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METROPOLITAN EDISON COMPANY

POST OFFICE BOX 542 READING, PENNSYLVANIA 19603

TELEPHONE 215 – 929-3601

April 3, 1978
GQL 0507

Mr. B.H. Grier, Director
Office of Inspection and Enforcement
Region I
U. S. Nuclear Regulatory Commission
631 Park Avenue
King of Prussia, Pennsylvania 19406

Dear Sir:

Three Mile Island Nuclear Station Unit 2 (TMI-2)
Operating License No. DPR-73
Docket No. 50-320

In accordance with the requirements of Section 6.9.2.e of the TMI-2 Technical Specifications, enclosed please find the TMI-2 Reactor Containment Building Integrated Leak Rate Test Report.

Sincerely,

Signed J. G. Herbein

J. G. Herbein
Vice President-Generation

JGH:RAL:cjg

Enclosure: Reactor Containment Building Integrated Leak Rate Test Report

cc: Mrs. Pat Higgins
Edison Electric Institute
90 Park Avenue
New York, New York 10016

Mr. W. R. Gibson
Babcock & Wilcox
P. O. Box 1260
Lynchburg, VA 24505

[illegible] J. L. Shirk
[illegible] C. W. Smyth*
[illegible] R. J. Stevens*
[illegible] GRC Secretary
[illegible] G. J. Troffer
[illegible] Chairman, CORB TMI-1
[illegible] Chairman, PORC TMI-1
[illegible] Chairman, PORC TMI-2
TMI CORB Secretary

[illegible]: 02.0016.0001.0001.0P

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THREE MILE ISLAND NUCLEAR STATION UNIT 2

REACTOR CONTAINMENT BUILDING

INTEGRATED LEAK RATE TEST

JANUARY 1973

METROPOLITAN EDISON COMPANY

SUBSIDIARY OF GENERAL PUBLIC UTILITIES CORPORATION

PREPARED BY: _____

APPROVED BY: _____

TABLE OF CONTENTS

1.0 SUMMARY

The preoperational integrated leak rate test of the reactor containment building was conducted for Three Mile Island Nuclear Station, Unit 2 from January 1 through January 3, 1978.

A. The test was conducted at a pressure P_a = 56.2 psig and calculations were made using the mass point analysis technique and the absolute method of leakage rate determination. The acceptance criteria were as follows:

1. L_{am} shall be less than 0.75 La = 0.0975%/day
   (La = 0.13% by weight per day)

2. The measured leakage rate at the upper 95% confidence limit, UCL, shall be less than 0.75 La = 0.0975%/day

The analysis of 27.5 hours of data resulted in the following:

1. Lam = 0.0887% by weight per day

2. UCL = 0.0947% by weight per day

These figures demonstrate the acceptability of the containment's leakage rate.

The leak rate test was followed by a supplementary test to confirm the adequacy of the instrumentation used. An additional controlled leakage rate of 0.0953% by weight per day was superimposed with the acceptance criterion as follows:

> Results from the supplemental test are acceptable provided the difference between the supplemental test and the Type A test data is within 0.25 La.
>
> The analysis of the data showed that the difference between the supplemental test and the Type A test data was 0.092 La, which is acceptable.

B. During the Type A test and the supplemental test, additional data was gathered using the deflection instrumentation previously installed for the Structural Integrity Test of the containment building. The purpose was to attempt to establish a correlation between the change in volume of the containment building due to the diurnal cycle versus apparent changes in the calculated mass of contained air due to the volume changes. The weather conditions during the time of the test were such that volume changes were not large enough to establish a sufficient degree of correlation, but were calculated anyway and are as follows:
The Type A test data with volume corrections inserted into the calculations provided the following results:

1. Lam = 0.0852% by weight per day

2. UCL = 0.0910% by weight per day

and for the supplementary test:

1. Lam = 0.1420% by weight per day

2. UCL = 0.1483% by weight per day

2.0 TEST INSTRUMENTATION

2.1 Description

2.1.1 Reactor Building Pressure Instruments (Texas Instruments)

Two precision pressure gauges
Accuracy: ± .015% of full scale
Repeatability: ± .0003% of full scale
Range: 0-75 psia

2.1.2 Reactor Building Temperature Instruments (Rosemount)

Twenty-four RTD's and a digital readout
Overall System Accuracy: ± 0.2°F
Overall System Repeatability: ± 0.1°F

2.1.3 Reactor Building Dewpoint Temperature Instruments (Foxboro)

Ten dewcell RTD's and a digital readout
Overall System Accuracy: ± 1.0°F
Overall System Repeatability: ± 0.5°F

2.1.4 Superimposed Leakage Rate Flowmeters (Brooks)

Two flowmeters in parallel
Accuracy: ± 1% of full scale
Range: 0-5 scfm

2.2 Figure of Merit

In conformance with the draft copy of ANS 274, Containment System Leakage Testing Requirements, May 1976, Appendix C, the figure of merit for the instrumentation system was calculated in order to justify the instrumentation selection.

The FOM formula for the Absolute Method, Mass Point Analysis is:

$$FOM = \pm \frac{2400}{t} \left[2\left(\frac{e_p}{P}\right)^2 + 2\left(\frac{e_t}{T}\right)^2 + 2\left(\frac{e_{pv}}{P}\right)^2 \right]^{\frac{1}{2}}$$

2.2.1 Pressure

Number of sensors: 2
System repeatability: $\pm$ .0003% of 75 psia = $\pm$ .000225 psia

$$e_p = \frac{\pm .000225}{\sqrt{2}} = \pm .000159 \text{ psia}$$

2.2.2 Water Vapor Pressure

Number of sensors: 10
System repeatability: $\pm$ 0.5°F dewcell temperature

At a dewcell temperature of 120°F, the corresponding dewpoint and vapor pressure changes are:

$\pm$ 0.5°F dewcell = $\pm$ 0.35°F dewpoint = $\pm$ .00238 psia

$$e_{pv} = \frac{\pm .00238}{\sqrt{10}} = \pm .00075 \text{ psia}$$

2.2.3 Temperature

Number of sensors: 24
System repeatability: $\pm$ 0.1°F

$$e_t = \frac{\pm 0.1}{\sqrt{24}} = \pm .02041°$$

2.2.4 FOM

$$FOM = \pm \frac{2400}{24}\left[2x\left(\frac{.000159}{70.9}\right)^2 + 2x\left(\frac{.00075}{70.9}\right)^2 + 2x\left(\frac{.02041}{525}\right)^2\right]^{\frac{1}{2}}$$

FOM = $\pm$ .0057% by weight per day

This low figure of merit indicates that the instrumentation selected is of appropriate accuracy for the intended use.

2.3 Corrections for Instrument Error

Corrections were made to the raw data based upon comparisons to measurement standards traceable to NBS. This corrected data was used in calculating the final results for the Type A test and the supplemental test in order to obtain the calculated mass of contained air.

2.3.1 Pressure

Corrections to the pressure data was based on computer-generated vendor-supplied tables of instrument reading versus true pressure for each of the two instruments. The corrections used were on the order of .003 psia for one and .0003 psia for the other. The corrected data was averaged to obtain the total pressure value used in calculating the mass.

2.3.2 Temperature

Corrections to the temperature data was based on calibration data obtained on-site for each RTD and the digital readout. Since the temperatures in the containment varied only slightly during the test, the corrections for each RTD did not vary significantly during the test and were therefore averaged together, then added to the averaged uncorrected data. The corrections for each RTD varied from -0.3°F to +0.5°F. The average of these was +0.1354°F.

2.3.3 Water Vapor Pressure

Corrections to the dewcell temperature data was based on calibration data obtained on-site for each RTD and the digital readout. The dewcell temperature corrections varied from -0.6°F to +0.8°F and were applied to each dewcell used during the test. The dewcell temperatures were averaged and converted to dewpoint temperatures by means of the calibration curve supplied by the manufacturer of the dewcells (Foxboro). The dewpoint temperatures were converted to vapor pressure using a curve accurately fitted to the table in Keenan and Keyes.

2.3.4 Superimposed Flow

Since the controlled flow for the supplementary test was maintained constant for the duration of this test, the correction to the flow data was a single value. This correction was determined by comparison of the parallel flowmeters to a calibrated, highly accurate Volumetrics test device. This corrected flow value was used for the supplementary test calculations.

3.0 ANALYSIS OF RESULTS

Full pressure of approximately 71.0 psia was reached at approximately 0300, 1/1/78. Following a stabilization period of greater than four hours, official data collection for the ILRT was begun at 0800, 1/1/78. A systematic search for possible leaks was also begun at this time.

During the time period from 0800 to 1320, 1/1/78, leakage was identified at Service Air System containment isolation valve SA-V20, which was then manually isolated. Leakage was also identified through a pressure sensing line at penetration P-5620, and was manually isolated. It was also determined that 4 of the 10 dewcell temperature readouts were exhibiting behavior such that deletion of data from these sources was warranted.

The time period from 1330, 1/1/78 to 1700, 1/2/78 constitutes the data base from which the actual leakage rates were calculated. During this time, the calculated leakage rate was continuously decreasing. Although no factual reason for this behavior was found, it was believed that this effect was due to slow leakage of air into enclosed spaces and/or concrete within the confines of the leakage boundary established for the test, and did not appear to be leakage past the test boundary.

The supplementary verification test was run from 1800, 1/2/78 to 0400, 1/3/78. Due to the steadily decreasing leak rate mentioned in the previous paragraph, the most accurate value of leakage rate for comparison with the supplementary test would be the last sets of data from the Type A test. The last ten hours of Type A test data was used to calculate a leakage rate for comparison with the data from the supplementary test. This data compared well, and successfully verified the accuracy of the Type A test.

Subsequent to performance of the above testing, post-repair measurements of leakage rate from the two identified leakage paths were made. The total leakage rate was 180 sccm, which is approximately 0.0000009% by weight per day. This was added to the previously measured leakage rate, but is insignificant.

Additionally, calibration checks were made on the dewcell RTD's and the flowmeters used for the supplementary test. The comparison between the test instruments and the calibration instruments (traceable to NBS), along with similar calibration checks made on the containment temperature RTD's and pressure instruments prior to the test, allowed an instrument error to be determined and a correction applied to the data accumulated during the test. The corrected values were used to calculate the final leakage rates and upper confidence limits given in this report.

A table of mass values versus time was then determined for the Type A test and for the supplementary test. The data rejection criterion described in the draft copy of ANS 274, Containment System Leakage Testing Requirements, May 1976, Appendix D was then applied. Based on this criterion, none of the data points were rejected.

By the above described processes, the final leakage rate values were obtained as listed in Section 1.0 of this report. These values demonstrate the acceptability of the containment's leakage rate in meeting the acceptance criteria.

Type A Test Data

1330; 1/1/78 to 1700, 1/2/78

Hour (decimal)	Temperature (°R)	Vapor Pressure (psia)	Total Pressure (psia)	Mass of Air (lbs. mass)
0	522.16	.19301	70.90875	767639.6739
0.5	522.13	.19152	70.90935	767607.514
1	522.11	.19144	70.90135	767649.8933
1.5	522.10	.19194	70.89285	767564.4966
2	522.10	.19079	70.89535	767616.3985
2.5	522.11	.19177	70.89735	767609.0159
3.25	522.12	.19359	70.89285	767528.1358
3.5	522.13	.19260	70.8964	767444.4222
4	522.09	.18980	70.8854	767531.2946
4.5	522.10	.19326	70.89	767525.3037
5	522.10	.19177	70.8834	767469.8185
5.5	522.10	.19293	70.8820	767457.9492
6	522.09	.19177	70.8770	767428.4809
6.5	522.09	.19070	70.8781	767442.2612
7	522.08	.19218	70.87295	767382.5078
7.5	522.07	.19285	70.8754	767420.2955
8	522.06	.19360	70.8705	767364.2056
8.5	522.06	.19326	70.8705	767368.7107
9	522.07	.19359	70.8655	767304.6077
9.5	522.00	.19128	70.8675	767320.9347
10	522.33	.19351	70.91135	767423.664
10.5	522.43	.19368	70.91825	767349.9273
11	522.39	.19376	70.90735	767285.7377
11.5	522.38	.19359	70.90535	767284.2015
12	522.40	.19343	70.94715	767702.8307
12.5	522.40	.19476	70.90035	767180.5671
13	522.37	.19434	70.89835	767206.2314
13.5	522.39	.19268	70.89635	767178.0892
14	522.41	.19468	70.90235	767190.9363
14.5	522.43	.19418	70.90135	767161.0443
15	522.45	.19560	70.90435	767135.3393
15.5	522.45	.19518	70.90335	767135.1551
16	522.49	.19459	70.90735	767123.724
16.5	522.48	.19451	70.90635	767132.1342
17	522.47	.19619	70.90635	767126.1855
17.5	522.52	.19619	70.90285	767020.9282
18	522.50	.19661	70.90635	767078.1933
18.5	522.51	.19451	70.90735	767100.1606
19	522.50	.19518	70.90185	767039.356
19.5	522.53	.19560	70.90585	767035.3855
20	522.52	.19678	70.90485	767030.1112
20.5	522.50	.19543	70.90035	767025.7809

TABLE 3.0-1 (Cont'd.)

Type A Test Data

1330, 1/1/78 to 1700, 1/2/78

Hour (decimal)	Temperature (°R)	Vapor Pressure (psia)	Total Pressure (psia)	Mass of Air (lbs. mass)
21	522.50	.19644	70.89985	767003.994
21.5	522.51	.19745	70.90235	767007.8932
22	522.51	.19619	70.90185	767016.1966
22.5	522.54	.19720	70.90235	766973.9485
23	522.53	.19703	70.90035	766972.4334
23.5	522.55	.19518	70.8949	766896.69
24	522.56	.19804	70.90035	766912.493
24.5	522.55	.19745	70.90135	766942.0028
25	522.58	.19728	70.89985	766873.9156
25.5	522.56	.19711	70.89885	766900.2076
26	522.55	.19872	70.8985	766897.2838
26.5	522.70	.19686	70.92825	767013.9188
27	522.89	.20013	70.9483	766926.4013
27.5	522.95	.19830	70.95565	766940.8538

Lam = .0387% by weight per day

UCL = .0947% by weight per day

For the last 10 hours data: Lam = .0513% by weight per day

NOTE: Vol. Volume = 2.1×10^6 cu. ft.

Table 3.0-2

Supplementary Test Data

1800, 1/2/78 to 0400, 1/3/78

Hour (decimal)	Temperature (°R)	Vapor Pressure (psia)	Total Pressure (psia)	Mass of Air (lbs. mass)
0	523.01	.19941	70.9457	766729.3743
0.5	522.96	.19869	70.93355	766670.4252
1	522.91	.20035	70.92625	766648.8624
1.5	522.92	.19872	70.92325	766627.8204
2	522.92	.19821	70.92325	766633.3476
2.5	522.91	.20086	70.91925	766567.4047
3	522.91	.19975	70.91925	766585.5863
3.5	522.91	.19889	70.9133	766530.3365
4	522.92	.20026	70.91725	766546.1256
4.5	522.91	.20052	70.9118	766496.4776
5	522.91	.19847	70.90935	766486.0221
5.5	522.72	.20035	70.9068	766719.0604
6	522.92	.19762	70.90685	766462.0104
6.5	522.92	.19949	70.90385	766403.1104
7	522.93	.19881	70.90285	766381.343
7.5	522.95	.19864	70.90285	766358.7625
8	522.96	.19889	70.90235	766332.2584
8.5	522.93	.19932	70.90285	766375.8013
9	522.95	.20052	70.90185	766327.5586
9.5	522.95	.20078	70.89585	766265.8402
10	522.95	.19983	70.89585	766269.9499

L_c = .1347% by weight per day

L_o = 6.77623 SCFH = .0953% by weight per day

L_{am} = .0513% by weight per day (last 10 hours of ILRT)

Criterion is: $(L_o + L_{am} - .25L_a) < L_c < (L_o + L_{am} + .25\ L_a)$

$.1141 < .1347 < .1791$

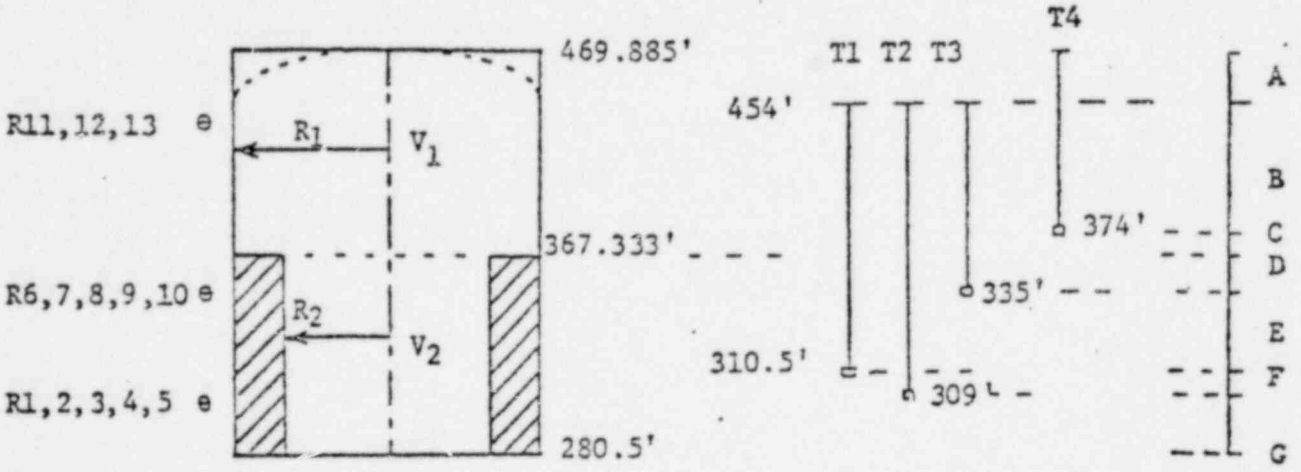
4.0 CONTAINMENT VOLUME CHANGES

Past observations of integrated leak rate tests have revealed, in some cases, an apparent cyclic variation in containment pressure with approximately a 24-hour period. One possible explanation of this phenomenon is an assumed variation in containment volume (normally assumed constant) due to external concrete surface heating and cooling from the sunshine during the day and lack of it at night.

In accordance with NRC Purchase Order DR-77-2405, Amendment 1, additional data was taken using previously installed instrumentation to periodically measure the containment vertical and radial deflections. This information was gathered in an attempt to correlate small changes in the containment volume with ILRT pressure variations, possibly due to effects of the diurnal cycle.

The instrumentation used was provided by Drewer Engineering Laboratories for use during the containment structural integrity test. Data was obtained hourly during the Type A test and the supplementary test by BEL personnel. The thirteen radial measurements were made with eight electronic deflection transducers and five optical devices. The four vertical measurements were made with invar tapes and electronic deflection transducers.

In order to simplify the use of these measurements, the containment was assumed to be a right-circular cylinder (shown below). The volume below the operating floor was calculationally reduced (to account for concrete, equipment, etc.) by assuming a solid annulus within containment, which reduces the total free volume to 2.1×10^6 cu. ft.



$V = V_1 + V_2 = 2.1 \times 10^6$ cu.ft., $R_1 = 65'$

$V_1 = \pi R_1^2 H_1 = 1{,}361{,}197$ cu. ft.

$V_2 = V - V_1 = 738{,}803$ cu.ft. $R_2 = 52.0411'$

In general:

$$\Delta V = \pi(R+\Delta R)^2(H+\Delta H) - \pi R^2 H = \pi(R^2H + R^2\Delta H + 2RH\Delta R + 2R\Delta R\Delta H + H\Delta R^2 + \Delta H\Delta R^2) - \pi R^2 H$$

Retaining only the first-order factors:

$$\Delta V = \pi(R^2\Delta H + 2RH\Delta R)$$

$$= \Delta V_1 + \Delta V_2 = \pi(R_1^2 \Delta H_1 + 2R_1H_1\Delta R_1 + R_2^2 \Delta H_2 + 2R_2H_2\Delta R_2)$$

For ΔV_1: $R_1 = 65'$, $\Delta R_1 = \frac{R11 + R12 + R13}{3}$, $H_1 = A+B+C$

$$\Delta H_1 = \frac{\frac{(B+C)(H1)}{(T1)(B+C)}(\Delta T1) + \frac{(B+C)(H1)}{(T2)(B+C)}(\Delta T2) + \frac{(B+C)(H1)}{(T3)(B+C)}(\Delta T3) + \frac{(A+B)(H1)}{(T4)(A+B)}(\Delta T4)}{4}$$

For ΔV_2: $R_2 = 52.0411$, $\Delta R_2 = \frac{R1+R2+R3+R4+R5+R6+R7+R8+R9+R10}{10}$

$H_2 = D+E+F+G$

$$\Delta H_2 = \frac{\frac{(D+E)(H2)}{(T1)(D+E)}(\Delta T1) + \frac{(D+E+F)(H2)}{(T2)(D+E+F)}(\Delta T2) + \frac{(D)(H2)}{(T3)(D)}(\Delta T3)}{3}$$

So $$\Delta V = \pi(65)^2\left(\frac{\frac{H1}{T1}\Delta T1 + \frac{H1}{T2}\Delta T2 + \frac{H1}{T3}\Delta T3 + \frac{H1}{T4}\Delta T4}{4}\right)$$

$$+2\pi(65)(H1)\left(\frac{R11 + R12 + R13}{3}\right)$$

$$+ \pi(52.0411)^2\left(\frac{\frac{H2}{T1}\Delta T1 + \frac{H2}{T2}\Delta T2 + \frac{H2}{T3}\Delta T3}{3}\right)$$

$$+2\pi(52.0411)(H2)\left(\frac{R1+R2+R3+R4+R5+R6+R7+R8+R9+R10}{10}\right)$$

Converting the deflection to mils (.001"), entering numerical values yields:

$$\frac{\Delta V}{V} = 5.540056 \times 10^{-7}(3\Delta R1) + 1.1267103\times10^{-7}(10\Delta R2) + 1.6220507\times10^{-7}(\Delta T1)$$
$$+ 1.6052708\times10^{-7}(\Delta T2) + 1.9560023\times10^{-7}(\Delta T3) + 1.4083419\times10^{-7}(\Delta T4)$$

TABLE 4.0 - 3

VOLUME - CORRECTED TYPE A TEST MASS POINTS

(Cont'd.)

Count	11	12	13	14	15	16	17	18	19	20	21
D1	40	40	39	40	40	40	40	40	40	40	40
D2	32	32	32	33	32	33	32	32	33	32	33
D3	33	33	33	33	33	33	33	33	33	33	33
D4		46	46	46	46	46	46	46	46	46	46
D5	4	4	4	4	4	4	4	4	4	4	4
D6	674	673	677	674	675	677	674	673	675	674	675
D7	11	11	11	11	11	10	10	9	9	9	10
D8	1086	1070	1078	1079	1078	1081	1081	1081	1082	1078	1079
D9	92	92	92	92	92	92	93	93	94	93	93
D10	118	118	118	118	118	118	117	117	117	117	118
D11	1206	1205	1205	1207	1202	1205	1210	1207	1206	1207	1204
D12	1202	1195	1200	1199	1200	1202	1200	1202	1197	1196	1197
D13	3116	3115	3117	3114	3116	3114	3113	3114	3110	3112	3112
D33	130	130	129	129	129	129	129	128	128	128	128
D39	93	93	93	93	91	93	93	93	95	94	92
D50	98	98	98	98	97	97	97	97	97	97	94
D37	539	539	539	539	539	538	537	536	535	535	535
Mass	767264.3329	767175.842	767176.7335	767158.8386	767131.863	767130.4412	767019.6316	767098.4586	767030.0046	767020.5217	767001.5201

TABLE 4.0 - 3

VOLUME - CORRECTED TYPE A TEST MASS POINTS

(Cont'd.)

Point	22	23	24	25	26	27					
D1	40	40	40	40	40	40					
D2	32	32	32	32	32	32					
D3	32	32	32	32	32	32					
D4	46	46	46	47	47	47					
D5	4	4	4	4	4	4					
D6	677	677	676	675	676	674					
D7	12	13	14	17	18	18					
D8	1082	1078	1081	1086	1085	1086					
D9	93	92	92	91	91	92					
D10	118	118	118	119	119	119					
D11	1205	1207	1207	1205	1206	1206					
D12	1201	1202	1198	1203	1200	1201					
D13	3114	3112	3111	3110	3108	3108					
D33	128	131	131	133	134	135					
D39	92	92	92	93	96	93					
D40	94	96	96	97	97	98					
D37	535	537	539	541	541	541					
Mass:	766970.9821	766894.6924	766938.3559	766898.3898	767011.4313	766939.3121					

TABLE 4.0 - 4

VOLUME - CORRECTED SUPPLEMENTARY TEST MASS POINTS

Point	0	1	2	3	4	5	6	7	8	9	10
D1	40	40	40	40	40	40	40	41	41	41	41
D2	32	32	32	32	32	33	33	33	33	33	33
D3	32	32	32	32	32	32	32	32	32	32	32
D4	47	46	46	46	46	46	46	46	46	46	46
D5	4	4	4	4	4	5	4	4	4	4	4
D6	676	677	677	679	676	678	675	674	675	676	676
D7	15	13	12	11	10	9	9	8	7	6	4
D8	1085	1084	1086	1087	1090	1086	1089	1090	1090	1087	1087
D9	92	93	94	94	95	95	95	96	97	97	98
D10	119	118	118	117	117	117	116	116	115	114	113
D11	1207	1209	1210	1209	1210	1211	1209	1208	1210	1207	1208
D12	1202	1196	1192	1202	1205	1203	1205	1206	1205	1201	1201
D13	3107	3109	3106	3110	3108	3111	3108	3107	3109	3106	3106
D14	135	135	134	134	133	132	132	131	131	131	130
D15	99	99	98	98	99	98	98	98	98	98	98
D16	99	99	99	99	99	99	98	98	97	97	97
D17	540	539	539	538	537	537	537	536	535	534	533
Mass:	766729.3743	766647.2211	766632.4812	766587.2464	766548.5258	766488.7014	766463.3293	766382.0913	766334.0224	766325.473	766267.0351

Based on this volume correction, each hourly mass point was corrected:

$$W'_i = \left(1 + \frac{\Delta V_i}{V}\right) W_i$$

and the leak rate L'_{am} and upper confidence limit UCL' calculated.

The results obtained in this manner do not show a correlation any greater than the normal Type A test results. The confidence interval for the normal Type A test data was 0.006% by weight per day, while the confidence interval for the "corrected mass" data was 0.0058% by weight per day.

During performance of the test, the weather was consistently cold and even the appearance of the sun did not significantly alter the external concrete surface temperature. No cyclic pressure variations were observed during this period of time. Therefore, it appears that the environmental conditions were such that the variations which this extra effort was attempting to correlate simply were not present to a discernable degree.

TABLE 4.0 - 1

BEL Deflection Instrumentation

Ident.	Type	Elevation	Azimuth	BEL No.
R1	Radial	293'	0°	D1
R2	Radial	293'	90°	D2
R3	Radial	293'	180°	D3
R4	Radial	293'	240°	D4
R5	Radial	293'	300°	D5
R6	Radial	352'	0°	06
R7	Radial	352'	60°	D7
R8	Radial	352'	90°	08
R9	Radial	352'	180°	D9
R10	Radial	352'	240°	D10
R11	Radial	436'	0°	011
R12	Radial	436'	90°	012
R13	Radial	436'	300°	013
T1	Vertical	310' 6"	0°	D38
T2	Vertical	309'	90°	D39
T3	Vertical	335'	240°	D40
T4	Vertical	374'	Dome-Apex	D37

The readings were taken in mils (thousandths of an inch)

TABLE 4.0 - 2

ENVIRONMENTAL CONDITIONS

DATE/TIME	HOUR	CONTAINMENT EXTERNAL TEMPERATURE (OF)	CLOUD COVER
1-1-73			
1300	0	37.0	Overcast
1400	1	36.7	Thick Overcast
1500	2	36.8	Overcast
1600	3	36.8	Overcast - Snowing
1700	4	37.0	Snowing
1800	5	37.0	Snowing
1900	6	36.8	Snowing
2000	7	36.8	Snowing
2100	8	37.2	Snowing
2200	9	37.2	Snowing
300	10	37.0	Snowing
1-2-73			
0000	11	36.8	Snowing
0100	12	36.8	Snowing
0200	13	36.8	Snowing
0300	14	36.8	Cloudy
0400	15	36.8	Clear
0500	16	37.0	Clear
0600	17	37.0	Clear
0700	18	36.2	Clear
0800	19	36.2	Clear
0900	20	36.2	Clear
1000	21	36.4	Clear
1100	22	---	-----
1200	23	36.3	Clear
1300	24	36.9	Clear

TABLE 4.0 - 3

VOLUME - CORRECTED TYPE A TEST MASS POINTS

Hour:	0	1	2	3	4	5	6	7	8	9	10
D1	39	39	39	39	40	39	40	39	39	40	40
D2	32	33	33	33	32	33	32	32	32	32	32
D3	33	33	33	33	33	33	33	33	33	33	33
D4	46	46	46	46	46	46	46	46	46	46	46
D5	4	4	4	4	4	4	4	4	4	4	4
D6	679	678	678	680	678	677	677	672	673	674	676
D7	14	13	13	12	12	12	12	12	12	12	11
D8	1073	1073	1074	1075	1074	1071	1076	1075	1077	1078	1084
D9	92	91	92	92	92	92	92	92	92	92	92
D10	120	119	119	118	118	118	118	118	118	118	118
D11	1213	1213	1212	1211	1205	1202	1204	1203	1200	1206	1205
D12	1203	1201	1206	1197	1199	1199	1195	1202	1203	1205	1202
D13	3105	3106	3107	3109	3112	3112	3117	3116	3111	3117	3117
D32	135	135	135	134	134	133	133	132	132	131	131
D37	92	92	93	93	93	93	93	93	93	93	93
D38	106	106	105	104	102	101	100	100	99	99	99
D37	537	538	537	537	537	538	538	538	538	538	539
Mass:	767607.5 4	767562.6443	767610.6035	767442.42	767522.3164	767453.3471	767439.044	767418.4745	767364.0292	767322.3338	767350.2393

(Cont'd)

TABLE 4.0 - 2

ENVIRONMENTAL CONDITIONS

DATE/TIME	HOUR	CONTAINMENT EXTERNAL TEMPERATURE (OF)	CLOUD COVER
1-2-78			
1400	25	37.2	Some Clouds
1500	26	37.2	Some Clouds
1600	27	36.4	Clear
1700	28	36.4	Clear
1800	0	36.0	Clear
1900	1	35.8	Clear
2000	2	35.8	Clear
2100	3	35.2	Clear
2200	4	35.0	Clear
2300	5	34.6	Clear
1-3-78			
0000	6	34.6	Clear
0100	7	34.2	Clear
0200	8	33.4	Clear
0300	9	33.4	Clear
0400	10	32.8	Clear

TABLE 4.0 - 3

VOLUME - CORRECTED TYPE A TEST MASS POINTS

Mass:	0	1	2	3	4	5	6	7	8	9	10
D1	39	39	39	39	40	39	40	39	39	40	40
D2	32	33	33	33	32	33	32	32	32	32	32
D3	33	33	33	33	33	33	33	33	33	33	33
D4	46	46	46	46	46	46	46	46	46	46	46
D5	4	4	4	4	4	4	4	4	4	4	4
D6	679	678	678	680	678	677	677	672	673	674	676
D7	14	13	13	12	12	12	12	12	12	12	11
D8	1073	1073	1074	1075	1074	1073	1076	1075	1077	1078	1084
D9	92	91	92	92	92	92	92	92	92	92	92
D10	120	119	119	118	118	118	118	118	118	118	118
D11	1213	1210	1212	1211	1205	1202	1204	1203	1200	1206	1205
D12	1203	1201	1206	1197	1199	1199	1195	1202	1203	1205	1202
D13	3105	3106	3107	3109	3112	3112	3117	3116	3111	3117	3117
D32	135	135	135	134	134	133	133	132	132	131	131
D33	92	92	93	93	93	93	93	93	93	93	93
D34	106	106	105	104	102	101	100	100	99	99	99
D37	537	538	537	537	537	538	538	538	538	538	539
Mass:	767607.514	767562.6443	767610.6035	767442.42	767522.3164	767453.3471	767439.044	767418.4745	767364.0292	767322.3338	767350.2393