ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
UNIT NO. I

REACTOR CONTAINMENT BUILDING INTEGRATED LEAK RATE TEST

SUMMARY TECHNICAL REPORT

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I. INTRODUCTION

A preoperational Type "A" Integrated Leakage Rate Test (ILRT) was performed on the containment structure of the Arizona Public Service Company, Palo Verde Nuclear Generating Station (PVNGS) - Unit No. 1 pressurized water reactor in December of 1982. The results of this test were analyzed utilizing the "Absolute Method". This test was performed for a period of eight (8) hours at a pressure equal to or greater than the calculated peak containment internal pressure related to the design bases accident (P_a) and specified in the Technical Specifications. This report describes and presents the results of this preoperational Type "A" Leakage Rate Test including the supplemental test method utilized for verification.

The test results are reported in accordance with the requirements of 10 CFR 50, Appendix J, Section V.B.2., ANSI N45.4 (1972) and ANSI/ANS 56.8 (1981).

II. SUMMARY

Prior to the performance of the ILRT, Local Leakage Rate Tests (LLRT) were performed to verify containment integrity. These Type B and Type C tests were performed on containment electrical penetrations, mechanical penetrations, containment isolation valves, fuel transfer tube, equipment hatch and air locks. The acceptance criteria for the LLRT is that the total leakage from these tests does not exceed 0.60 (L_a) where L_a is the maximum allowable leakage rate at pressure P_a stated as a percent of containment free volume per twenty-four (24) hours. The total leakage from these tests was well within these limits and the results are presented in the official copy of preoperational test procedure 91PE-1CL01, Local Leak Rate Test, which is on file at PVNGS.

At the start of the Type "A" test, all valves were in their normal position for accident conditions. Exceptions to this valve lineup were noted and corrected prior to test start and are listed in the official copy of preoperational test procedure 91PE-1CL02, Integrated Leak Rate Test, which is on file at PVNGS.

The first order least squares fit analysis of the data utilizing the mass-point method yielded a leak rate of 0.0057% per day with a 95% upper confidence limit of 0.0142% per day and a total-time leak rate of 0.0094% per day with a 95% upper confidence limit of 0.0183% per day. These values are well within the allowable limit of 0.075% per day.

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III. TEST DISCUSSION

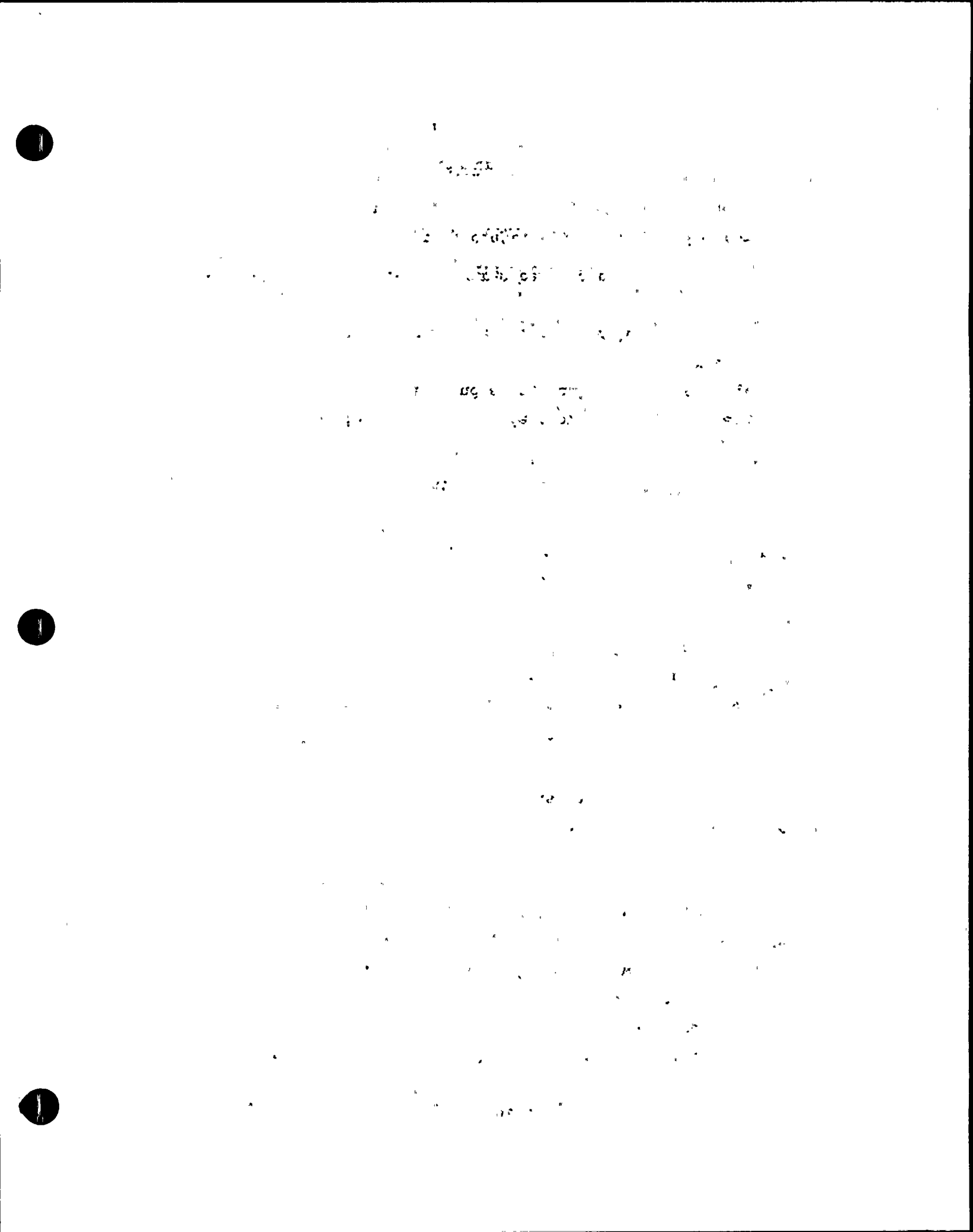
A. Description of Containment

The containment design basis is to limit release of radioactive materials, subsequent to postulated accidents, such that resulting calculated offsite doses are less than the guideline values of 10CFR100. In order to meet this requirement, a design (maximum) containment leakage rate has been defined in conjuction with performance requirements placed on the engineered safety features (ESF) systems.

The capability of the containment structure to maintain design leaktight integrity and to provide a predictable environment for operation of ESF systems is ensured by a comprehensive design analysis and testing program that includes consideration of:

- The peak containment pressure and temperature associated with the most severe postulated accident coincident with the operating basis earthquake (OBE) or safe shutdown earthquake (SSE).
- Maximum external pressure loading condition to which the containment may be subjected as a result of inadvertent containment systems operations that potentially reduce containment internal pressure below outside atmospheric pressure.

The bases in determining design are containment peak pressure (and temperature) and external pressure. For the containment structure peak pressure analysis, it is assumed that each postulated accident is concurrent with the most limiting single active failure in systems required to mitigate the consequence of the accident or to shut down the plant. No two accidents are postulated to occur simultaneously or consecutively.



A. Description of Containment (Cont'd)

The design basis accident (DBA) for each of the categories of: containment peak pressure (and temperature) and containment maximum external pressure is defined as the most severe accident postulated for each case. The difference between the design pressure (60 psig) and the calculated peak pressure of the as-constructed design (49.2 psig) results in a design margin of approximately 20%.

The containment structure is designed to house the reactor coolant system (RCS) and is referred to as the containment. The containment is part of the containment system whose functional requirements are summarized by the following criteria:

- The containment must withstand the peak pressure and time-varying thermal gradient resulting from a hypothetical failure of the RCS or main steam system.
- The containment must provide biological shielding during normal operation and following a postulated loss-of-coolant accident (LOCA) to minimize radiation exposure.
- The containment must be leaktight in order to minimize leakage of airborne radioactive materials.
- The containment must provide approximately 150 penetrations for piping and electrical cabling, as well as, personnel and equipment access, and provides rigid anchor points for piping entering or leaving.

The containment consists of three basic parts:

- Flat base slab with a central cavity and an instrumentation tunnel.
- Right circular cylinder
- Hemispherical dome

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A. Description of Containment (Cont'd)

Principal nominal dimensions of the containment are as follows:

- Interior diameter.....146 ft.
- Interior height (above filler slab).....206 ft. - 6 in.
- Cylindrical wall thickness.....4 ft. - 0 in.
- Dome thickness.....3 ft. - 6 in. at dome apex
  4 ft. - 0 in. at wall springline
- Basemat thickness.....10 ft. - 6 in.
- Liner plate thickness.....1/4 in.
- Internal free volume.....2,600,000 ft^3 net

The containment is constructed of reinforced concrete prestressed by post-tensioned tendons in the cylinder and the dome. The base mat is designed and constructed of conventionally reinforced concrete. Special reinforcing details are provided at discontinuities and at openings in the shell.

A welded steel liner attached to the inside face of the concrete limits the release of radioactivity from the containment. The base liner is installed on the top of the base mat and is covered by a 2 ft. - 9 in. thick concrete slab. The containment building provides biological shielding during normal operation and following a LOCA. It also functions as a leaktight barrier following an accident inside the containment.

The post-tensioning or tendon system consists of high strength wires which are used with buttonhead anchorage techniques. There are 186 one-quarter inch diameter wires per tendon.

Each tendon assembly consists of wires together with end anchor heads and ring nuts. The tendons transfer load to the structure through shims and a bearing plate.

A. Description of Containment (Cont'd)

Tendons are installed in sheaths that form ducts through the concrete between anchorage points. Trumpets, which are enlarged ducts attached to the bearing plate, allow the wires to spread out at the anchorage to suit buttonhead spacing requirements. Further, trumpets facilitate field button heading of wires.

Tendon sheathing provides an enclosed space surrounding each tendon. A valved vent at the highest points of curvature permits release of entrapped air during greasing operations. Drains are provided at the lowest points of curvature to remove accumulated water prior to installing tendons. After the greasing operation, the vents and drains are closed and sealed.

The prestressing tendons are protected against atmospheric corrosion during shipment and installation, and during the life of the containment. Prior to shipment, the tendons are coated with a thin film of petrolatum containing rust inhibitors. The sheathing filler material used for permanent corrosion protection is a modified, refined petroleum-base product. The material is pumped into the sheathing after stressing.

Prestressing of the cylindrical wall is achieved by a post-tensioning system consisting of both vertical inverted U-shaped and circumferential (hoop) tendons. Vertical tendons are anchored at the base slab and extend up and over the dome to form an inverted U shape. Three buttresses are equally spaced at 120° around the cylinder and extend over the dome joining together at the crown. The hoop tendons are anchored at buttresses located at 240° apart. The successive hoop tendons are anchored at alternate buttresses so that two complete horizontal loops are achieved by three consecutive horizontal tendons.

A. Description of Containment (Cont'd)

Prestressing of the hemispherical dome is achieved by a two-way pattern of tendons, which are an extension of the continuous vertical tendons and are anchored at the base slab. They are arranged to produce two families of tendons mutually intersecting each other at 90° on the horizontal projected plane. Hoop tendons extend into the hemispherical region to provide a two-way pattern up to the 90° solid angle of the dome.

A welded steel inner plate covers the entire inside surface of the containment (excluding penetrations) to satisfy the leaktight criteria. The liner is typically 1/4-inch thick and is thickened locally around penetration sleeves, large brackets, and attachments to the basemat and shell wall. The stability of the liner plate, including the thickened plate, is controlled by anchoring it to the concrete structure. The shell wall and dome liner plate system is also used as a form for construction.

A circular equipment hatch and two personnel airlock assemblies (100' and 140' elevations) penetrate the concrete cylinder walls. Penetration assemblies consist of steel sleeves or nozzles, reinforcing plates and anchors. They are anchored to the concrete walls and are welded to the steel liner. Hatch and air lock doors are provided with double-gasketed flanges with provisions for leak testing the flange-gasket combinations.

The 100' elevation personnel air lock is for emergency access. Each personnel air lock has a door at each end and is an ASME Code stamped pressure vessel. A quick-acting equalizing valve connects the personnel air lock with the interior or exterior of the containment to equalize pressure in the two systems.

A. Description of Containment (Cont'd)

During plant operation, the two doors of each personnel air lock are interlocked to prevent both being opened simultaneously. Remote indicating lights and annunciators in the control room indicate the operational status of the doors. Provision is made to bypass the interlock system during plant cold shutdown.

Single barrier piping penetrations are provided for all piping passing through the containment walls. The closure for process piping to the liner plate is accomplished with a special flued head welded into the piping system and to the penetration sleeve which is, in turn, welded to a reinforced section of the liner plate. In the case of piping carrying hot fluid, the pipe is insulated to prevent excessive concrete temperatures and to prevent excessive heat loss from the fluid. Closures to these penetration assemblies are provided by the piping systems that are served by the penetrations.

Electrical penetration assemblies provide means for carrying one or more electric circuits through a single aperture (nozzle) in the containment pressure barrier while maintaining the integrity of the pressure barrier.

Medium voltage power penetrations are configured in the form of tubular canisters slightly shorter than the containment structure nozzle into which it will be installed. The penetration assemblies are installed in 24-inch diameter nozzles. The canister is used as a pressure chamber to monitor penetration leakage rate by pressurizing the interior space with nitrogen and measuring the leak rate with a pressure gage. The medium voltage power penetration is flange-mounted to the outside containment wall with nuts, bolts, washers, and lock-washers. The aperture seal is formed between the header plate and the flange with two concentric Viton O-rings.

A. Description of Containment (Cont'd)

The low voltage power, control, and instrumentation penetrations are also flange-mounted to the outside containment wall in the manner described for the medium voltage power penetrations. Each penetration in this category has a stainless steel header plate at the outside containment end. Stainless steel feed-through subassemblies, containing electrical conductors, pass through the header plate and are secured and sealed with special stainless steel compression fittings. The interstices between the seals and feed-through subassemblies provide a pressure chamber which is used to monitor the leakage rate.

A fuel transfer tube penetration is provided for refueling. An inner pipe acts as the refueling tube with an outer pipe as the housing. The tube is fitted with a double-gasketed blind flange in the refueling canal and a standard gate valve in the spent fuel pool. This arrangement prevents leakage through the refueling tube. Outer sleeves permit the transfer tube to penetrate the refueling canal wall, the containment shell, and the exterior wall of the fuel handling building, while maintaining a pressure-tight boundary at each wall. The sleeves are anchored into each wall respectively and welded to each wall's liner plate. The housing is supported by the sleeves in the vertical and horizontal directions. Bellows at both the interior and exterior faces of the containment shell and of the fuel handling building permit thermal expansion of the transfer tube and of the housing. The same expansion bellows permit differential movement between structures.

The structural acceptance criteria complies with ASME Section III, Division 2,Article CC-3000. The fundamental acceptance criteria for the complete containment is successful completion of the structural integrity test with measured responses within the

A. Description of Containment (Cont'd)

limits predicted by analyses. Prediction of limits are based on test load combinations and code values for stress, strain, or gross deformation for the range of material properties and construction tolerances specified.

The structural integrity test is planned to yield information on both the overall response of the containment and the response of localized areas, such as major penetrations or buttresses, which are important to its design functions.

The design and analysis methods, as well as, the type of construction and construction materials, are chosen to allow assessment of the structure's capability throughout its service life. Additionally, surveillance testing provides further assurances of the structure's continuing ability to meet its design functions. The report concerning Structural Acceptance Criteria is submitted under separate cover and shall not be addressed for any other purpose other than ILRT interface within this report. The interfaces shall be noted since both tests were performed concurrently.

B. Description of Instrumentation

A "state-of-the-art" ILRT instrumentation package was utilized to allow leak rate determination by the "Absolute Method". The primary measurement variables include containment pressure, dewpoint temperature and drybulb temperature as a function of time. Ancillary measurements include outside ambient temperature and barometric pressure. During the supplemental CLRT, containment verification (fixed-orifice) flow is also measured. Instrument readings were output at 15 minute intervals via a data acquisition system and line printer. The measurement system is shown in Figure 8.

Utilizing the Absolute Method, the actual mass of dry air within the containment is calculated. The leakage rate becomes the time rate of change of this value. The mass of air (Q) is calculated according to the Perfect Gas Law as follows (the location of the sensors is shown in Figures 1 through 7):

$$Q = \frac{P_a V}{RT} = \frac{(P_t - P_{wv}) V}{RT}$$

where: P_a = air partial pressure
V = free volume
R = gas constant
T = temperature
P_t = total pressure, psia
P_{wv} = water vapor pressure, psia

1. Temperature Instrumentation

Twenty-four (24) precision platinum Resistance Temperature Detectors (RTD's) were located throughout the containment to allow measurement of the volumetrically weighted average drybulb temperature. The specified accuracy of the RTD's is $\pm$ 0.1°F (40°F to 120°F range). The specified repeatability for each sensor is 0.025% of temperature or 0.05°C, whichever is greater.

B. Description of Instrumentation (Cont'd)

2. Dewpoint Instrumentation

Six (6) chilled-mirror dewcells were located throughout the containment to allow measurement of the volumetrically weighted dewpoint temperature. The specified accuracy of each of the sensors is $\pm$ 0.3°C ($\pm$ 0.54°F), nominal over a range of -50°C to +100°C (-58°F to 212°F). The specified repeatability for each sensor is $\pm$ 0.11°F.

3. Pressure Instrumentation

Two (2) precision fused quartz bourdon tube pressure indicators (0-100 psia) were provided for the determination of containment absolute pressure. One pressure indicator was utilized as a primary while the second indicator was available as a backup. The specified accuracy of the indicators is $\pm$ 0.010% of reading $\pm$ 0.002% full scale or $\pm$ 0.0095 psia. The repeatability of the indicator is $\pm$ 0.0005% full scale.

4. Flow Instrumentation

Two (2) thermal mass flowmeters with a range of 0 to 10scfm were utilized during the supplemental CLRT for verification flow. The specified accuracy of the instrument is $\pm$ 1.0% full scale. The specified repeatability of the instrument is $\pm$ 0.2% full scale.

5. Ancillary Instrumentation

The outside ambient temperature and barometric pressure as well as wind speed and wind direction were measured utilizing the site meteorological tower.

C. Description of the Computer Program

The ILRT computer program is an APS-specified vendor-supplied program which performs the leak rate calculation utilizing the Generator Temperature Monitor (GTM) mini-computer (LSI 11/23). The computer is connected via a data link to the data acquisition system (DAS). The drybulb temperature, dewpoint temperature and absolute pressure data that are scanned by the DAS are fed to the computer for storage and printing. The ILRT computer system consists of:

- Volumetrics A-100 DAS
- DEC VT55 FE graphics terminal with hard copy unit
- LSI 11/23 ILRT computer system with dual double-density disk drives.
- Parallel line printer, Data Royal 5000

After every scan by the DAS, the computer will print a "Raw Data Summary Report" (RDSR). The computer stores the data and, on demand, prints the "ILRT Program Report" (PR). From this report, temperature stabilization can be calculated from average temperature. The ILRT computer uses the mass-point analysis technique to calculate the measured leak rate, calculated leak rate, and 95% upper confidence limit leak rate. The 95% upper confidence limit leak rate is used to determine if the test has met the acceptance criteria. During the verification test or CLRT, the computer will calculate the composite leak rate (L_c). To aide the Test Director in data analysis, plots of the data are made. The RDSR, PR and plots are contained in Appendix A.

The computer contains the following:

- DEC LSI 11/23 processor with KEV 11 option
- 128K bytes of memory
- two double-density disk drives (RX02 format)
- two serial line interfaces
  - one for console device
  - one for serial link to DAS

C. Description of the Computer Program (Cont'd)

- DEC VT55-FE graphics terminal with hard copy unit
- TCU-50D timing control unit
- Parallel line printer

The system software consists of an operating system and an applications package. The operating system is supplied by DEC as the RT-11 version 4.0 Foreground/Background monitor with the appropriate RT-11 version 4.0 device handlers.

The applications package consists of the following programs (not including special maintenance and editing programs):

- LOOK
- SCAN
- EXAM
- CONWEI
- CALPRE
- CALC
- RELHUM
- INERR
- PLOT
- INLEAK

Program LOOK will read data from the A-100 DAS. These data are displayed on the console device. The data output from the DAS are in the same form as is output during the ILRT (i.e., 24 RTD temperatures, 6 dewpoint temperatures, 2 pressure readings, time and date). This program is used during the initial phases of the equipment set-up. The program is a never-ending loop and requires operator intervention to exit.

C. Description of the Computer Program (Cont'd)

Program SCAN is designed to read data from the A-100 DAS and re-format the data into a form more digestable to the other programs in the application package. The program will run continuously until a total of 257 data scans have been received or halted by operator intervention. This program will also run concurrently with the other programs in the application package; it has priority in execution if a conflict arises. The operation of the program is transparent to the user.

Program EXAM is designed to display the contents of the raw data files acquired by the program SCAN. This program will inspect the data files to determine if the raw data file needs editing before being utilized in the calculation sequence.

Program CONWEI is used to create or modify the containment weighting factors of the sensors used in the calculation program. The containment is divided into various sub-volumes. The sub-volume is represented by RTDs and dewcells. Their readings are proportionally applied to the total volume.

Program CALPRE is designed to compute the calibration constants for pressure gauges. The program requests the true pressure and gauge readings for both pressure gauges, then derives the multiplication factor and correction constant for each gauge.

Program CALC is the main application module in the applications package. This program takes the pre-formatted data from the raw data files and performs various calculations with it to produce the various parameters required in the final report of leak rate. The results of these calculations are stored in two data files for use in the plot routines.

C. Description of the Computer Program (Cont'd)

Upon execution, the program CALC reads the scan data files, containment weighting factors and the pressure gauge calibration constants. The RTD and Dewcell temperatures are then multiplied by their corresponding weighting factors and summed. The program checks each sensor reading to insure that it is within the allowable deviation for that set of readings. The elapsed time from "time zero" is calculated and a true pressure is determined from the gauge readings and calibration constants. The pressure is then corrected for the effects of the water vapor pressure. The weighted average containment temperature, average weighted dewcell temperature and containment pressure are used to compute the measured and calculated leak rate for the Point-to-Point, Total-Time and Mass-Point methods.

From these values, a regression line is calculated by the least squares fit method to compute a calculated leak rate for each of the methods. The upper confidence limit is calculated with the "Students T" analysis of n-2 degrees of freedom where n is the number of data samples utilized at each time n.

Program RELHUM is designed to read the average containment dry-bulb and dewpoint temperatures and compute a value of the relative humidity in the containment.

Program INERR is designed to compute the instrument error as a function of average containment temperature, number of RTD sensors, average corrected containment pressure, number of dewcell sensors, elapsed time and the accuracy of the various sensors used.

Program PLOT is designed to accept computed data from the programs: CALC, RELHUM, INERR, and display the results on the DEC VT55-FE graphics terminal.

C. Description of the Computer Program (Cont'd)

Program INLEAK is designed to calculate the value of the installed leak for the CLRT as measured by the ILRT system. The program requires the operator to enter the various leak rate parameters.

This program interacts with the user to convert the leak rates obtained in weight percent per day to standard cubic feet per minute. The conversion is obtained by calculating the initial containment mass and applying the measured leak rate to this mass. The program also calculates the installed leak.

D. Error Analysis

The instrument system error analysis is based on the Instrument Selection Guide (ISG) formula in ANSI/ANS 56.8-1981 "Containment System Leakage Testing Requirements." The formula is:

$$ISG = \pm \frac{2400}{t} \left[2\left(\frac{ep}{P}\right)^2 + 2\left(\frac{epv}{P}\right)^2 + 2\left(\frac{et}{T}\right)^2 \right]^{1/2} \text{ \%Day}$$

where,

ep = absolute pressure measurement repeatability error divided by the square root of the number of sensors.
= (.0005%) (100 psia)/$(1)^{1/2}$
= .0005 psia

epv = vapor pressure measurement accuracy error divided by the square root of the number of sensors.
= (.54°F) (0.0124 psia/°F)*/$(6)^{1/2}$
= .00273 psia
* From steam tables at dewpoint temperature range 69-71°F

et = drybulb temperature measurement repeatability error divided by the square root of the number of sensors.
= (0.1°F)/$(24)^{1/2}$ = .0204°F

P = Test pressure
= 63.9 psia

T = Test temperature (nominal)
=540° R

D. Error Analysis (Cont'd)

t = Test duration in hours

t· = 8 hours

Therefore, the ISG is:

$$ISG = \frac{2400}{8}\left[2\left(\frac{.0005}{63.9}\right)^2 + 2\left(\frac{.00273}{63.9}\right)^2 + 2\left(\frac{.0204}{540.}\right)^2\right]^{1/2} \%/day$$

ISG = 0.0244% per day for 8 hour ILRT

Additional error calculations are discussed in Section III.C.

E. Description of Tests

The containment was made ready for the Integrated Leak Rate Test (ILRT) with final containment inspection, closure and exclusion areas established at 2330 hours on 12-18-82. It should be noted that the Structural Integrity Test (SIT) was scheduled and was performed in conjunction with ILRT. The official start of this milestone was 1355 hours on 12-17-82 and was the first data set for SIT baseline at ϕ psig taken twenty-four (24) hours prior to pressurization. The details concerning SIT performance such as instrumentation, data collection, acceptance criteria, etc. shall be transmitted by others under separate cover and shall not be specifically addressed in this report with the exception of interface areas such as pressure hold points, outgassing, etc. During the period between 1355 hours on 12-17-82 and 2330 hours on 12-18-82, various tasks were completed including ILRT instrument sensor installation, in-situ testing, temperature survey, valve line-ups, etc. Various problems were encountered and corrected concerning sensor connectors proper and cabling connections. Dewcell number 2 was deleted due to sensor malfunction and the volume fractions for the remaining five (5) sensors were adjusted, accordingly.

E. Description of Tests (Cont'd)

Six (6) portable circulating fans were installed to prevent stratification within the containment with two (2) fans located on the 80', 120' and 170' elevations. These fans were positioned 180° apart on each elevation but 60° apart with respect to each other. The 115 VAC fans were controlled from electrical distribution panels external to the containment and were designed to deliver 6200 cfm at nameplate amperage at 51 psig utilizing a 1.5 HP motor. Therefore, the heat input to containment from these units was insignificant. The fans were tested satisfactorily and were left de-energized until containment pressure was scheduled not to exceed 51 psig. A pneumatic test (nitrogen) was satisfactorily performed prior to ILRT start of the steam generators up to the MSIVs at approximately 70 psig to identify and correct leaks detected. This pressure was reduced to less that 10 psig to satisfy Chemistry Department's requirements for a nitrogen blanket on this "dry" system and to assure no potential adverse effects on the ILRT test results. The RCS was dry and vented to containment. Just prior to containment pressurization, an additional test was done on the containment personnel lock (140' elevation) and the emergency lock (100' elevation) to re-verify their integrity. Excessive leakage was observed on both locks due to the inner door equalizer valve "0" rings leaking. The "0" rings were replaced and both locks were tested satisfactorily. However, this specific item is presently under review and was an open item at the NRC exit interview held subsequent to ILRT performance.

At 1032 hours on 12-19-82 pressurization of the containment commenced with all eleven (11) mobile compressors in service having a total capacity of 10,500 cfm. The compressors were oil-free diesel-driven, rotary screw-type units. These units were connected to the containment as shown in Figures 9, 10 and 11.

E. Description of Tests (Cont'd)

A rate of approximately 3.6 psi/hr was obtained and an air inlet temperature to containment of approximately 60°F to 70°F was maintained by adjusting cooling water flow to the aftercoolers and chiller-dryers. With an ambient temperature in containment of approximately 70°F prior to pressurization, this inlet temperature reduced the stabilization time by limiting the temperature gradient. Pressurization continued with SIT hold points satisfied at 10, 25, 40, 55 and 69 psig (the latter being the overpressure test condition). The leak survey team was deployed at approximately 1400 hours on 12-19-82 at a pressure of approximately 25 psig. Numerous minor leaks were detected and corrected during this period but none were of any consequence and resolution was obtained by installation of missing pipe caps on vent/drain valves. One (1) air compressor was taken out of service, (1200 cfm) at 0945 hours on 12-20-82 due to an injector problem which could not be resolved in the field reducing the total pressurization capacity to 9300 cfm for the remainder of the test. At 1354 hours the overpressure test plateau of 69.0 psig (115% of containment design pressure of 60 psig) was achieved.

At 1645 hours depressurization to the outgassing plateau of 41.8 psig (85% of P_a) commenced with one (1) SIT holdpoint satisfied at 55 psig. Depressurization was maintained at a maximum rate of 10 psi/hr with the six (6) portable circulating fans energized at 2155 hours at a pressure of approximately 45 psig. Depressurization was secured at 2228 hours at approximately 41 psig. During this period, no additional leaks were observed and airlock pressures remained at ϕ psig. As a result, the leak survey team was secured until further notice. An unofficial ILRT was performed at this plateau following a stabilization period. The calculated mass-point leak rate at the 95% upper confidence limit was approximately 0.002% per day. A review of the ILRT computer program benchmark data with NRC representatives was also performed during this period with no discrepancies found.

E. Description of Tests (Cont'd)

Pressurization to the peak accident pressure (P_a) commenced at 2231 hours on 12-21-82 with pressurization secured at 0120 hours on 12-22-82 at a pressure of approximately 49.7 psig. A 0.5 psig "buffer" was intentionally installed to assure pressure did not fall below P_a due to temperature stabilization and/or potential leakage. The stabilization period commenced at 0130 hours with stabilization achieved and all criteria satisfied at 0530 hours. With no leaks detectable, the leak survey team was dismissed at 0900 hours. The ILRT was officially started at this point (time zero) and a meeting was held with NRC representatives for concurrence on a reduced duration of eight (8) hours. With NRC agreement subsequent to a review of all data and all requirements for both ANSI/ANS-56.8 (1981) and BN-TOP-1, Revision 1 (1972) satisfied, the ILRT was successfully completed at 1330 hours. The results yielded a calculated total-time leak rate of 0.0094% per day and 0.0183% per day at the 95% upper confidence limit. The calculated mass-point leak rate was 0.0057% per day and 0.0142% per day at the 95% upper confidence limit. It should be noted that during this period there were no apparent diurnal effects due to overcast sky, no sunshine and light rain.

The CLRT commenced at 1330 hours immediately following the successfull completion of the ILRT by installing a fixed-orifice "leak" for verification of the ILRT data of 7.642 scfm which is approximately equivalent to 0.1% per day (L_a). With stable conditions in containment, a momentary loss of power occured at approximately 1730 hours followed by another loss in power approximately 1755 hours. Power was restored at approximately 1810 hours and was a result of the loss of source at the Buckeye sub-station in conjunction with the out-of-step with the Parker/Davis 161/230KV system (California black-out). With power restored, the CLRT was repeated following confirmation of stable measuring system conditions at 1900 hours and successfully completed at 0145 hours 12-23-82 for a total CLRT duration of 6.75 hours.

E. Description of Tests (Cont'd)

The results yielded a calculated mass-point leak rate of 0.0862% per day. It should be noted that no data sets or individual data points were rejected for either the ILRT or CLRT.

Depressurization to atmosphere commenced at 0204 hours with SIT hold points satisfied at 40, 25 and 10 psig. Depressurization was maintained at a maximum rate of 10 psi/hr. At 2245 hours on 12-25-82, ϕpsig containment pressure was achieved followed by containment air sampling and personnel entry at 0700 hours on 12-26-82. All six (6) portable circulating fans were found operating satisfactorily and were secured. All sumps were verified to be dry as they were prior to pressurization. The exclusion areas were removed and no abnormalities were noted. The nitrogen blanket on the secondary side (less than 10 psig) was confirmed to have no indicated decrease in pressure and the ILRT test log was closed at 1215 hours on 12-26-82.

IV. RESULTS AND VERIFICATION

The Type A Integrated Leak Rate Test was conducted for a period of eight (8) hours starting at 63.628 psia (49.326 psig) with a total of thirty-three (33) samples or data sets taken and ending at 63.563 psia (49.261 psig). The results of a computed least squares statistical fit of all data revealed a fitted Mass-Point Leak Rate of 0.0057% per day with a 95% upper confidence limit of 0.0142% per day and a fitted Total-Time Leak Rate of 0.0094% per day with a 95% upper confidence limit of 0.0183% per day.

Following satisfactory completion of the ILRT at P_a, a 6.75 hour verification flow or CLRT was performed with a total of twenty-eight (28) samples or data sets taken. This test was conducted by superimposing a know fixed-orifice leak approximately equivalent to L_a (0.1% per day) of 7.642 scfm. The fitted Mass-Point Leak Rate for the CLRT was 0.0862% per day and the fitted Total-Time Leak Rate was 0.1080% per day.

No data samples were rejected in computing the results for either the ILRT or the CLRT and all data were recorded at equal fifteen (15) minute intervals.

V. CONCLUSIONS

The Integrated Leak Rate Test at P_a (49.2 psig) provided acceptable results as evidenced by the computer printouts in Appendix A of this report. The computed leak rate is well within the specified limit. The acceptance criteria for the ILRT are as follows:

1 - The maximum allowable operational leak rate shall not exceed 75% of L_a (0.1% per day) at a pressure of not less than P_a (49.2 psig)
   - 0.075% per day

2 - The accuracy of the ILRT is verified by a supplemental test (CLRT) where the difference between the containment leakage rate measured during the CLRT and the ILRT must be within 0.25 (L_a).
   - $L_c = L_o + L_{am} \pm 0.25\ (L_a)$

	Leak Rate (L_{am}) % per 24 hrs by weight	
ILRT	Fitted	95% UCL
° Mass-Point	.0057	.0142
° Total-Time Analysis	.0094	.0183

CLRT

° Induced flow — 7.642 scfm (L_a or 0.1%)

CLRT	Leak Rate % per 24 hrs by weight
° Mass-Point Analysis	0.0862
° Total-Time Analysis	0.1080

V. CONCLUSIONS (Cont'd)

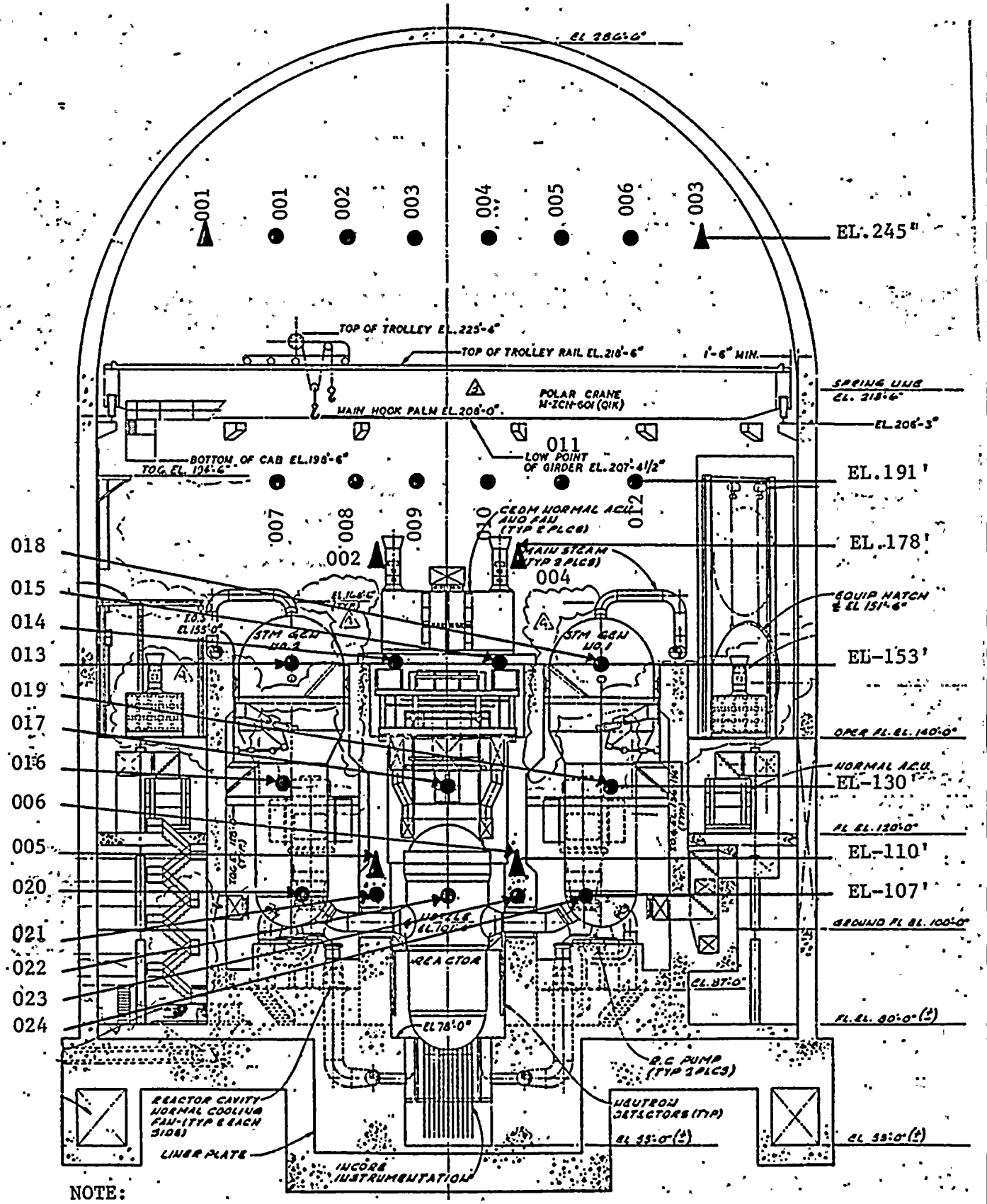
CLRT Limits	CLRT Limits % per 24 hrs by weight
Mass-Point Analysis	
° Upper Limit	0.1307
° Lower Limit	0.0807
Total-Time Analysis	
° Upper Limit	0.1344
° Lower Limit	0.0844

The computer generated reports based upon verified data substantiate for both the ILRT and CLRT that an acceptable test has been performed in accordance with 10 CFR 50, Appendix J, ANSI N45.4 (1972) and ANSI/ANS 56.8 (1981).

VI. FIGURES

Figure 1

RTD & ME LOCATION



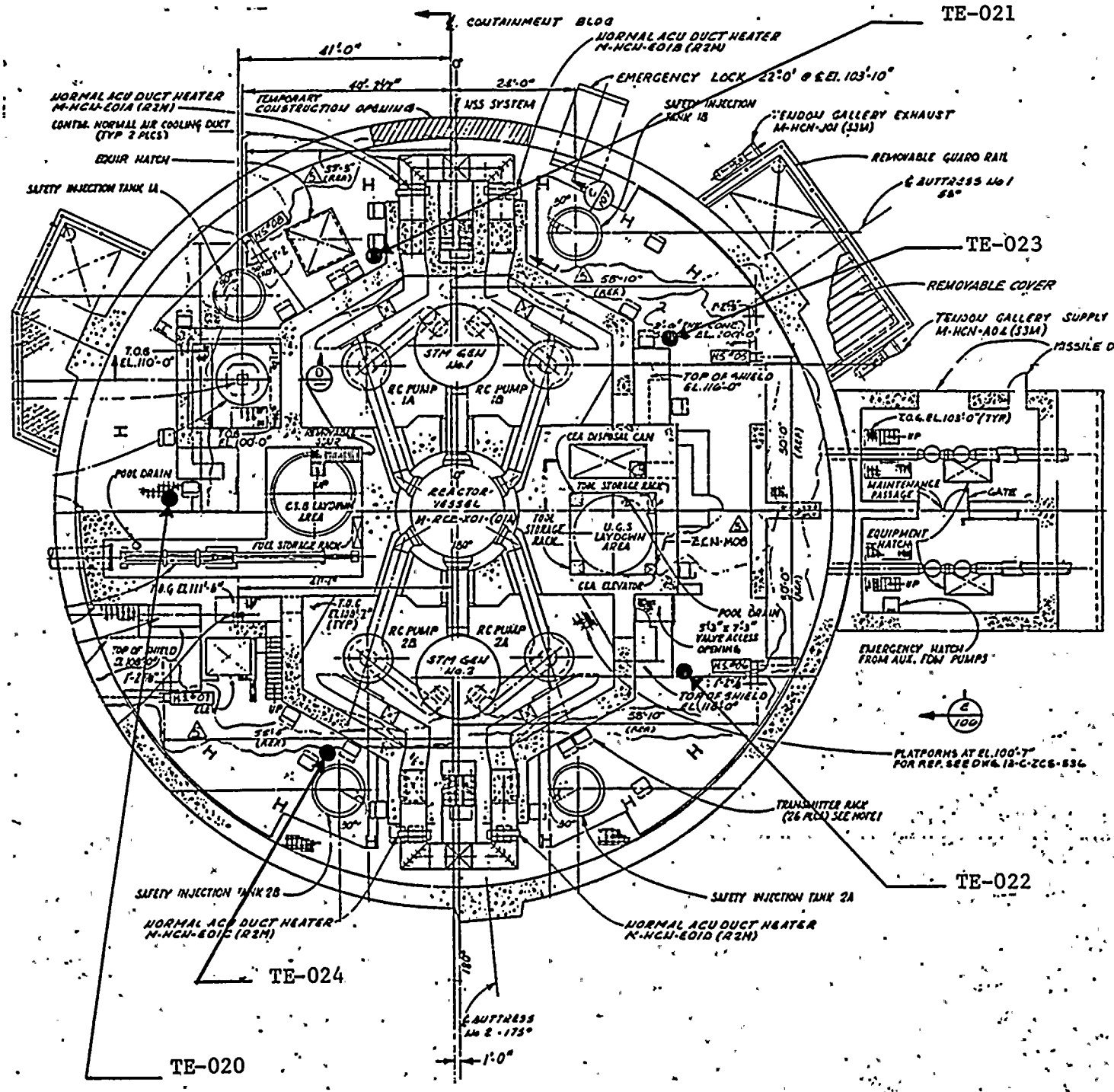
NOTE:
RTD's 1-6 are elevated above the polar crane at approximately elevation 245' (suspended from containment spray headers)

● TEMPERATURE ELEMENT (RTD)

▲ DEWCELL ELEMENT (ME)

Figure 2

RTD & ME LOCATION

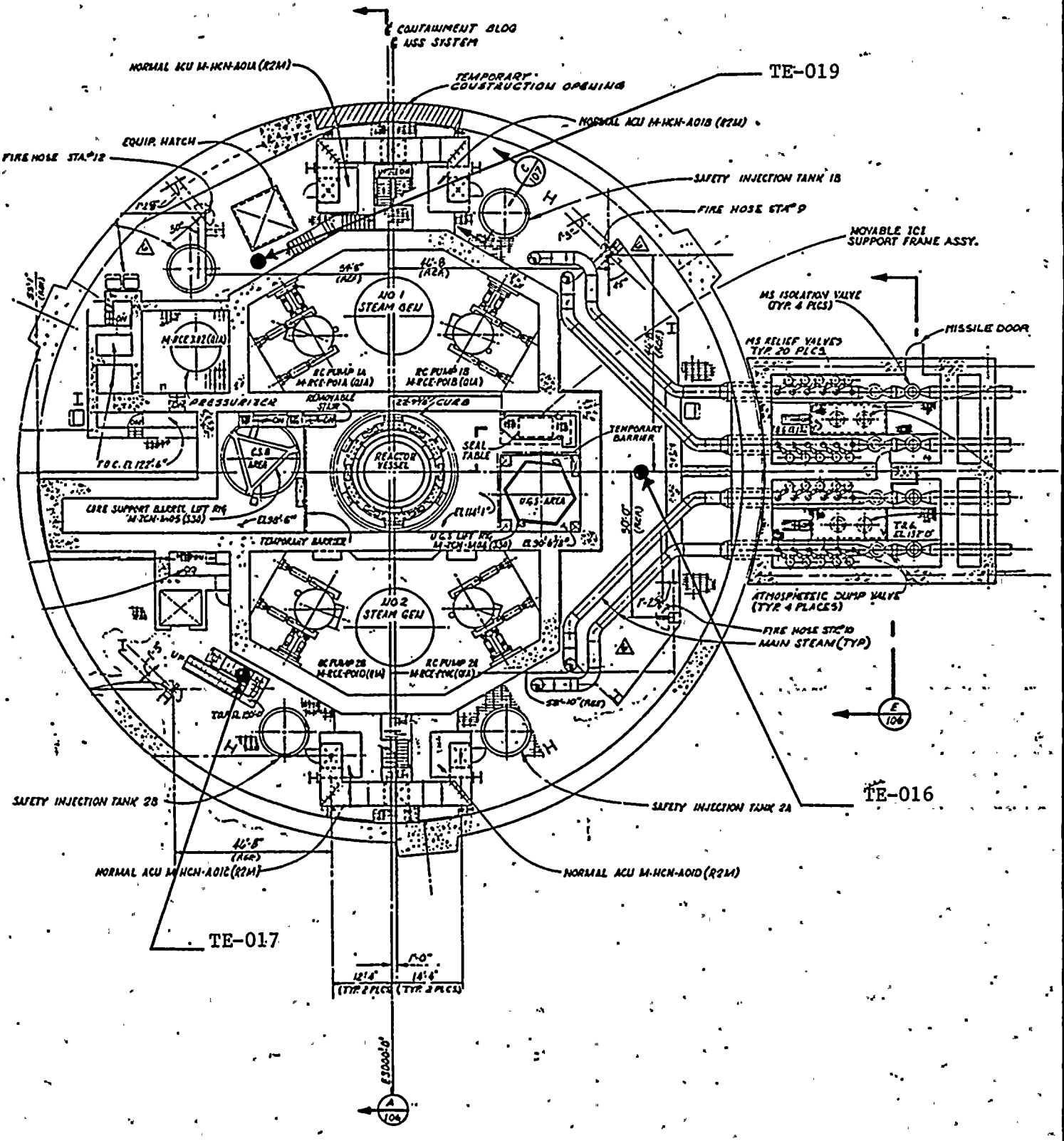


PLAN AT EL 100'-0"

TE's 020 through 024
are located at EL.107'

Figure 3

RTD & ME LOCATION

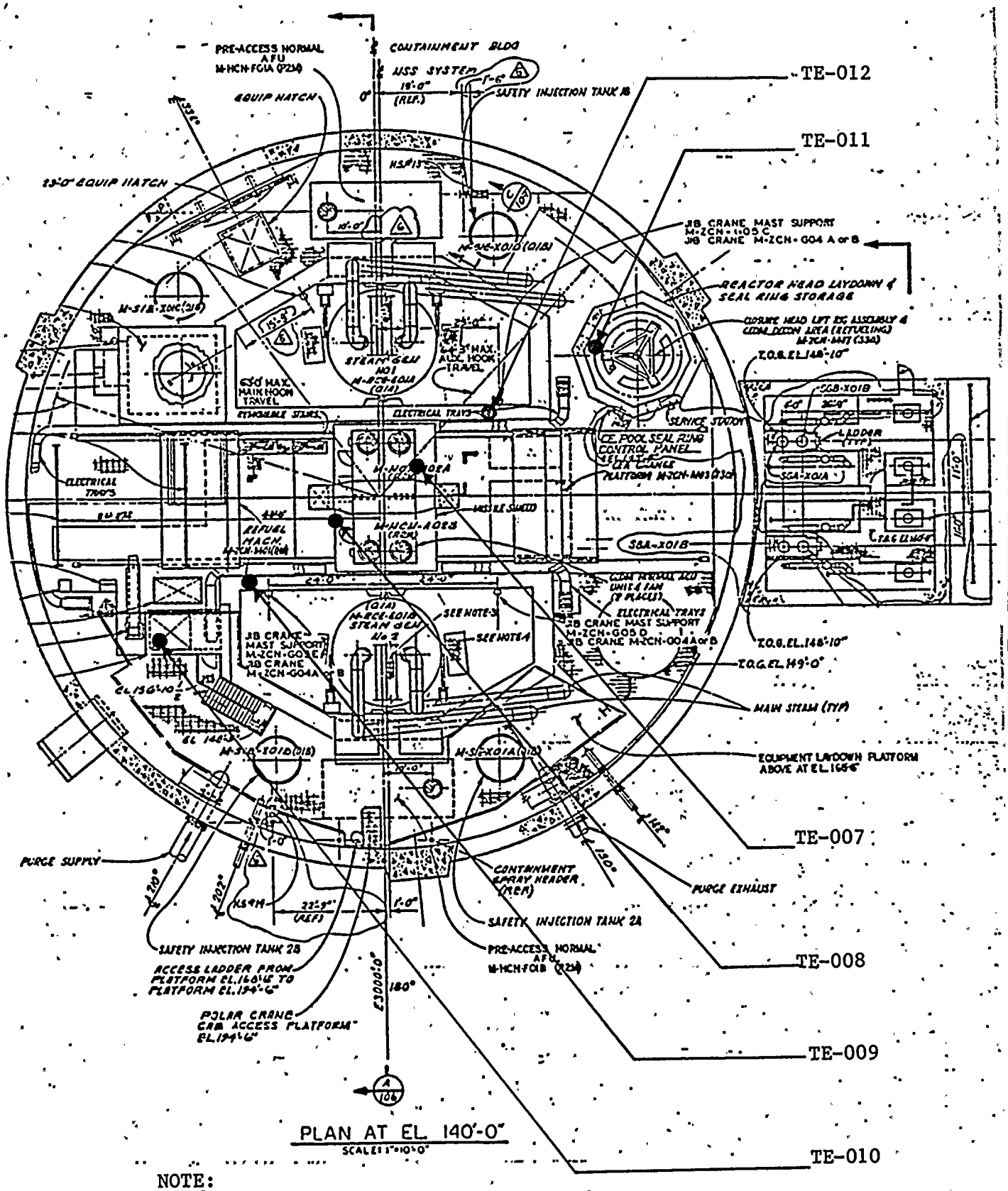


PLAN AT EL. 120'-0"

TE's 016, 017 and 019
are located at EL.130'

Figure 4

RTD & ME LOCATION

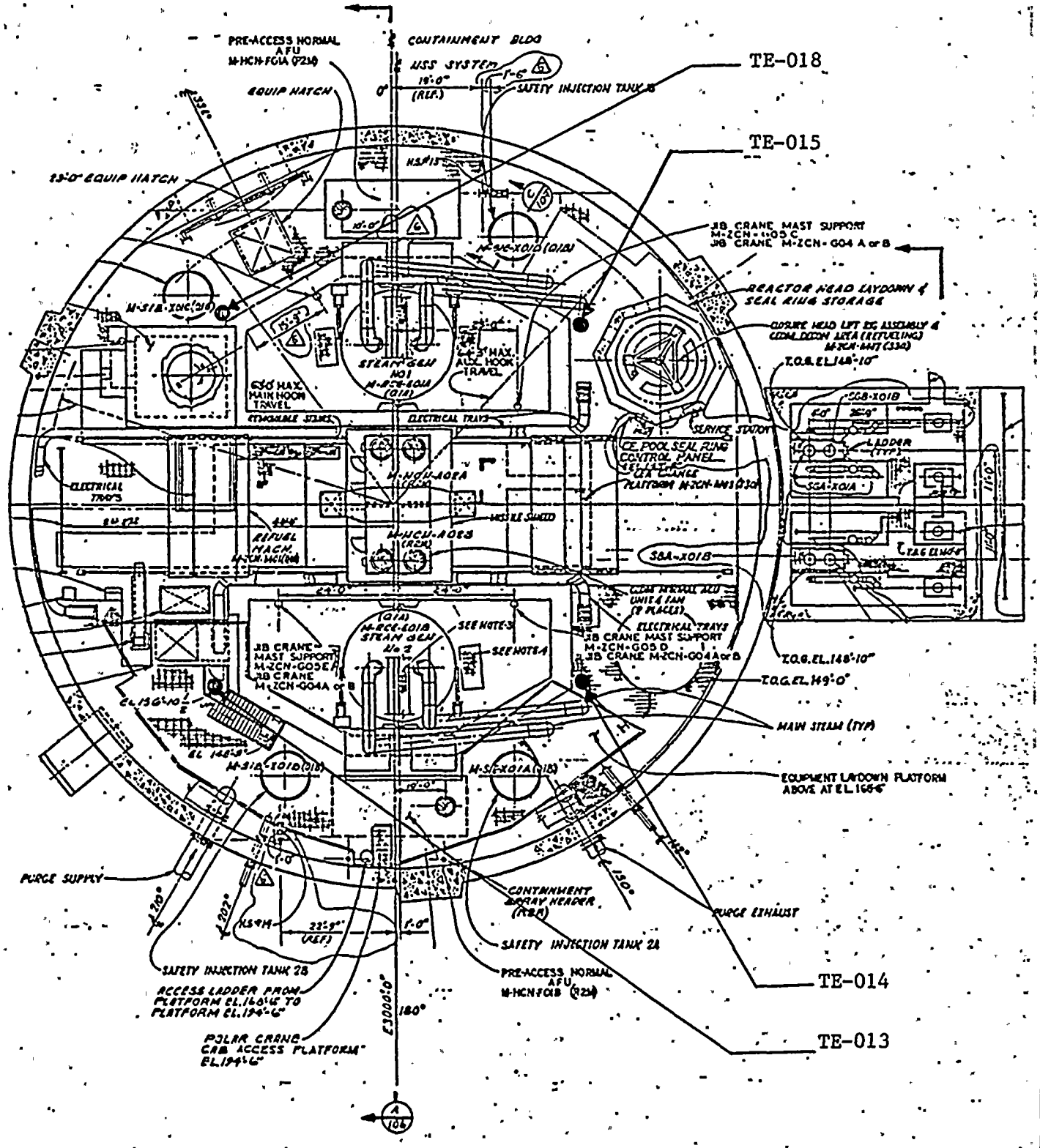


NOTE:
RTD's 7-12 are lowered from the crane to an elevation approximately 30' below the top of the crane rail.

TE's 007 through 012 are located at EL.191'

Figure 5

RTD & ME LOCATION



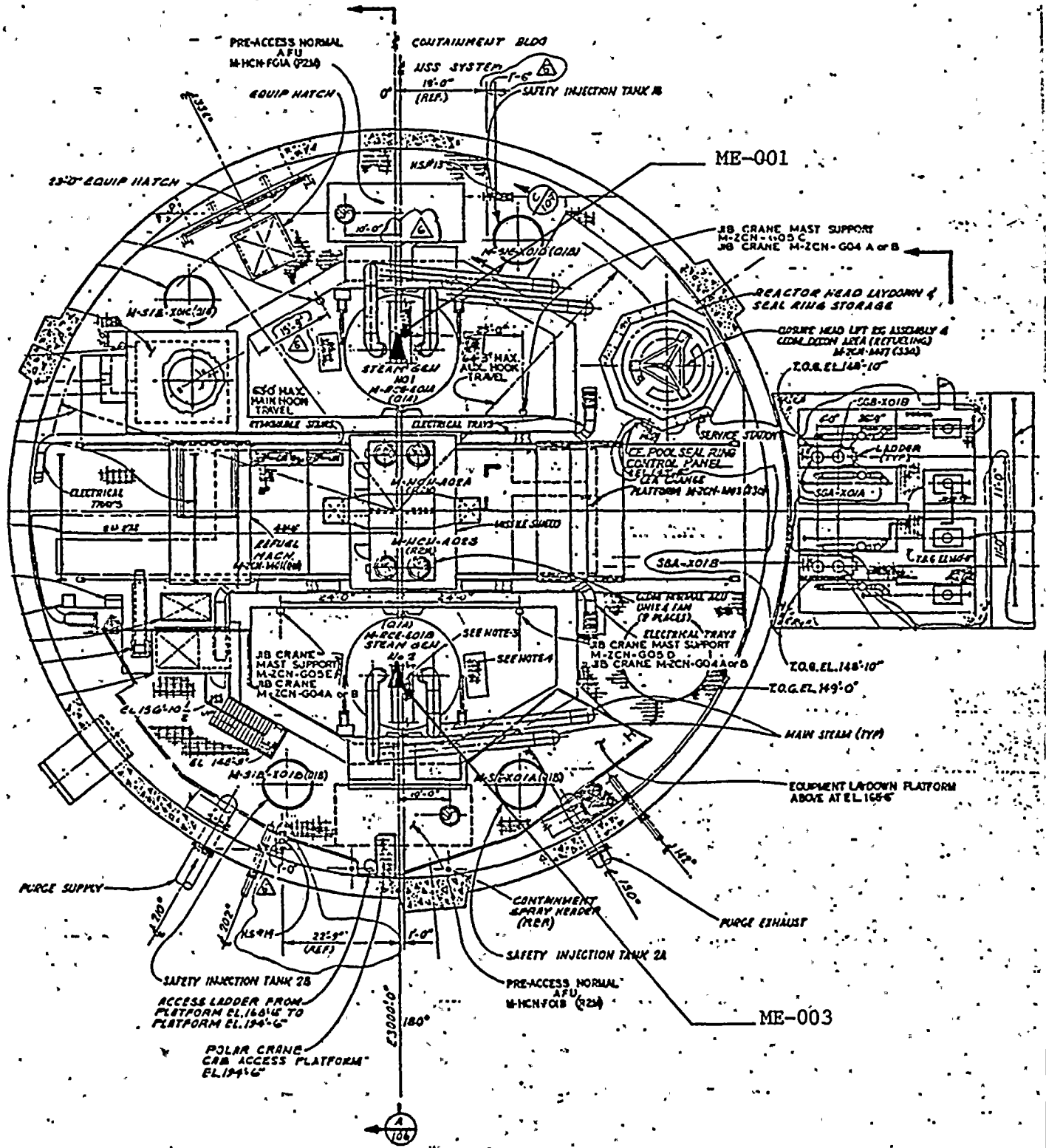
PLAN AT EL 140'-0"

SCALE 1"=10'-0"

TE's 013, 014, 015 and 018 are located at EL.153"

Figure 6

RTD & ME LOCATION



PLAN AT EL 140'-0"

SCALE: 1"=10'-0"

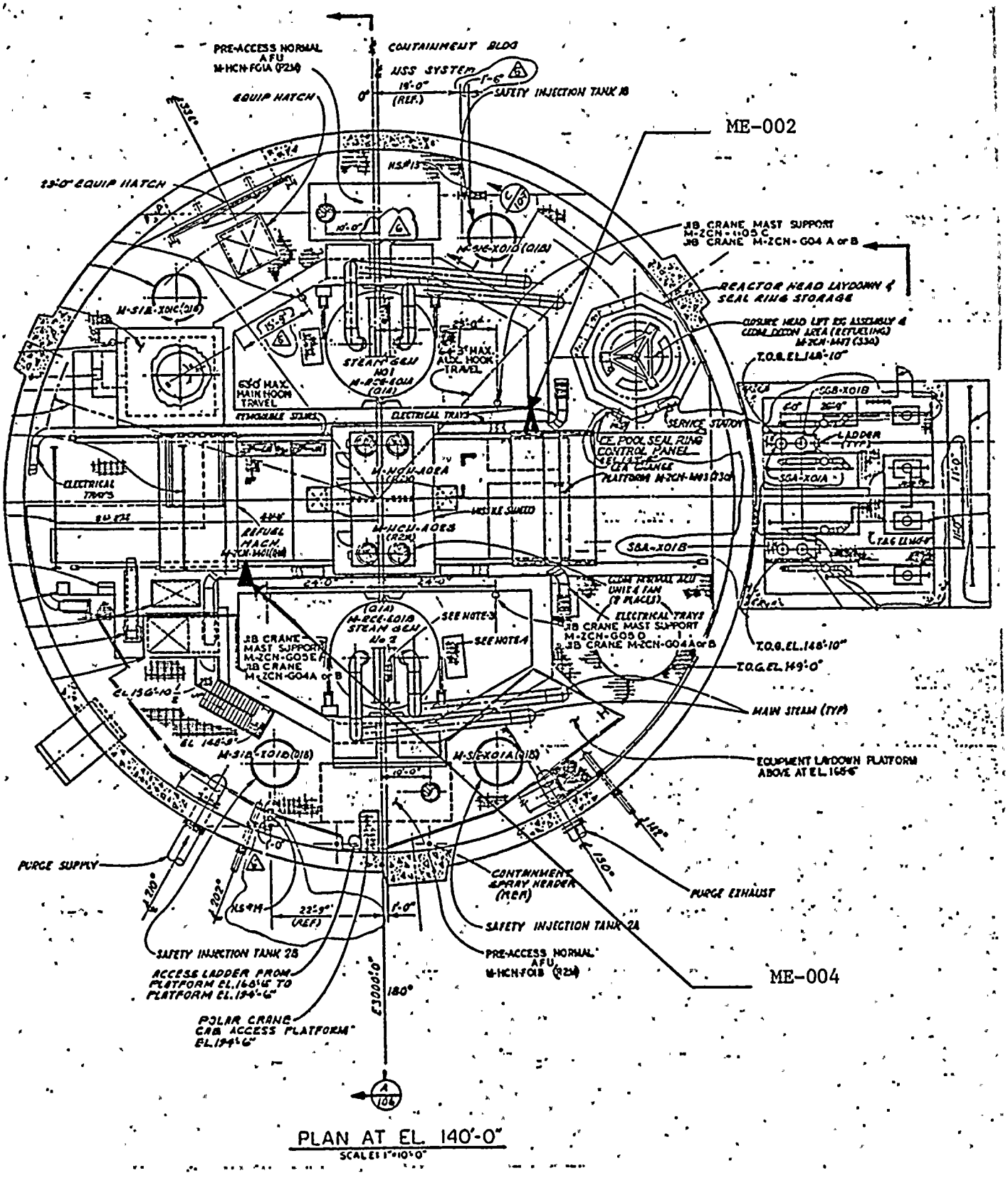
NOTE:

ME's 1 and 3 are elevated above the polar crane at approximately elevation 245' (suspended from containment spray headers)

ME's 001 and 003 are located at EL.245'

Figure 7

RTD & ME LOCATION



PLAN AT EL. 140'-0"

SCALE: 1"=10'-0"

NOTE:

ME's 2 and 4 are lowered from the crane to an elevation approximately 30' below the top of the crane rail.

ME's 002 and 004 are located at EL.178'

Figure 8

ILRT MEASUREMENT SYSTEM
SCHEMATIC

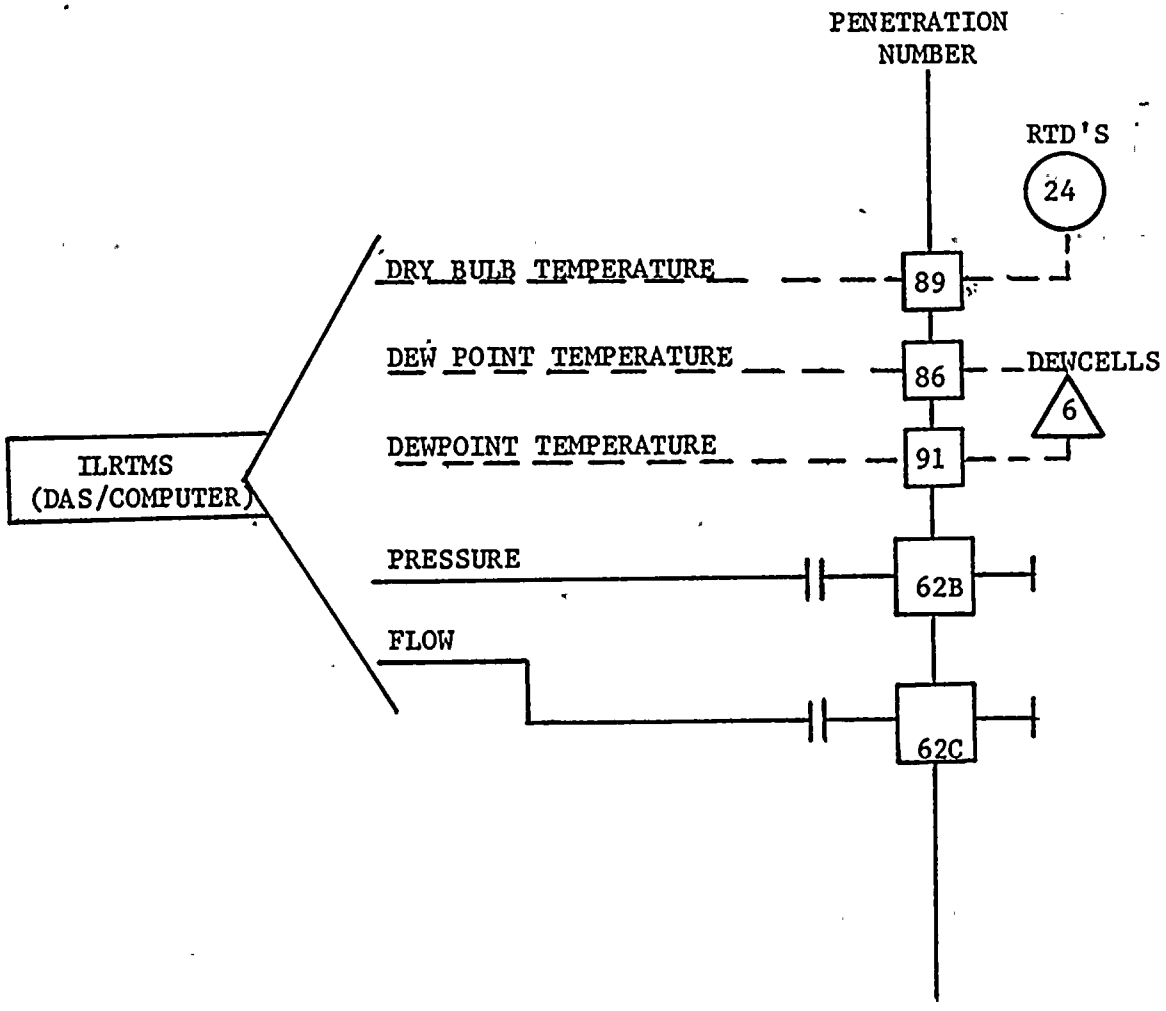
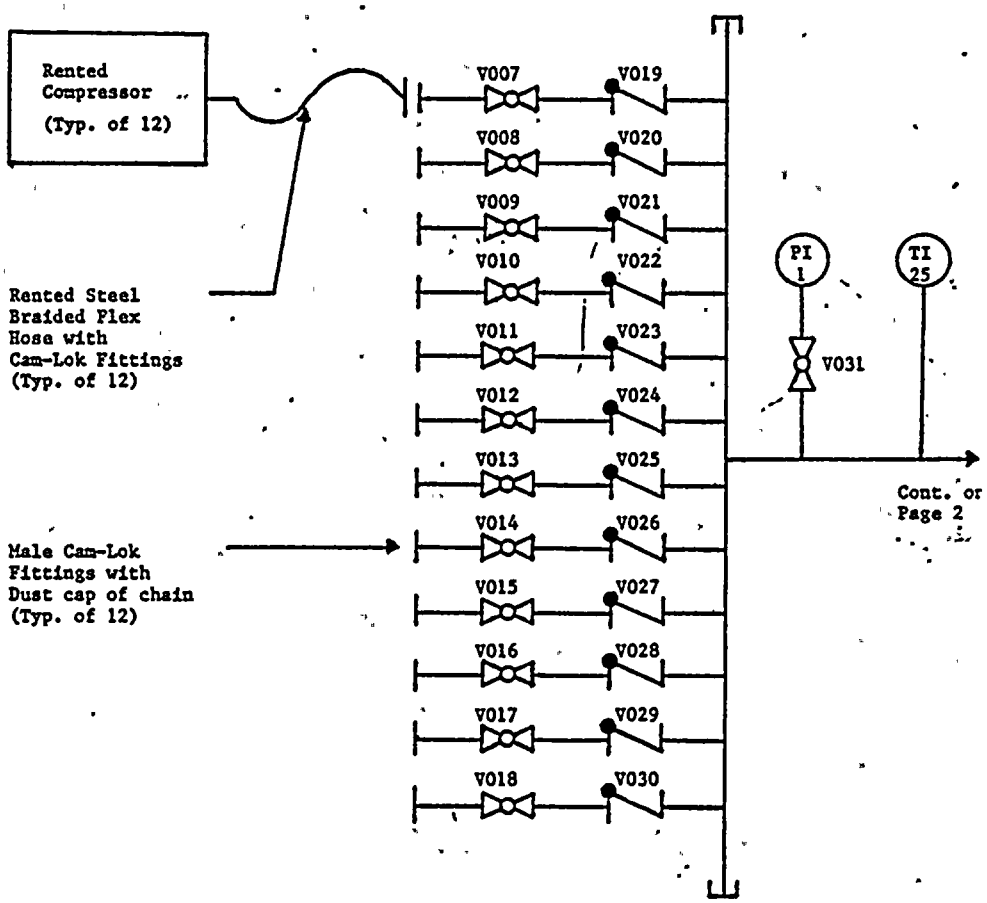


Figure 9

PRESSURIZATION SYSTEM



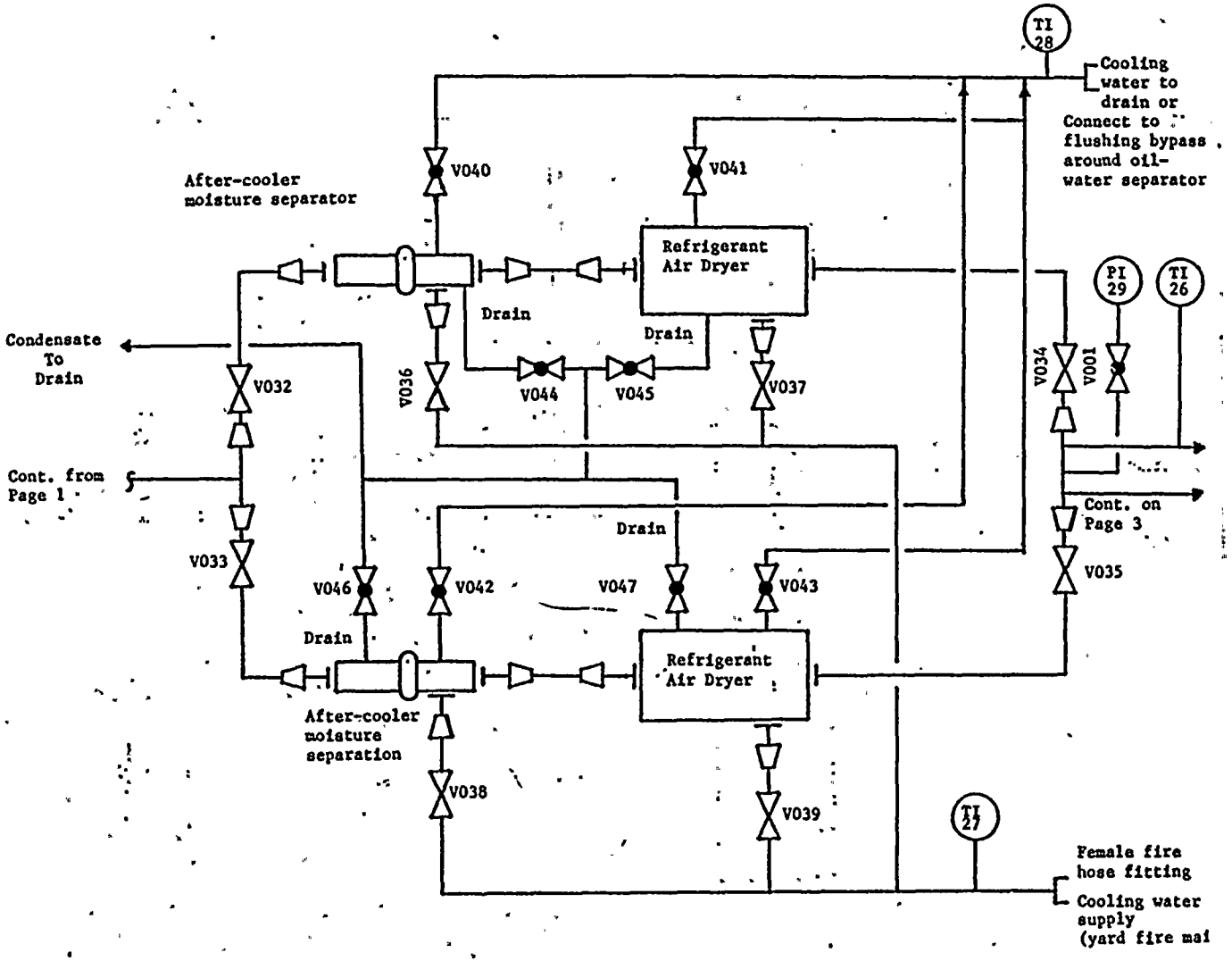
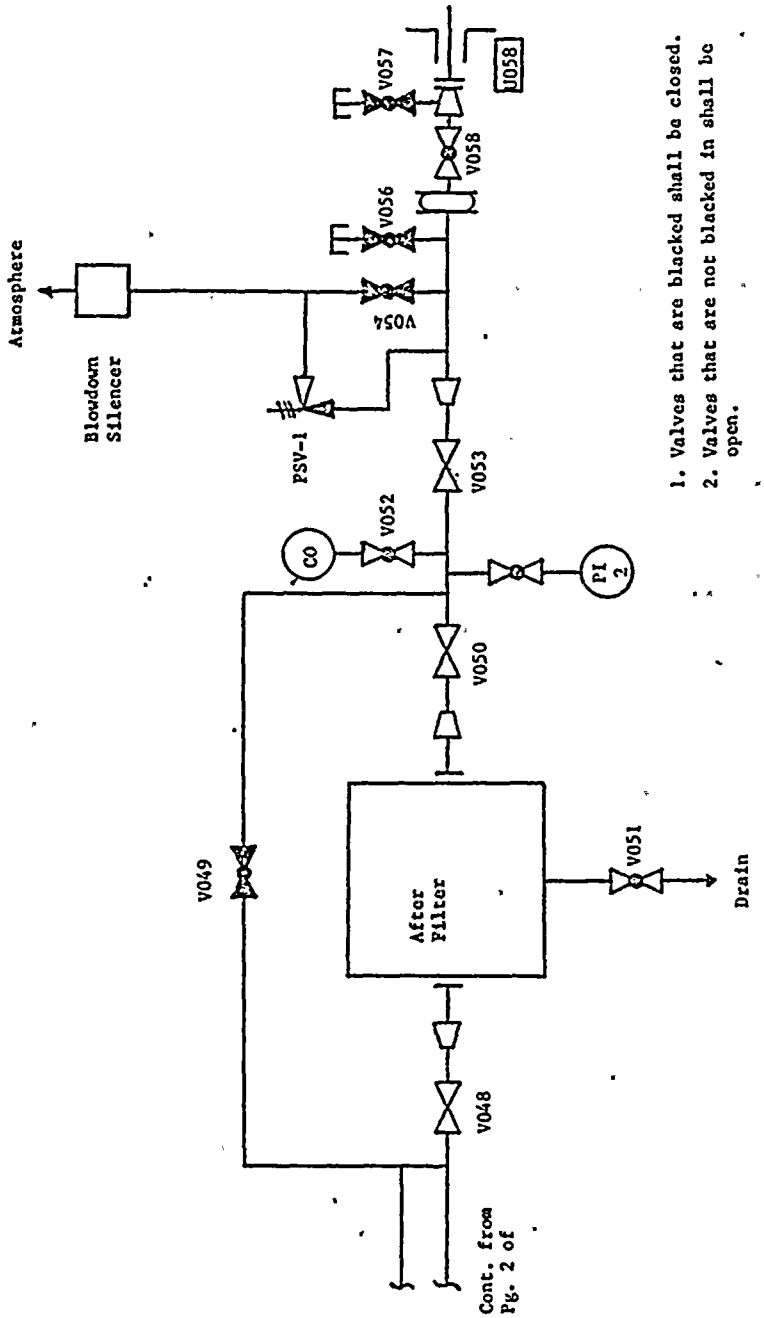


Figure 10

PRESSURIZATION SYSTEM

Figure 11

PRESSURIZATION SYSTEM



VII. APPENDICES

APPENDIX A

COMPUTER - GENERATED REPORT

1.

STABILIZATION

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RAW DATA SUMMARY REPORT

SCAN NO.	DATE	TIME	PRESS 1	PRESS 2	RTD #1	RTD #2	RTD #3	RTD #4	RTD #5	RTD #6	RTD #7	RTD #8	RTD #9
SD.101	356	1:30	63.213	64.674	84.880	83.950	82.698	83.407	82.579	84.423	80.813	81.239	81.935
SD.102	356	1:45	63.133	64.592	83.708	82.960	81.631	82.287	81.558	83.261	79.838	80.271	80.912
SD.103	356	2: 0	63.082	64.541	83.039	82.410	80.970	81.570	80.961	82.550	79.223	79.728	80.238
SD.104	356	2:15	63.049	64.506	82.553	81.980	80.625	81.205	80.595	82.133	78.790	79.303	79.919
SD.105	356	2:30	63.025	64.482	82.286	81.710	80.450	80.986	80.360	81.837	78.559	79.014	79.660
SD.106	356	2:45	63.007	64.464	82.124	81.540	80.242	80.761	80.108	81.666	78.337	78.836	79.518
SD.107	356	3: 0	62.993	64.449	81.961	81.370	80.105	80.636	79.965	81.533	78.236	78.691	79.345
SD.108	356	3:15	62.982	64.438	81.872	81.340	79.997	80.538	79.916	81.437	78.132	78.599	79.243
SD.109	356	3:30	62.972	64.429	81.764	81.220	79.896	80.461	79.788	81.338	78.060	78.508	79.158
SD.110	356	3:45	62.964	64.421	81.726	81.140	79.835	80.383	79.750	81.304	78.009	78.447	79.098
SD.111	356	4: 0	62.957	64.413	81.658	81.100	79.769	80.328	79.682	81.240	77.914	78.376	79.045
SD.112	356	4:15	62.951	64.407	81.622	81.020	79.728	80.282	79.634	81.170	77.902	78.346	79.005
SD.113	356	4:30	62.945	64.401	81.568	81.030	79.687	80.224	79.602	81.140	77.825	78.302	78.935
SD.114	356	4:45	62.940	64.395	81.507	80.990	79.628	80.181	79.545	81.073	77.769	78.257	78.880
SD.115	356	5: 0	62.935	64.390	81.448	80.900	79.608	80.139	79.509	81.033	77.722	78.186	78.842
SD.116	356	5:15	62.931	64.386	81.436	80.900	79.568	80.116	79.483	80.999	77.720	78.198	78.825
SD.117	356	5:30	62.926	64.381	81.405	80.850	79.518	80.099	79.454	80.969	77.664	78.115	78.772

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RAW DATA SUMMARY REPORT

SCAN NO.	RTD #10	RTD #11	RTD #12	RTD #13	RTD #14	RTD #15	RTD #16	RTD #17	RTD #18	RTD #19.	RTD #20
SD.101	81.304	79.925	80.200	77.922	78.833	79.112	77.787	78.588	81.050	81.195	79.364
SD.102	80.400	78.990	79.225	77.323	78.328	78.489	77.490	78.318	80.540	80.925	79.148
SD.103	79.686	78.439	78.649	76.954	77.883	77.926	77.299	78.186	79.927	80.690	78.964
SD.104	79.333	78.076	78.294	76.600	77.522	77.717	77.072	77.996	79.635	80.500	78.810
SD.105	79.141	77.754	78.001	76.461	77.252	77.473	76.969	77.836	79.428	80.358	78.683
SD.106	78.915	77.627	77.809	76.301	77.070	77.314	76.776	77.740	79.258	80.194	78.593
SD.107	78.764	77.435	77.693	76.196	76.907	77.172	76.658	77.650	79.170	80.116	78.573
SD.108	78.675	77.357	77.583	76.097	76.838	77.078	76.603	77.526	79.058	80.021	78.430
SD.109	78.573	77.233	77.504	76.026	76.738	76.980	76.550	77.473	79.017	79.962	78.335
SD.110	78.524	77.243	77.462	75.952	76.658	76.904	76.475	77.389	78.933	79.913	78.306
SD.111	78.456	77.168	77.377	75.891	76.600	76.867	76.464	77.334	78.912	79.821	78.268
SD.112	78.414	77.111	77.328	75.839	76.562	76.788	76.416	77.375	78.820	79.774	78.251
SD.113	78.369	77.058	77.299	75.767	76.530	76.843	76.379	77.252	78.796	79.731	78.241
SD.114	78.305	77.005	77.250	75.744	76.478	76.794	76.342	77.261	78.765	79.667	78.221
SD.115	78.277	76.957	77.198	75.698	76.417	76.750	76.321	77.192	78.712	79.617	78.166
SD.116	78.225	76.899	77.160	75.659	76.388	76.748	76.301	77.188	78.681	79.586	78.138
SD.117	78.210	76.899	77.119	75.634	76.356	76.704	76.265	77.253	78.668	79.531	78.134

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RAW DATA SUMMARY REPORT

SCAN NO.	RTD #21	RTD #22	RTD #23	RTD #24	DEW CELL #1	DEW CELL #2	DEW CELL #3	DEW CELL #4	DEW CELL #5	DEW CELL #6
SD.101	78.213	78.088	78.315	78.340	68.830	31.697	67.990	68.257	67.218	67.079
SD.102	78.117	77.929	78.270	78.126	68.737	31.695	67.832	68.075	67.276	67.028
SD.103	78.077	77.876	78.341	77.989	68.463	31.695	67.636	68.071	67.257	66.912
SD.104	78.065	77.845	78.186	77.871	68.472	31.697	67.538	67.900	67.301	67.385
SD.105	78.036	77.850	78.115	77.871	68.396	31.698	67.533	67.739	67.466	67.640
SD.106	78.010	77.818	78.073	77.836	68.338	31.695	67.439	67.692	67.431	67.884
SD.107	77.957	77.795	77.980	77.786	68.101	31.697	67.451	67.582	67.572	67.923
SD.108	77.891	77.740	77.983	77.735	68.171	31.694	67.393	67.527	67.575	67.915
SD.109	77.807	77.703	77.987	77.728	68.167	31.698	67.300	67.581	67.631	67.990
SD.110	77.780	77.681	77.922	77.693	68.067	31.697	67.273	67.482	67.697	67.959
SD.111	77.752	77.662	77.912	77.662	68.086	31.698	67.211	67.442	67.619	67.919
SD.112	77.742	77.636	77.877	77.633	68.101	31.701	67.236	67.573	67.640	67.894
SD.113	77.723	77.616	77.835	77.623	67.965	31.697	67.140	67.450	67.655	67.924
SD.114	77.723	77.606	77.821	77.624	67.947	31.695	67.195	67.433	67.784	67.869
SD.115	77.732	77.565	77.784	77.584	67.880	31.700	67.187	67.361	67.680	67.866
SD.116	77.716	77.581	77.745	77.536	67.985	31.700	67.097	67.410	67.631	67.898
SD.117	77.726	77.531	77.722	77.516	67.956	31.700	67.051	67.395	67.544	67.825

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
ILRT PROGRAM REPORT

STARTING DAY - 356 STARTING TIME - 1:30: 0 STARTING SCAN - SD.101 ENDING SCAN - SD.117

SCAN NO.	ELAPSED TIME (HR)	AVERAGE TEMP. (F)	AVERAGE PRESSURE (PSIA)	POINT TO POINT MEASURED LEAK RATE	POINT TO POINT CALCULATED LEAK RATE	TOTAL TIME MEASURED LEAK RATE	TOTAL TIME CALCULATED LEAK RATE (WEIGHT PERCENT PER DAY)	TOTAL TIME UPPER CONFIDENCE	MASS PLOT MEASURED LEAK RATE	MASS PLOT CALCULATED LEAK RATE	MASS PLOT UPPER CONFIDENCE
SD.101	0.00	80.79	63.580								
SD.102	0.25	80.08	63.501	-0.589E+00	-0.589E+00	-0.589E+00	-0.589E+00	0.000E+00	-0.592E+00	-0.592E+00	0.000E+00
SD.103	0.50	79.63	63.450	-0.486E+00	-0.486E+00	-0.537E+00	-0.537E+00	0.000E+00	-0.538E+00	-0.538E+00	0.000E+00
SD.104	0.75	79.33	63.417	-0.299E+00	-0.313E+00	-0.458E+00	-0.462E+00	-0.427E+00	-0.458E+00	-0.390E+00	0.738E-01
SD.105	1.00	79.14	63.393	0.175E+00	0.719E-01	-0.300E+00	-0.329E+00	-0.277E+00	-0.300E+00	-0.212E+00	0.100E+00
SD.106	1.25	78.98	63.375	-0.149E-01	0.119E+00	-0.243E+00	-0.239E+00	-0.208E+00	-0.243E+00	-0.137E+00	0.401E-01
SD.107	1.50	78.86	63.362	-0.561E-01	0.113E+00	-0.212E+00	-0.180E+00	-0.147E+00	-0.212E+00	-0.104E+00	0.874E-02
SD.108	1.75	78.78	63.351	0.156E+00	0.203E+00	-0.159E+00	-0.126E+00	-0.922E-01	-0.159E+00	-0.636E-01	0.245E-01
SD.109	2.00	78.70	63.340	0.140E+00	0.247E+00	-0.122E+00	-0.791E-01	-0.436E-01	-0.122E+00	-0.305E-01	0.432E-01
SD.110	2.25	78.65	63.333	0.186E+00	0.290E+00	-0.875E-01	-0.381E-01	-0.707E-03	-0.876E-01	-0.689E-03	0.640E-01
SD.111	2.50	78.59	63.326	0.383E-01	0.265E+00	-0.751E-01	-0.793E-02	0.339E-01	-0.752E-01	0.171E-01	0.711E-01
SD.112	2.75	78.55	63.320	0.275E+00	0.319E+00	-0.432E-01	0.218E-01	0.654E-01	-0.433E-01	0.381E-01	0.871E-01
SD.113	3.00	78.51	63.314	0.114E+00	0.310E+00	-0.300E-01	0.458E-01	0.917E-01	-0.301E-01	0.538E-01	0.971E-01
SD.114	3.25	78.47	63.309	0.595E-01	0.286E+00	-0.231E-01	0.643E-01	0.113E+00	-0.232E-01	0.629E-01	0.100E+00
SD.115	3.50	78.43	63.305	-0.141E+00	0.215E+00	-0.316E-01	0.750E-01	0.128E+00	-0.316E-01	0.631E-01	0.950E-01
SD.116	3.75	78.41	63.301	0.229E+00	0.247E+00	-0.142E-01	0.865E-01	0.141E+00	-0.142E-01	0.677E-01	0.955E-01
SD.117	4.00	78.38	63.296	0.169E+00	0.258E+00	-0.265E-02	0.972E-01	0.153E+00	-0.282E-02	0.722E-01	0.969E-01

2.

INTEGRATED LEAK RATE TEST

(ILRT)

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RAW DATA SUMMARY REPORT

SCAN NO.	DATE	TIME	PRESS 1	PRESS 2	RTD #1	RTD #2	RTD #3	RTD #4	RTD #5	RTD #6	RTD #7	RTD #8	RTD #9
SD.117	356	5:30	62.926	64.381	81.405	80.850	79.518	80.099	79.454	80.969	77.664	78.115	78.772
SD.118	356	5:45	62.922	64.377	81.387	80.820	79.489	80.067	79.414	80.944	77.642	78.105	78.758
SD.119	356	6: 0	62.919	64.373	81.340	80.780	79.476	80.030	79.397	80.885	77.601	78.065	78.695
SD.120	356	6:15	62.915	64.369	81.311	80.790	79.435	79.994	79.347	80.883	77.578	78.050	78.671
SD.121	356	6:30	62.912	64.366	81.262	80.730	79.400	79.965	79.332	80.792	77.529	78.009	78.646
SD.122	356	6:45	62.909	64.363	81.268	80.730	79.403	79.946	79.322	80.818	77.513	78.002	78.631
SD.123	356	7: 0	62.906	64.359	81.262	80.680	79.374	79.936	79.295	80.754	77.478	77.970	78.595
SD.124	356	7:15	62.903	64.357	81.219	80.670	79.354	79.901	79.284	80.781	77.476	77.964	78.572
SD.125	356	7:30	62.900	64.354	81.185	80.650	79.335	79.870	79.269	80.770	77.456	77.952	78.582
SD.126	356	7:45	62.898	64.352	81.178	80.640	79.315	79.867	79.248	80.717	77.459	77.923	78.564
SD.127	356	8: 0	62.895	64.349	81.135	80.590	79.309	79.864	79.246	80.716	77.417	77.900	78.540
SD.128	356	8:15	62.893	64.347	81.167	80.590	79.277	79.817	79.194	80.696	77.418	77.867	78.494
SD.129	356	8:30	62.891	64.345	81.123	80.560	79.252	79.798	79.187	80.661	77.346	77.847	78.466
SD.130	356	8:45	62.890	64.343	81.108	80.560	79.228	79.759	79.158	80.650	77.343	77.816	78.460
SD.131	356	9: 0	62.888	64.341	81.115	80.520	79.237	79.763	79.136	80.638	77.359	77.861	78.448
SD.132	356	9:15	62.886	64.339	81.057	80.550	79.194	79.760	79.116	80.632	77.308	77.809	78.422
SD.133	356	9:30	62.883	64.337	81.080	80.550	79.177	79.740	79.119	80.584	77.299	77.798	78.425
SD.134	356	9:45	62.881	64.335	81.056	80.520	79.182	79.736	79.124	80.619	77.328	77.796	78.418
SD.135	356	10: 0	62.879	64.333	81.053	80.500	79.167	79.724	79.115	80.636	77.284	77.807	78.425
SD.136	356	10:15	62.878	64.331	81.034	80.470	79.150	79.699	79.098	80.607	77.293	77.775	78.407
SD.137	356	10:30	62.877	64.330	81.033	80.490	79.150	79.690	79.106	80.610	77.267	77.777	78.393
SD.138	356	10:45	62.876	64.328	81.013	80.490	79.147	79.675	79.078	80.596	77.247	77.752	78.364
SD.139	356	11: 0	62.874	64.328	80.995	80.410	79.089	79.675	79.043	80.525	77.247	77.737	78.356
SD.140	356	11:15	62.872	64.326	80.967	80.410	79.119	79.647	79.052	80.592	77.243	77.746	78.355
SD.141	356	11:30	62.871	64.325	80.929	80.380	79.103	79.638	79.045	80.517	77.211	77.708	78.356
SD.142	356	11:45	62.869	64.323	80.935	80.420	79.119	79.640	79.042	80.497	77.224	77.688	78.326
SD.143	356	12: 0	62.868	64.321	80.934	80.390	79.068	79.628	79.019	80.503	77.217	77.671	78.314
SD.144	356	12:15	62.866	64.319	80.879	80.350	79.081	79.617	79.022	80.467	77.169	77.615	78.300
SD.145	356	12:30	62.866	64.318	80.816	80.300	79.081	79.624	79.000	80.479	77.166	77.557	78.271
SD.146	356	12:45	62.864	64.317	80.818	80.270	79.046	79.571	78.978	80.479	77.165	77.549	78.257
SD.147	356	13: 0	62.864	64.316	80.921	80.350	79.029	79.580	78.965	80.427	77.142	77.644	78.253
SD.148	356	13:15	62.862	64.314	80.896	80.390	79.005	79.573	78.944	80.404	77.137	77.652	78.221
SD.149	356	13:30	62.861	64.312	80.831	80.260	78.993	79.557	78.932	80.369	77.130	77.549	78.215

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RAW DATA SUMMARY REPORT

SCAN NO.	RTD #10	RTD #11	RTD #12	RTD #13	RTD #14	RTD #15	RTD #16	RTD #17	RTD #18	RTD #19	RTD #20
SD.117	78.210	76.899	77.119	75.634	76.356	76.704	76.265	77.253	78.668	79.531	78.134
SD.118	78.183	76.847	77.104	75.598	76.342	76.585	76.243	77.208	78.598	79.495	78.137
SD.119	78.132	76.857	77.082	75.561	76.304	76.588	76.219	77.201	78.572	79.414	78.123
SD.120	78.096	76.765	77.027	75.532	76.252	76.602	76.194	77.133	78.556	79.408	78.100
SD.121	78.079	76.759	77.002	75.512	76.246	76.516	76.190	77.143	78.529	79.380	78.099
SD.122	78.025	76.742	77.003	75.486	76.211	76.495	76.159	77.095	78.514	79.310	78.100
SD.123	78.021	76.667	76.962	75.471	76.196	76.454	76.155	77.104	78.476	79.327	78.080
SD.124	78.007	76.710	76.947	75.436	76.194	76.414	76.136	77.099	78.451	79.270	78.082
SD.125	77.992	76.684	76.908	75.427	76.147	76.477	76.129	77.081	78.486	79.249	78.091
SD.126	77.984	76.657	76.893	75.378	76.141	76.449	76.107	77.069	78.459	79.237	78.083
SD.127	77.986	76.570	76.878	75.369	76.089	76.420	76.100	77.012	78.413	79.220	78.062
SD.128	77.919	76.577	76.873	75.358	76.104	76.361	76.081	76.977	78.389	79.205	78.057
SD.129	77.896	76.530	76.834	75.337	76.092	76.396	76.066	76.985	78.399	79.182	78.053
SD.130	77.882	76.545	76.858	75.325	76.054	76.321	76.034	76.968	78.381	79.179	78.042
SD.131	77.859	76.565	76.849	75.309	76.057	76.377	76.048	76.936	78.356	79.116	78.001
SD.132	77.856	76.559	76.840	75.302	76.063	76.359	76.033	76.927	78.356	79.124	78.042
SD.133	77.841	76.510	76.779	75.291	76.023	76.341	76.014	76.908	78.340	79.086	78.047
SD.134	77.845	76.521	76.757	75.276	76.010	76.280	76.020	76.896	78.340	79.060	78.033
SD.135	77.813	76.522	76.736	75.245	76.010	76.303	75.990	76.876	78.323	79.035	78.015
SD.136	77.836	76.487	76.742	75.242	75.965	76.242	75.985	76.869	78.311	79.043	78.024
SD.137	77.836	76.493	76.716	75.227	75.962	76.219	75.978	76.864	78.283	79.014	78.025
SD.138	77.789	76.455	76.698	75.209	75.953	76.339	75.970	76.853	78.280	78.991	77.978
SD.139	77.821	76.437	76.707	75.224	75.943	76.200	75.968	76.834	78.277	79.010	77.990
SD.140	77.781	76.467	76.686	75.192	75.927	76.242	75.947	76.828	78.260	78.993	77.975
SD.141	77.764	76.432	76.629	75.183	75.918	76.144	75.956	76.821	78.196	78.950	78.019
SD.142	77.749	76.405	76.646	75.172	75.915	76.190	75.953	76.799	78.216	78.965	77.990
SD.143	77.731	76.387	76.648	75.170	75.891	76.190	75.949	76.806	78.198	78.956	77.983
SD.144	77.737	76.394	76.594	75.180	75.836	76.109	75.929	76.786	78.157	78.913	77.963
SD.145	77.725	76.380	76.539	75.170	75.784	76.089	75.938	76.763	78.065	78.904	77.967
SD.146	77.710	76.414	76.532	75.155	75.766	76.039	75.921	76.745	78.093	78.906	77.948
SD.147	77.667	76.351	76.629	75.146	75.868	76.118	75.895	76.747	78.160	78.889	77.917
SD.148	77.638	76.301	76.637	75.135	75.895	76.196	75.889	76.742	78.199	78.920	77.941
SD.149	77.626	76.319	76.567	75.087	75.784	76.040	75.872	76.742	78.068	78.912	77.902

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RAW DATA SUMMARY REPORT

SCAN NO.	RTD #21	RTD #22	RTD #23	RTD #24	DEW CELL #1	DEW CELL #2	DEW CELL #3	DEW CELL #4	DEW CELL #5	DEW CELL #6
SD.117	77.726	77.531	77.722	77.516	67.956	31.700	67.051	67.395	67.544	67.825
SD.118	77.699	77.525	77.702	77.505	67.918	31.700	67.131	67.387	67.637	67.804
SD.119	77.719	77.528	77.748	77.504	68.016	31.695	67.022	67.242	67.529	67.807
SD.120	77.658	77.490	77.688	77.482	67.834	31.695	67.063	67.291	67.578	67.797
SD.121	77.642	77.482	77.655	77.429	67.871	31.698	67.036	67.326	67.604	67.799
SD.122	77.619	77.481	77.621	77.392	67.842	31.697	67.013	67.260	67.504	67.775
SD.123	77.601	77.462	77.610	77.423	67.823	31.698	67.016	67.181	67.469	67.749
SD.124	77.555	77.450	77.581	77.372	67.799	31.697	66.941	67.277	67.564	67.750
SD.125	77.571	77.465	77.572	77.406	67.825	31.695	66.923	67.178	67.547	67.723
SD.126	77.548	77.446	77.598	77.378	67.677	31.700	66.917	67.149	67.417	67.713
SD.127	77.516	77.446	77.528	77.334	67.793	31.695	66.922	67.202	67.392	67.717
SD.128	77.533	77.417	77.522	77.288	67.767	31.695	66.873	67.176	67.453	67.698
SD.129	77.525	77.404	77.575	77.330	67.720	31.701	66.830	67.141	67.396	67.614
SD.130	77.500	77.394	77.516	77.267	67.665	31.698	66.827	67.115	67.349	67.675
SD.131	77.487	77.365	77.558	77.265	67.662	31.694	66.836	67.134	67.407	67.575
SD.132	77.479	77.360	77.523	77.285	67.634	31.695	66.809	67.109	67.369	67.553
SD.133	77.491	77.359	77.513	77.264	67.659	31.695	66.836	67.169	67.454	67.584
SD.134	77.476	77.378	77.502	77.252	67.688	31.697	66.807	66.987	67.422	67.637
SD.135	77.475	77.377	77.502	77.223	67.640	31.695	66.774	67.053	67.340	67.564
SD.136	77.461	77.363	77.482	77.224	67.628	31.694	66.723	66.973	67.359	67.565
SD.137	77.456	77.371	77.475	77.203	67.617	31.698	66.688	67.001	67.344	67.569
SD.138	77.444	77.363	77.439	77.195	67.572	31.694	66.719	66.993	67.318	67.465
SD.139	77.420	77.333	77.462	77.186	67.547	31.695	66.667	66.969	67.263	67.491
SD.140	77.409	77.346	77.468	77.180	67.540	31.694	66.685	66.989	67.321	67.517
SD.141	77.412	77.308	77.388	77.157	67.436	31.689	66.626	66.941	67.303	67.533
SD.142	77.429	77.356	77.444	77.160	67.407	31.698	66.627	66.857	67.215	67.442
SD.143	77.404	77.310	77.404	77.157	67.417	31.694	66.636	66.914	67.233	67.459
SD.144	77.345	77.343	77.330	77.139	67.439	31.695	66.598	66.984	67.196	67.402
SD.145	77.281	77.305	77.298	77.128	67.488	31.695	66.577	66.926	67.279	67.401
SD.146	77.284	77.296	77.327	77.121	67.430	31.697	66.572	66.914	67.234	67.408
SD.147	77.388	77.273	77.375	77.133	67.430	31.701	66.491	66.957	67.216	67.334
SD.148	77.381	77.272	77.392	77.121	67.460	31.695	66.564	66.874	67.163	67.364
SD.149	77.296	77.247	77.290	77.111	67.402	31.691	66.542	66.809	67.146	67.344

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RELATIVE HUMIDITY PROGRAM

SCAN NO.	AVERAGE DEW POINT TEMPERATURE (F)	AVERAGE CONTAINMENT TEMPERATURE (F)	AVERAGE VAPOR PRESSURE (PSIA)	AVERAGE RELATIVE HUMIDITY (%)
SD.117	67.513	78.376	0.332	69.338
SD.118	67.527	78.347	0.332	69.438
SD.119	67.450	78.322	0.332	69.310
SD.120	67.456	78.290	0.332	69.397
SD.121	67.476	78.259	0.332	69.516
SD.122	67.422	78.242	0.331	69.427
SD.123	67.378	78.219	0.331	69.375
SD.124	67.418	78.201	0.331	69.509
SD.125	67.372	78.193	0.331	69.417
SD.126	67.317	78.176	0.330	69.325
SD.127	67.353	78.148	0.330	69.475
SD.128	67.338	78.128	0.330	69.484
SD.129	67.289	78.113	0.330	69.403
SD.130	67.272	78.093	0.330	69.408
SD.131	67.274	78.088	0.330	69.425
SD.132	67.247	78.076	0.329	69.387
SD.133	67.297	78.061	0.330	69.541
SD.134	67.225	78.055	0.329	69.383
SD.135	67.217	78.044	0.329	69.389
SD.136	67.178	78.029	0.328	69.329
SD.137	67.181	78.023	0.329	69.352
SD.138	67.157	78.009	0.328	69.324
SD.139	67.131	77.990	0.328	69.307
SD.140	67.154	77.988	0.328	69.364
SD.141	67.110	77.960	0.328	69.324
SD.142	67.045	77.965	0.327	69.157
SD.143	67.076	77.950	0.327	69.266
SD.144	67.088	77.922	0.327	69.359
SD.145	67.081	77.896	0.327	69.400
SD.146	67.061	77.886	0.327	69.377
SD.147	67.053	77.906	0.327	69.313
SD.148	67.031	77.905	0.327	69.260
SD.149	66.987	77.856	0.326	69.267

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
ILRT PROGRAM REPORT

STARTING DAY - 356 STARTING TIME - 5:30: 0 STARTING SCAN - SD.117 ENDING SCAN - SD.149

SCAN NO.	ELAPSED TIME (HR)	AVERAGE TEMP. (F)	AVERAGE PRESSURE (PSIA)	POINT TO POINT MEASURED LEAK RATE	POINT TO POINT CALCULATED LEAK RATE	TOTAL TIME MEASURED LEAK RATE	TOTAL TIME CALCULATED LEAK RATE	TOTAL TIME UPPER CONFIDENCE	MASS PLOT MEASURED LEAK RATE	MASS PLOT CALCULATED LEAK RATE	MASS PLOT UPPER CONFIDENCE
				(WEIGHT PERCENT PER DAY)							
SD.117	0.00	78.38	63.296								
SD.118	0.25	78.35	63.292	0.110E+00	0.110E+00	0.110E+00	0.110E+00	0.000E+00	0.110E+00	0.110E+00	0.000E+00
SD.119	0.50	78.32	63.290	-0.113E+00	-0.113E+00	-0.229E-02	-0.229E-02	0.000E+00	-0.182E-02	-0.182E-02	0.000E+00
SD.120	0.75	78.29	63.286	0.429E-01	-0.203E-01	0.132E-01	-0.811E-02	0.158E+00	0.131E-01	-0.349E-01	0.354E+00
SD.121	1.00	78.26	63.282	-0.572E-01	-0.562E-01	-0.429E-02	-0.199E-01	0.260E-01	-0.436E-02	-0.326E-01	0.270E-01
SD.122	1.25	78.24	63.280	0.652E-01	0.286E-02	0.950E-02	-0.154E-01	0.228E-01	0.959E-02	-0.130E-01	0.259E-01
SD.123	1.50	78.22	63.278	-0.366E-01	-0.194E-01	0.181E-02	-0.160E-01	0.152E-01	0.182E-02	-0.115E-01	0.118E-01
SD.124	1.75	78.20	63.274	0.221E+00	0.879E-01	0.330E-01	-0.124E-02	0.313E-01	0.332E-01	0.152E-01	0.491E-01
SD.125	2.00	78.19	63.272	0.233E+00	0.159E+00	0.579E-01	0.187E-01	0.525E-01	0.582E-01	0.443E-01	0.849E-01
SD.126	2.25	78.18	63.270	-0.996E-01	0.794E-01	0.406E-01	0.255E-01	0.552E-01	0.408E-01	0.482E-01	0.793E-01
SD.127	2.50	78.15	63.267	0.252E-01	0.670E-01	0.391E-01	0.296E-01	0.560E-01	0.391E-01	0.492E-01	0.735E-01
SD.128	2.75	78.13	63.265	-0.778E-01	0.251E-01	0.285E-01	0.292E-01	0.528E-01	0.285E-01	0.431E-01	0.634E-01
SD.129	3.00	78.11	63.263	-0.538E-01	0.138E-02	0.216E-01	0.269E-01	0.482E-01	0.217E-01	0.369E-01	0.550E-01
SD.130	3.25	78.09	63.263	-0.237E+00	-0.668E-01	0.185E-02	0.197E-01	0.398E-01	0.190E-02	0.236E-01	0.439E-01
SD.131	3.50	78.09	63.261	0.224E+00	-0.540E-03	0.176E-01	0.183E-01	0.368E-01	0.178E-01	0.210E-01	0.385E-01
SD.132	3.75	78.08	63.259	0.452E-01	0.840E-02	0.195E-01	0.177E-01	0.348E-01	0.195E-01	0.198E-01	0.349E-01
SD.133	4.00	78.06	63.255	0.270E+00	0.668E-01	0.351E-01	0.207E-01	0.370E-01	0.352E-01	0.246E-01	0.386E-01
SD.134	4.25	78.05	63.254	0.795E-01	0.729E-01	0.377E-01	0.238E-01	0.393E-01	0.378E-01	0.292E-01	0.423E-01
SD.135	4.50	78.04	63.252	0.973E-01	0.814E-01	0.411E-01	0.270E-01	0.418E-01	0.411E-01	0.335E-01	0.458E-01
SD.136	4.75	78.03	63.252	-0.179E+00	0.346E-01	0.295E-01	0.274E-01	0.414E-01	0.296E-01	0.330E-01	0.440E-01
SD.137	5.00	78:02	63.251	0.429E-01	0.366E-01	0.302E-01	0.279E-01	0.411E-01	0.302E-01	0.327E-01	0.426E-01
SD.138	5.25	78.01	63.250	-0.140E+00	0.587E-02	0.221E-01	0.269E-01	0.394E-01	0.221E-01	0.304E-01	0.396E-01
SD.139	5.50	77.99	63.248	-0.767E-01	-0.950E-02	0.176E-01	0.252E-01	0.372E-01	0.176E-01	0.275E-01	0.364E-01
SD.140	5.75	77.99	63.246	0.314E+00	0.411E-01	0.305E-01	0.259E-01	0.374E-01	0.305E-01	0.284E-01	0.365E-01
SD.141	6.00	77.96	63.245	-0.422E+00	-0.307E-01	0.116E-01	0.235E-01	0.346E-01	0.117E-01	0.246E-01	0.329E-01
SD.142	6.25	77.96	63.244	0.277E+00	0.126E-01	0.223E-01	0.231E-01	0.337E-01	0.223E-01	0.240E-01	0.317E-01
SD.143	6.50	77.95	63.243	-0.629E-01	0.919E-03	0.190E-01	0.223E-01	0.325E-01	0.190E-01	0.225E-01	0.297E-01
SD.144	6.75	77.92	63.241	-0.166E+00	-0.237E-01	0.122E-01	0.206E-01	0.304E-01	0.122E-01	0.202E-01	0.273E-01
SD.145	7.00	77.90	63.241	-0.475E+00	-0.872E-01	-0.523E-02	0.167E-01	0.266E-01	-0.522E-02	0.144E-01	0.231E-01
SD.146	7.25	77.89	63.239	0.858E-01	-0.698E-01	-0.209E-02	0.137E-01	0.234E-01	-0.206E-02	0.105E-01	0.195E-01
SD.147	7.50	77.91	63.239	0.341E+00	-0.219E-01	0.933E-02	0.126E-01	0.219E-01	0.935E-02	0.918E-02	0.176E-01
SD.148	7.75	77.90	63.237	0.253E+00	0.101E-01	0.172E-01	0.125E-01	0.215E-01	0.172E-01	0.991E-02	0.178E-01
SD.149	8.00	77.86	63.237	-0.793E+00	-0.862E-01	-0.812E-02	0.940E-02	0.184E-01	-0.811E-02	0.573E-02	0.142E-01

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
ILRT PROGRAM REPORT

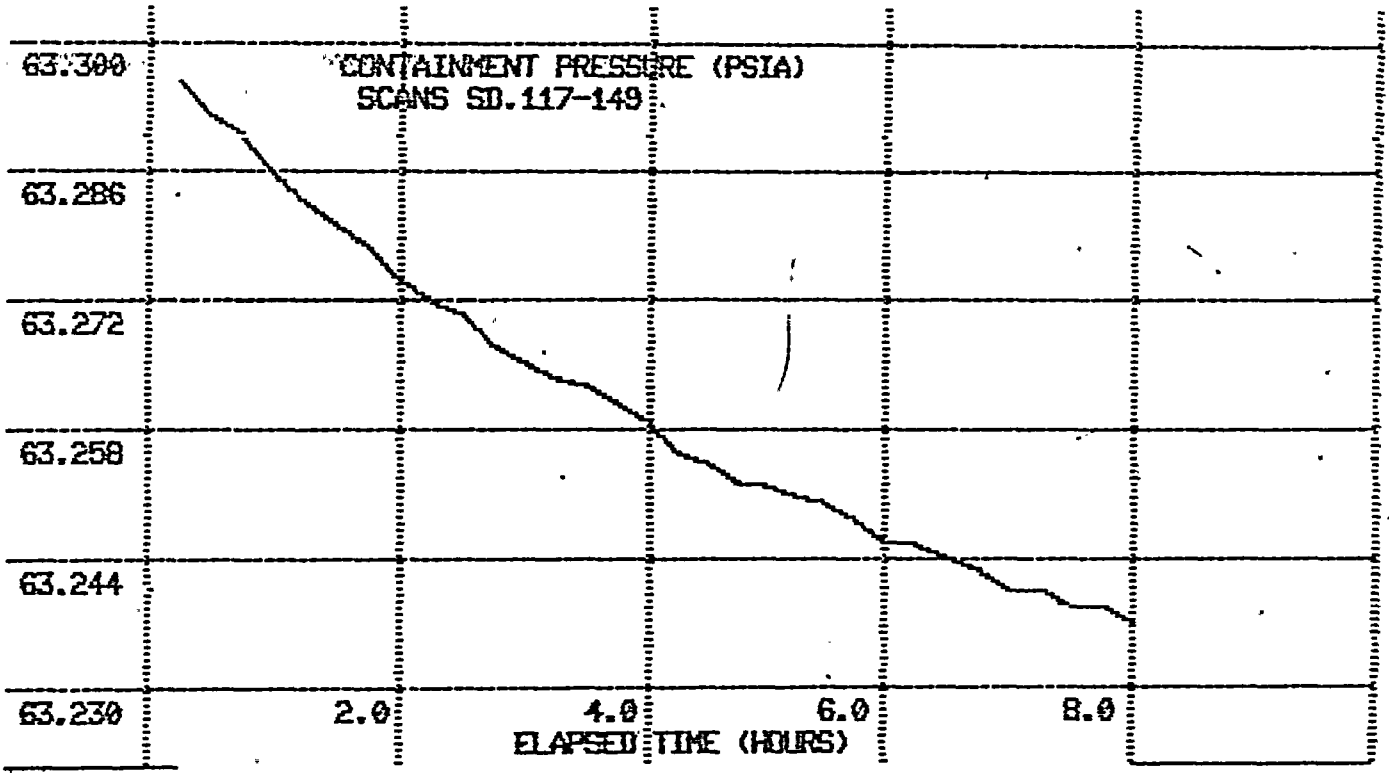
STARTING DAY - 356 STARTING TIME - 5:30: 0 STARTING SCAN - SD.117 ENDING SCAN - SD.149

ILRT RESULTS AFTER 8.00 HRS.

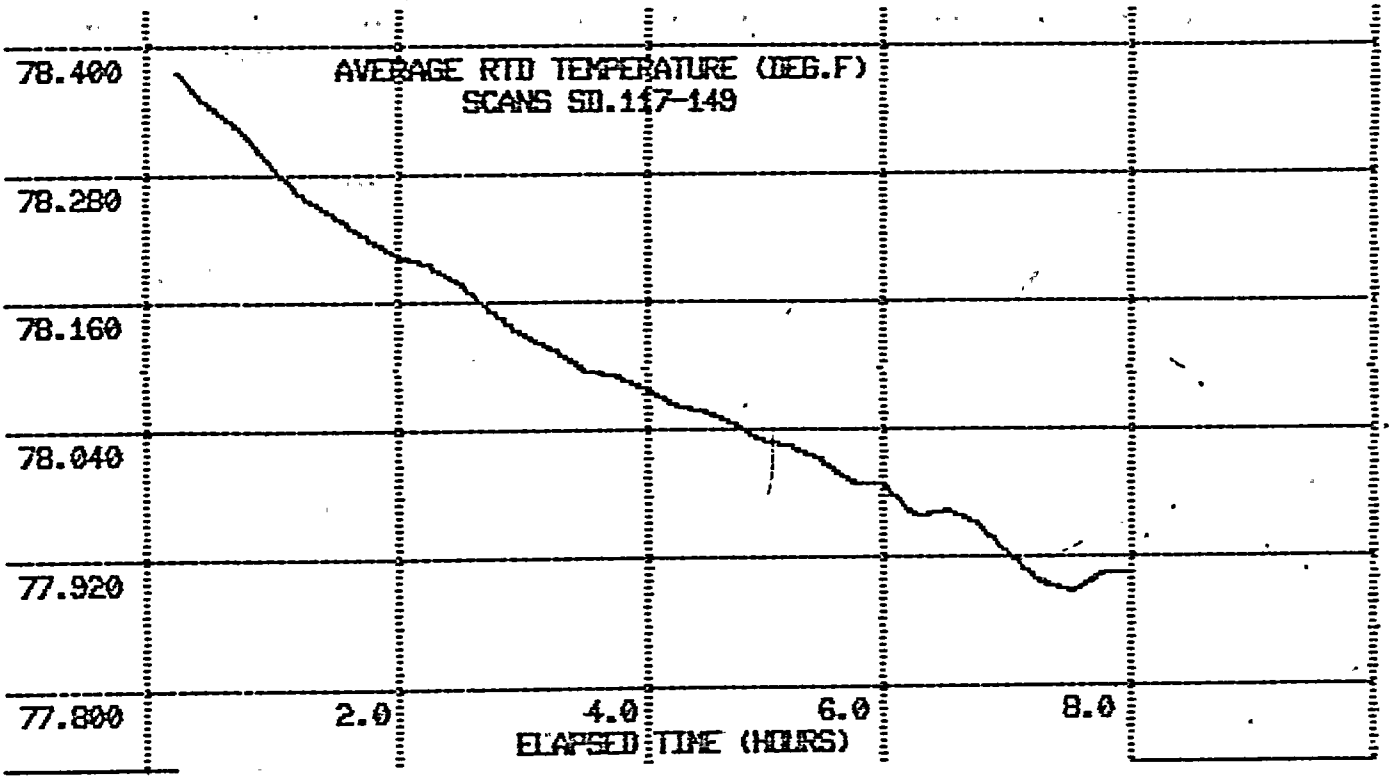
POINT TO POINT	TOTAL TIME		MASS PLOT	
AVERAGE MEASURED LEAK RATES (WEIGHT PERCENT PER DAY)				
LEAK RATE	LEAK RATE	STD.DEV.	LEAK RATE	STD.DEV.
-0.815E-02	0.221E-01	0.226E-01	0.222E-01	0.226E-01

CALCULATED LEAK RATES (WEIGHT PERCENT PER DAY)						
LEAK RATE	LEAK RATE	STD.DEV.	UPPER CON. LIMIT	LEAK RATE	STD.DEV.	UPPER CON.LIMIT
-0.862E-01	0.940E-02	0.526E-02	0.183E-01	0.573E-02	0.497E-02	0.142E-01

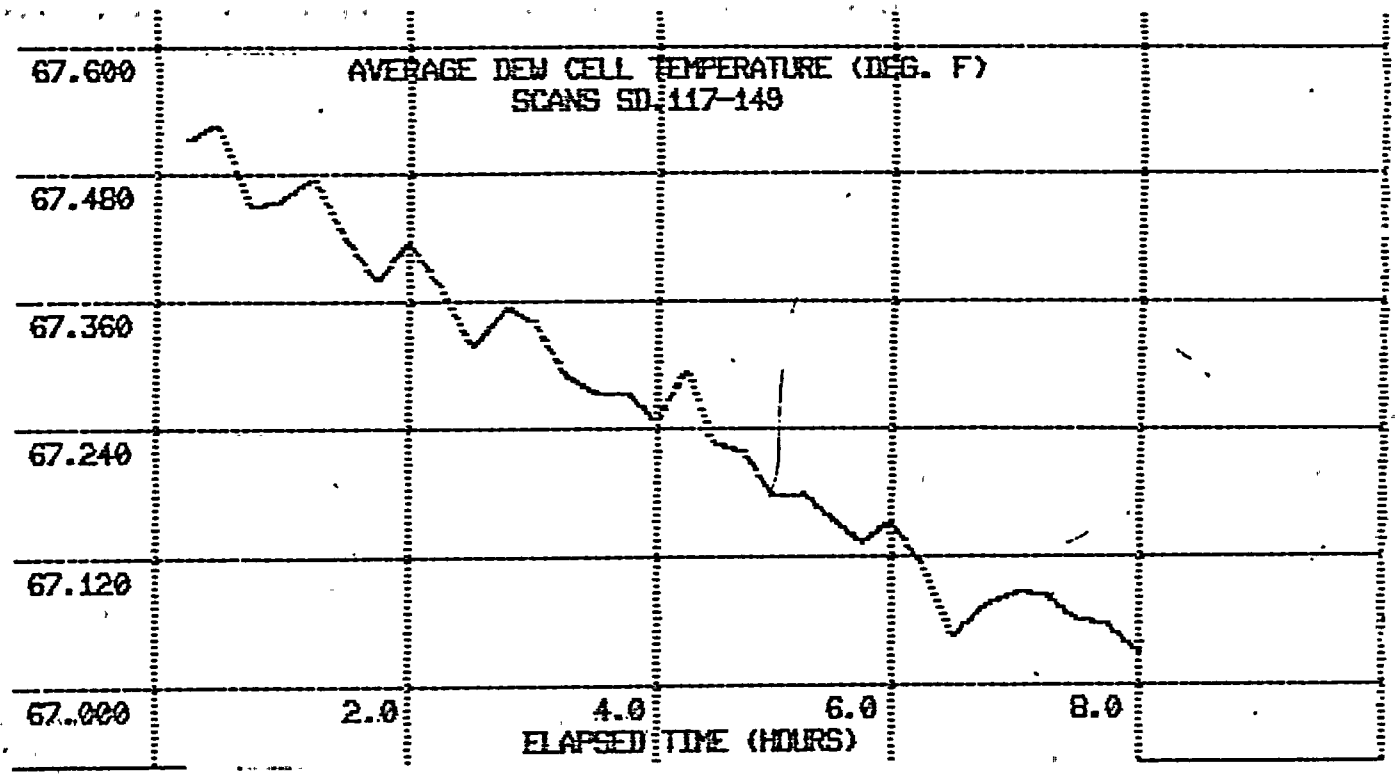
ILRT


CONTAINMENT PRESSURE (PSIA)
SCANS SD.117-149
63.300
63.286
63.272
63.258
63.244
63.230
2.0
4.0
6.0
8.0
ELAPSED TIME (HOURS)

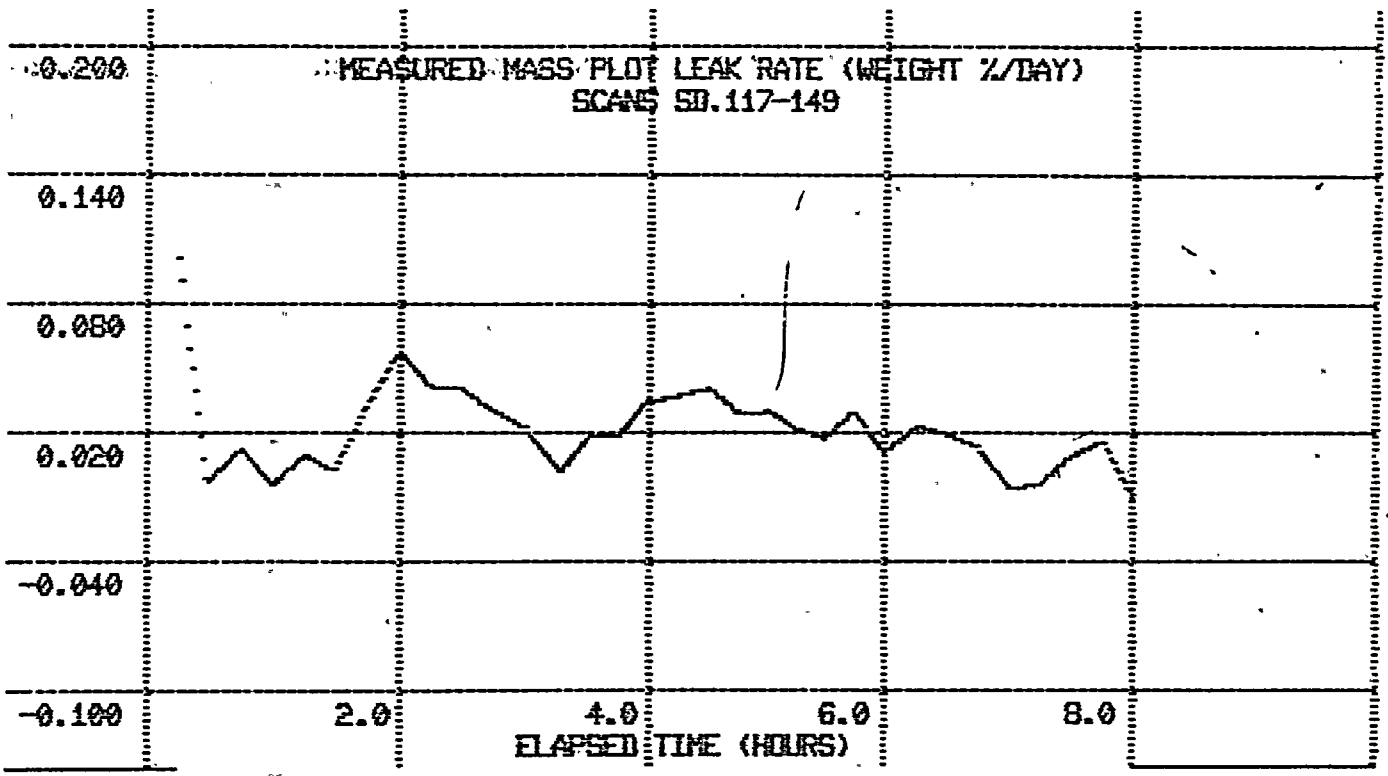
ILRT


AVERAGE RTD TEMPERATURE (DEG.F)
SCANS SD.147-149
78.400
78.280
78.160
78.040
77.920
77.800
2.0
4.0
6.0
8.0
ELAPSED TIME (HOURS)

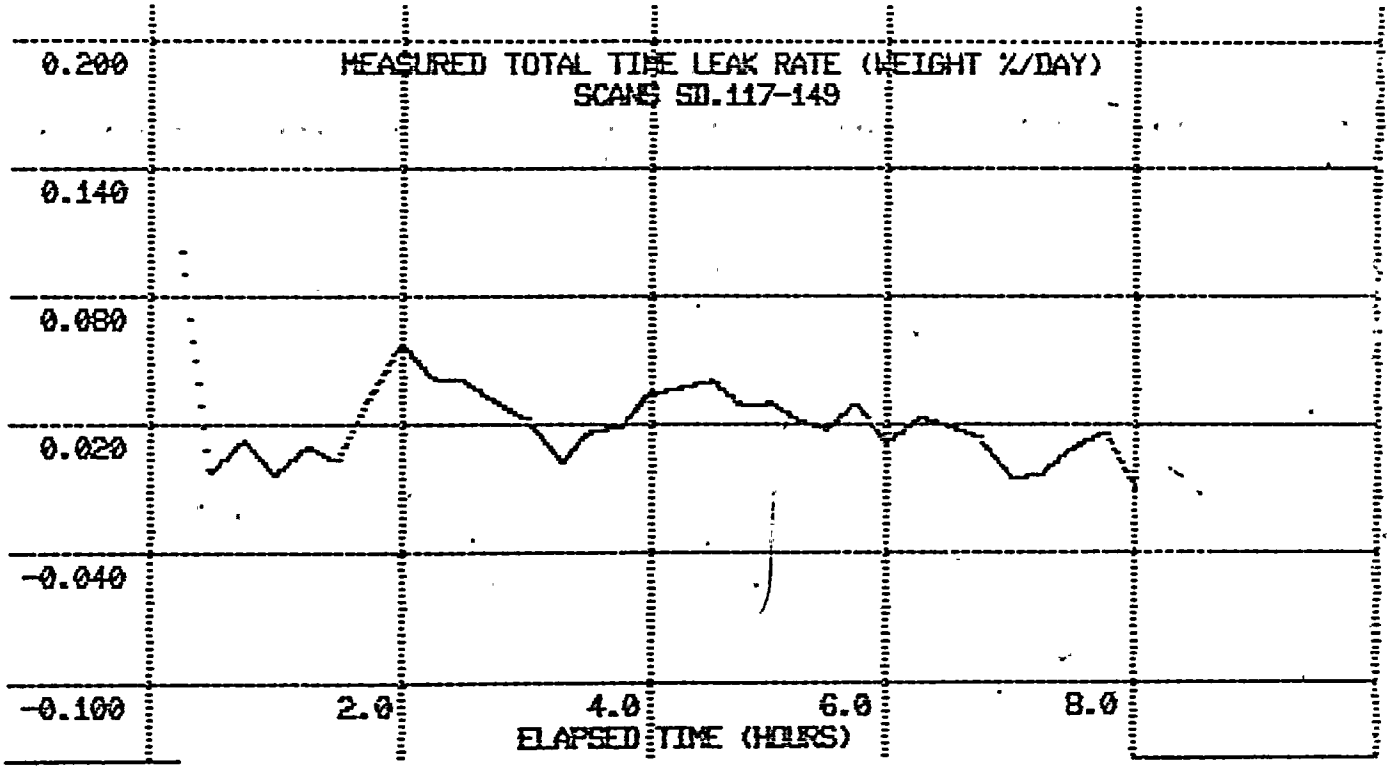
ILRT


AVERAGE DEW CELL TEMPERATURE (DEG. F)
SCANS SD-117-149
67.600
67.480
67.360
67.240
67.120
67.000
2.0
4.0
6.0
8.0
ELAPSED TIME (HOURS)

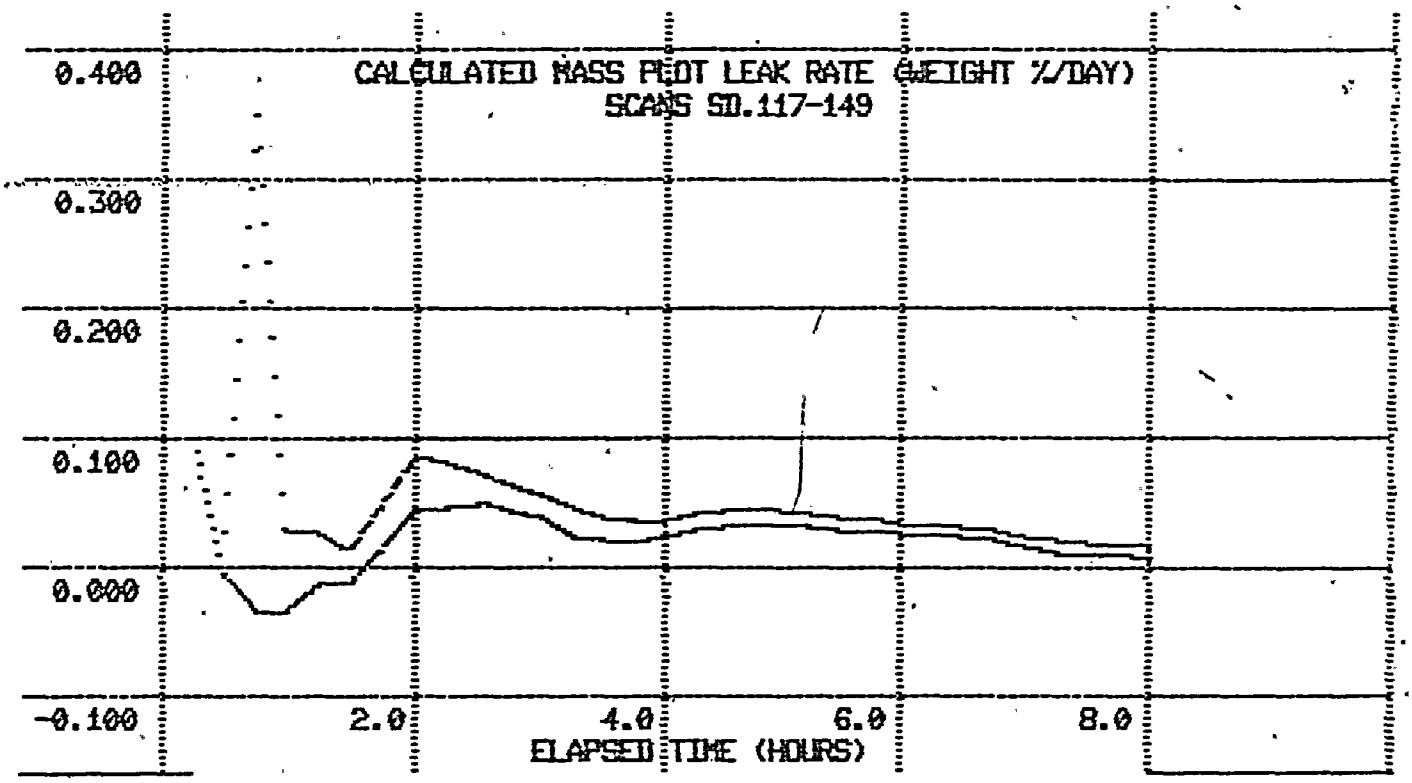
ILRT


MEASURED MASS PLOT LEAK RATE (WEIGHT %/DAY)
SCANS SD.117-149
0.200
0.140
0.080
0.020
-0.040
-0.100
2.0
4.0
6.0
8.0
ELAPSED TIME (HOURS)

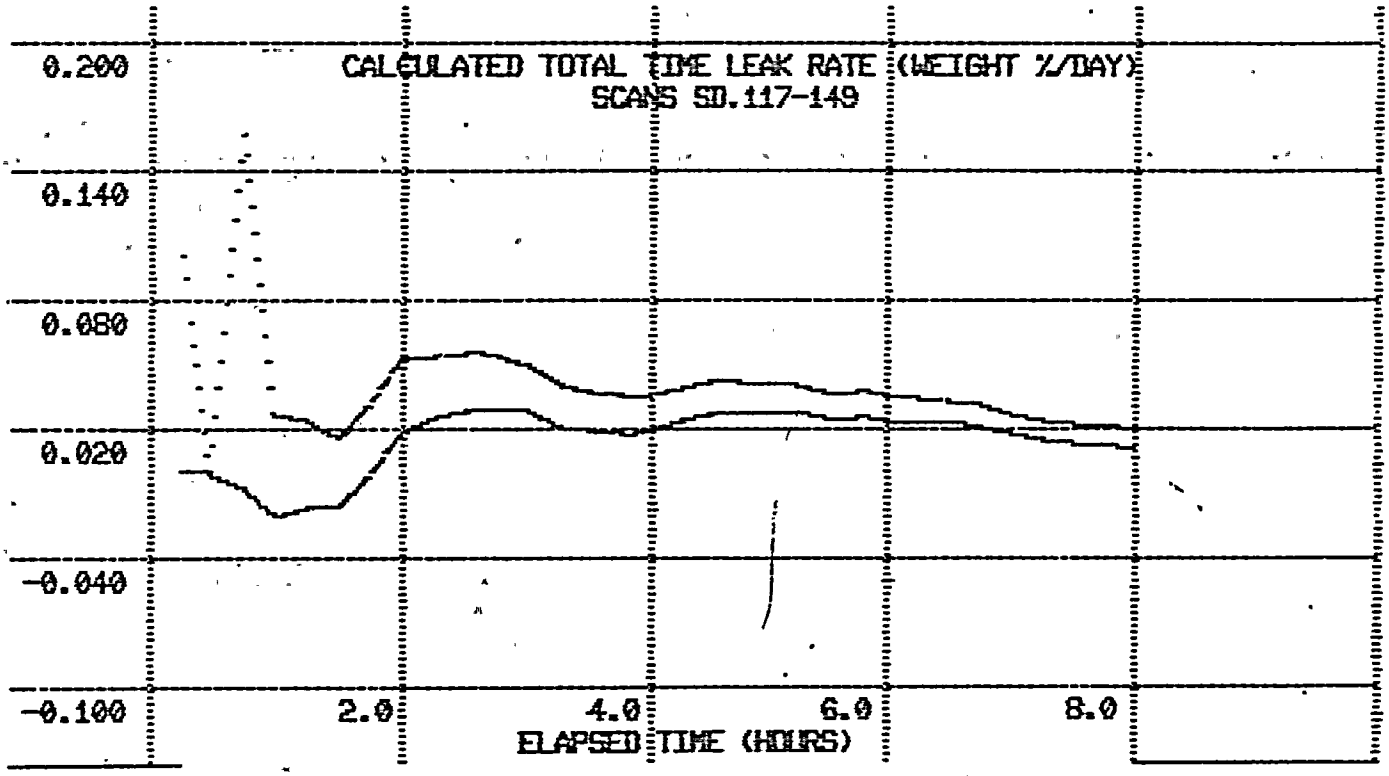
ILRT


MEASURED TOTAL TIME LEAK RATE (WEIGHT %/DAY)
SCANS SD.117-149
0.200
0.140
0.080
0.020
-0.040
-0.100
2.0
4.0
6.0
8.0
ELAPSED TIME (HOURS)

ILRT


CALCULATED MASS POINT LEAK RATE (WEIGHT %/DAY)
SCANS SD.117-149
0.400
0.300
0.200
0.100
0.000
-0.100
2.0
4.0
6.0
8.0
ELAPSED TIME (HOURS)

ILRT


CALCULATED TOTAL TIME LEAK RATE (WEIGHT %/DAY)
SCANS SD.117-149
0.200
0.140
0.080
0.020
-0.040
-0.100
2.0
4.0
6.0
8.0
ELAPSED TIME (HOURS)

3.

CONTROLLED LEAK RATE TEST

(CLRT)

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RAW DATA SUMMARY REPORT

SCAN NO.	DATE	TIME	PRESS 1	PRESS 2	RTD #1	RTD #2	RTD #3	RTD #4	RTD #5	RTD #6	RTD #7	RTD #8	RTD #9
SD.169	356	19: 0	62.822	64.269	78.247	77.770	78.907	78.181	78.651	78.443	76.658	75.271	76.466
SD.170	356	19:15	62.821	64.269	78.250	77.750	78.892	78.230	78.840	78.460	76.612	75.241	76.472
SD.171	356	19:30	62.819	64.267	78.225	77.740	78.912	78.225	78.817	78.414	76.640	75.230	76.440
SD.172	356	19:45	62.817	64.265	78.250	77.750	78.887	78.228	78.819	78.434	76.660	75.256	76.461
SD.173	356	20: 0	62.816	64.264	78.271	77.740	78.881	78.219	78.807	78.436	76.651	75.242	76.445
SD.174	356	20:15	62.814	64.262	78.268	77.770	78.906	78.210	78.811	78.480	76.649	75.231	76.438
SD.175	356	20:30	62.813	64.261	78.228	77.720	78.866	78.212	78.779	78.443	76.658	75.233	76.449
SD.176	356	20:45	62.811	64.258	78.212	77.770	78.881	78.181	78.797	78.431	76.611	75.231	76.425
SD.177	356	21: 0	62.809	64.258	78.230	77.750	78.904	78.201	78.802	78.445	76.615	75.201	76.429
SD.178	356	21:15	62.807	64.256	78.250	77.720	78.842	78.187	78.764	78.476	76.644	75.218	76.440
SD.179	356	21:30	62.806	64.254	78.237	77.740	78.855	78.216	78.767	78.437	76.640	75.233	76.431
SD.180	356	21:45	62.804	64.252	78.234	77.720	78.845	78.204	78.776	78.425	76.606	75.198	76.416
SD.181	356	22: 0	62.802	64.251	78.215	77.750	78.846	78.213	78.761	78.454	76.617	75.189	76.452
SD.182	356	22:15	62.801	64.250	78.195	77.720	78.859	78.181	78.764	78.393	76.632	75.195	76.416
SD.183	356	22:30	62.799	64.249	78.230	77.710	78.865	78.224	78.764	78.443	76.606	75.196	76.435
SD.184	356	22:45	62.798	64.247	78.190	77.720	78.840	78.198	78.755	78.419	76.620	75.174	76.382
SD.185	356	23: 0	62.796	64.245	78.170	77.710	78.823	78.114	78.750	78.387	76.602	75.177	76.390
SD.186	356	23:15	62.794	64.244	78.175	77.690	78.817	78.176	78.738	78.390	76.580	75.161	76.356
SD.187	356	23:30	62.793	64.242	78.155	77.710	78.813	78.150	78.749	78.350	76.554	75.157	76.359
SD.188	356	23:45	62.792	64.241	78.094	77.630	78.819	78.051	78.721	78.320	76.532	75.082	76.293
SD.189	357	0: 0	62.791	64.240	78.096	77.620	78.808	78.085	78.715	78.309	76.509	75.088	76.287
SD.190	357	0:15	62.789	64.238	78.067	77.630	78.799	78.067	78.694	78.268	76.522	75.077	76.310
SD.191	357	0:30	62.788	64.236	78.071	77.590	78.804	78.089	78.730	78.303	76.521	75.054	76.284
SD.192	357	0:45	62.786	64.235	78.079	77.620	78.791	78.091	78.698	78.270	76.515	75.059	76.274
SD.193	357	1: 0	62.785	64.233	78.071	77.570	78.776	78.038	78.697	78.266	76.503	75.062	76.287
SD.194	357	1:15	62.783	64.232	78.028	77.590	78.772	78.015	78.688	78.285	76.489	75.050	76.266
SD.195	357	1:30	62.782	64.231	78.035	77.570	78.770	78.038	78.686	78.257	76.486	75.047	76.261
SD.196	357	1:45	62.781	64.229	78.064	77.590	78.767	78.064	78.669	78.256	76.484	75.053	76.261

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RAW DATA SUMMARY REPORT

SCAN NO.	RTD #10	RTD #11	RTD #12	RTD #13	RTD #14	RTD #15	RTD #16	RTD #17	RTD #18	RTD #19	RTD #20
SD.169	76.731	75.189	74.128	74.678	73.382	73.600	75.614	76.614	75.650	76.582	77.815
SD.170	76.724	75.195	74.092	74.691	73.367	73.584	75.592	76.617	75.596	76.565	77.793
SD.171	76.710	75.170	74.116	74.655	73.367	73.606	75.605	76.609	75.604	76.561	77.827
SD.172	76.715	75.154	74.104	74.684	73.353	73.596	75.599	76.599	75.598	76.565	77.795
SD.173	76.715	75.210	74.125	74.673	73.355	73.571	75.598	76.596	75.610	76.590	77.819
SD.174	76.719	75.224	74.116	74.649	73.370	73.574	75.578	76.582	75.602	76.579	77.764
SD.175	76.712	75.177	74.133	74.653	73.344	73.649	75.587	76.574	75.628	76.564	77.795
SD.176	76.689	75.140	74.099	74.650	73.352	73.611	75.602	76.577	75.613	76.579	77.781
SD.177	76.701	75.157	74.104	74.638	73.346	73.524	75.579	76.565	75.576	76.557	77.795
SD.178	76.693	75.204	74.147	74.671	73.347	73.584	75.589	76.545	75.582	76.585	77.787
SD.179	76.686	75.189	74.133	74.627	73.349	73.571	75.569	76.548	75.585	76.585	77.789
SD.180	76.709	75.187	74.102	74.649	73.342	73.593	75.575	76.557	75.572	76.576	77.781
SD.181	76.715	75.149	74.116	74.665	73.327	73.582	75.581	76.559	75.589	76.573	77.751
SD.182	76.675	75.138	74.102	74.624	73.339	73.561	75.575	76.547	75.599	76.554	77.754
SD.183	76.695	75.129	74.104	74.626	73.349	73.555	75.573	76.533	75.575	76.557	77.801
SD.184	76.681	75.158	74.093	74.638	73.317	73.539	75.561	76.518	75.560	76.544	77.815
SD.185	76.669	75.122	74.070	74.623	73.313	73.613	75.567	76.538	75.552	76.513	77.767
SD.186	76.652	75.096	74.058	74.595	73.312	73.512	75.555	76.510	75.570	76.504	77.803
SD.187	76.670	75.056	74.050	74.615	73.292	73.512	75.549	76.477	75.570	76.521	77.766
SD.188	76.562	75.070	73.997	74.562	73.234	73.477	75.497	76.493	75.486	76.438	77.738
SD.189	76.580	75.044	74.006	74.559	73.242	73.548	75.505	76.489	75.509	76.454	77.723
SD.190	76.559	74.989	74.028	74.552	73.239	73.492	75.497	76.499	75.468	76.437	77.710
SD.191	76.532	75.033	74.012	74.574	73.213	73.410	75.485	76.472	75.450	76.466	77.690
SD.192	76.577	75.056	73.986	74.540	73.205	73.434	75.483	76.467	75.463	76.428	77.710
SD.193	76.542	75.025	73.994	74.543	73.208	73.442	75.477	76.496	75.459	76.429	77.751
SD.194	76.521	74.981	73.971	74.531	73.187	73.442	75.497	76.448	75.441	76.435	77.731
SD.195	76.525	74.997	73.957	74.510	73.205	73.458	75.473	76.460	75.428	76.431	77.699
SD.196	76.527	75.003	73.948	74.520	73.184	73.414	75.459	76.463	75.437	76.416	77.671

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RAW DATA SUMMARY REPORT

SCAN NO.	RTD #21	RTD #22	RTD #23	RTD #24	DEW CELL #1	DEW CELL #2	DEW CELL #3	DEW CELL #4	DEW CELL #5	DEW CELL #6
SD.169	74.954	77.204	74.919	75.100	66.957	31.695	66.235	66.362	66.803	66.842
SD.170	74.939	77.175	74.877	75.076	67.089	31.698	66.207	66.487	66.799	66.886
SD.171	74.935	77.171	74.913	75.074	67.057	31.692	66.224	66.464	66.809	66.861
SD.172	74.934	77.163	74.882	75.093	66.998	31.692	66.209	66.494	66.810	67.004
SD.173	74.945	77.151	74.900	75.094	67.031	31.692	66.172	66.343	66.749	66.871
SD.174	74.922	77.179	74.894	75.093	67.015	31.689	66.157	66.400	66.789	66.926
SD.175	74.922	77.157	74.896	75.088	67.015	31.694	66.145	66.479	66.751	66.873
SD.176	74.916	77.157	74.896	75.079	66.989	31.692	66.166	66.247	66.728	66.960
SD.177	74.928	77.148	74.920	75.087	67.013	31.695	66.154	66.575	66.717	66.822
SD.178	74.928	77.133	74.939	75.094	66.980	31.694	66.122	66.241	66.708	66.854
SD.179	74.925	77.142	74.925	75.080	66.915	31.695	66.102	66.339	66.697	66.874
SD.180	74.928	77.130	74.906	75.067	66.978	31.691	66.104	66.149	66.668	66.784
SD.181	74.917	77.151	74.888	75.064	66.920	31.695	66.090	66.253	66.690	66.871
SD.182	74.890	77.117	74.879	75.059	66.944	31.698	66.027	66.249	66.674	66.746
SD.183	74.896	77.111	74.890	75.061	66.867	31.695	66.078	66.204	66.674	66.774
SD.184	74.899	77.099	74.844	75.045	66.868	31.694	66.033	66.105	66.708	66.781
SD.185	74.874	77.093	74.821	75.054	66.827	31.694	66.009	66.259	66.664	66.822
SD.186	74.870	77.113	74.882	75.029	66.844	31.697	66.004	66.247	66.673	66.784
SD.187	74.879	77.095	74.821	75.032	66.796	31.695	65.962	66.059	66.621	66.720
SD.188	74.807	77.110	74.816	74.955	66.856	31.694	65.963	66.001	66.626	66.706
SD.189	74.801	77.087	74.760	74.964	66.835	31.695	65.991	66.236	66.624	66.725
SD.190	74.798	77.070	74.777	74.958	66.870	31.692	65.914	66.272	66.537	66.716
SD.191	74.792	77.052	74.784	74.955	66.790	31.691	65.954	66.221	66.577	66.760
SD.192	74.772	77.075	74.824	74.951	66.780	31.698	65.918	66.090	66.587	66.719
SD.193	74.774	77.030	74.777	74.949	66.803	31.694	65.911	65.986	66.606	66.690
SD.194	74.772	77.040	74.769	74.940	66.793	31.691	65.890	66.252	66.536	66.737
SD.195	74.768	77.055	74.723	74.925	66.767	31.692	65.931	66.093	66.540	66.659
SD.196	74.762	77.047	74.771	74.934	66.754	31.692	65.901	66.270	66.571	66.687

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
RELATIVE HUMIDITY PROGRAM

SCAN NO.	AVERAGE DEW POINT TEMPERATURE (F)	AVERAGE CONTAINMENT TEMPERATURE (F)	AVERAGE VAPOR PRESSURE (PSIA)	AVERAGE RELATIVE HUMIDITY (%)
SD.169	66.568	76.403	0.322	71.634
SD.170	66.640	76.391	0.322	71.844
SD.171	66.626	76.387	0.322	71.817
SD.172	66.650	76.388	0.323	71.873
SD.173	66.558	76.391	0.322	71.639
SD.174	66.591	76.390	0.322	71.722
SD.175	66.608	76.383	0.322	71.782
SD.176	66.522	76.375	0.321	71.587
SD.177	66.636	76.373	0.322	71.874
SD.178	66.493	76.379	0.321	71.505
SD.179	66.522	76.375	0.321	71.587
SD.180	66.436	76.368	0.320	71.390
SD.181	66.484	76.369	0.321	71.508
SD.182	66.456	76.354	0.320	71.473
SD.183	66.438	76.361	0.320	71.411
SD.184	66.397	76.348	0.320	71.342
SD.185	66.450	76.334	0.320	71.506
SD.186	66.443	76.328	0.320	71.502
SD.187	66.335	76.318	0.319	71.260
SD.188	66.319	76.271	0.319	71.331
SD.189	66.419	76.271	0.320	71.579
SD.190	66.413	76.259	0.320	71.593
SD.191	66.399	76.254	0.320	71.570
SD.192	66.334	76.254	0.319	71.409
SD.193	66.292	76.244	0.319	71.328
SD.194	66.393	76.233	0.320	71.606
SD.195	66.319	76.228	0.319	71.434
SD.196	66.394	76.229	0.320	71.619

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
ILRT PROGRAM REPORT

STARTING DAY - 356 STARTING TIME - 19: 0: 0 STARTING SCAN - SD.169 ENDING SCAN - SD.196

SCAN NO.	ELAPSED TIME (HR)	AVERAGE TEMP. (F)	AVERAGE PRESSURE (PSIA)	POINT TO POINT MEASURED LEAK RATE	POINT TO POINT CALCULATED LEAK RATE	TOTAL TIME MEASURED LEAK RATE	TOTAL TIME CALCULATED LEAK RATE (WEIGHT PERCENT PER DAY)	TOTAL TIME UPPER CONFIDENCE	MASS PLOT MEASURED LEAK RATE	MASS PLOT CALCULATED LEAK RATE	MASS PLOT UPPER CONFIDENCE
SD.169	0.00	76.40	63.202								
SD.170	0.25	76.39	63.200	0.486E-01	0.486E-01	0.486E-01	0.486E-01	0.000E+00	0.486E-01	0.486E-01	0.000E+00
SD.171	0.50	76.39	63.198	0.221E+00	0.221E+00	0.134E+00	0.134E+00	0.000E+00	0.135E+00	0.135E+00	0.000E+00
SD.172	0.75	76.39	63.196	0.364E+00	0.369E+00	0.211E+00	0.213E+00	0.224E+00	0.211E+00	0.292E+00	0.645E+00
SD.173	1.00	76.39	63.196	0.429E-01	0.188E+00	0.169E+00	0.207E+00	0.272E+00	0.169E+00	0.226E+00	0.353E+00
SD.174	1.25	76.39	63.194	0.355E+00	0.293E+00	0.206E+00	0.224E+00	0.268E+00	0.206E+00	0.238E+00	0.299E+00
SD.175	1.50	76.38	63.193	0.498E-01	0.187E+00	0.180E+00	0.218E+00	0.261E+00	0.180E+00	0.214E+00	0.260E+00
SD.176	1.75	76.37	63.192	0.166E-01	0.109E+00	0.157E+00	0.202E+00	0.247E+00	0.157E+00	0.186E+00	0.232E+00
SD.177	2.00	76.37	63.188	0.466E+00	0.248E+00	0.195E+00	0.208E+00	0.245E+00	0.196E+00	0.196E+00	0.232E+00
SD.178	2.25	76.38	63.188	0.172E+00	0.229E+00	0.193E+00	0.210E+00	0.243E+00	0.193E+00	0.199E+00	0.226E+00
SD.179	2.50	76.37	63.186	0.128E+00	0.200E+00	0.186E+00	0.209E+00	0.240E+00	0.186E+00	0.197E+00	0.218E+00
SD.180	2.75	76.37	63.185	0.298E-01	0.148E+00	0.172E+00	0.204E+00	0.233E+00	0.172E+00	0.188E+00	0.208E+00
SD.181	3.00	76.37	63.183	0.413E+00	0.223E+00	0.192E+00	0.205E+00	0.232E+00	0.192E+00	0.192E+00	0.209E+00
SD.182	3.25	76.35	63.182	-0.167E+00	0.120E+00	0.164E+00	0.199E+00	0.225E+00	0.165E+00	0.182E+00	0.199E+00
SD.183	3.50	76.36	63.180	0.410E+00	0.189E+00	0.182E+00	0.198E+00	0.222E+00	0.182E+00	0.183E+00	0.198E+00
SD.184	3.75	76.35	63.180	-0.158E+00	0.106E+00	0.159E+00	0.192E+00	0.216E+00	0.159E+00	0.175E+00	0.190E+00
SD.185	4.00	76.33	63.177	0.154E+00	0.111E+00	0.159E+00	0.187E+00	0.210E+00	0.159E+00	0.169E+00	0.183E+00
SD.186	4.25	76.33	63.175	0.180E+00	0.120E+00	0.160E+00	0.183E+00	0.205E+00	0.160E+00	0.165E+00	0.178E+00
SD.187	4.50	76.32	63.175	-0.211E+00	0.487E-01	0.140E+00	0.175E+00	0.197E+00	0.140E+00	0.156E+00	0.171E+00
SD.188	4.75	76.27	63.175	-0.714E+00	-0.108E+00	0.947E-01	0.160E+00	0.184E+00	0.947E-01	0.135E+00	0.160E+00
SD.189	5.00	76.27	63.173	0.318E+00	-0.476E-01	0.106E+00	0.150E+00	0.174E+00	0.106E+00	0.123E+00	0.148E+00
SD.190	5.25	76.26	63.171	0.853E-01	-0.373E-01	0.105E+00	0.141E+00	0.165E+00	0.105E+00	0.113E+00	0.138E+00
SD.191	5.50	76.25	63.170	0.412E-01	-0.358E-01	0.102E+00	0.133E+00	0.156E+00	0.102E+00	0.105E+00	0.129E+00
SD.192	5.75	76.25	63.168	0.197E+00	-0.874E-02	0.106E+00	0.127E+00	0.149E+00	0.106E+00	0.100E+00	0.123E+00
SD.193	6.00	76.24	63.168	-0.858E-01	-0.296E-01	0.980E-01	0.120E+00	0.142E+00	0.980E-01	0.943E-01	0.115E+00
SD.194	6.25	76.23	63.165	0.269E+00	0.595E-02	0.105E+00	0.116E+00	0.136E+00	0.105E+00	0.914E-01	0.111E+00
SD.195	6.50	76.23	63.165	-0.629E-01	-0.111E-01	0.984E-01	0.111E+00	0.131E+00	0.984E-01	0.877E-01	0.106E+00
SD.196	6.75	76.23	63.163	0.294E+00	0.241E-01	0.106E+00	0.108E+00	0.127E+00	0.106E+00	0.862E-01	0.103E+00

ARIZONA PUBLIC SERVICE COMPANY
PALO VERDE NUCLEAR GENERATING STATION
ILRT PROGRAM REPORT

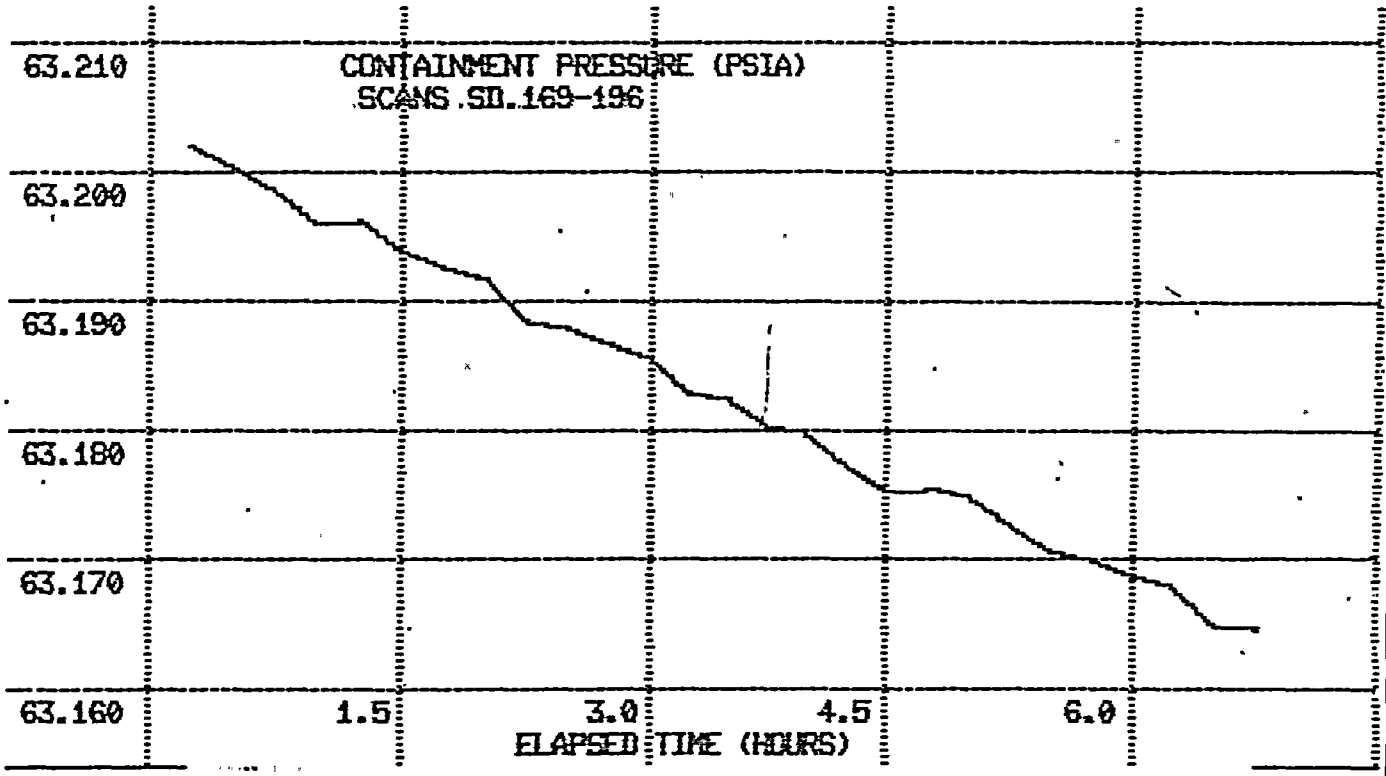
STARTING DAY - 356 STARTING TIME - 19: 0: 0 STARTING SCAN - SD.169 ENDING SCAN - SD.196

ILRT RESULTS AFTER 6.75 HRS.

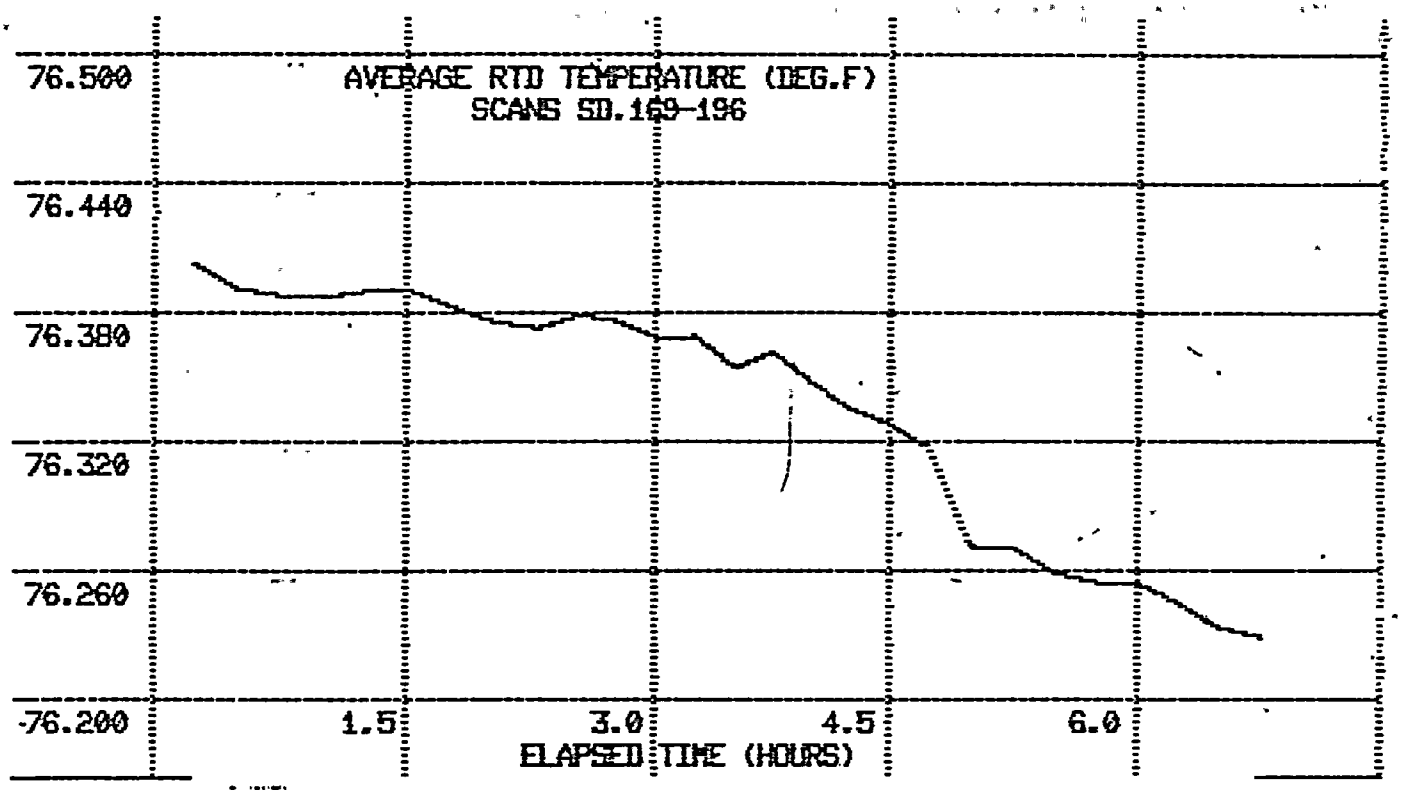
POINT TO POINT	TOTAL TIME		MASS PLOT	
AVERAGE MEASURED LEAK RATES (WEIGHT PERCENT PER DAY)				
LEAK RATE	LEAK RATE	STD.DEV.	LEAK RATE	STD.DEV.
0.106E+00	0.146E+00	0.506E-01	0.146E+00	0.506E-01

CALCULATED LEAK RATES (WEIGHT PERCENT PER DAY)						
LEAK RATE	LEAK RATE	STD.DEV.	UPPER CON. LIMIT	LEAK RATE	STD.DEV.	UPPER CON.LIMIT
0.241E-01	0.108E+00	0.111E-01	0.126E+00	0.862E-01	0.998E-02	0.103E+00

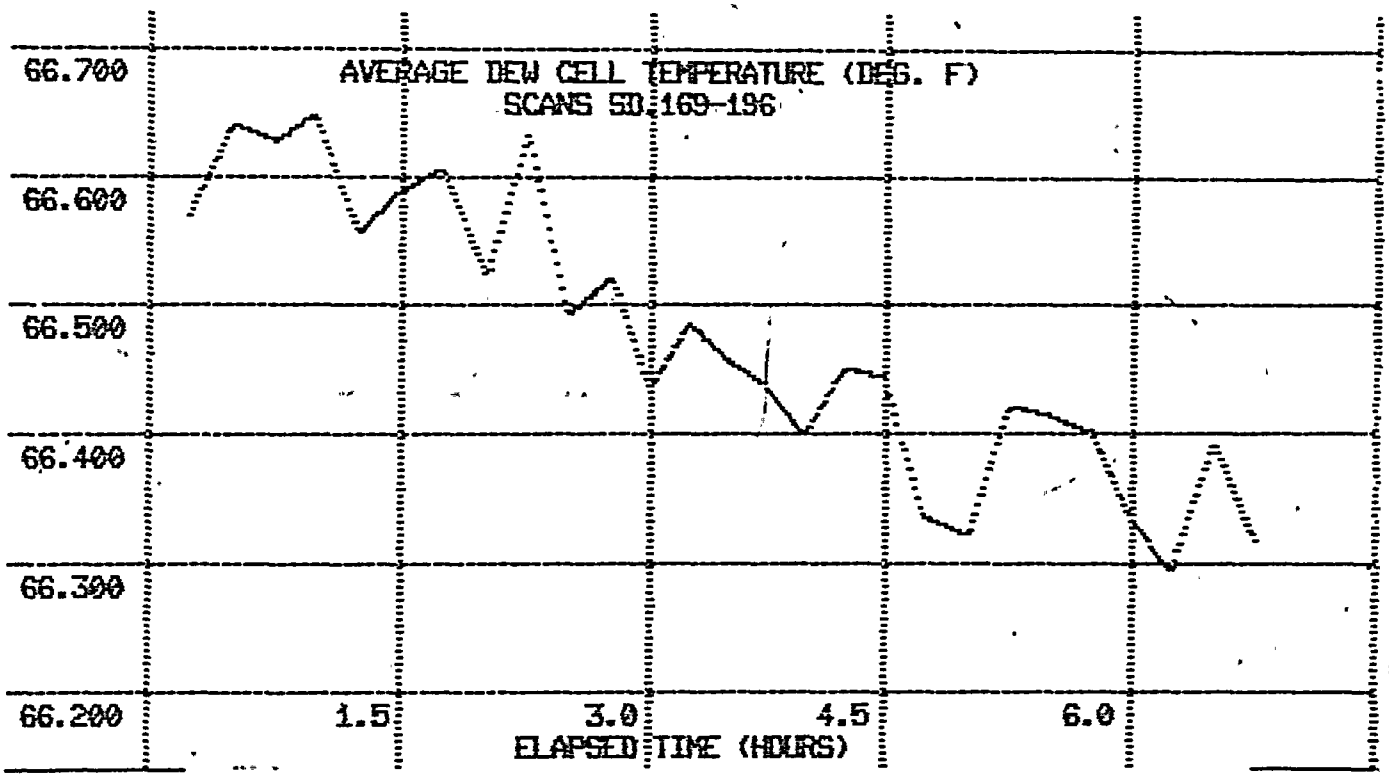
CLRT


CONTAINMENT PRESSURE (PSIA)
SCANS SD.169-196
63.210
63.200
63.190
63.180
63.170
63.160
1.5
3.0
4.5
6.0
ELAPSED TIME (HOURS)

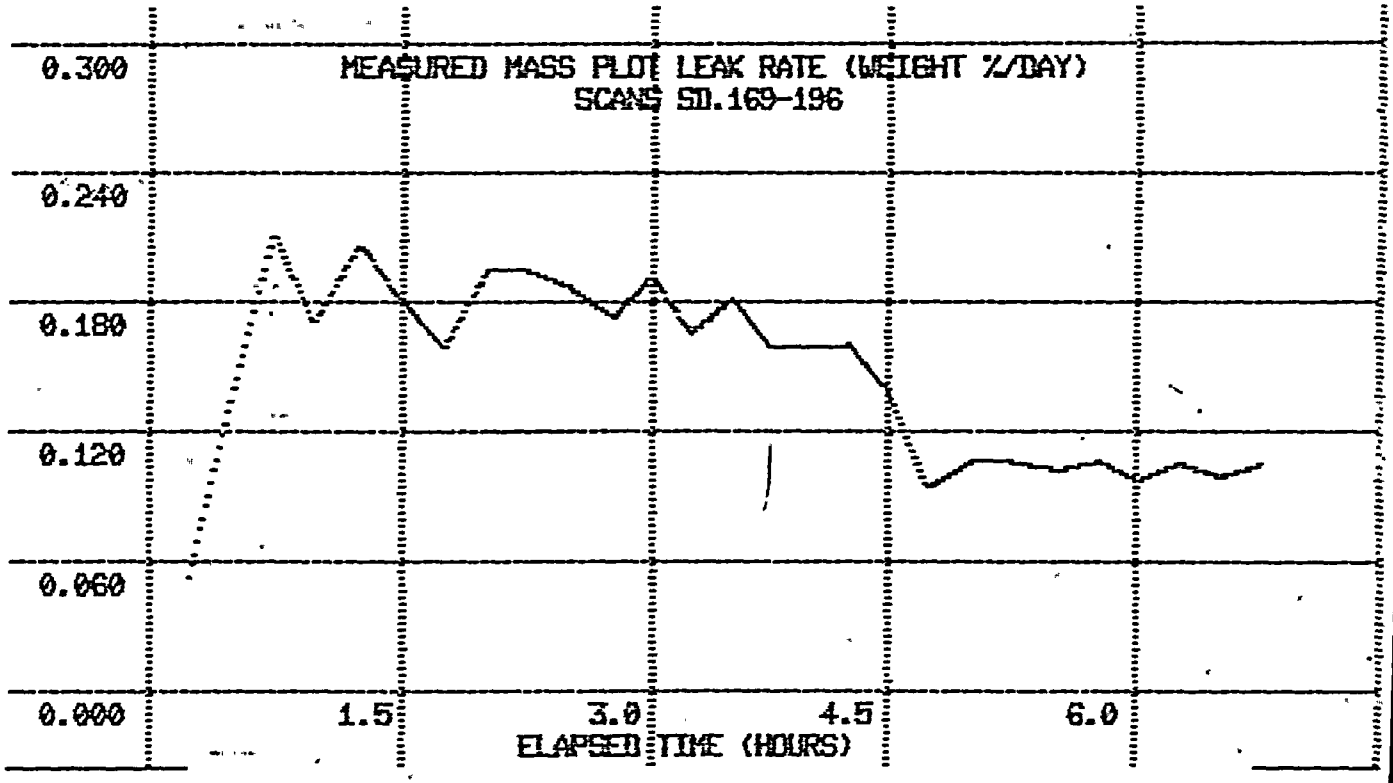
CLRT


76.500
AVERAGE RTD TEMPERATURE (DEG.F)
SCANS SD.169-196
76.440
76.380
76.320
76.260
76.200
1.5
3.0
4.5
6.0
ELAPSED TIME (HOURS)

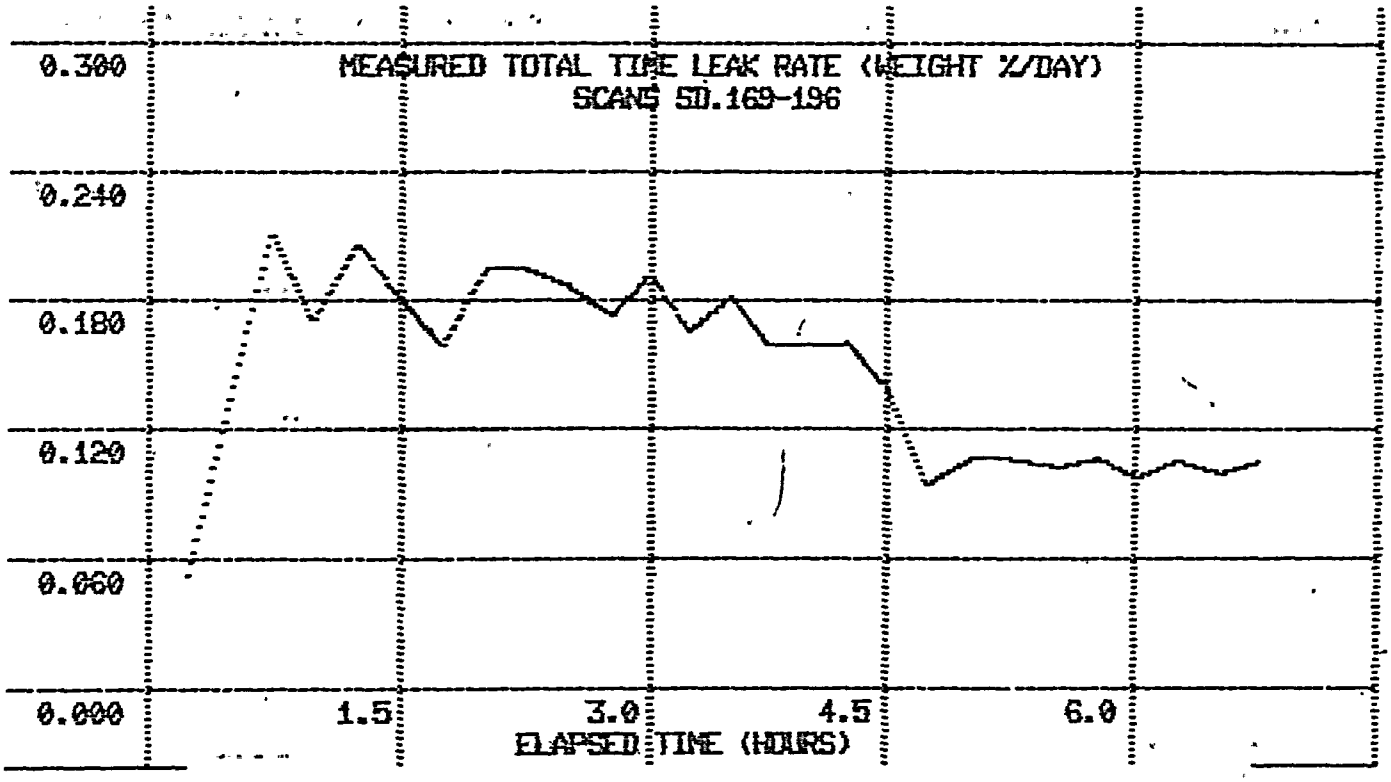
CLRT


AVERAGE DEW CELL TEMPERATURE (DEG. F)
SCANS SD 169-196
66.700
66.600
66.500
66.400
66.300
66.200
1.5
3.0
4.5
6.0
ELAPSED TIME (HOURS)

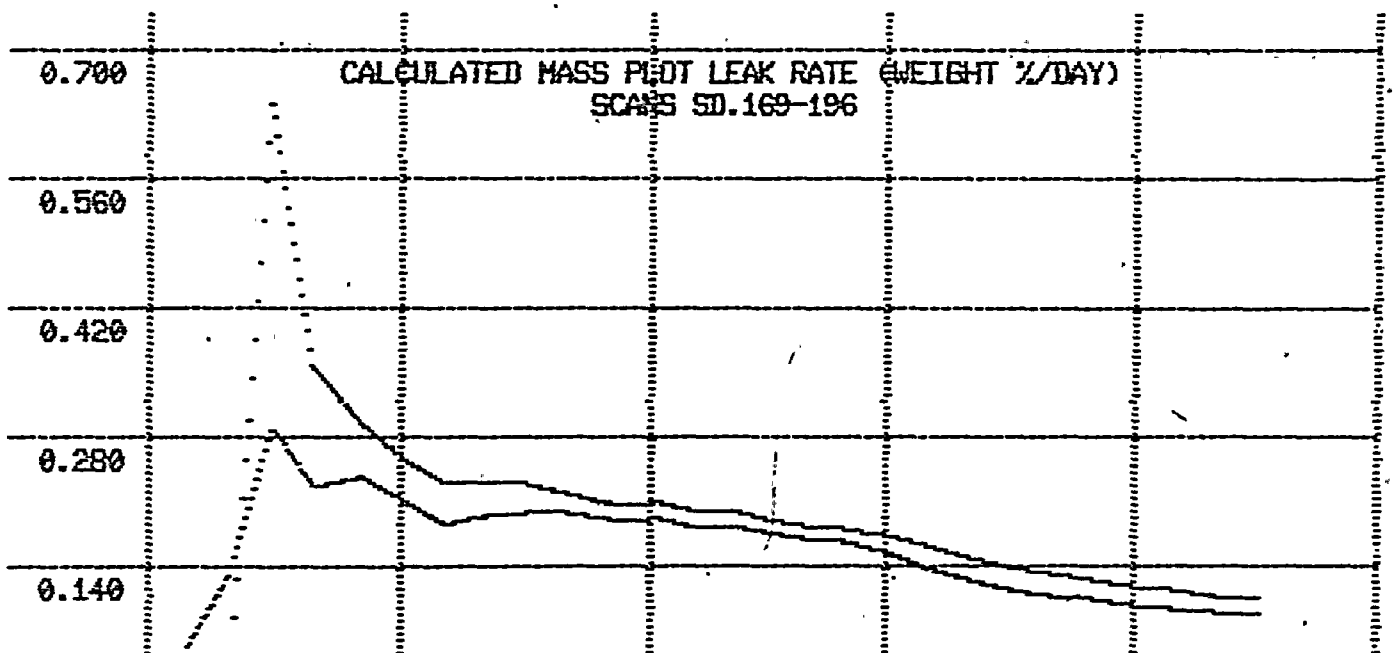
CLRT


MEASURED MASS PLOT LEAK RATE (WEIGHT %/DAY)
SCANS SD.169-196
0.300
0.240
0.180
0.120
0.060
0.000
1.5
3.0
4.5
6.0
ELAPSED TIME (HOURS)

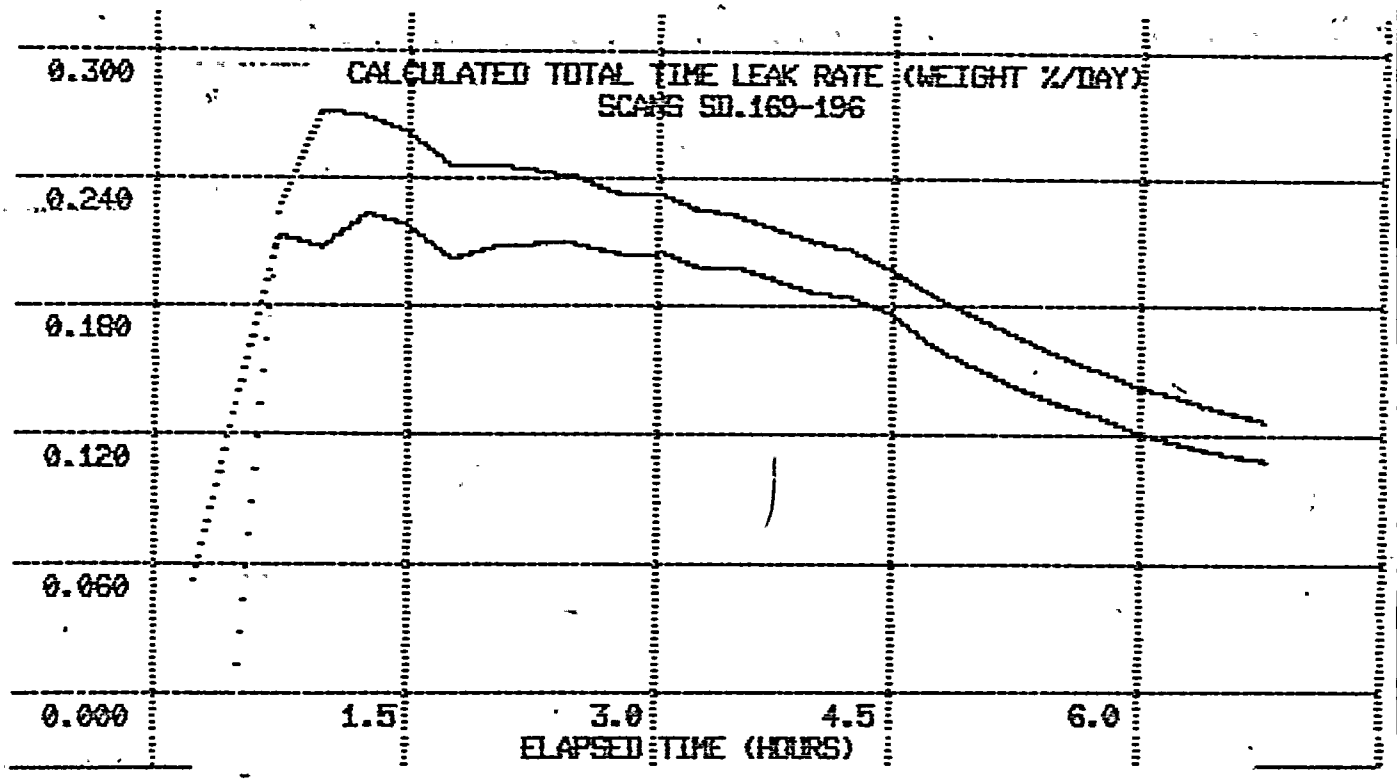
CLRT


MEASURED TOTAL TIME LEAK RATE (WEIGHT %/DAY)
SCANS 50.169-196
0.300
0.240
0.180
0.120
0.060
0.000
1.5
3.0
4.5
6.0
ELAPSED TIME (HOURS)

CLRT


CALCULATED MASS PLOT LEAK RATE (WEIGHT %/DAY)
SCANS SD.169-196
0.700
0.560
0.420
0.280
0.140
0.000
1.5
3.0
4.5
6.0
ELAPSED TIME (HOURS)

CLRT


CALCULATED TOTAL TIME LEAK RATE (WEIGHT %/DAY)
SCANS SD.169-196
0.300
0.240
0.180
0.120
0.060
0.000
1.5
3.0
4.5
6.0
ELAPSED TIME (HOURS)

4.

GENERAL

ARIZONA PUBLIC SERVICE COMPANY

PALO VERDE NUCLEAR GENERATING STATION

PRESSURE GAUGE CALIBRATION PROGRAM

CALIBRATION POINT	TRUE PRESSURE	PRESSURE GAUGE 1			PRESSURE GAUGE 2		
		GAUGE READING	MULTIPLICATION FACTOR	CORRECTION CONSTANT	GAUGE READING	MULTIPLICATION FACTOR	CORRECTION CONSTANT
1	0.000	* 0.000			* 0.000		
		*----------<	1.01586	0.000	*----------<	0.98794	0.000
2	4.995	* 4.917			* 5.056		
		*----------<	1.01648	-0.003	*----------<	0.98794	0.000
3	9.990	* 9.831			* 10.112		
		*----------<	1.01483	0.013	*----------<	0.98774	0.002
4	14.986	* 14.754			* 15.170		
		*----------<	1.01318	0.037	*----------<	0.98911	-0.019
5	19.981	* 19.684			* 20.220		
		*----------<	1.01195	0.062	*----------<	0.98793	0.005
6	24.976	* 24.620			* 25.276		
		*----------<	1.01298	0.036	*----------<	0.99068	-0.064
7	29.971	* 29.551			* 30.318		
		*----------<	1.01032	0.115	*----------<	0.98424	0.131
8	34.966	* 34.495			* 35.393		
		*----------<	1.00991	0.129	*----------<	0.99107	-0.111
9	39.961	* 39.441			* 40.433		
		*----------<	1.00929	0.153	*----------<	0.98892	-0.024
10	44.957	* 44.391			* 45.485		
		*----------<	1.00807	0.208	*----------<	0.98930	-0.042
11	49.952	* 49.346			* 50.534		
		*----------<	1.00665	0.278	*----------<	0.98930	-0.042
12	54.947	* 54.308			* 55.583		
		*----------<	1.00766	0.223	*----------<	0.98833	0.012
13	59.945	* 59.268			* 60.640		
		*----------<	1.00726	0.247	*----------<	0.98794	0.037
14	64.940	* 64.227			* 65.696		
		*----------<	1.00402	0.455	*----------<	0.98813	0.024
15	69.935	* 69.202			* 70.751		
		*----------<	1.00201	0.594	*----------<	0.98540	0.217
16	74.930	* 74.187			* 75.820		
		*----------<	1.00950	0.038	*----------<	0.98696	0.099
17	79.925	* 79.135			* 80.881		
		*----------<	1.00382	0.488	*----------<	0.98250	0.460
18	84.921	* 84.112			* 85.966		
		*----------<	0.98872	1.758	*----------<	0.98521	0.227
19	89.916	* 89.164			* 91.036		
		*----------<	0.98813	1.810	*----------<	0.98269	0.456
20	94.911	* 94.219			* 96.119		
		*----------<	1.00564	0.161	*----------<	0.98424	0.307
21	99.906	* 99.186			* 101.194		

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ARIZONA PUBLIC SERVIC COMPANY

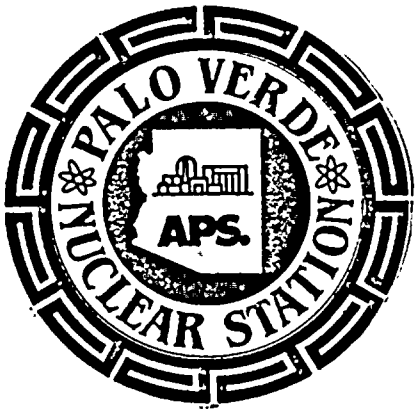
PALO VERDE NUCLEAR GENERATING STATION

ILRT SUB-VOLUME WEIGHTING PROGRAM

DATE: 2- 7-82 TIME: 08:28:35

DAS CHANNEL NO.	TYPE OF SENSOR	CONTAINMENT WEIGHTING FACTOR(%)	DAS CHANNEL NO.	TYPE OF SENSOR	CONTAINMENT WEIGHTING FACTOR(%)
1	RTD# 1	4.83	2	RTD# 2	4.83
3	RTD# 3	4.83	4	RTD# 4	4.83
5	RTD# 5	4.83	6	RTD# 6	4.83
7	RTD# 7	4.33	8	RTD# 8	4.33
9	RTD# 9	4.33	10	RTD#10	4.33
11	RTD#11	4.33	12	RTD#12	4.33
13	RTD#13	3.77	14	RTD#14	3.77
15	RTD#15	3.77	16	RTD#16	3.41
17	RTD#17	3.41	18	RTD#18	3.77
19	RTD#19	3.41	20	RTD#20	3.95
21	RTD#21	3.95	22	RTD#22	3.95
23	RTD#23	3.95	24	RTD#24	3.95
25	DEW CELL# 1	14.49	26	DEW CELL# 2	00.00
27	DEW CELL# 3	14.49	28	DEW CELL# 4	41.04
29	DEW CELL# 5	14.99	30	DEW CELL# 6	14.99

FAULTY PRESSURE GUAGE-- 2.
THE CONTAINMENT VOLUME IS 0.2600E+07 CUBIC FEET
THE NUMBER OF RTDS IN USE ARE 24.
THE TOTAL PERCENT FOR RTDS IS 100.000 %
THE NUMBER OF DEW CELLS IN USE IS 5.
THE TOTAL PERCENT FOR DEW CELLS IS 100.000 %


PALO VERDE
NUCLEAR STATION
APS.