). Specific plant information and technical data is contained in Attachment 1A.

Stone & Webster Engineering Corporation (SWEC) provided engineering consultation services to Iowa Electric Light and Power Company during the performance of this test.

This report is submitted as required by 10CFR50, Appendix J, Paragraph V.B.

ATTACHMENT 1A

TEST DATA SUMMARY

A. Plant Information

Operator	Iowa Electric Light and Power Company
Plant	Duane Arnold Energy Center
Location	Palo, Iowa
Containment Type	Mark I, BWR/4
Docket Number	50-331
Operating License No.	DPR-49
Date Test Completed	August 30, 1990

B. Technical Data

Containment Net Free Air Volume as Tested	205,360 cu. ft.
Drywell Free Air Volume	109,400 cu. ft.
Torus Free Air Volume	95,960 cu. ft.
Design Pressure	56 psig
Calculated Peak Accident Pressure	43 psig
Containment Design Temperature	281 °F
Containment ILRT Average Temperature Limits	40-100 °F

SECTION 2

2.0 SUMMARY

2.1 TYPE A TEST

2.1.1 Test Summary

Pressurization for the ILRT began at approximately 0525 hours on August 29, 1990. Pressurization was initially at 6.3 psi/hour but was slowed to 3.6 psi/hour when the air drier appeared to overload. Extensive investigations of all penetration areas were conducted throughout the pressurization and the Type A test. One major leak was detected at a cracked nipple on the containment side of isolation valve CV4304. This leak was monitored during the pressurization and throughout the test.

Containment pressurization was secured at approximately 1525 hours on August 29, 1990. The pressurization piping system was isolated and vented. The leakage from CV4304 was measured locally and estimated to be in the range of 100,000 SCCM.

At 2000 hours on August 29, 1990, the thermal stabilization criteria of Reference 2 was satisfied. Pressure, temperature and dew point data were continuously recorded throughout the test period at 15 minute intervals.

The Type A test was successfully completed at 0400 hours on August 30, 1990 with a Total Time Upper Confidence Limit (UCL-TT) of 1.063981 percent/day and a Mass Point Upper Confidence Limit of 1.035137 percent/day. Both Total Time and Mass Point leakage rates were below the $0.75L_a$ acceptance criteria.

The Superimposed Verification Test was started at 0515 hours on August 30, 1990 and was successfully completed at 0915 hours on August 30, 1990. The results of the verification test satisfied the requirements of Reference 2 (See Appendix G, page 3).

After the completion of the verification test, the broken nipple on CV4304 was replaced and verified to be leak tight prior to the completion of depressurization.

Depressurization of the containment began at approximately 1000 on August 30, 1990 and was completed at 2000 on August 30, 1990.

2.2 LOCAL LEAKAGE RATE TESTS (Types B and C)

The Local Leakage Rate Tests (LLRT) of containment isolation valves and other containment penetrations were conducted as required by the methods described in the plant surveillance procedures, References 6, 7 and 8, for the Types B and C Tests.

Section 4 of this report summarizes the data for the LLRT conducted since the December 1988 Type A test in accordance with Appendix J, 10CFR50, Paragraph V.B. Also contained in Section 4 of this report is the 1990 LLRT Summary Analysis.

SECTION 3

3.0 TYPE A TEST

3.1 EDITED LOG OF EVENTS

This log was edited from information contained in the ILRT Coordinator's Official Type A Log of Events or from Reference 2.

August 28, 1990

2000 Drywell inspection successfully completed.

2030 Drywell cooling and fans secured.

August 29, 1990

0525 Pressurization started.

0545 CV4312 closed at 1 psi differential pressure.

0620 Jumper on CV4312 discovered not to be making contact. This was corrected and flow re-established with two compressors running.

0830 Energized dewpoint sensor power supply. Walk down for leakage detection initiated.

1015 Large leak detected on top of valve CV4304. Appears to be leaking at cracked nipple on containment side of the valve seat.

1045 Dewpoint rising rapidly. Drier appears to be overloaded. Drains opened and back pressure increased on the drier.

1100 One compressor tripped out. Will continue pressurization with one compressor to help control dewpoint.

1525 Pressurization secured with a peak pressure of 59.2574 psia.

1615 Reactor coolant temperature increasing steadily. Operations personnel were making efforts to control temperature with RHR.

1640 Leakage at CV4304 was measured and estimated to be about 100,000 SCCM or about 0.6 % per day.

1950 Thermal stabilization criteria was satisfied at the 1945 data set.

2000 Leakrate test started.

2045 Leak surveys have revealed only minor leakage. V43-161 which is the vent valve in the pressurization line up is leaking slightly. V24-51 and V22-65 are showing slight packing leaks.

2313 Additional small leaks found at packing of V43-199 and CV4310 in the drywell exhaust valve room.

August 30, 1990

0400 Short duration test criteria satisfied.

0414 Superimposed leakage established.

0515 Superimposed verification test started.

0915 Superimposed verification test successfully completed.

1000 Started depressurization of the containment.

2000 Containment depressurized.

3.2 GENERAL TEST DESCRIPTION

3.2.1 Prerequisites

In accordance with Reference 2, the following is a listing of the pertinent prerequisites and other procedural requirements completed and documented prior to containment pressurization:

a. Site meteorological data recorded during the performance of the ILRT (Attachment 3.2A)

b. All required test instrumentation installed and functionally verified within 6 months of the test.

c. Primary containment ventilation system secured.

d. Satisfactory inspection of the primary containment in accordance with Reference 2.

e. Pressurization system lined-up and ready for operation.

f. RCS temperature maintained stable prior to and during the performance of the ILRT.

g. Data acquisition and analysis computer systems used for the test are operational.

h. All required system valve lineups completed.

i. Drywell-to-torus vacuum breakers are blocked open.

j. Restricted plant access plan in effect.

k. An Official Type A Log of Events established and maintained by the ILRT Coordinator.

l. All pressurized components and systems either removed from the containment or vented.

m. All required Types B and C leakage rate testing completed.

n. Verification flowmeter installed.

o. Instrument Selection Guide (ISG) calculated.

3.2.2 Equipment and Instrumentation

Pressurization of the primary containment was achieved by utilizing two diesel driven air compressors, an aftercooler, and a refrigerant air drier. The system included adequate instrumentation and valving to maintain proper monitoring and control of the compressed air quality throughout the pressurization sequence. The capacity of the temporary air compressors is approximately 1,800 standard cubic feet per minute (SCFM).

The various containment parameters required to calculate containment leakage during the test, were monitored using instrumentation which consisted of 15 resistance temperature detectors, 6 dewpoint temperature sensors, and 2 absolute pressure indicators. Pertinent data for the test instrumentation is listed in Attachment 3.2B, and the general locations of the test instrumentation for both the drywell and the suppression chamber are shown in Attachments 3.2C and 3.2D. Elevations and azimuths are approximate.

A rotometer was used to perform the superimposed leakage verification test.

Instrument Selection Guide (ISG)

Sensor Type	No. of Sensors	Sensitivity Error	System Error
Pressure	2	0.015 psi	0.00 psi
Temperature	15	2.00 °F	0.00 °F
Dewpoint Temp.	6	5.00 °F	0.00 °F

Test Duration (t) 8 hrs.
Test Pressure 57.696 psia
Test Temperature 80 °F = 540 °R
Test Dewpoint Temp. 80 °F

$$ISG = \pm \frac{2400}{t}\sqrt{2\times\left(\frac{EP}{P}\right)^2 + 2\times\left(\frac{ET}{T}\right)^2 + 2\times\left(\frac{EP_v}{P}\right)^2}$$

ISG $\leq$ 0.25 L_a which equals 0.5% per day since L_a = 2.0% per day

a. EP = error associated with absolute pressure instruments

$$EP = \frac{0.015}{\sqrt{2}} = 0.010607$$

b. ET = error associated with temperature instruments

$$ET = \frac{2.0}{\sqrt{15}} = 0.516398$$

c. EP_v = error associated with vapor pressure instruments

$$EP_v = \frac{0.082896}{\sqrt{6}} = 0.033842$$

Using values established in a,b and c above, calculate ISG.

$$ISG = \pm \frac{2400}{8}\sqrt{2\times\left(\frac{0.010607}{57.696}\right)^2 + 2\times\left(\frac{0.0.516398}{540}\right)^2 + 2\times\left(\frac{0.033842}{57.696}\right)^2}$$

ISG = ±0.482309 which is less than 0.5%/day (25% of L_a)

3.2.3 Data Acquisitiou System

A programmable, multichannel data logger was used to scan the data from the 15 resistance temperature detectors and 6 dewpoint temperature sensor input signals. The 2 pressure readings were taken manually. Data was taken at 15 minute intervals throughout the test.

3.2.4 Data Resolution System

The recorded data was manually inputted to a dedicated computer system using Stone & Webster Engineering Corporation's (SWEC) ILRT analysis program for data reduction and leakage rate calculations. The computer program converted the Dewcel Element Temperatures to Dewpoint Temperatures using a polynomial curve fit derived from the Dewcel vendor's test data. The following calculations used the instantaneous values of the ILRT sensors to determine both the Mass Point and Total Time Analysis Method leakage rates.

Absolute Method of Mass Point Analysis

The Absolute Method of Mass Point Analysis consists of calculating the air mass within the containment structure, over the test period using pressure, temperature, and dewpoint temperature observations made during the ILRT. The air mass is computed using the ideal gas law as follows:

$$M = 144 \times V \frac{(P - P_v)}{RT} \qquad \text{(Eq. 1)}$$

where:

M = air mass, lbm
P = total pressure, psia
P_v = average vapor pressure, psia
R = 53.35 ft-lbf/lbm°R (for air)
T = average containment temperature, °R
V = containment free volume, ft^3

The leakage rate is then determined by plotting the air mass as a function of time, using a least-squares fit to determine the slope, A = dM/dT. The leakage rate is expressed as a percentage of the air mass lost in 24 hours or symbolically:

$$\textit{Leakage Rate} = -2400 \left[\frac{A}{B}\right] \qquad \text{(Eq. 2)}$$

Where A is the slope of the least-squares curve and B is the y-intercept. The sign convention is such that the leakage out of the containment is positive, and the units are in percent/day.

A confidence interval is calculated using a Student's T distribution. The sum of the leakage rate and confidence interval is the Upper Confidence Limit - Mass Point (UCL-MP).

Absolute Method of Total Time Analysis

The Absolute Method of Total Time Analysis consists of calculating air lost from the containment, using pressure, temperature, and dewpoint temperature observations made during the ILRT.

The containment air mass is computed using Equation 1. The measured leakage rate at any time (t) is then determined by subtracting the mass at that time (Mt) from the initial mass (Mi) and dividing by the initial mass. The measured leakage rate is expressed as a percentage of containment mass lost in 24 hours or symbolically:

$$\textit{Measured Leakage rate} = 2400\frac{(M_i - M_t)}{M_i(\Delta t)} \qquad \text{(Eq. 3)}$$

The sign convention is such that leakage out of the containment is positive, and the units are in percent/day.

The calculated leakage rate is then determined by plotting the measured leakage rate as a function of time and then performing a least-squares curve fit of the measured leakage rate values as follows:

$$\textit{Calculated Leakage rate} = At + B \qquad \text{(Eq. 4)}$$

Where, A is the slope and B is the y-intercept of the least squares curve.

A confidence interval is calculated using the requirements of Bechtel Topical Report BN-TOP-1, Rev. 1.

The sum of the calculated leakage rate and the confidence interval is the Upper Confidence Limit - Total Time (UCL-TT).

ATTACHMENT 3.2A

SITE METEOROLOGY

Date	Time	Ambient Temp. (Deg F)	Dewpoint Temp. (Deg F)	Barometric Pressure (In. Hg)	General Weather Conditions
August 29, 1990	0600	67.0	62.0	30.0	clear
	0700	64.9	60.9	30.0	clear
	0800	66.7	62.8	30.0	clear
	0900	70.6	60.0	30.0	clear
	1000	75.9	60.2	30.0	clear
	1100	78.5	59.8	30.0	clear
	1200	79.8	58.6	30.0	clear
	1300	80.7	60.2	30.0	clear
	1400	81.1	60.8	30.0	clear
	1500	80.6	63.0	29.9	cloudy
	1600	79.3	64.1	29.9	rain
	1700	66.3	62.2	30.0	cloudy
	1800	69.2	63.5	30.0	cloudy
	1900	68.7	61.5	30.0	cloudy
	2000	67.6	62.9	30.0	cloudy
	2100	66.9	63.7	30.0	partly cloudy
	2200	66.3	63.1	30.0	cloudy
	2300	65.9	62.4	30.0	cloudy
	2400	66.2	63.3	30.0	cloudy
August 30, 1990	0100	65.8	62.9	30.0	cloudy
	0200	65.6	62.5	30.0	foggy
	0300	64.0	61.2	30.0	foggy
	0400	64.5	61.4	30.0	foggy
	0500	62.7	59.8	30.0	foggy
	0600	61.9	59.0	30.0	clear
	0700	61.5	58.5	30.1	clear
	0800	63.3	59.5	30.1	sunny

ATTACHMENT 3.2B

INSTRUMENTATION LIST

The following instruments were calibrated and functionally verified within 6 months prior to the performance of this test and in accordance with 10CFR50, Appendix J.

Instrument	Weight Fraction	Computer Point	Zone	Azimuth	Elevation	Range	Accuracy
A.	**Temperature**						
T1	0.1155	C0	6	270°	735	32-250°F	±0.5°F
T2	0.1155	C1	6	0°	735	32-250°F	±0.5°F
T3	0.1155	C2	6	90°	735	32-250°F	±0.5°F
T4	0.1155	C3	6	180°	735	32-250°F	±0.5°F
T5	0.047	C4	4	45°	749	32-250°F	±0.5°F
T6	0.047	C5	4	225°	750	32-250°F	±0.5°F
T12	0.024	C11	5	Rx CL	750	32-250°F	±0.5°F
T7	0.053	C6	3	90°	764	32-250°F	±0.5°F
T8	0.053	C7	3	210°	763	32-250°F	±0.5°F
T14*	0.054	C13	3	315°	766	32-250°F	±0.5°F
T9	0.046	C8	2	20°	786	32-250°F	±0.5°F
T10	0.046	C9	2	150°	786	32-250°F	±0.5°F
T13*	0.046	C12	2	290°	787	32-250°F	±0.5°F
T11	0.061	C10	1	345°	828	32-250°F	±0.5°F
T15*	0.061	C14	1	165°	828	32-250°F	±0.5°F
B.	**Dewpoint Temperature**						
M5	0.231	C24	C	270°	735	32-150°F**	±5.0°F
M6	0.231	C25	C	90°	735	32-150°F**	±5.0°F
M3	0.139	C22	B	225°	750	32-150°F**	±5.0°F
M4	0.139	C23	B	45°	749	32-150°F**	±5.0°F
M1	0.130	C20	A	340°	809	32-150°F**	±5.0°F
M2	0.130	C21	A	160°	809	32-150°F**	±5.0°F

ATTACHMENT 3.2B

INSTRUMENTATION LIST

Instrument	Weight Fraction	Computer Point	Zone	Azimuth	Elevation	Range	Acouracy
C. Pressure							
P1	0.500000	Local	Drywell	-	-	0-100psia	± 0.015%FS
P2	0.500000	Local	Torus	-	-	0-100psia	± 0.015%FS
D. Superimposed Leakage Verification Test Flow Instrument							
Rotometer		-	Local	-	-	5-19scfm	±1.0%F.S.

Notes:

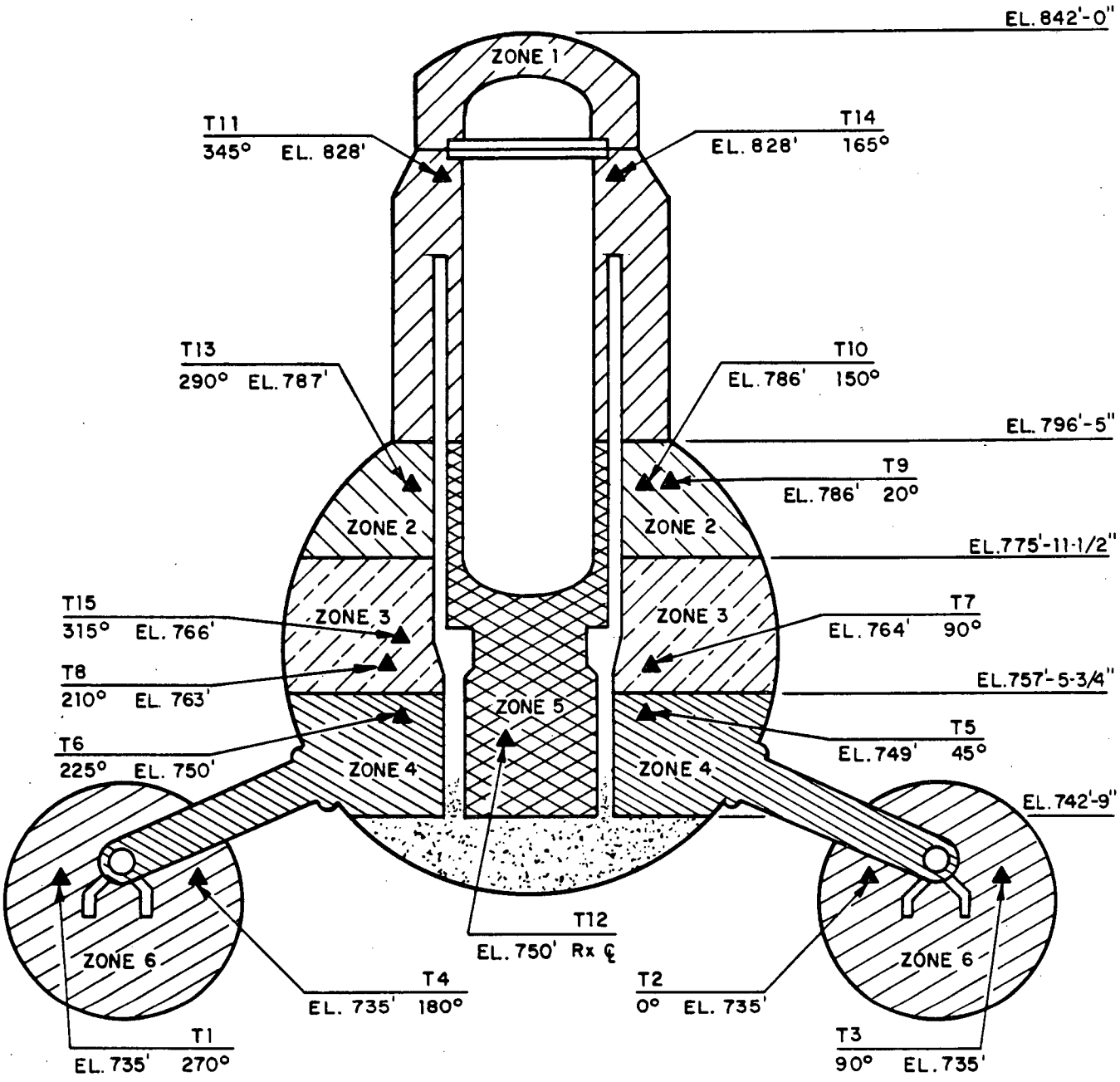
* Temporary RTD and/or Dewpoint Sensors.

** The Dewcel Element Temperatures (ET) were converted to Dewpoint Temperatures (DPT) by the following polynomial equation:

$$DPT = -1.5923290156E+1 + 3.2150392932E-1*ET + 2.7879779394E-3*ET^2 - 7.1099385788E-6*ET^3$$

This equation is valid over the range of 51.2 to 83.7 °F Dewpoint Temperature (ET of 121 to 169 °F)

ATTACHMENT 3.2C

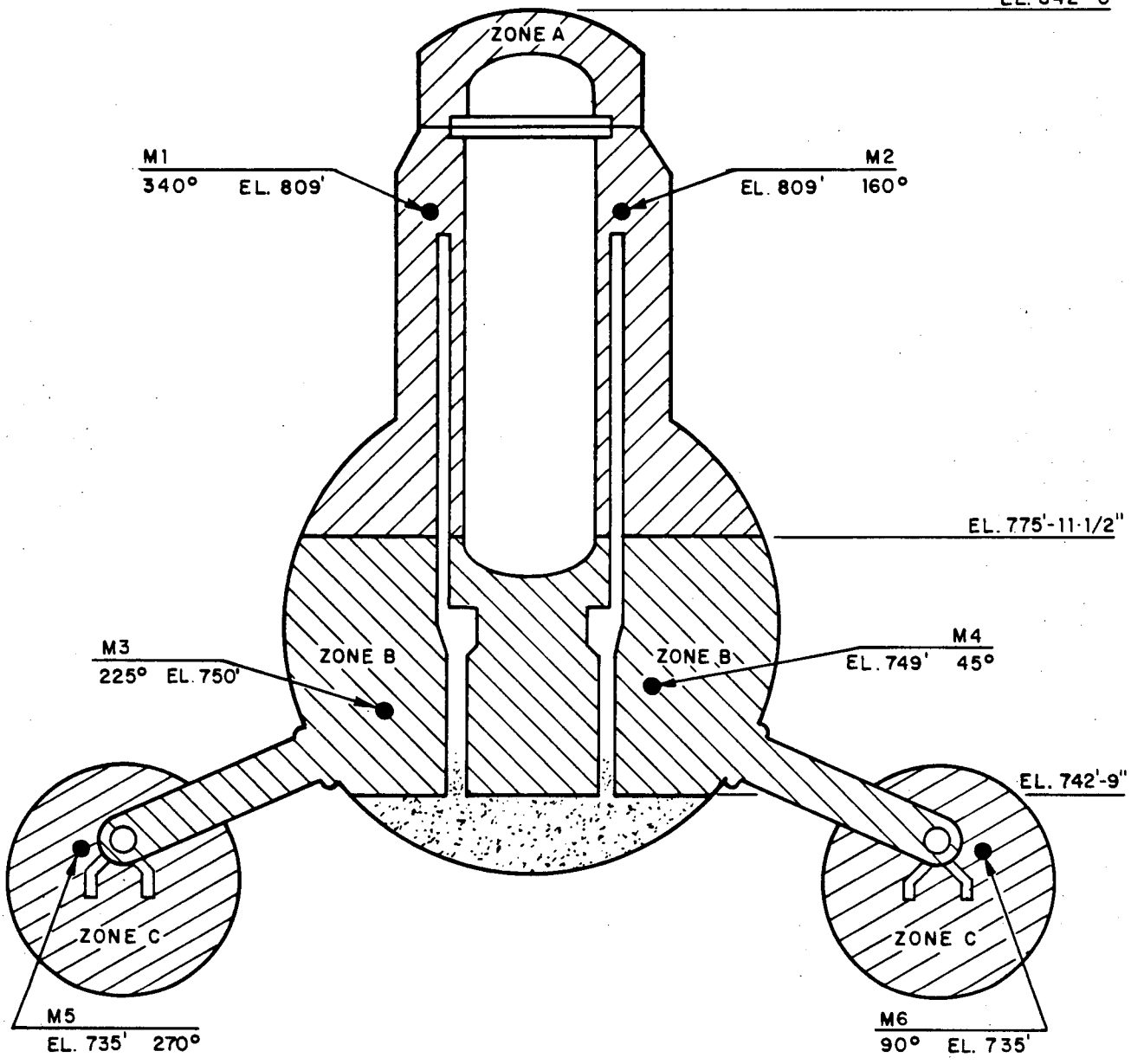


NOTES:

1. ZONE BOUNDARIES ARE APPROXIMATE, REFERENCE DAEC DWG. No. M-156
2. RTD ELEVATIONS AND AZIMUTH POSITIONS ARE APPROXIMATE

ATTACHMENT 3.2C
ILRT TEMPERATURE DETECTOR LOCATIONS
DUANE ARNOLD ENERGY CENTER

ATTACHMENT 3.2D



NOTES:

1. ZONE BOUNDARIES ARE APPROXIMATE, REFERENCE DAEC DWG. No. M-156
2. DEWPOINT TEMPERATURE SENSOR ELEVATIONS AND. AZIMUTH POSITIONS ARE APPROXIMATE

ATTACHMENT 3.2D
ILRT DEWPOINT TEMPERATURE SENSOR LOCATIONS
DUANE ARNOLD ENERGY CENTER

3.3 TEST RESULTS

3.3.1 Presentation of Test Results

The test data for the August 1990 ILRT is based on a 8 hour test period starting at 2000 hours on August 29, 1990. The final test results were determined using SWEC's ILRT computer program. The Measured Input Data, Reduced Input Variables, Mass Point Analysis Test Results, Total Time Analysis Test Results, and representative graphs are contained in Attachments 3.3A through 3.3K.

Both the Mass Point and Total Time Analysis Test Results for the ILRT satisfied the procedural acceptance criteria.

The Type A Test instrumentation was verified by the Superimposed Leakage Verification Test Method. The Measured Input Data, Reduced Input Variables, Mass Point Analysis Test Results, Total Time Analysis Test Results, and representative graphs are contained in Attachments 3.3L through 3.3S.

Both the Mass Point and Total Time Analysis Test Results for the Superimposed Leakage Verification Test satisfied the procedural acceptance criteria.

3.3.2 ILRT Results

The 57.696 psia ILRT was conducted in accordance with Reference 2. The results for the ILRT and for the Supplemental Test are shown below.

3.3.2.1 ILRT Results - Mass Point Analysis

	Item		(Percent/Day)
1.	L_{am}, Leakage Rate Calculated		1.028984
2.	UCL, Upper Confidence Level		0.006153
3.	UCL-MP, L_{am} Leakage Rate plus UCL (1&2)		1.035137
4.	Corrections for: (See Sections 3.3.2.4)		
	i. Type B & C Penalties	0.048644	
	ii. Water Levels	0.033722	
	iii. Total Corrections (i. and ii.)		0.082366
5.	Total Reported Type A Leakage Rate (Items 3&4 iii.)		1.117503

Results were within the acceptable limits of 0.75 L_a or 1.5 percent/day.

3.3.2.2 ILRT Results - Total Time Analysis

Item			(Percent/Day)
1.	L_{am}, Leakage Rate Calculated		1.033847
2.	UCL, Upper Confidence Level		0.030133
3.	UCL-TT, L_{am} Leakage Rate plus UCL (1&2)		1.063981
4.	Corrections for: (See Section 3.3.2.4)		
	i. Type B & C Penalties	0.048644	
	ii. Water Levels	0.033722	
	iii. Total Corrections (i. and ii.)		0.082366
5.	Total Reported Type A Leakage Rate (Items 3&4 iii.)		1.146347

Results were within the acceptable limits of 0.75 L_a or 1.5 percent/day.

3.3.2.3 Supplemental Test Results

The Supplemental Verification Test was performed using the Superimposed Leakage Verification Test Method in accordance with Reference 2. The results for the Superimposed Leakage Verification Test are shown below.

1. The Superimposed Leakage Verification Test is acceptable provided L_c falls within the following range:

$$(L_{am}+L_o-0.25\times L_a) \leq L_c \leq (L_{am}+L_o+0.25\times L_a) \qquad \text{(Eq. 5)}$$

Where: L_{am} = Type A calculated leakage rate (computer)
(L_{am} - MP = 1.028984 %/day)
(L_{am} - TT = 1.033847 %/day)

L_o = Superimposed leakage rate (rotometer)
(L_o = 2.064705 %/day)

L_a = Maximum allowable leakage rate
(L_a = 2.0 %/day)

L_c = Composite leakage rate (computer)
(L_c - MP = 2.696423 %/day)
(L_c - TT = 2.700510 %/day)

a. Mass Point

$$(1.028984+2.064705-0.5) \leq 2.696423 \leq (1.028984+2.064705+0.5)$$

$$(2.593689) \leq 2.696423 \leq (3.593689)$$

b. Total Time

$$(1.033847+2.064705-0.5) \leq 2.70051 \leq (1.033847+2.064705+0.5)$$

$$(2.598552) \leq 2.70051 \leq (3.598552)$$

The Superimposed Leakage Verification Test met the requirements set forth in Reference 2.

3.3.2.4 Leakage Penalties Added to Type A Leakage

Penetration leakage to be added since these penetrations were isolated or could not be vented and drained during the Type A test. The leakage assigned is the recorded value for minimum pathway analysis.

i. Type B & C Penalties	Description	Leakage SCCM
X-9A	Feedwater	2700.
X-9B	Feedwater	950.
X-10	RCIC Steam	450.
X-11	HPCI Steam	450.
X-16A	Core Spray	0.
X-16B	Core Spray	215.
X-21	Service Air	0.
X-23A	RBCCW Inlet	950.
X-23B	RBCCW Inlet	210.
X-24A	RBCCW Outlet	220.
X-24B	RBCCW Outlet	720.
X-32D	N_2 Comp Suction	275.
X-32E	Recirc. Pump Seal	0.
X-32F	Recirc. Pump Seal	0.
X-36	CRD Return	34.
X-40C	Jet Pump	0.
X-40D	Jet Pump	0.
X-41	Recirc. Loop Sample	159.
X-229H	PASS	380.
X-219	HPCI/RCIC Vac. Br.	0.

Total Type B & C Leakage 7713 SCCM
Total Type B & C Leakage 0.048644 percent/day

ii. Water Level Corrections	Description	Gallons
	Rx Vessel	0.0
	D.W. Equipment Sump	518.0
	D.W. Floor Sump	0.0
	Torus	0.0

Total Water Level Corrections 518.0 Gallons
Total Water Level Corrections 0.033722 percent/day

iii Total Corrections	Description	Leakage Percent/Day
Total Type A Corrections (i. and ii.)	Penalties and Corrections	0.082366

ATTACHMENT 3.3A

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
MEASURED INPUT DATA

08/29/90 20:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.785	85.525	85.538	85.454	84.930	84.136	84.270	89.924	88.717	89.890
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
95.703	96.328	97.278	125.360	125.590	169.710	170.880	155.630	158.460	169.900
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
164.880	83.785	85.538	58.9834	58.8777					

08/29/90 20:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.731	85.470	85.484	85.400	84.942	84.136	84.293	89.924	88.717	89.925
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
95.714	96.339	97.301	125.310	125.510	169.640	170.760	155.920	158.640	170.000
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
165.140	83.731	85.484	58.9754	58.8693					

08/29/90 20:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.698	85.439	85.438	85.357	84.951	84.113	84.313	89.955	88.728	89.925
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
95.769	96.414	97.332	125.280	125.450	169.560	170.660	155.820	158.740	170.090
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
165.110	83.698	85.438	58.9676	58.8616					

08/29/90 20:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.651	85.391	85.402	85.332	84.992	84.131	84.308	89.942	88.746	89.943
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
95.784	96.443	97.384	125.240	125.410	169.490	170.580	156.000	158.840	170.310
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
165.240	83.651	85.402	58.9604	58.8539					

08/29/90 21:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.591	85.341	85.352	85.271	84.996	84.145	84.336	89.967	88.728	89.945
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
95.832	96.457	97.432	125.230	125.350	169.440	170.500	156.220	158.920	170.350
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
165.370	83.591	85.352	58.9534	58.8466					

ATTACHMENT 3.3A

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
MEASURED INPUT DATA

08/29/90 21:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.559	85.307	85.309	85.238	85.028	84.145	84.358	89.989	88.760	89.957
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
95.887	96.511	97.475	125.130	125.370	169.390	170.450	156.260	159.040	170.440
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
165.560	83.559	85.309	58.9465	58.8395					

08/29/90 21:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.517	85.264	85.266	85.195	84.996	84.167	84.379	90.001	88.760	89.957
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
95.909	96.565	97.518	125.130	125.340	169.310	170.420	156.290	159.160	170.730
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
165.500	83.517	85.266	58.9397	58.8327					

08/29/90 21:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.484	85.232	85.232	85.163	85.039	84.179	84.422	90.021	88.794	89.991
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
95.941	96.599	97.595	125.110	125.350	169.300	170.370	156.310	159.170	170.720
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
165.700	83.484	85.232	58.9330	58.8256					

08/29/90 22:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.457	85.203	85.205	85.134	85.065	84.161	84.437	90.037	88.819	90.016
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
95.989	96.667	97.631	125.120	125.230	169.160	170.360	156.520	159.340	170.750
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
165.830	83.457	85.205	58.9264	58.8188					

08/29/90 22:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.423	85.171	85.171	85.102	85.099	84.192	84.469	90.069	88.819	90.016
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.043	96.710	97.674	125.060	125.210	169.130	170.310	156.400	159.380	170.790
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
165.780	83.423	85.171	58.9200	58.8122					

ATTACHMENT 3.3A

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
MEASURED INPUT DATA

08/29/90 22:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.399	85.144	85.135	85.087	85.094	84.210	84.476	90.087	88.837	90.034
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.084	96.751	97.735	125.030	125.210	169.030	170.300	156.650	159.430	171.050
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.050	83.399	85.135	58.9136	58.8057					

08/29/90 22:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.370	85.106	85.107	85.037	85.130	84.258	84.535	90.112	88.862	90.048
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.131	96.810	97.782	125.030	125.190	169.100	170.200	156.900	159.570	171.010
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.150	83.370	85.107	58.9074	58.7992					

08/29/90 23:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.350	85.083	85.073	85.005	85.153	84.301	84.503	90.112	88.873	90.059
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.186	96.841	97.837	125.030	125.120	168.990	170.150	156.520	159.650	171.170
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.000	83.350	85.073	58.9014	58.7931					

08/29/90 23:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.316	85.063	85.053	84.994	85.162	84.335	84.557	90.157	88.885	90.082
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.229	96.896	97.891	125.040	125.270	168.940	170.040	156.970	159.700	171.270
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.270	83.316	85.053	58.8953	58.7866					

08/29/90 23:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.296	85.029	85.030	84.963	85.208	84.366	84.589	90.166	88.905	90.102
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.260	96.972	97.945	125.000	125.180	168.710	170.540	157.140	159.770	171.380
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.370	83.296	85.030	58.8894	58.7805					

ATTACHMENT 3.3A

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
MEASURED INPUT DATA

08/29/90 23:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.274	84.997	85.008	84.929	85.196	84.355	84.600	90.177	88.916	90.102
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.326	97.015	97.988	124.960	125.100	167.920	169.620	159.340	159.900	171.410
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.220	83.274	85.008	58.8836	58.7745					

08/30/90 00:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.249	84.981	85.005	84.904	85.235	84.384	84.662	90.218	88.946	90.143
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.376	97.042	98.050	124.980	125.080	166.660	168.790	162.120	159.880	171.610
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.400	83.249	85.005	58.8780	58.7685					

08/30/90 00:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.231	84.954	84.976	84.875	85.271	84.400	84.655	90.211	88.971	90.168
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.412	97.090	98.108	125.000	125.000	167.320	169.110	160.680	160.030	171.740
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.640	83.231	84.976	58.8723	58.7626					

08/30/90 00:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.209	84.943	84.953	84.886	85.305	84.421	84.698	90.254	88.994	90.180
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.455	97.167	98.172	124.970	125.070	168.810	170.310	157.110	160.110	171.720
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.560	83.209	84.953	58.8670	58.7572					

08/30/90 00:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.200	84.920	84.933	84.875	85.326	84.443	84.709	90.286	89.005	90.202
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.510	97.210	98.226	124.960	125.010	168.780	170.650	157.280	160.210	171.800
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.950	83.200	84.933	58.8617	58.7514					

ATTACHMENT 3.3A

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
MEASURED INPUT DATA

08/30/90 01:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.178	84.911	84.922	84.854	85.348	84.475	84.720	90.297	89.037	90.234
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.576	97.275	98.280	124.920	124.950	168.830	170.680	157.080	160.240	171.810
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.850	83.178	84.922	58.8561	58.7458					

08/30/90 01:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.174	84.906	84.897	84.839	85.376	84.504	84.748	90.304	89.064	90.262
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.625	97.302	98.341	125.060	124.940	168.710	170.700	157.540	160.320	172.000
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
166.900	83.174	84.897	58.8509	58.7401					

08/30/90 01:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.147	84.877	84.878	84.821	85.403	84.529	84.806	90.340	89.080	90.266
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.664	97.350	98.389	124.980	124.860	168.680	170.580	157.400	160.450	172.130
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.110	83.147	84.878	58.8458	58.7350					

08/30/90 01:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.124	84.857	84.856	84.800	85.403	84.561	84.784	90.363	89.103	90.278
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.718	97.395	98.423	124.930	124.950	168.680	170.650	157.480	160.430	172.230
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.190	83.124	84.856	58.8408	58.7295					

08/30/90 02:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.120	84.841	84.863	84.796	85.430	84.590	84.879	90.402	89.118	90.316
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.777	97.454	98.495	124.950	124.860	168.650	170.580	157.550	160.570	172.170
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.220	83.120	84.863	58.8358	58.7243					

ATTACHMENT 3.3A

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
MEASURED INPUT DATA

08/30/90 02:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.120	84.841	84.842	84.796	85.476	84.613	84.845	90.433	89.153	90.350
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.823	97.553	98.570	124.970	124.940	168.610	170.500	157.510	160.620	172.390
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.110	83.120	84.842	58.8309	58.7192					

08/30/90 02:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.093	84.823	84.835	84.778	85.501	84.627	84.915	90.438	89.178	90.376
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.879	97.556	98.629	124.870	124.840	168.580	170.470	157.840	160.690	172.450
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.280	83.093	84.835	58.8262	58.7142					

08/30/90 02:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.082	84.811	84.813	84.755	85.523	84.660	84.938	90.460	89.200	90.387
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.925	97.644	98.672	124.860	124.860	168.590	170.480	157.690	160.770	172.450
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.480	83.082	84.813	58.8212	58.7091					

08/30/90 03:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.066	84.798	84.797	84.753	85.530	84.688	84.976	90.499	89.227	90.426
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
96.975	97.671	98.733	124.740	124.900	168.500	170.440	157.980	160.810	172.530
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.540	83.066	84.797	58.8165	58.7041					

08/30/90 03:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.060	84.791	84.781	84.746	85.566	84.703	84.992	90.515	89.255	90.453
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.022	97.752	98.780	124.770	124.890	168.490	170.440	157.860	160.880	172.650
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.690	83.060	84.781	58.8119	58.6991					

ATTACHMENT 3.3A

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
MEASURED INPUT DATA

08/30/90 03:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.060	84.779	84.781	84.735	85.587	84.746	85.024	90.547	89.287	90.464
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.076	97.795	98.857	124.640	124.720	168.330	170.370	158.720	160.900	172.840
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.870	83.060	84.781	58.8073	58.6942					

08/30/90 03:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.051	84.768	84.770	84.713	85.621	84.758	85.024	90.581	89.298	90.496
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.120	97.850	98.900	124.650	124.760	168.400	170.390	158.410	160.950	172.790
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.830	83.051	84.770	58.8025	58.6897					

08/30/90 04:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
83.040	84.757	84.758	84.713	85.641	84.789	85.046	90.590	89.341	90.519
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.174	97.893	98.955	124.670	124.740	168.520	170.400	158.080	161.070	172.820
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
167.770	83.040	84.758	58.7980	58.6847					

ATTACHMENT 3.3B

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
REDUCED INPUT VARIABLES

Time (hh:mm)	Press. (PSIA)	V.P. (PSI)	Temp. (R)	Dewpoint (F)	Mass (LbM)
20:00	58.931	0.5345	551.588	81.630	58683.09
20:15	58.922	0.5353	551.560	81.676	58676.99
20:30	58.915	0.5349	551.546	81.654	58671.04
20:45	58.907	0.5355	551.532	81.687	58664.52
21:00	58.900	0.5359	551.509	81.710	58659.37
21:15	58.893	0.5363	551.500	81.734	58652.84
21:30	58.886	0.5366	551.484	81.751	58647.40
21:45	58.879	0.5368	551.483	81.761	58640.41
22:00	58.873	0.5372	551.475	81.787	58634.07
22:15	58.866	0.5369	551.467	81.767	58628.75
22:30	58.860	0.5378	551.464	81.823	58621.65
22:45	58.853	0.5385	551.461	81.860	58614.88
23:00	58.847	0.5376	551.454	81.809	58610.42
23:15	58.841	0.5385	551.468	81.863	58601.74
23:30	58.835	0.5399	551.462	81.944	58594.87
23:45	58.829	0.5390	551.450	81.892	58591.16
00:00	58.823	0.5385	551.459	81.863	58584.89
00:15	58.817	0.5396	551.454	81.924	58578.46
00:30	58.812	0.5409	551.467	81.998	58570.39
00:45	58.807	0.5429	551.469	82.110	58562.69
01:00	58.801	0.5427	551.471	82.098	58557.01
01:15	58.796	0.5436	551.485	82.154	58549.05
01:30	58.790	0.5437	551.479	82.159	58544.54
01:45	58.785	0.5443	551.481	82.191	58538.49
02:00	58.780	0.5443	551.493	82.193	58531.98
02:15	58.775	0.5442	551.514	82.184	58524.89
02:30	58.770	0.5450	551.507	82.232	58519.94
02:45	58.765	0.5453	551.513	82.246	58513.92
03:00	58.760	0.5457	551.518	82.269	58508.16
03:15	58.755	0.5460	551.529	82.285	58501.83
03:30	58.751	0.5473	551.526	82.364	58496.01
03:45	58.746	0.5470	551.535	82.346	58490.69
04:00	58.741	0.5470	551.545	82.343	58484.92

ATTACHMENT 3.3C

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
ABSOLUTE TEST METHOD, MASS POINT ANALYSIS TEST RESULTS

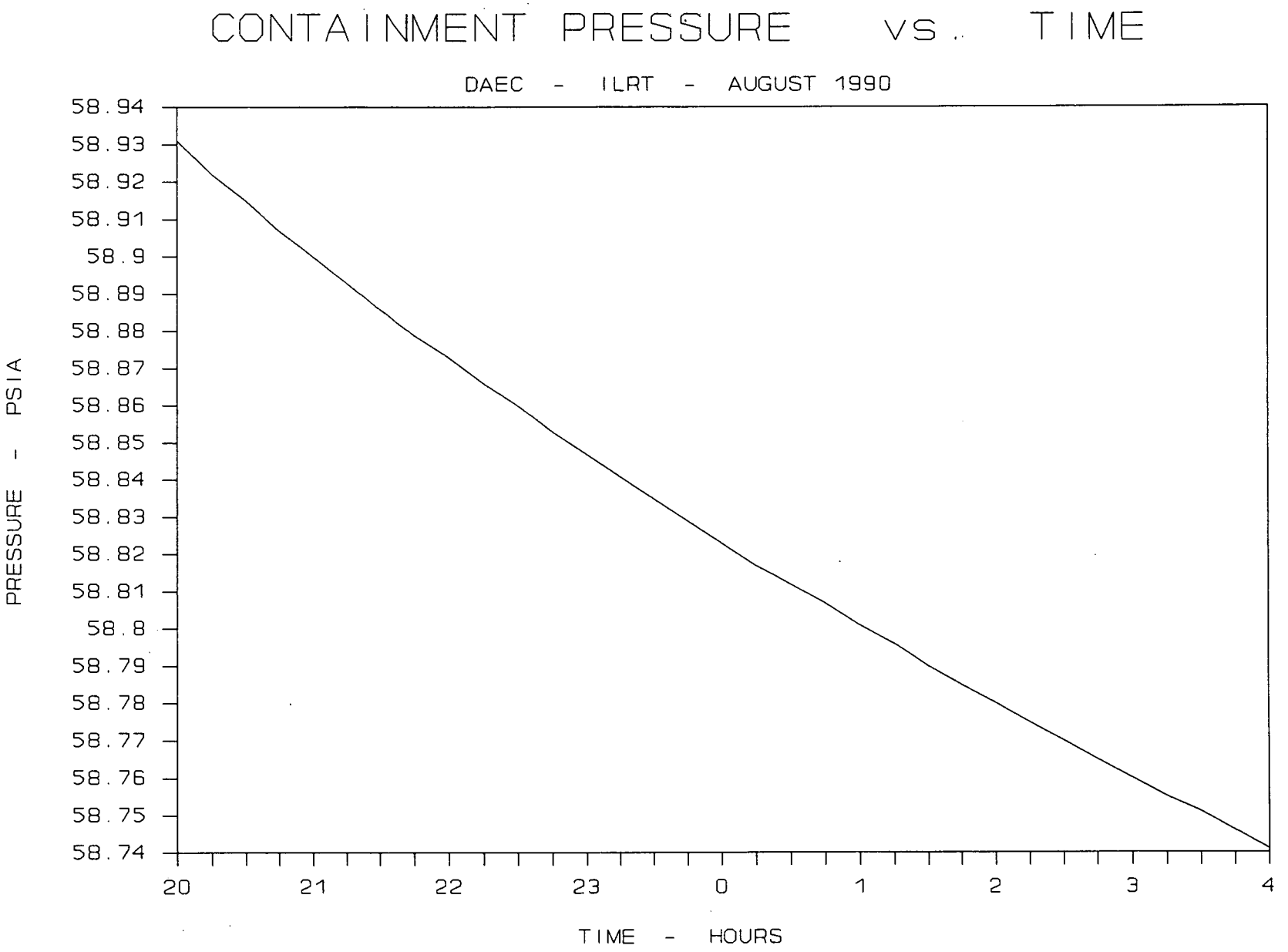
Time (hh:mm)	Mass (LbM)	Leakage (PCT./DAY)	Confidence (PCT./DAY)	UCL (PCT./DAY)
20:00	58683.09	0.000000	0.000000	0.000000
20:15	58676.99	0.000000	0.000000	0.000000
20:30	58671.04	0.985807	0.061065	1.046872
20:45	58664.52	1.009100	0.040669	1.049769
21:00	58659.37	0.980252	0.043488	1.023740
21:15	58652.84	0.984573	0.026319	1.010892
21:30	58647.40	0.976062	0.020187	0.996249
21:45	58640.41	0.986439	0.018605	1.005044
22:00	58634.07	0.994665	0.016686	1.011351
22:15	58628.75	0.992084	0.013356	1.005440
22:30	58621.65	0.998344	0.012628	1.010973
22:45	58614.88	1.006187	0.013242	1.019429
23:00	58610.42	1.001803	0.011985	1.013788
23:15	58601.74	1.010985	0.013896	1.024881
23:30	58594.87	1.019783	0.014966	1.034749
23:45	58591.16	1.016553	0.013424	1.029977
00:00	58584.89	1.014522	0.011962	1.026484
00:15	58578.46	1.013757	0.010613	1.024370
00:30	58570.39	1.018020	0.010383	1.028404
00:45	58562.69	1.024590	0.011403	1.035993
01:00	58557.01	1.028203	0.010900	1.039104
01:15	58549.05	1.034177	0.011536	1.045713
01:30	58544.54	1.035499	0.010589	1.046087
01:45	58538.49	1.036065	0.009701	1.045765
02:00	58531.98	1.036773	0.008934	1.045706
02:15	58524.89	1.038366	0.008381	1.046747
02:30	58519.94	1.037822	0.007765	1.045587
02:45	58513.92	1.036992	0.007245	1.044238
03:00	58508.16	1.035675	0.006860	1.042534
03:15	58501.83	1.034598	0.006481	1.041079
03:30	58496.01	1.033218	0.006205	1.039423
03:45	58490.69	1.031157	0.006152	1.037309
04:00	58484.92	1.028984	0.006153	1.035137

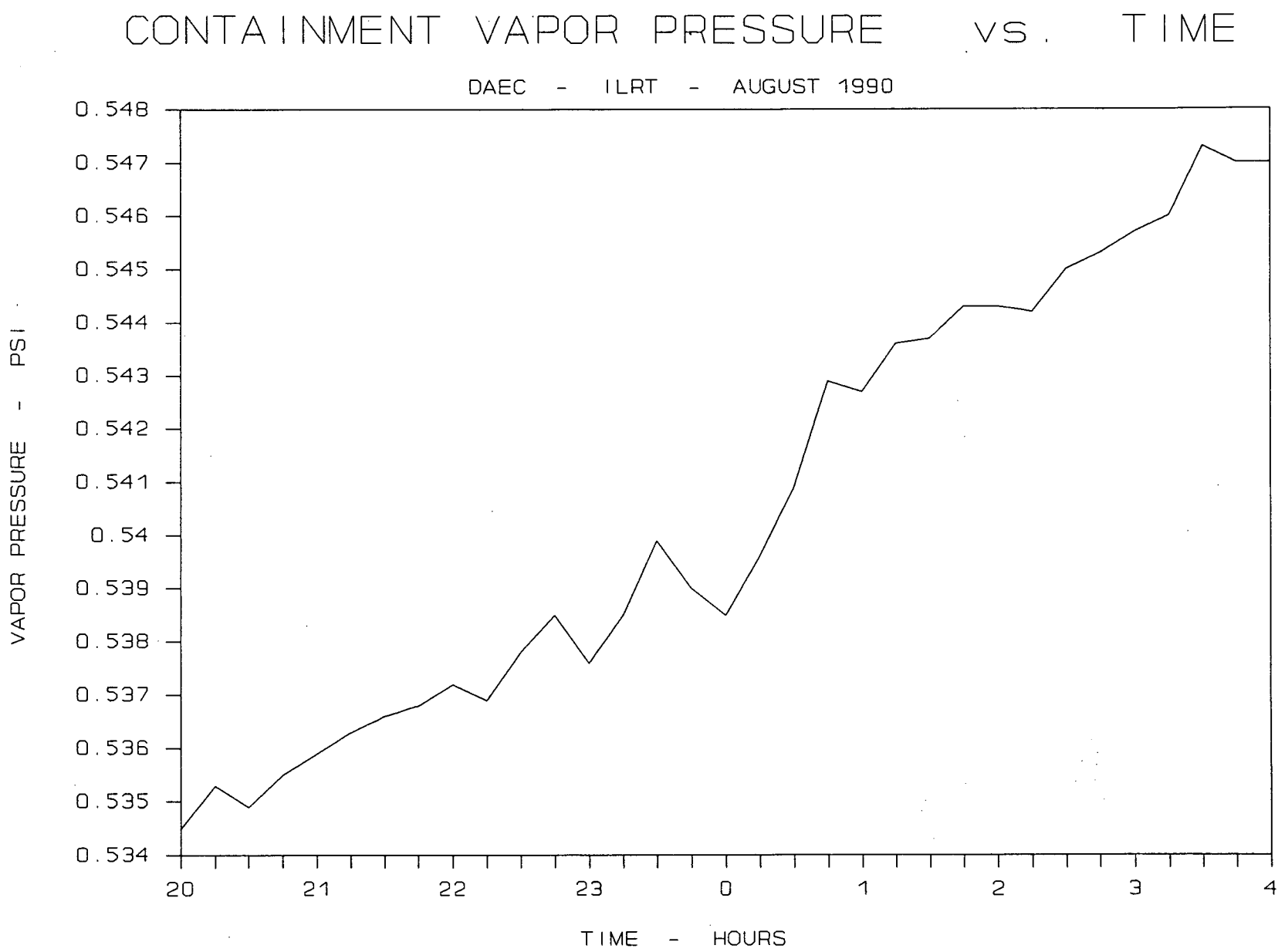
ATTACHMENT 3.3D

Duane Arnold Energy Center - 1990 ILRT
FROM 20:00 HOURS ON 08/29/90 TO 04:00 HOURS ON 08/30/90
ABSOLUTE TEST METHOD, TOTAL TIME ANALYSIS TEST RESULTS

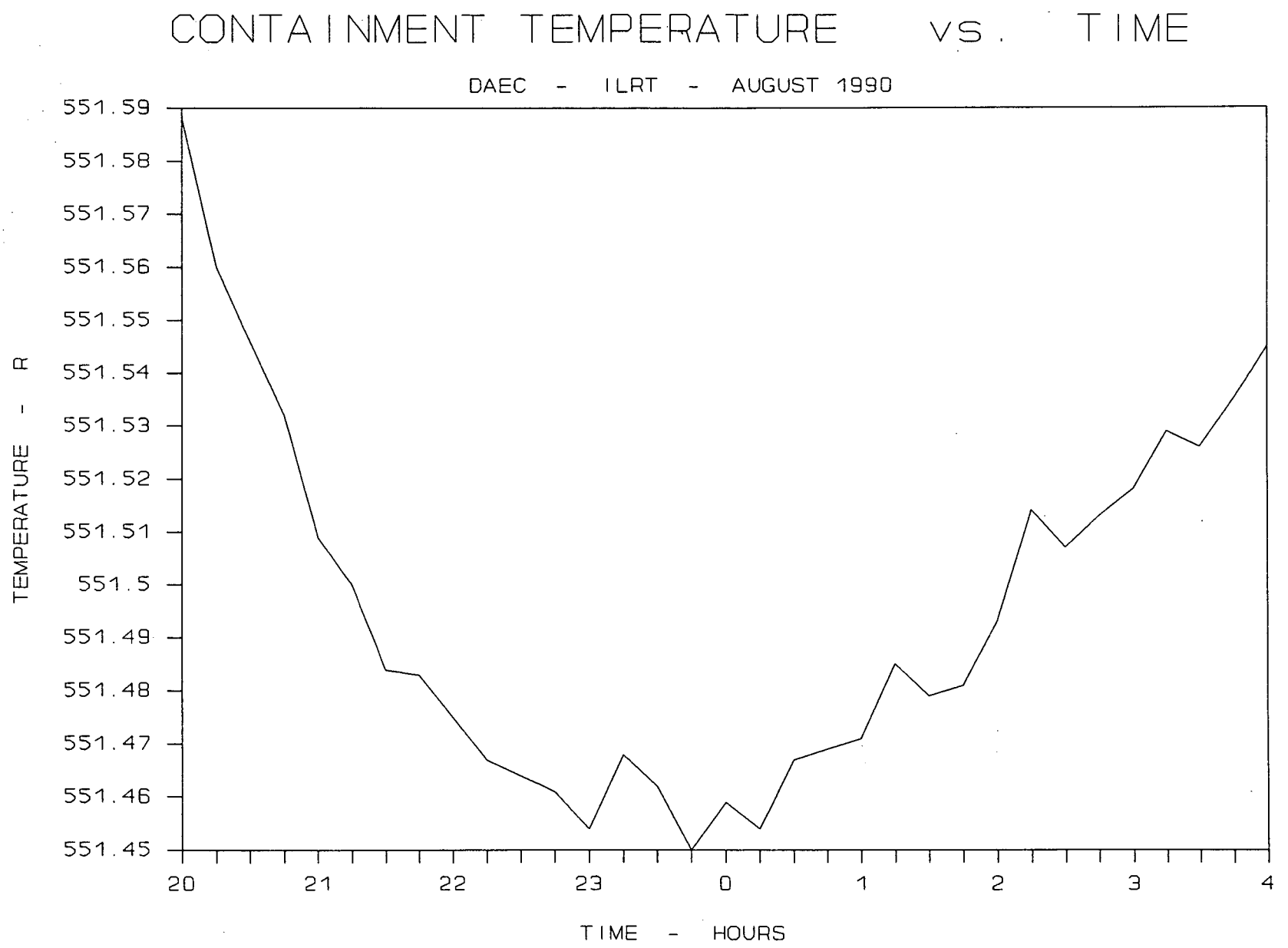
Time (hh:mm)	Mass (LbM)	Meas.Leak. (PCT./DAY)	Calc.Leak. (PCT./DAY)	Confidence (PCT./DAY)	UCL (PCT./DAY)
20:00	58683.09	0.000000	0.000000	0.000000	0.000000
20:15	58676.99	0.998169	0.000000	0.000000	0.000000
20:30	58671.04	0.985807	0.000000	0.000000	0.000000
20:45	58664.52	1.013063	1.006460	0.156687	1.163147
21:00	58659.37	0.970186	0.983302	0.102617	1.085919
21:15	58652.84	0.989788	0.984926	0.066917	1.051844
21:30	58647.40	0.973277	0.977282	0.051315	1.028597
21:45	58640.41	0.997548	0.984313	0.048832	1.033145
22:00	58634.07	1.002504	0.990847	0.045614	1.036461
22:15	58628.75	0.987843	0.989633	0.040394	1.030027
22:30	58621.65	1.005140	0.994781	0.038404	1.033185
22:45	58614.88	1.014529	1.001436	0.037757	1.039192
23:00	58610.42	0.990761	0.999287	0.035915	1.035202
23:15	58601.74	1.023764	1.006702	0.036770	1.043472
23:30	58594.87	1.030941	1.014218	0.037218	1.051436
23:45	58591.16	1.002632	1.013216	0.036163	1.049379
00:00	58584.89	1.004094	1.012698	0.034965	1.047663
00:15	58578.46	1.006923	1.012845	0.033650	1.046495
00:30	58570.39	1.024241	1.016472	0.032655	1.049127
00:45	58562.69	1.036682	1.021857	0.032731	1.054588
01:00	58557.01	1.031265	1.025306	0.031757	1.057062
01:15	58549.05	1.044221	1.030468	0.031688	1.062156
01:30	58544.54	1.030276	1.032437	0.030707	1.063144
01:45	58538.49	1.028539	1.033794	0.029920	1.063715
02:00	58531.98	1.030061	1.035160	0.029192	1.064351
02:15	58524.89	1.035189	1.037077	0.028422	1.065499
02:30	58519.94	1.026538	1.037453	0.028200	1.065653
02:45	58513.92	1.024977	1.037528	0.028148	1.065676
03:00	58508.16	1.022048	1.037166	0.028364	1.065530
03:15	58501.83	1.022491	1.036875	0.028476	1.065351
03:30	58496.01	1.020141	1.036291	0.028756	1.065047
03:45	58490.69	1.015314	1.035153	0.029426	1.064578
04:00	58484.92	1.013087	1.033847	0.030133	1.063981

ATTACHMENT 3.3E
GRAPH 1

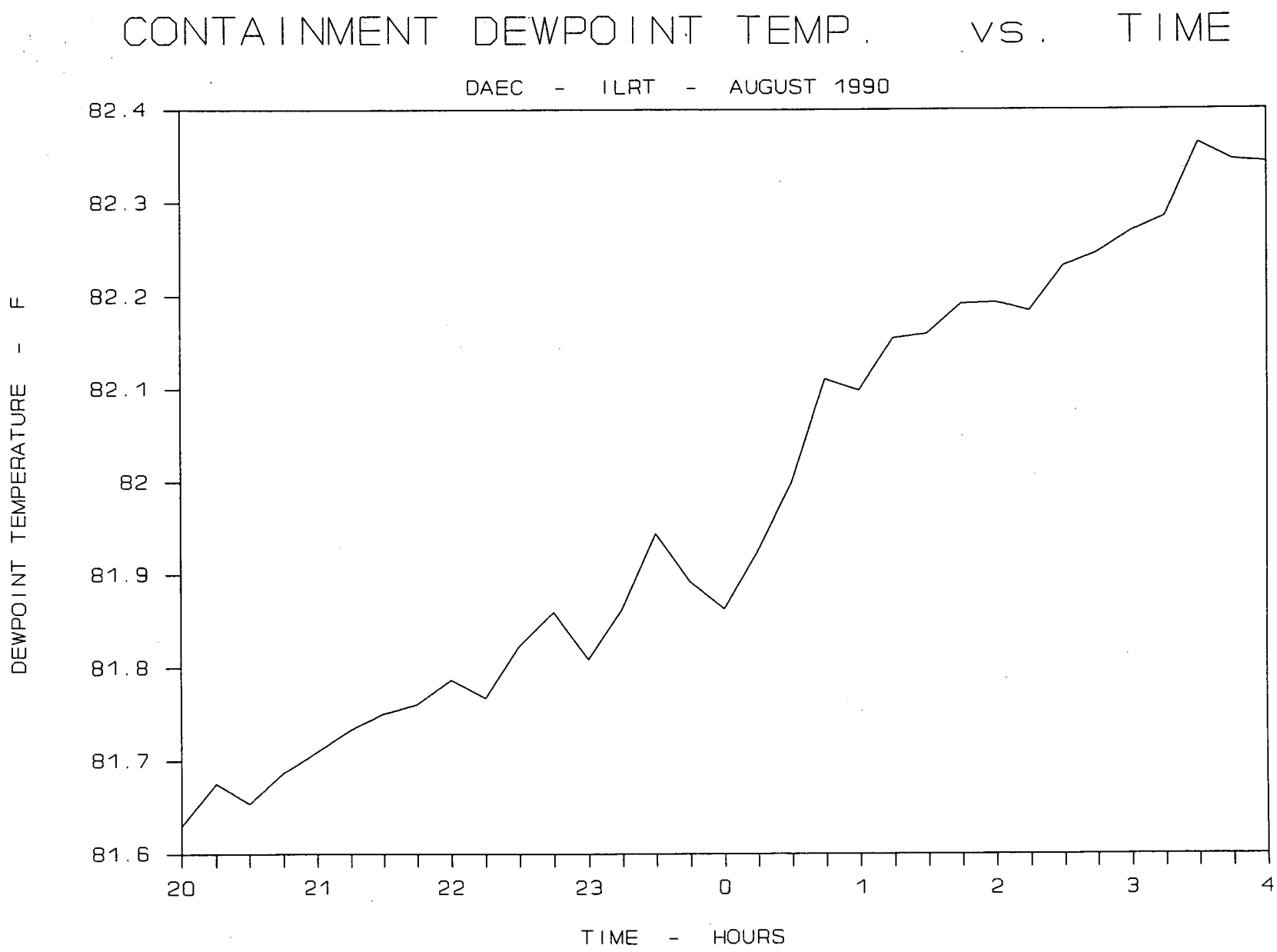




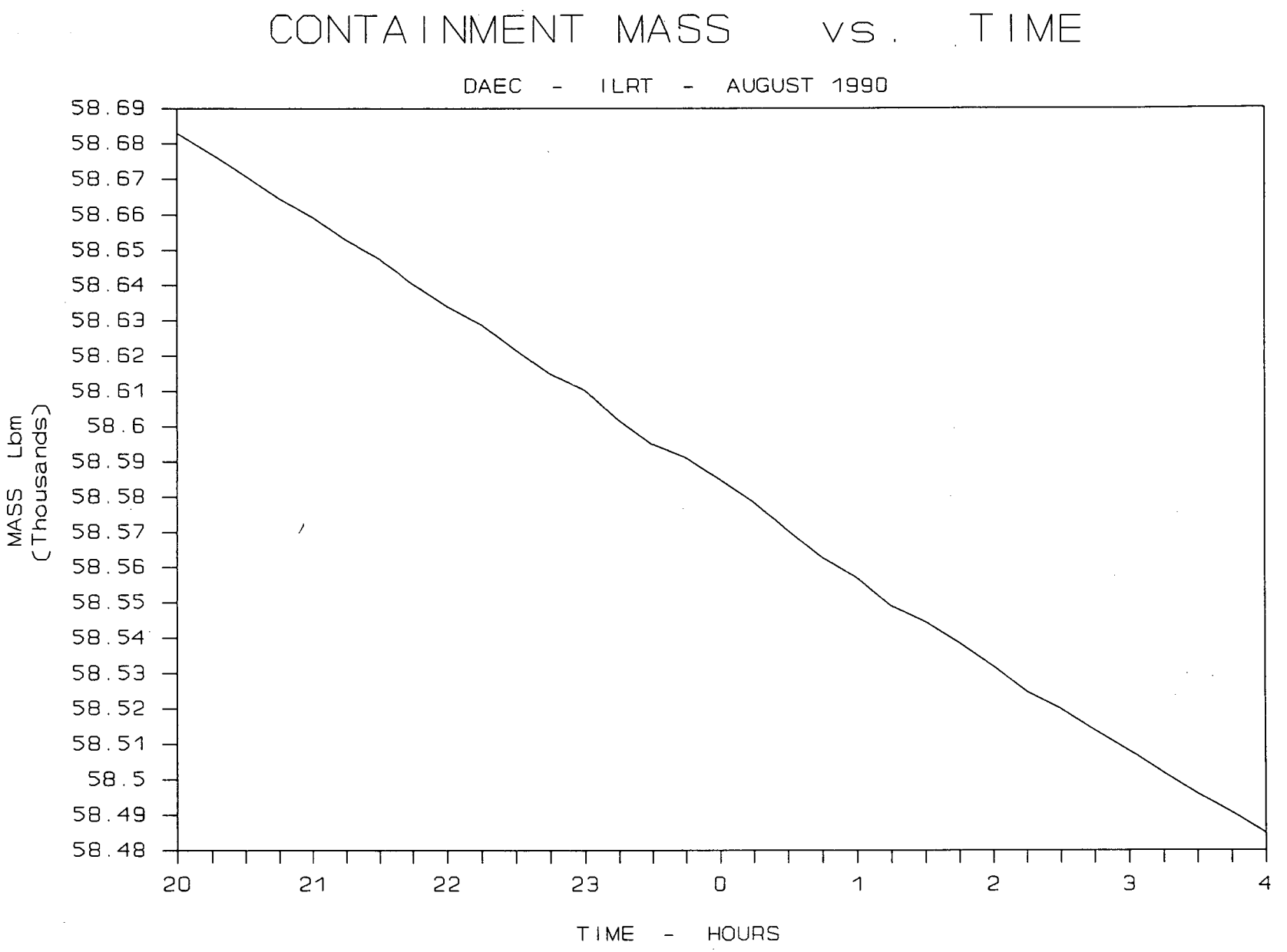
ATTACHMENT 3.3F
GRAPH 2



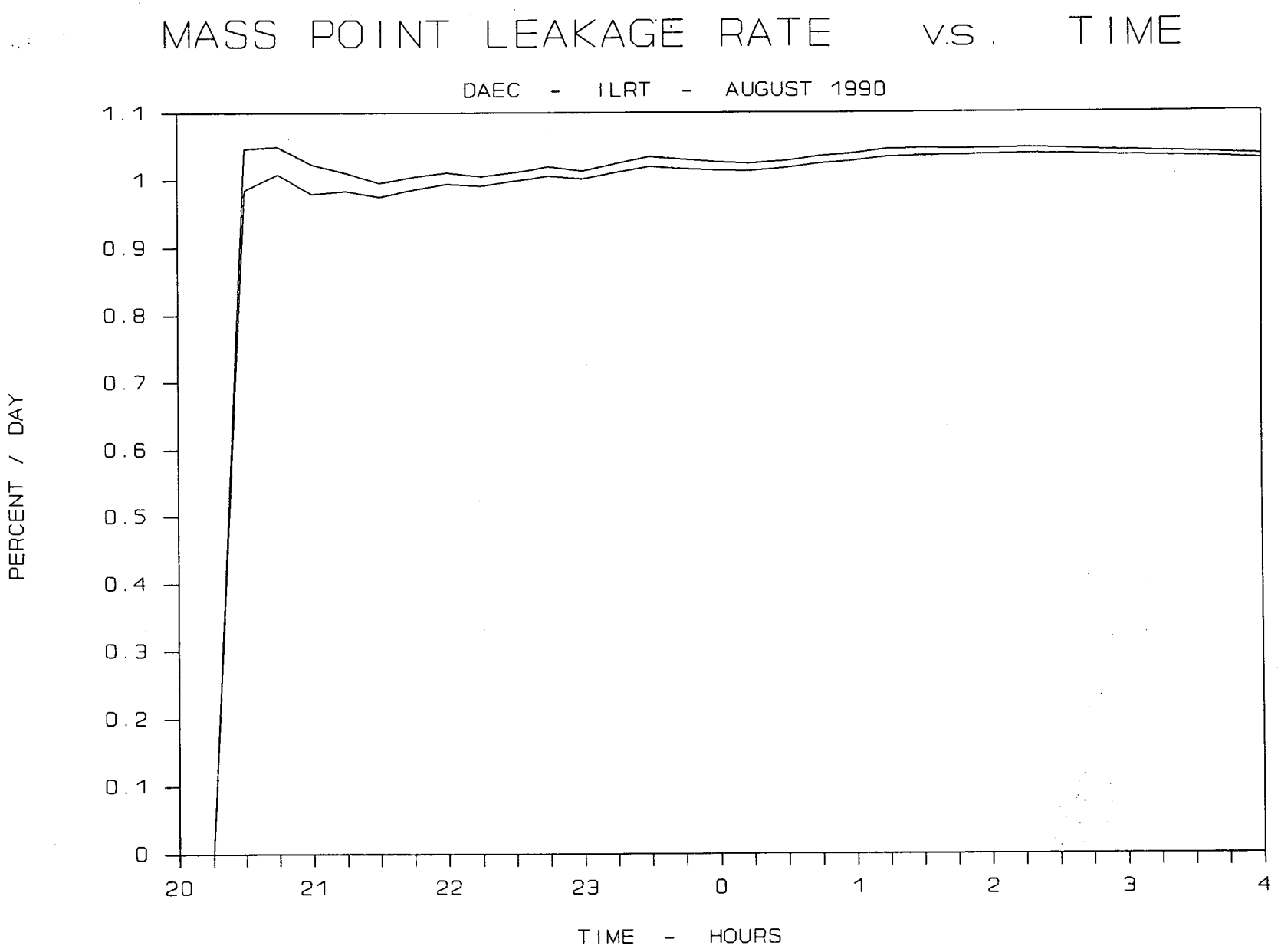
ATTACHMENT 3.3G
GRAPH 3



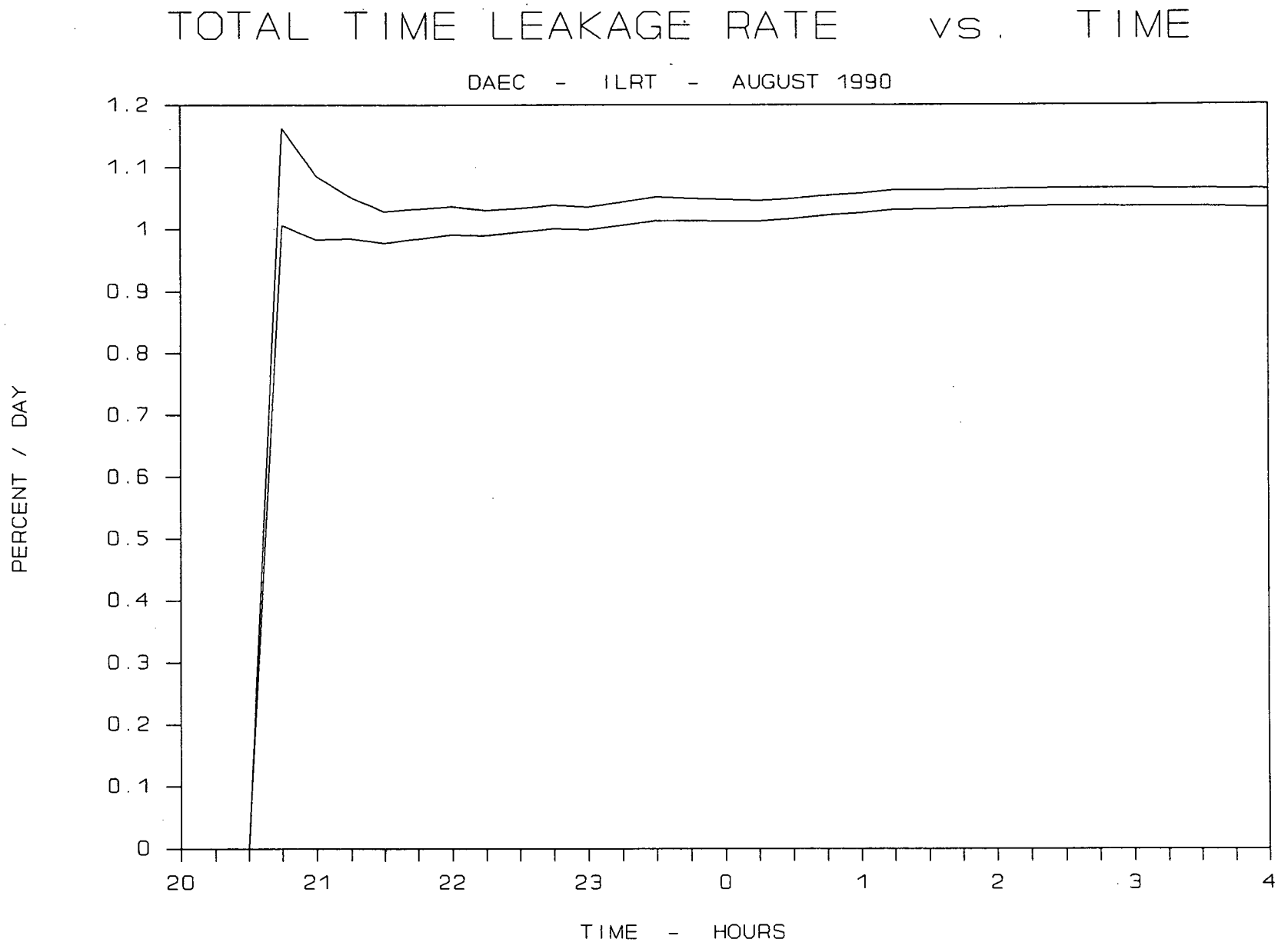
ATTACHMENT 3.3H
GRAPH 4



ATTACHMENT 3.3I
GRAPH 5



ATTACHMENT 3.3J
GRAPH 6



ATTACHMENT 3.3K
GRAPH 7

ATTACHMENT 3.3L

Dnane Arnold Energy Center - 1990 ILRT
FROM 05:15 HOURS TO 09:15 HOURS ON 08/30/90
VERIFICATION TEST MEASURED INPUT DATA

08/30/90 05:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.975	84.693	84.693	84.649	85.762	84.887	85.164	90.698	89.439	90.617
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.412	98.141	99.215	124.400	124.590	168.380	170.220	158.390	161.330	173.300
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.080	82.975	84.693	58.7308	58.6159					

08/30/90 05:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.964	84.682	84.684	84.638	85.784	84.909	85.218	90.710	89.473	90.649
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.466	98.218	99.290	124.280	124.580	168.360	170.190	158.510	161.390	173.390
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.320	82.964	84.684	58.7158	58.6006					

08/30/90 05:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.953	84.660	84.672	84.627	85.816	84.941	85.230	90.744	89.484	90.672
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.512	98.261	99.324	124.390	124.580	168.360	170.160	158.480	161.390	173.440
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.230	82.953	84.672	58.7005	58.5852					

08/30/90 06:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.944	84.660	84.672	84.616	85.839	84.963	85.273	90.787	89.527	90.692
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.566	98.284	99.387	124.410	124.640	168.360	170.150	158.460	161.470	173.390
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.260	82.944	84.672	58.6857	58.5699					

08/30/90 06:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.944	84.650	84.650	84.616	85.848	84.984	85.273	90.775	89.527	90.703
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.609	98.347	99.441	124.410	124.610	168.370	170.140	158.500	161.490	173.580
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.330	82.944	84.650	58.6707	58.5547					

ATTACHMENT 3.3L

Duane Arnold Energy Center - 1990 ILRT
FROM 05:15 HOURS TO 09:15 HOURS ON 08/30/90
VERIFICATION TEST MEASURED INPUT DATA

08/30/90 06:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.939	84.646	84.645	84.600	85.900	85.013	85.345	90.825	89.577	90.742
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.659	98.399	99.502	124.380	124.690	168.350	170.140	158.670	161.520	173.530
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.390	82.939	84.645	58.6560	58.5395					

08/30/90 06:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.921	84.628	84.629	84.595	85.903	85.029	85.350	90.884	89.570	90.758
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.707	98.446	99.561	124.410	124.680	168.310	170.100	158.860	161.570	173.670
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.530	82.921	84.629	58.6410	58.5244					

08/30/90 07:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.910	84.628	84.629	84.584	85.937	85.061	85.350	90.873	89.625	90.781
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.761	98.501	99.604	124.470	124.720	168.280	170.080	158.870	161.710	173.600
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.590	82.910	84.629	58.6262	58.5093					

08/30/90 07:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.890	84.628	84.606	84.573	85.957	85.072	85.393	90.895	89.636	90.813
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.804	98.564	99.650	124.410	124.610	168.260	170.110	158.890	161.720	173.570
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.630	82.890	84.606	58.6112	58.4941					

08/30/90 07:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.899	84.605	84.606	84.562	85.991	85.115	85.393	90.938	89.668	90.836
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.847	98.598	99.713	124.350	124.580	168.280	170.100	158.890	161.810	173.740
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.660	82.899	84.606	58.5961	58.4788					

ATTACHMENT 3.3L

Duane Arnold Energy Center - 1990 ILRT
FROM 05:15 HOURS TO 09:15 HOURS ON 08/30/90
VERIFICATION TEST MEASURED INPUT DATA

08/30/90 07:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.879	84.596	84.595	84.550	86.012	85.126	85.447	90.959	89.691	90.856
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.890	98.652	99.778	124.450	124.650	168.250	170.020	158.860	161.770	173.810
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.780	82.879	84.595	58.5811	58.4634					

08/30/90 08:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.857	84.596	84.584	84.541	86.023	85.147	85.479	90.993	89.711	90.879
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.924	98.718	99.821	124.480	124.590	168.270	169.970	159.110	161.840	173.920
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.840	82.857	84.584	58.5661	58.4480					

08/30/90 08:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.846	84.573	84.563	84.530	86.046	85.169	85.470	90.993	89.723	90.899
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
97.979	98.749	99.876	124.470	124.560	168.260	170.020	159.090	161.820	173.860
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.840	82.846	84.563	58.5508	58.4325					

08/30/90 08:30

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.843	84.569	84.548	84.525	86.062	85.197	85.465	91.011	89.761	90.918
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
98.029	98.788	99.937	124.470	124.690	168.220	170.020	159.090	161.870	174.040
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
169.020	82.843	84.548	58.5358	58.4175					

08/30/90 08:45

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.832	84.546	84.536	84.503	86.084	85.208	85.519	91.020	89.772	90.929
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
98.072	98.831	99.991	124.560	124.650	168.300	170.020	158.860	161.920	174.020
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.880	82.832	84.536	58.5210	58.4022					

ATTACHMENT 3.3L

Duane Arnold Energy Center - 1990 ILRT
FROM 05:15 HOURS TO 09:15 HOURS ON 08/30/90
VERIFICATION TEST MEASURED INPUT DATA

08/30/90 09:00

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.821	84.546	84.516	84.494	86.107	85.242	85.551	91.054	89.807	90.961
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
98.115	98.896	100.060	124.500	124.680	168.180	169.980	159.160	161.970	174.180
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
168.050	82.821	84.516	58.5061	58.3869					

08/30/90 09:15

RTD 0	RTD 1	RTD 2	RTD 3	RTD 4	RTD 5	RTD 11	RTD 6	RTD 7	RTD 13
82.810	84.537	84.516	84.494	86.139	85.262	85.583	91.074	89.816	90.984
RTD 8	RTD 9	RTD 12	RTD 10	RTD 14	DC 24	DC 25	DC 22	DC 23	DC 20
98.169	98.951	100.100	124.590	124.660	168.160	170.010	159.300	162.070	174.240
DC 21	RTD 0	RTD 2	PRESS A	PRESS B					
169.050	82.810	84.516	58.4912	58.3717					

ATTACHMENT 3.3M

Duane Arnold Energy Center - 1990 ILRT
FROM 05:15 HOURS TO 09:15 HOURS ON 08/30/90
VERIFICATION TEST REDUCED INPUT VARIABLES

Time (hh:mm)	Press. (PSIA)	V.P. (PSI)	Temp. (R)	Dewpoint (F)	Mass (LbM)
05:15	58.673	0.5482	551.555	82.415	58414.27
05:30	58.658	0.5489	551.560	82.452	58397.87
05:45	58.643	0.5487	551.572	82.441	58381.38
06:00	58.628	0.5488	551.589	82.443	58364.39
06:15	58.613	0.5492	551.592	82.471	58348.39
06:30	58.598	0.5495	551.611	82.487	58331.00
06:45	58.583	0.5501	551.617	82.521	58314.65
07:00	58.568	0.5502	551.634	82.527	58297.79
07:15	58.553	0.5503	551.631	82.532	58282.82
07:30	58.537	0.5508	551.638	82.559	58266.29
07:45	58.522	0.5507	551.655	82.552	58249.39
08:00	58.507	0.5514	551.661	82.591	58232.75
08:15	58.492	0.5513	551.661	82.589	58217.33
08:30	58.477	0.5519	551.678	82.618	58199.98
08:45	58.462	0.5515	551.683	82.599	58184.61
09:00	58.447	0.5507	551.694	82.550	58169.21
09:15	58.431	0.5527	551.708	82.664	58150.55

ATTACHMENT 3.3N

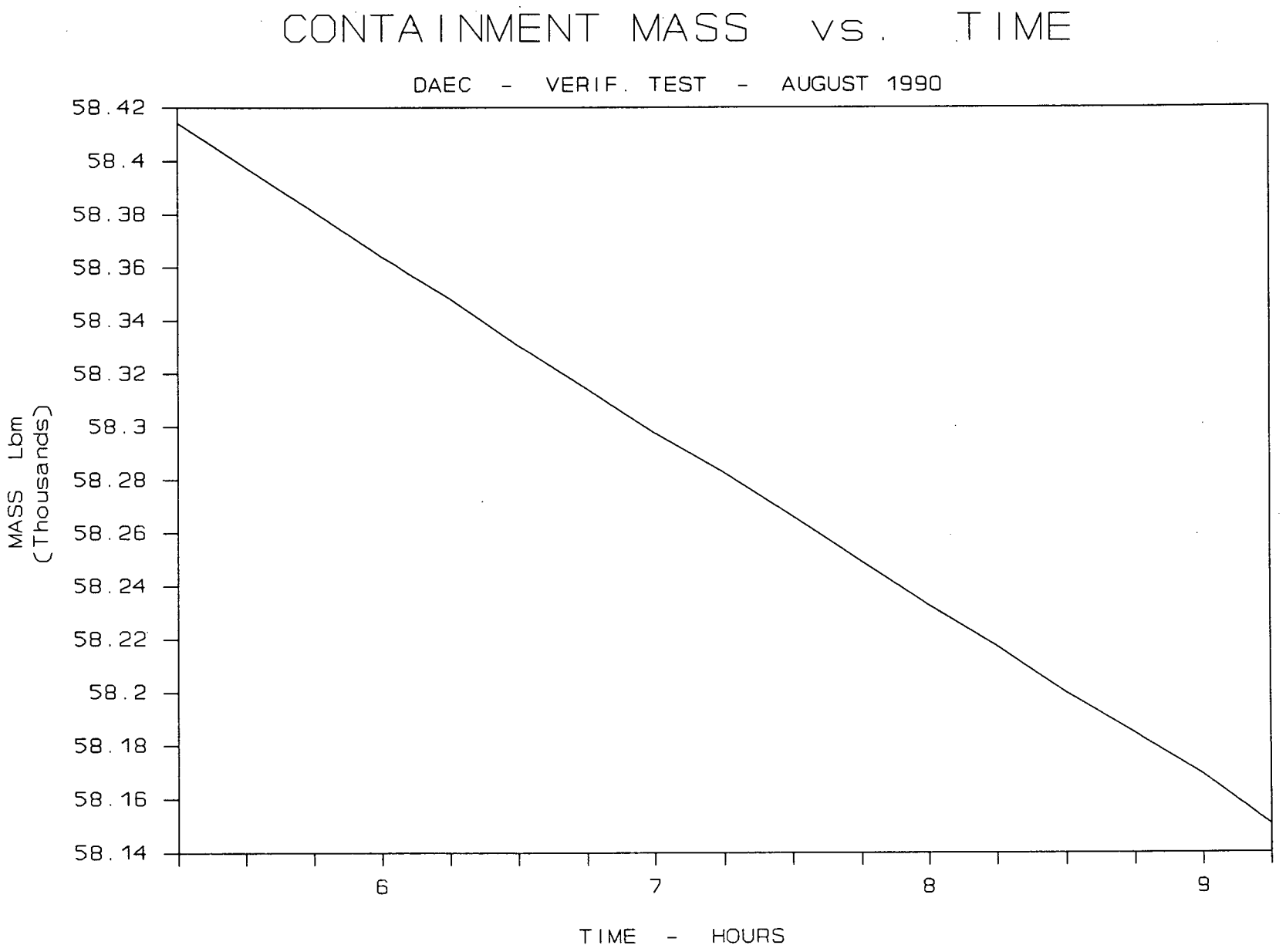
Duane Arnold Energy Center - 1990 ILRT
FROM 05:15 HOURS TO 09:15 HOURS ON 08/30/90
ABSOLUTE TEST METHOD, MASS POINT ANALYSIS TEST RESULTS
VERIFICATION TEST

Time (hh:mm)	Mass (LbM)	Leakage (PCT./DAY)	Confidence (PCT./DAY)	UCL (PCT./DAY)
05:15	58414.27	0.000000	0.000000	0.000000
05:30	58397.87	0.000000	0.000000	0.000000
05:45	58381.38	2.702877	0.036900	2.739776
06:00	58364.39	2.730037	0.046493	2.776530
06:15	58348.39	2.715376	0.029306	2.744683
06:30	58331.00	2.731532	0.026409	2.757941
06:45	58314.65	2.732591	0.017693	2.750284
07:00	58297.79	2.736188	0.013343	2.749531
07:15	58282.82	2.719476	0.020884	2.740361
07:30	58266.29	2.710816	0.018814	2.729630
07:45	58249.39	2.709147	0.015246	2.724393
08:00	58232.75	2.709163	0.012543	2.721706
08:15	58217.33	2.703426	0.012074	2.715500
08:30	58199.98	2.704010	0.010279	2.714289
08:45	58184.61	2.699963	0.009768	2.709730
09:00	58169.21	2.693531	0.010727	2.704257
09:15	58150.55	2.696423	0.009861	2.706284

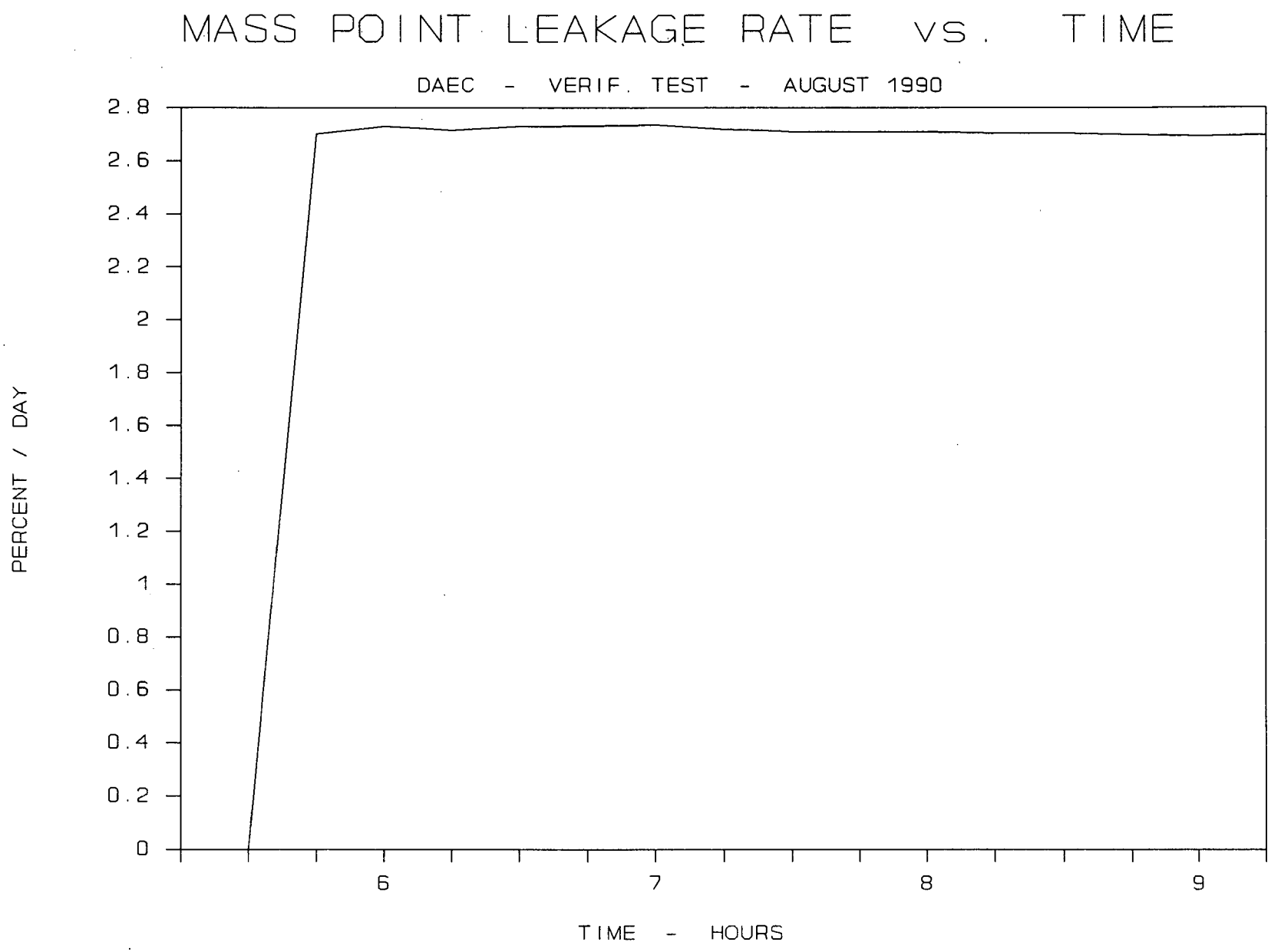
ATTACHMENT 3.3P

Duane Arnold Energy Center - 1990 ILRT
FROM 05:15 HOURS TO 09:15 HOURS ON 08/30/90
ABSOLUTE TEST METHOD, TOTAL TIME ANALYSIS TEST RESULTS
VERIFICATION TEST

Time (hh:mm)	Mass (LbM)	Meas.Leak. (PCT./DAY)	Calc.Leak. (PCT./DAY)	Confidence (PCT./DAY)	UCL (PCT./DAY)
05:15	58414.27	0.000000	0.000000	0.000000	0.000000
05:30	58397.87	2.695407	0.000000	0.000000	0.000000
05:45	58381.38	2.702877	0.000000	0.000000	0.000000
06:00	58364.39	2.732231	2.728584	0.086548	2.815132
06:15	58348.39	2.706562	2.718692	0.084802	2.803494
06:30	58331.00	2.736818	2.732080	0.056009	2.788089
06:45	58314.65	2.728607	2.734380	0.044456	2.778836
07:00	58297.79	2.734591	2.738184	0.037002	2.775186
07:15	58282.82	2.700287	2.726010	0.050931	2.776941
07:30	58266.29	2.702107	2.718551	0.050022	2.768573
07:45	58249.39	2.709701	2.715994	0.045735	2.761729
08:00	58232.75	2.711967	2.714875	0.042008	2.756883
08:15	58217.33	2.697190	2.709692	0.040707	2.750399
08:30	58199.98	2.708964	2.709030	0.038051	2.747081
08:45	58184.61	2.695944	2.705190	0.036611	2.741801
09:00	58169.21	2.684940	2.699541	0.036428	2.735969
09:15	58150.55	2.708796	2.700510	0.035173	2.735684



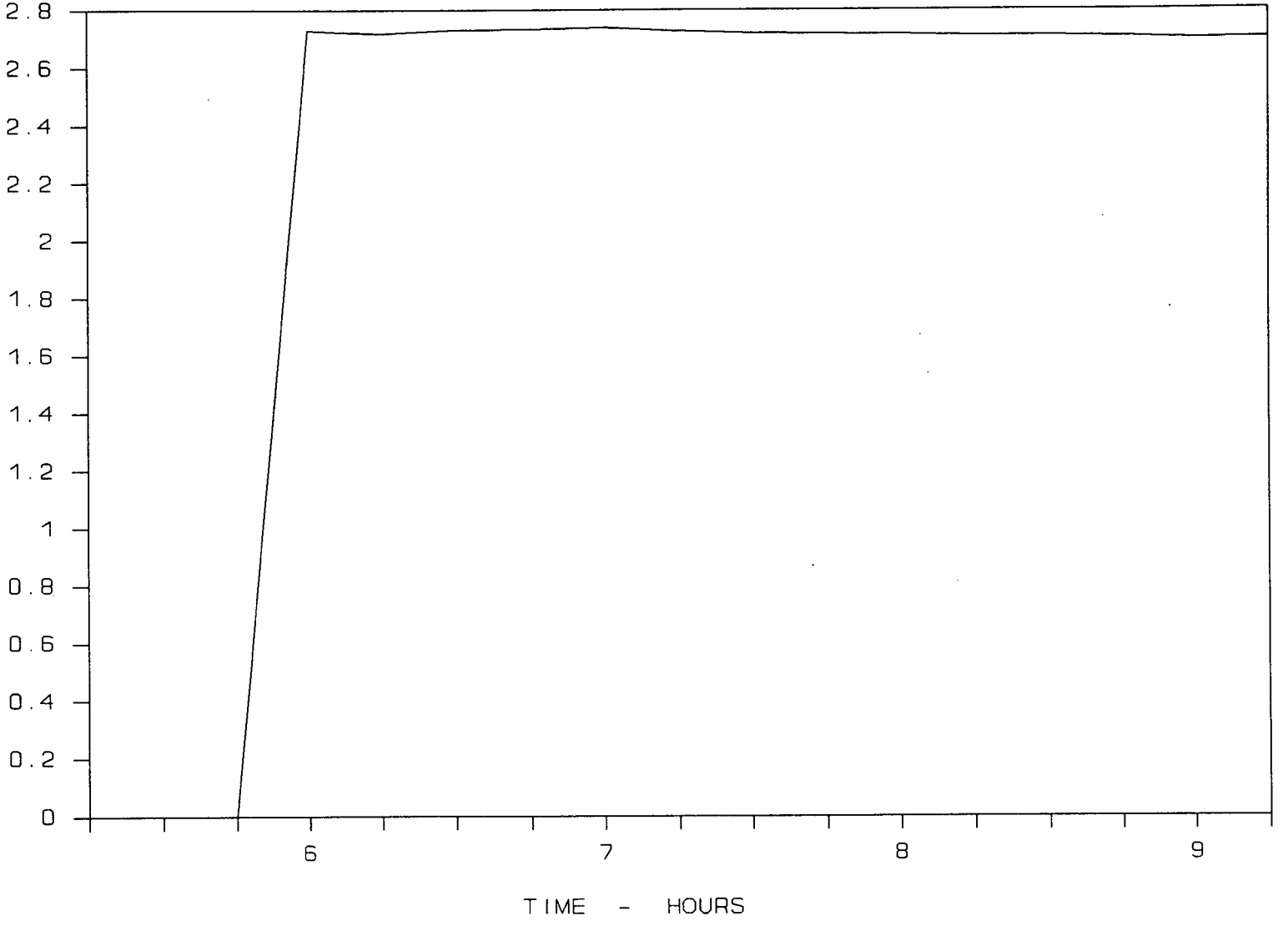
ATTACHMENT 3.3Q
GRAPH 8



ATTACHMENT 3.3R
GRAPH 9

TOTAL TIME LEAKAGE RATE vs. TIME

DAEC - VERIF. TEST - AUGUST 1990



ATTACHMENT 3.3S
GRAPH 10

SECTION 4

4.0 LOCAL LEAKAGE RATE TESTS (TYPES B AND C)

Section 4 summarizes the results of the Local Leakage Rate Test's (LLRT's) data which has been obtained from periodic testing performed since the December 1988 Periodic Type A test. Maintenance data is provided for surveillance testing performed in 1990. Each penetration's leakage rate can be obtained from site reference material.

Attachment 4B contains an analysis of the containment penetrations that were repaired during the 1990 Refueling Outage to assess the as found containment condition.

The acceptance criteria for Types B and C testing are in accordance with 10CFR50, Appendix J. The combined as left leakage rate for all penetrations and valves, subject to Types B and C tests in 1990, were well below the acceptance criteria of less than $0.60L_a$.

The data contained in this section are summarized below:

Attachment No.	Title
4A	1990 Local Leakage Rate Test Data
4B	1990 Local Leakage Rate Test Summary Analysis.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
	Testable Gaskets (Type B)					
X-1	Drywell Personnel Airlock	B	Airlock	4046/03-14-89 5545/10-21-89 5114/11-14-89 5932/11-19-89 5696/11-22-89 5700/11-28-89	4046/03-14-89 5545/10-21-89 5114/11-14/89 5932/11-19-89 5696/11-22-89 5700/11-28-89	
X-1	Drywell Airlock Hatch	B	Gaskets	0/06-29-90	0/08-17-90	Replaced O-Rings.
X-2	Equipment Access Hatch	B	Gaskets	0/06-29-90	0/08-25-90	Replaced O-Rings.
X-4	Drywell Head Access Hatch	B	Gaskets	0/07-06-90	0/07-19-90	Replaced O-Rings.
X-6	CRD Removal Hatch	B	Gaskets	0/06-28-90	0/08-27-90	Replaced O-Rings.
X-35A	TIP Drive	B	Gaskets	85/07-11-90	85/07-11-90	
X-35B	TIP Drive	B	Gaskets	85/07-11-90	85/07-11-90	
X-35C	TIP Drive	B	Gaskets	0/07-11-90	0/07-11-90	
X-35D	TIP Purge Line	B	Gaskets	70/07-11-90	70/07-11-90	
X-53	Spare	B	Gaskets	0/06-24-90	0/06-24-90	
	Drywell Head	B	Gaskets	4920/06-29-90	0/08-23-90	Gaskets replaced, O.C. review.
X-58A	Stabilizer Access Port	B	Gaskets	240/07-09-90	0/08-22-90	Replaced O-Rings.
X-58B	Stabilizer Access Port	B	Gaskets	0/07-09-90	0/08-22-90	Replaced O-Rings.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-58C	Stabilizer Access Port	B	Gaskets	0/07-09-90	0/08-22-90	Replaced O-Rings.
X-58D	Stabilizer Access Port	B	Gaskets	0/07-09-90	0/08-22-90	Replaced O-Rings.
X-58E	Stabilizer Access Port	B	Gaskets	0/07-09-90	0/08-22-90	Replaced O-Rings.
X-58F	Stabilizer Access Port	B	Gaskets	0/07-09-90	0/08-22-90	Replaced O-Rings.
X-58G	Stabilizer Access Port	B	Gaskets	0/07-09-90	0/08-22-90	Replaced O-Rings.
X-58H	Stabilizer Access Port	B	Gaskets	0/07-09-90	0/08-22-90	Replaced O-Rings.
N-200A	Torus Access Hatch - South	B	Gaskets	0/06-24-90	0/09-01-90	Replaced O-Rings.
N-200B	Torus Access Hatch - North	B	Gaskets	0/06-24-90	0/08-18-90	Replaced O-Rings
	Electrical Canisters (Type B)					
X-100B	Neutron Monitoring	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-100C	Neutron Monitoring	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-100E	Neutron Monitoring	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-100F	Neutron Monitoring	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-100G	RPV Vibration Monitoring	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-101A	Recirc. Pump Power	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-101C	Recirc. Pump Power	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-103	Thermocouple	B	Electrical Pen.	0/06-27-90	0/06-27-90	

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-104A	CRD Rod Position Indication	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-104B	CRD Rod Position Indication	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-104C	CRD Rod Position Indication	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-104D	CRD Rod Position Indication	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-105B	Power & Control	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-105D	Power & Control	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-106A	Power & Control	B	Electrical Pen.	0/06-27-90	0/06-27-90	
X-106C	Power & Control	B	Electrical Pen.	0/06-27-90	0/06-27-90	
N-230B	Vacuum Breaker Cables	B	Electrical Pen.	0/06-27-90	0/06-27-90	
	Flange O-Rings (Type B)					
X-25	Drywell Purge Outlet	B	CV-4302	- 0/06-28-90	0/11-23-89 0/07-19-90	Replaced O-Rings. Replaced O-Rings.
X-26	Drywell Purge Outlet	B	CV-4307	0/06-28-90	0/08-14-90	Replaced O-Rings.
N-220	Torus Purge Supply	B	CV-4308	0/06-28-90	0/08-14-90	Replaced O-Rings.
N-205	Torus Purge Outlet	B	CV-4300	0/06-26-90	0/08-21-90	Replaced O-Rings.
N-213A	Torus Drain Line Flange - South	B	Flange	0/06-26-90	0/06-26-90	

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
N-213B	Torus Drain Line Flange - North	B	Flange	0/06-25-90	0/06-25-90	
N-231	RB/Torus Vacuum Breaker	B	CV-4304	0/06-26-90	0/08-14-90	Replaced O-Rings.
N-231	RB/Torus Vacuum Breaker	B	CV-4305	0/06-26-90	0/08-14-90	Replaced O-Rings.
	Expansion Bellows (Type B)					
X-7A	Steam to Turbine	B	Bellows	0/07-06-90	0/07-06-90	
X-7B	Steam to Turbine	B	Bellows	0/07-06-90	0/07-06-90	
X-7C	Steam to Turbine	B	Bellows	0/07-06-90	0/07-06-90	
X-7D	Steam to Turbine	B	Bellows	0/07-06-90	0/07-06-90	
X-9A	RPV Feedwater	B	Bellows	0/07-09-90	0/07-09-90	
X-9B	RPV Feedwater	B	Bellows	0/07-09-90	0/07-09-90	
X-10	Steam to RCIC Turbine	B	Bellows	290/07-09-90	290/07-09-90	
X-11	Steam to HPCI Turbine	B	Bellows	0/07-09-90	0/07-09-90	
X-12	Shutdown Pump Supply RHR	B	Bellows	0/06-27-90	0/06-27-90	
X-13A	RHR Pump Discharge	B	Bellows	0/06-27-90	0/06-27-90	
X-13B	RHR Pump Discharge	B	Bellows	0/06-27-90	0/06-27-90	
X-15	RWCU Supply	B	Bellows	0/07-10-90	0/07-10-90	
X-16A	Core Spray Pump Discharge	B	Bellows	0/07-09-90	0/07-09-90	

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As fouud leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-16B	Core Spray Pump Discharge	B	Bellows	0/07-09-90	0/07-09-90	
X-17	RPV Head Spray	B	Bellows	0/07-09-90	0/07-09-90	
N-201A	Vent Line	B	Bellows	0/06-28-90	0/06-28-90	
N-201B	Vent Line	B	Bellows	0/06-28-90	0/06-28-90	
N-201C	Vent Line	B	Bellows	0/06-28-90	0/06-28-90	
N-201D	Vent Line	B	Bellows	0/06-28-90	0/06-28-90	
N-201E	Vent Line	B	Bellows	0/06-27-88	0/06-27-88	
N-201F	Vent Line	B	Bellows	0/06-27-90	0/06-27-90	
N-201G	Vent Line	B	Bellows	0/06-27-90	0/06-27-90	
N-201H	Vent Line	B	Bellows	0/06-27-90	0/06-27-90	
N-213A	Torus Drain Line Bellows - Inboard (South)	B	Bellows	0/07-12-90	0/07-12-90	
N-213A	Torus Drain Line Bellows - Outboard (South)	B	Bellows	0/07-12-90	0/07-12-90	
N-213B	Torus Drain Line Bellows - Inboard (North)	B	Bellows	0/06-29-90	0/06-29-90	
N-213B	Torus Drain Line Bellows - Outboard (North)	B	Bellows	0/06-29-90	0/06-29-90	

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
	Valve Bonnets (Type B)					
X-39A	Drywell Spray	B	MO-2000	0/07-02-90	0/07-02-90	
X-39B	Drywell Spray	B	MO-1902	615/07-14-90	615/07-14-90	
N-211A	Torus Spray	B	MO-1933	615/07-14-90	615/07-14-90	
N-211B	Torus Spray	B	MO-2006	20/07-03-90	20/07-03-90	
	Shaft Stem Seals (Type B)					
X-26	Drywell Purge Supply	B	CV-4307	7,300/07-02-90	0/08-16-90	Replaced O-Rings, repaired galled shaft and replaced shaft.
N-220	Torus Purge Supply	B	CV-4308	4,500/07-02-90	0/08-16-90	Replaced O-Rings

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
	Local Leakage Rate Tests (Type C)					
X-7A	"A" Main Steam Line	C	CV-4412(IPC) CV-4413(OPC)	2,500/09-15-89 (Combined)	2,500/09-15-89 (Combined)	
X-7A	"A" Main Steam Line	C	CV-4412(IPC)	15,750/06-30-90	175/08-25-90	Internals replaced/oversized, machined seat ring, replaced operator assembly with a unit utilizing larger springs, guide tube and cylinder. All MSIVs were modified under DCP-1476.
			CV-4413(OPC)	(Combined)	(Combined)	Internals replaced/oversized, machined seat ring, replaced operator assembly with a unit utilizing larger springs, guide tube and cylinder. All MSIVs were modified under DCP-1476.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-7B	"B" Main Steam Line	C	CV-4415(IPC)	4,425/09-16-89	470/09-25-69Reworked valve disc seat and main seat.	
			CV-4416(OPC)	(Combined)	(Combined)	Replaced stem.
			CV-4416(OPC)	>82,000/09-16-89	590/09-22-89	Replaced disc & piston with oversized internals, replaced stem.
X-7B	"B" Main Steam Line	C	CV-4415(IPC)	2,375/06-30-90	275/08-25-90	Internals replaced/oversized, machined seat ring, replaced operator assembly with a unit utilizing larger springs, guide tube and cylinder. All MSIVs were modified under DCP-1476.
			CV-4416(OPC)	(Combined)	(Combined)	Internals replaced/oversized, machined seat ring, replaced operator assembly with a unit utilizing larger springs, guide tube and cylinder. All MSIVs were modified under DCP-1476.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-7C	"C" Main Steam Line	C	CV-4418(IPC)	2,000/09-16-89	2000/09-16-89	
			CV-4419(OPC)	12,000/09-16-89	1,600/09-22-89	Reworked disc & valve seat.
X-7C	"C" Main Steam Line	C	CV-4418(IPC)	1,450/06-29-90	320/08-25-90	Internals replaced/oversized, machined seat ring, replaced operator assembly with a unit utilizing larger springs, guide tube and cylinder. All MSIVs were modified under DCP-1476.
			CV-4419(OPC)	(Combined)	(Combined)	Internals replaced/oversized, machined seat ring, replaced operator assembly with a unit utilizing larger springs, guide tube and cylinder. All MSIVs were modified under DCP-1476.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-7D	"D" Main Steam Line	C	CV-4420(IPC)	2,975/09-16-89	2,975/09-16-89	
			CV-4421(OPC)	1,725/09-16-89	1,725/09-16-89	
X-7D	"D" Main Steam Line	C	CV-4420(IPC)	2,225/06-29-90	380/08-25-90	Internals replaced/oversized, machined seat ring, replaced operator assembly with a unit utilizing larger springs, guide tube and cylinder. All MSIVs were modified under DCP-1476.
			CV-4421(OPC)	(Combined)	(Combined)	Internals replaced/oversized, machined seat ring, replaced operator assembly with a unit utilizing larger springs, guide tube and cylinder. All MSIVs were modified under DCP-1476.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-8	Steam Drain	C	MO-4423(IPC)	0/07-01-90	0/08-25-90	Replaced body to bonnet gasket.
			MO-4424(OPC)	- 2,200/07-01-90	1,880/03-13-89 0/08-11-90	Repacked. Repacked with live load and short box conversion, Overhauled operator.
X-9A	Feedwater	C	V-14-3(IPC)	87,750/07-02-90	9,300/08-16-90	Removed soft seat under DCP-1504. Verified disc to seat ring fit-up. Repacked.
			MO-4441(OPC)	950/07-02-90	2,700/08-25-90	Repacked with live load and short box conversion, overhaul operator.
			MO-2312(OPC)	(Combined)	(Combined)	Replaced stem and disc, machined seat rings, overhaul operator.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-9B	Feedwater	C	V-14-1(IPC)	7,150/07-06-90	8,050/08-10-90	Removed soft seat under DCP-1504, verified disc to ring fit-up, repacked.
			MO-4442(OPC) MO-2740(OPC) MO-2512(OPC)	950/07-07-90 (Combined) (Combined)	950/08-02-90 (Combined) (combined)	Overhaul operator. Replaced torque switch.
X-10	RCIC Condensate Return	C	CV-2410(IPC)	375/07-03-90	0/08-18-90	Replaced valve per DCP-1461.
			CV-2411(OPC)	425/07-03-90	0/08-18-90	Replaced valve per DCP-1461.
X-10	RCIC Steam	C	MO-2400(IPC) CV-2401(OPC)	500/06-30-90 1,100/06-30-90	500/08-25-90 450/08-25-90	 Repacked with live load and short box configuration.
X-11	HPCI Condensate Return	C	CV-2211(IPC)	- 3,450/07-03-90	350/10-06-89 0/08-14-90	Packing tightened. Replaced valve per DCP-1461.
			CV-2212(OPC)	- 3,450/07-03-90	350/10-06-89 0/08-14-90	Packing tightened. Replaced valve per DCP-1461.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-11	HPCI Steam	C	MO-2238(IPC)	-	300/03-13-89	Packing tightened.
				700/06-30-90	1,300/08-25-90	Installed spring Pack-Live load.
			MO-2239(OPC)	-	74/03-13-89	Repacked.
				140/06-30-90	450/08-28-90	Repacked stem, replaced packing follower with short box and live load configuration, overhauled operator.
X-15	Reactor Water Cleanup	C	MO-2700(IPC)	0/07-05-90	0/08-02-90	Overhauled operator.
			MO-2701(OPC)	0/07-05-90	40/08-02-90	Repacked with short box and live load configuration.
X-16A	Core Spray	C	MO-2117(IPC)	150/07-02-90	150/07-02-90	
			MO-2115(OPC)	21,000/07-02-90	0/07-10-90	Increase torque switch setting to 12,218 ft-lbs.
X-16B	Core Spray	C	MO-2137(IPC)	355/08-01-90	215/08-16-90	
			MO-2135(OPC)	610/08-01-90	610/08-01-90	
X-19	Drywell Drain	C	CV-3704(IPC)	0/07-02-90	0/07-02-90	
			CV-3705(OPC)	0/07-02-90	0/07-02-90	
X-20	Demineralized Water	C	V-09-111(IPC)	0/07-20-90	0/07-20-90	
			V-09-65(OPC)	0/07-20-90	0/07-20-90	

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As fouud leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-21	Service Air	C	Blind Flange(IPC) V-30-287(OPC)	0/07-22-90 (Combined)	0/07-22-90 (Combined)	
X-22, N-229A	N_2 Compressor Discharge	C	V-43-214(IPC) CV-4371C(OPC) CV-4371A(OPC)	0/07-23-90 210/07-23-90 440/07-23-90	0/07-23-90 210/07-23-90 440/07-23-90	
X-23A	Drywell Cooling Water Supply	C	CV-5718A(IPC) V-57-77(OPC)	950/07-06-90 (Combined)	950/07-06-90 (Combined)	
X-23B	Drywell Cooling Water Supply	C	CV-5718B(IPC) V-57-78(OPC)	89,250/07-20-90 (Combined)	210/08-11-90 (Combined)	Replaced stem, cleaned up seating surfaces. Cleaned internals, repacked with short box configuration.
X-24A	Drywell Cooling Water Return	C	CV-5704A(IPC) V-57-75(OPC)	220/07-18-90 (Combined)	220/07-19-90 (Combined)	
X-24B	Drywell Cooling Water Return	C	CV-5704B(IPC) V-57-76(OPC)	720/07-20-90 (Combined)	720/07-20-90 (Combined)	
X-25	Drywell Purge Outlet	C	CV-4302(IPC) CV-4303(OPC)	26,200/11-21-89 (Combined)	13,000/11-23-89 (Combined)	Replaced 'T' seal and O-Rings.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As fouud leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-25	Drywell Purge Outlet	C	CV-4302(IPC)	2,950/06-28-90	5,200/07-19-90	Replaced 'T' seal and flange O-Rings.
			CV-4303(OPC)	(Combined)	(Combined)	Replaced 'T' seal and flange O-Rings.
			CV-4310(OPC)	5,400/06-28-90	5,400/06-28-90	
X-26, N-220	Drywell Purge Supply	C	CV-4306(IPC)	540/07-02-90	1,900/08-20-90	Replaced 'T' seal and O-Rings, repaired galled shaft at O-Ring contact and replaced shaft O-Rings.
			CV-4307(OPC)	(Combined)	(Combined)	Replaced 'T' seal and flange O-Rings, also replaced shaft O-Rings.
			CV-4308(OPC)	(Combined)	(Combined)	Replaced 'T' seal and flange O-Rings, also replaced shaft O-Rings.
X-26, N-220	Drywell and Torus Makeup	C	CV-4311(IPC)	1,350/07-02-90	1,350/07-02-90	
			CV-4312(OPC)	2,000/07-02-90	2,000/07-02-90	
			CV-4313(OPC)	425/07-03-90	425/07-03-90	
X-32D	N_2 Compressor Suction	C	CV-4378A(IPC)	275/07-06-90	275/07-06-90	
			CV-4378B(OPC)	295/07-06-90	295/07-06-90	
X-32E	Recirc. Pump A Seal	C	V-17-96(IPC)	0/07-07-90	0/07-07-90	
			CV-1804B(OPC)	0/07-07-90	0/07-07-90	
X-32F	Recirc. Pump B Seal	C	V-17-83(IPC)	0/07-07-90	0/07-07-90	
			CV-1804A(OPC)	0/07-07-90	0/07-07-90	

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-35A	TIP Check	C	Check Valve(OPC)	650/07-20-90	650/07-20-90	
X-35B	TIP Ball	C	Ball Valve(OPC)	0/07-20-90	0/07-24-90	
X-35C	TIP Ball	C	Ball Valve(OPC)	0/07-20-90	0/07-24-90	
X-35D	TIP Ball	C	Ball Valve(OPC)	0/07-20-90	0/07-24-90	
X-36	CRD Return	C	V-17-53(IPC)	69/08-02-90	69/08-02-90	See note 2.
			V-17-52(OPC)	34/08-02-90	34/08-02-90	See note 2.
X-39A	CAD Supply	C	SV-4332A(IPC)	40/07-16-90	40/07-16-90	
			SV-4332B(OPC)	60/07-16-90	60/07-16-90	
X-39B	CAD Supply	C	SV-4331A(IPC)	0/07-16-90	0/07-16-90	
			SV-4331B(OPC)	-	0/11-09-89	Repaired main and pilot seats and cleaned parts.
				-	<105/05-17-89	Rebuilt valve.
				0/07/16/88	0/07-16-90	
X-40C	Jet Pump Coolant Sample	C	SV-4594B(IPC)	0/07-11-90	0/07-11-90	
			SV-4595B(OPC)	10,500/07-11-90	0/08-25-90	Overhauled valve.
X-40D	Jet Pump Coolant Sample	C	SV-4594A(IPC)	0/07-11-90	0/07-11-90	
			SV-4595A(OPC)	0/07-11-90	0/07-11-90	
X-41A	Recirc. Loop Sample	C	CV-4639(IPC)	159/07-06-90	159/07-06-90	
			CV-4640(OPC)	-	238/12-06-89	Repacked.
				500/07-06-90	500/07-06-90	

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
X-42	Standby Liquid Control	C	V-26-9(IPC) V-26-8(OPC)	520/08-01-90 15,100/08-01-90	520/08-01-90 800/08-08-90	Disassembled, cleaned internals, reassembled.
X-46F	CAM Return	C	SV-8105B(IPC) SV-8106B(OPC)	0/07-10-90 0/07-10-90	0/07-10-90 0/07-10-90	
X-48	Drywell Drain Discharge	C	CV-3728(IPC) CV-3729(OPC)	0/07-04-90 0/07-04-90	0/07-04-90 0/07-04-90	
X-50B	CAM Supply	C	SV-8101A(IPC) SV-8102A(OPC)	0/07-24-90 0/07-24-90	0/07-24-90 0/07-24-90	
X-50D	CAM Supply	C	SV-8105A(IPC) SV-8106A(OPC)	0/07-24-90 0/07-24-90	0/07-24-90 0/07-24-90	
X-50E	CAM Supply	C	SV-8103A(IPC) SV-8104A(OPC)	0/07-24-90 0/07-24-90	0/07-24-90 0/07-24-90	
X-54	CCW Return	C	MO-4841A(IPC)	35/07-10-90	170/08-04-90	Replaced torque switch.
X-55	CCW Supply	C	MO-4641B(OPC)	225/07-10-90	140/08-04-90	Replaced torque switch.
X-56C	CAM Supply	C	SV-8101B(IPC) SV-8102B(OPC)	0/06-30-90 0/06-30-90	0/08-26-90 0/08-26-90	See note 3. See note 3.
X-56D	CAM Supply	C	SV-8103B(IPC) SV-8104B(OPC)	0/06-30-90 0/06-30-90	0/08-26-90 0/08-26-90	See note 3. See note 3.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
N-205	Torus Exhaust Outlet	C	CV-4300(IPC)	9,500/07-03-90	440/08-21-90	Replaced 'T' seal and flange O-Rings.
			CV-4301(OPC)	(Combined)	(Combined)	Replaced 'T' seal and flange O-Rings.
			CV-4309(OPC)	14,000/07-03-90	14,000/07-03-90	
N-211A	CAD Supply	C	SV-4333A(IPC)	-	<125/04-25-89	Rebuilt valve.
				35/07-17-90	0/07-17-90	Rebuilt valve.
			SV-4333B(OPC)	0/07-17-90	0/07-17-90	
N-211B	CAD Supply	C	SV-4334A(IPC)	1,500/07-17-90	1,500/07-17-90	
			SV-4334B(OPC)	1,500/07-17-90	1,500/07-17-90	
N-212	RCIC Turbine Exhaust	C	V-24-8(IPC)	141/07-03-90	141/07-03-90	See note 2.
			V-24-23(OPC)	(Combined)	(Combined)	
N-212	RCIC Turbine Exhaust Vacuum Breaker	C	V-24-46(IPC)	50/07-03-90	2,475/08-11-90	Performed BS-3 inspection on internals.
			V-24-47(OPC)	815/07-03-90	2,750/08-13-90	Performed BS-3 inspection on internals.
N-214	HPCI Turbine Exhaust	C	V-22-17(IPC)	596/07-03-90	596/07-03-90	See note 2.
			V-22-16(OPC)	(Combined)	(Combined)	
N-214	HPCI Turbine Exhaust Vacuum Breaker	C	V-22-63(IPC)	500/07-03-90	735/08-14-90	Performed BS-3 inspection on internals.
			V-22-64(OPC)	510/07-03-90	850/08-14-90	Performed BS-3 inspection on internals.

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
N-219	HPCI/RCIC Exhaust	C	MO-2290B(IPC)	1,150/07-04-90	380/08-11-90	Replaced torque switch.
			MO-2290A(OPC)	1,050/07-04-90	1,050/07-04-90	
N-222	HPCI Condensate Return	C	V-22-22(IPC)	0/07-06-90	84/08-12-90	See note 2. Performed BS-3 inspection on internals.
			V-22-21(OPC)	(Combined)	(combined)	Performed BS-3 inspection on internals.
N-229B	CAM Supply	C	SV-8107A(IPC)	0/07-12-90	0/07-12-90	
			SV-8108A(OPC)	0/07-12-90	0/07-12-90	
N-229C	CAM Return	C	SV-8109A(IPC)	0/07-12-90	0/07-12-90	
			SV-8110A(OPC)	0/07-12-90	0/07-12-90	
N-229F	CAM Return	C	SV-8109B(IPC)	0/07-12-90	0/07-12-90	
			SV-8110B(OPC)	0/07-12-90	0/07-12-90	
N-229G	CAM Supply	C	SV-8107B(IPC)	0/07-12-90	0/07-12-90	
			SV-8108B(OPC)	0/07-12-90	0/07-12-90	
N-229H	PASS Sample Return	C	SV-8772A(IPC)	0/07-12-90	0/07-12-90	
			SV-8772B(OPC)	0/07-12-90	0/07-12-90	
N-231	Vacuum Breaker	C	CV-4304(IPC)	260/07-01-90	225/08-14-90	Replaced 'T' seal and flange O-Rings, replaced body drain nipple.
			V-43-169(OPC)	(Combined)	(combined)	

ATTACHMENT 4A
1990 LOCAL LEAKAGE RATE TEST DATA

Pen No.	System Name	Test Type	Equipment/ Valves (Note 1)	As found leakage (SCCM) / date	As left leakage (SCCM) / date	Remarks
N-231	Vacuum Breaker	C	CV-4305(IPC)	450/07-01-90	235/08-20-90	Replaced 'T' seal flange O-Rings and 3-way valve.
			V-43-168(OPC)	(Combined)	(combined)	

Notes:

1. (IPC) Inside Reactor Containment
   (OPC) Outside Reactor Containment

2. These valves were tested with water as the test medium. The test results are in cc/min.

3. CAM supply piping was cut and valve locations moved per DCP-1492.

ATTACHMENT 4B
1990 LOCAL LEAKAGE RATE SUMMARY ANALYSIS

The as found LLRT, the repair, and the as left LLRT for each boundary, or penetration, was reviewed. The net leakage contribution for each penetration was determined using the following criteria:

1. A leakage equivalent to the repair improvement achieved on each valve in the penetration is calculated.

2. The leakage equivalent is the difference between the as found and the as left leakage rates.

3. If a repair was not performed, a zero leakage equivalent is assessed to the valve.

4. The leakage equivalent assessed to a penetration may be reduced due to the safety-related service of the system associated with the penetration(s). Justification for this reduction will be provided with the analysis.

5. The net equivalent leakage for the penetration is the lowest of the inside or outside valve grouping (e.g., simulates minimum pathway leakage). The inside barrier may be inside the containment or the innermost barrier of the two barriers outse the containment. See Attachment 4A.

6. No repair improvement credit is taken if the as left leakage rate is higher than the as found leakage rate. Only those penetrations where repairs were performed are included in this attachment.

7. If the as left leakage rate of a repaired valve is lower than the as left leakage rate of a valve that didn't require a repair, then the penetration net equivalent leakage is the difference between the as left leakage rates, or the repair improvement of the reworked valve.

8. For series valves tested together (i.e. combination test), the penetration net equivalent leakage is half the difference between the as found and the as left leakage rates when both valves are repaired at the same time (prior to performing another test).

9. When the summation of the leakage equivalent and the leakage measured during a successful Type A test is greater than L_a, the penetration(s) with excessive leakage(s) shall be analyzed under a failure analysis program.

10 All leakage rate values are in SCCM.

Conclusions:

The resulting net equivalent leakage of 75,842 SCCM or 0.486569 percent/day indicates that the as found ILRT test results determined by analysis are below the plant's maximum allowable leakage rate of 2.0 percent/day.

ATTACHMENT 4B
1988 LOCAL LEAKAGE RATE SUMMARY ANALYSIS

Pen Num.	System	Inside	Outside	Net	Notes
X-53	Drywell Head	-	4,920	4,920	
X-58A	Stabilizer Access Port	-	240	240	
X-26	Drywell Purge Supply	-	7,300	7,300	
N-220	Torus Purge Supply	-	4,500	4,500	
X-7A	Main Steam	7788	7788	7788	Comb. Test
X-7B	Main Steam	1050	1050	1050	
X-7C	Main Steam	565	565	565	
X-7D	Main Steam	923	923	923	Comb. Test
X-8	Steam Drain	0	2,200	0	
X-9A	Feedwater	78,450	0	0	
X-9B	Feedwater	0	0	0	
X-10	RCIC Cond. Ret.	375	425	375	
X-10	RCIC Steam	0	650	0	
X-11	HPCI Cond. Return	3,450	3,450	3,450	
X-11	HPCI steam	0	0	0	
X-15	RWCU	0	0	0	
X-16A	Core Spray	0	21,000	0	
X-16B	Core Spray	140	0	0	
X-23B	Drywell Cooling Water Supply	44,520	44,520	44,520	Comb. Test
X-25	Drywell Purge Outlet	-	0	0	Comb. Test
X-26, N-220	Drywell & Torus Makeup	0	0	0	
X-40C	Jet Pump Coolant Sample	0	10,500	0	
X-42	Standby Liquid Control	0	14,300	0	
X-54	CCW Return	0	0	0	
X-55	CCW Supply	-	85	85	
X-56C	CAM Supply	0	0	0	
X-56D	CAM Supply	0	0	0	

ATTACHMENT 4B
1988 LOCAL LEAKAGE RATE SUMMARY ANALYSIS

Pen Num.	System	Inside	Outside	Net	Notes
N-205	Torus Exhaust Outlet	-	0	0	Comb. Test
N-211A	CAM Supply	35	0	0	
N-212	RCIC Turb. Exhaust	0	0	0	
N-214	HPCI Vac. Br.	0	0	0	
N-219	HPCI Exhaust	770	0	0	
N-222	HPCI Condensate	0	0	0	
N-231	Vacuum Breaker	-	35	18	Comb. Test
N-231	Vacuum Breaker	-	215	108	