TENNESSEE VALLEY AUTHORITY
CHATTANOOGA, TENNESSEE 37401
400 Chestnut Street Tower II

February 26, 1982

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Director of Nuclear Reactor Regulation
Attention: Ms. E. Adensam, Chief
Licensing Branch No. 4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Dear Ms. Adensam:

In the Matter of the Applicaton of) Docket Nos. 50-390
Tennessee Valley Authority) 50-391

Enclosed are TVA's responses to informal NRC questions concerning the initial test program for Watts Bar Nuclear Plant (WBN). This information should resolve open item 69 in the WBN draft Safety Evaluation Report.

If you have any questions concerning this matter, please get in touch with D. P. Ormsby at FTS 858-2682.

Very truly yours,

TENNESSEE VALLEY AUTHORITY

L. M. Mills, Manager
Nuclear Regulation and Safety

Sworn to and subscribed before me
this 26th day of Feb. 1982.
Paulette H. White
Notary Public

My Commission Expires 9-5-84

Enclosure
cc: U.S. Nuclear Regulatory Commission
Region II
Attn: Mr. James P. O'Reilly, Regional Administrator
101 Marietta Street, Suite 3100
Atlanta, Georgia 30303

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ENCLOSURE
WATTS BAR NUCLEAR PLANT UNITS 1 AND 2
CHAPTER 14 OUTSTANDING ITEMS

Question 413.12

Part 1: The October 28, 1981 response ignored part of the question which stated "Ensure that the acceptance criteria include minimum and maximum flow rates for pressurizer code safeties. . . ."

Part 8: No copy of W7.1A and 7.1B has been made available for review.

Part 29: Revise test abstract TVA-1 to include the acceptance criteria for response time and leak tightness required.

Part 30: Part gg. It is the staff's position that all communication systems be tested to ensure they can be heard at necessary stations during operating conditions. Testing should include backup AC, DC, or self contained battery power supplies. Remove the test description of HEPA filter testing in test TVA-11A and replace it with the appropriate test description.

Response to 413.12

Part 1: The safety valves are an open or close valve. Therefore, there will not be a minimum flow. The flow will be 420,00 lb_m/hr of saturated steam at 2485 lb_f/in^2. The pressurizer Safety Valves (Crosby 6M6) have been benchmark tested according to Crosby test T-16069. This test was performed on Crosby 6M6 valves identical to the safety valves at Watts Bar.

Part 8: Attached (Attachment 1) is a revision to Watts Bar FSAR table 14.2-1 which includes tests 7.1A and 7.1B.

Part 29: The mentioned systems are tested in accordance with Regulatory Guide 1.52 and ANSI N510-1975. This has been included in the test abstract. (See Attachment 6)

Part 30: Tests TVA-11A, B have been revised to include testing on communication systems in the emergency plan during normal operation. This is more thoroughly addressed in response to questions 40.77. (See Attachment 7)

Question

Figure 14.2-6 has yet to be provided.

Response

The attached (Attachment 3) figure 14.2-6 was included in the Final Safety Analysis Report in Amendment 32.

Question

TVA representatives have yet to agree that Section 14.2.11 will be revised (p. 14-15) to conform to Regulatory Guide 1.68, Revision 0. WBNP states SU test procedures will be available 1 month early for review. Revision 0 says 90 days, though we have been accepting 60 days (Rev. 2).

Response

As indicated by the attached (Attachment 4) revised pages 14-14 and 14-15, of the FSAR, test instructions will be available two months before the date the test is to be started.

Question

TVA agreed during the teleconference to supply a copy of a April 15, 1981 letter that would address the following item. We have not received that copy.

TVA-2-A - the SNP test was 24 hours in duration while the WBN test only requires an 8 hour test. Explain or eliminate this difference.

Response

Attachment 2 provides Browns Ferry Nuclear Plant and Sequoyah Nuclear Plant tests results and justification to shorten the Containment Integrated Leak Rate test from 24 to 8 hours.

Attachment 5 provides Bechtel Topical Report BN-TOP-1, "Test Criteria for Integrated Leakage Rate Testing of Primary Containment Structures for Nuclear Power Plants." This report also supports the proposed reduction in test duration.

Question

TVA agreed during the teleconference to provide (after they had a chance to re-review SNP responses) a formal commitment of Watts Bar to Sequoyah Q-1, Q-2, and staff position responses. This item was stated as:

If the basis for the approval of Watt Bar's FSAR Chapter 14 is that Watts Bar and Sequoyah are nearly identical, and therefore identical test programs are adequate, then Watts Bar should commit to all Q-1, Q-2, and staff position responses made by Sequoyah.

Note that frequently a plant's commitment to perform certain detailed testing is contained in the response to a question, not in the FSAR Chapter 14 test.

Response

Following resolution of NRC questions, including NRC staff positions, the Sequoyah Nuclear Plant test program was found to be satisfactory for plant licensing. The Sequoyah test program which included satisfactory responses to NRC Q-1, Q-2, and staff positions was utilized for developing a test program for Watts Bar Nuclear Plant. Differences between the specific Watts Bar and Sequoyah tests were provided by letter from L. M. Mills to E. Adensam dated November 16, 1981. Except as specified by the referenced letter the bases of the Watts Bar and Sequoyah tests are the same.

ATTACHMENT 1

TABLE 14.2-1 (Co[illegible]d)

LIST OF PREOPERATIONAL TESTS

Test No.	Title of Test	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria
W6.1	Fuel Handling Tools and Fixtures	Components have been inspected.	Test objective is to check out the equipment (including the Manipulator Crane, Spent Fuel Pit Bridge, New Fuel Elevator and Fuel Transfer System to assure that all functions are performed adequately. Each tool and piece of equipment will be utilized and evaluated for smooth and complete actuation and for the adequacy of lo-cating devices guides, and chambers. All interlock and safety devices will be tested.
W6.2A	Fuel Transfer System	The spent fuel pit, transfer canal, and refueling cavity will be dry. Fuel Handling Tools Testing will be completed prior to conducting the test. Dummy fuel assembly is available for use.	The test demonstrates the proper functioning of the Fuel Transfer System, the fuel handling tools, and equipment (including Manipulator Crane and Spent Fuel Pit Bridge). A dummy fuel assembly will be moved from the new fuel storage area to the fuel elevator in the transfer canal and through the Transfer System to the RCC change fixture and then to positions in the reactor core. The reverse of the above will also be followed and the element moved to a storage rack in the spent fuel pit. All operational modes, ranges of travel, limit stops, and interlocks for the system will be tested. The refueling crane and the spent fuel pit bridge will be load tested to 125% of their design loads.
W6.2B	Fuel Transfer System	The fuel racks have been inspected, and the Westinghouse dummy fuel assembly is available for use.	Using the dummy fuel assembly provided by Westinghouse, perform a drag test on each cell in the new fuel pit and the spent fuel pit. The acceptable drag force for both insertion and withdrawal of each cell is 50 pounds or less.
W7.1 (W7.1A) (W7.1B)	Reactor Protection System Time Response	Testing performed prior to initial criticality. All Reactor Protection System instrumentation must be installed, aligned, and calibrated.	Test objective is to verify the specified response times to the Reactor Protection System. Simulated sensor output signals will be used to actuate each reactor trip channel.

IP Test W-7.1 has been divided into W-7.1A and W-7.1B. W-7.1A measures primary sensor response time. W-7.1B measures the response time of the RPS or ESF channel from the primary sensor input onward. the times measured in 7.1A and 7.1B are added to times measured in other tests of equipment actuated by these channels and total RPS or ESF times are verified

LIST OF PREOPERATIONAL TESTS

Test No.	Title of Test	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria
W7.1 (Cont.)	Reactor Protection System Time Response (cont'd.)		Total channel response times, including the sensor* will be determined. Where coincident channels are necessary to initiate logic tripping, response times are measured from final channel tripping. *Neutron detectors are exempt from response time testing. Response time of the neutron flux signal portion of the channel shall be measured from detector output or input of first electronic component in channel.
W7.2	Reactor Operation Protection System Test	Testing performed prior to fuel load. All instrumentation and protection systems completed and calibrated.	Test objective is to verify the proper functioning of the Reactor Protection System logic. The test includes both analog system tripping and logic train functioning, with and without overriding manual or blocking circuits. The various controllers and/or devices will be placed in the tripped or untripped condition and the appropriate logic train observed for the expected effect on the reactor trip breakers. The power supplies will be tripped and the effect observed to verify correct assignment of redundant power sources and correct failure mode on loss of power. Instrument channels and logic trains not expected to be affected will also be observed for possible extraneous interactions.

dated April 15, 1980
BFNP

ATTACHMENT 2

NUCLEAR CONTAINMENT TESTING FOR TVA NUCLEAR POWER PLANTS

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Presented to the American Nuclear Society Winter Meeting
November 11-16, 1979

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INTRODUCTION

A significant part of the surveillance requirements for a nuclear power plant involves the assurance of isolation of radioactive contaminants from the environment in the event of a radiological accident. The primary containment serves as the final barrier of isolation in an accident. General Design Criteria 54 and 56 of Title 10 Code of Federal Regulations, Part 50 (10 CFR 50), specify design provisions for the reactor building primary containment. Appendix J to 10 CFR 50 defines the basis for a surveillance program to ensure that the primary containment will perform as designed for the life of the plant.

The most significant test prescribed by Appendix J, the reactor building containment integrated leak rate test, involves simulating as close as is practical the predicted conditions within the primary containment after the most severe postulated accident. The leakage of air from the primary containment to the environment is measured to demonstrate that offsite exposure to postulated radioactive contaminants will not exceed 10 CFR 50 guidelines, as implemented by the plant technical specifications.

Since the publication of Appendix J to 10 CFR 50, it has been customary to conduct reactor building containment leak rate tests (CILRT's) for at least 24 hours. This practice originated from experience gained in the ORNL-AEC containment proof program. The current national standard for the conduct of the CILRT, ANSI 45.4-1972, recommends tests be conducted for ". . .not less than twenty four hours of retained pressure. . ." This arbitrary test duration was set as a means to ensure the primary containment leakage would be accurately measured, with the instrumentation typically in use when the standard was prepared.

Experience gained by the Tennessee Valley Authority in the conduct of CILRT's has demonstrated that the primary containment leak rate may be accurately measured for tests conducted for considerably less than 24 hours. The purpose of this presentation is to discuss the techniques, equipment, and method of analysis TVA proposes to use to conduct future CILRT's of shorter duration than current practice. Data collected from two CILRT's conducted for 24 hours with the techniques and equipment described by this paper are discussed.

TEST OBJECTIVES

A. General

The reactor building primary containment is designed to prevent the release of radioactive contaminants to the environment either in normal operation of a nuclear power plant or as the consequence of an accident. Plant site meteorological conditions determine from the guidelines presented in 10 CFR 100 a maximum amount of radioactive contaminants that may be released to the environment.

Various plant design and reactor specific features determine a predicted maximum pressure expected to exist within the primary containment under accident conditions and a maximum rate of release of radioactive contaminants to the environment. Appendix J requires that the plant operator periodically demonstrate the ability of the primary containment to limit the release of contaminants below the calculated maximum.

The CILRT measures the rate of release, or the leak rate, of the primary containment atmosphere to the environment at a test pressure of either one-half or equal to the calculated peak pressure expected for the most severe accident. Lines that penetrate the primary containment are aligned with the configuration assumed automatically after an accident. Lines postulated to rupture inside the primary containment are drained to the extent practical of fluid and vented to the containment atmosphere for the duration of the test. Lines postulated to rupture outside the primary containment are drained to the extent practical of fluid and vented to the environment.

Before a nuclear power plant may return to operation, the CILRT must demonstrate that this measured rate of leakage is less than 75 percent of the design maximum. The 25-percent margin provides assurance that, with unforeseen degradation of performance, the maximum leakage will not be exceeded.

B. Specific Objectives

The specific objectives of the CILRT are:

1. Accurately measure the actual rate of primary containment atmosphere leakage under conditions close to those predicted for the most severe postulated accident.

2. Demonstrate that the primary containment leak rate has been accurately measured by the CILRT by a subsequent verification test.

3. Demonstrate that the measured rate of leakage is less than 75 percent of the design maximum before the nuclear plant may return to power operation.

4. Demonstrate that no potential means for the release of primary containment atmosphere has arisen since the previous CILRT.

5. Provide a statistical statement of the validity of the measured leak rate of the primary containment by calculating the confidence interval of the results.

TEST CRITERIA

A. Primary Containment Atmosphere Stabilization

During the pressurization of the primary containment, the containment atmosphere temperature will significantly increase. This heating, due to the work required to pressurize the air, can introduce instabilities of the containment atmosphere that may preclude the accurate measurement of leak rate. In a similar manner, the operation of large equipment within the containment can cause the apparent leak rate to change during the CILRT.

Appendix J requires that the primary containment atmosphere be allowed to stabilize at least 4 hours after the end of pressurization. This arbitrary requirement can prove of insufficient duration particularly when applied to high-pressure, small-volume containments. From the experience gained in the conduct of six CILRT's, the following guidelines were prepared to supplement the Appendix J requirement:

1. The average primary containment atmosphere temperature change should be less than 1°F per hour before starting the CILRT.

2. A time versus temperature plot for the stabilization period should be approximately linear by the start of the CILRT.

3. Heat-producing equipment located within the primary containment should only be operated to maintain the safety of the reactor.

4. Any air circulation equipment operated during the CILRT should be operated continuously since intermittent operation could disturb the containment air temperature distribution.

5. Water levels within the reactor and any other vessel within the primary containment should be held as constant as is possible. Any required level changes should be made slowly.

B. Accuracy of the Measured Leak Rate

Since any measurement has some degree of uncertainty associated with random and systematic errors, the reported measured leak rate of the primary containment atmosphere is only an approximation to the "true" value. A statement of the goodness or degree of confidence of the CILRT results is necessary to provide assurance that the primary containment functions as designed. Following general testing practice, TVA reports a 95-percent upper confidence level for the reported leak rate.

A CILRT is considered satisfactory if the measured leak rate is less than 75 percent of the design maximum. To ensure adequate confidence in this leak rate, TVA further requires that the 95-percent upper confidence level be less than 75 percent of the design maximum leak rate.

TECHNIQUES OF ANALYSIS

A. Containment Modeling

The accurate measurement of primary containment leak rate pivots on the precise measurement of temperature, pressure, and vapor pressure. The primary containment is not constructed as a single homogenous pressure vessel but as a series of interconnected compartments. Although all compartments forming the primary containment are vented to each other for the CILRT, the flow of containment atmosphere may be restricted.

Pressure suppression containment designs incorporate special compartments that may have significantly different temperature and vapor pressure conditions from the rest of the primary containment. A boiling water reactor pressure suppression chamber is characterized by humidity approaching the saturation point. The ice condenser for a pressurized water reactor employs two large compartments far below the freezing point of water. Since a substantial portion of the primary containment free air volume is contained within these pressurization suppression compartments for both reactor designs, significant errors may result in the calculation of the leak rate if the containment atmosphere conditions are not correctly considered by the analysis.

To compensate for the compartmental construction of the primary containment, the leak rate is calculated from a model in which the containment is a multiple element system. Temperature, pressure, and vapor pressure are measured for each compartment. The mass of the air in each compartment is calculated from these measurements. The primary containment leak rate is calculated from the sum of the compartment air masses. Temperature, vapor

pressure, and pressure measurements are individually assigned volumetric weighting or influence factors determined by the relative volume each sensor represents within the compartment.

A primary containment model is developed from information provided in section 6.2 of the Final Safety Analysis Report. Any compartment that represents more than 10 percent of the containment free air volume is considered a compartment for the CILRT.

B. Method of Leak Rate Calculation

Several techniques have been used previously to calculate the primary containment leak rate. ANS 45.2-1972 recognizes the absolute and the reference vessel methods. The proposed standard for containment testing, ANSI 56.8, recognizes the same techniques. We have found the absolute, or mass loss, method yields the most accurate measurement of the primary containment leak rate.

The primary containment leak rate is calculated by the application of the ideal gas law. During the CILRT, the mass of the air in the containment is calculated periodically. The leak rate is computed from the slope of the least squares fit line to these data. The uncertainty of the measured leak rate is estimated by calculating the deviation of the individual mass points from the least squares fit line, with adjustments for the sample size.

C. Instrumentation Selection Guide

The accurate determination of leak rate by the absolute method requires the precise measurement of primary containment atmospheric temperature, vapor pressure, and total pressure. Since any measurement will include some error, the accuracy of these measurements determine the accuracy of the measured primary containment leak rate. Prior to the performance of

the CILRT, the number of temperature, vapor pressure, and total pressure sensors required to accurately determine the leak rate must be estimated. Based on the expected leak rate and the anticipated conditions encountered in the test, this instrumentation selection guide determines the minimum instrumentation necessary to conduct the CILRT.

The basic criteria TVA uses for the selection of minimum CILRT instrumentation is that the primary containment leak rate should be accurately measured within the first 8 hours of data collection with an assumed leak rate equal to 25 percent of the maximum allowed under technical specifications. In addition, no temperature measurement may represent more than 10 percent of the containment free air volume. Appendix A presents an example of the estimation of sensors required for a typical boiling water reactor CILRT.

DATA ACQUISITION AND REDUCTION SYSTEMS

The precise measurement of many test variables is required to accurately calculate the primary containment leak rate. CILRT test data must, therefore, be acquired and analyzed rapidly. TVA has developed a leak rate measurement system that acquires and reduces test data automatically. The principal advantages afforded by this automatic system are highly accurate, reliable results and data collection speed. The purpose of this section is to describe the principal functions and features of the automatic data acquisition and reduction systems.

A. Data Acquisition System

The principal function of the data acquisition system is to periodically measure the test variables. A microprocessor controls the timing of periodic acquisition, the conversion from analog to digital values, and the transmission of data to the data reduction system. The microprocessor will periodically collect data at a set interval or, at the discretion of the test director, can be demanded to acquire data within the selected interval. A log of all collected data is printed for permanent records. Table 1 lists typical data collected for a boiling water reactor and a pressurized water containment. The data acquisition system is designed to allow for any combination of temperature, pressure, and vapor pressure measurements. Figure 1 depicts the components that form the data acquisition system.

The principal feature of the data acquisition system is the accurate, rapid measurement of test variables. In CILRT's previously conducted by TVA without the automatic data acquisition system, data could not be collected more frequently than once per hour. Even at this slow rate of

collection, mistakes by test personnel in the measurement of test variables degraded the results. For a typical ice condenser pressurized water reactor, the data acquisition can collect up to 20 samples of the test variables per hour. The significant increase in the volume of collected data improves the confidence of test results.

B. Data Reduction System

The primary purpose of the data reduction system is to accurately perform the necessary calculations to compute the primary containment leak rate. The central element of the data reduction system is a minicomputer system directly connected to the data acquisition system. All raw data collected by the data acquisition system is transmitted to the minicomputer and stored on flexible disks. These data are subsequently corrected according to each sensor's calibration data. The leak rate is automatically calculated and results are printed on a local printer. The system is designed to be tolerant of power failure. Figure 2 depicts the data reduction system.

Several features are included in the design of the data reduction system. The most significant is that the reliability of field test results is significantly enhanced because no manual data entry or calculations are required. The speed of data reduction is significantly increased. For a typical ice condenser, pressurized water reactor data can be collected by the acquisition system, stored, reduced, and the leak rate calculated in less than 2 minutes.

In addition to speed, the minicomputer offers several features to enhance test performance. Test variables or results may be automatically plotted by the minicomputer any time during the CILRT. The test engineer may also choose to redefine the time of the test start to any previously collected

sample while the test is conducted. This "base reset" feature allows the field evaluation of the effect of prolonging test duration.

INSTRUMENTATION TECHNIQUES

A. Temperature Measurement

Four-wire resistance temperature detectors (RTD's) are used by the leak rate measurement system to monitor primary containment atmosphere temperature. Before and after the performance of each CILRT, each RTD is individually compared with a standard certified by the National Bureau of Standards over a temperature range of 0-150°F. The uncertainty of the temperature standard is better than 0.005°F. A unique temperature as a function of resistance calibration curve is calculated for each RTD from this comparison.

When installed in the primary containment, each RTD is connected to a separate excitation bridge (wheatstone) by quick disconnect extension cables. Systematic errors due to lead length resistance, excitation bridge nonlinearity, and analog to digital conversion repeatable offset error are measured by substituting precision resistors in place of the RTD at the end of the extension cable. A unique resistance as a function of measured bridge output calibration curve is calculated for each measurement channel. The minicomputer automatically calculates and stores each calibration curve. For each temperature measurement, measured bridge voltage is first converted to resistance. The minicomputer then uses the individual RTD calibration curve to calculate the equivalent temperature from this resistance.

Tests have been conducted to determine the accuracy of temperature measurements by the integrated leak rate measurement system. Seven RTD's were compared with a standard certified by the National Bureau of Standards at five temperatures. This standard is certified with a measurement

uncertainty of better than 0.005°F. Figure 3 depicts the difference between the temperature measured by the standard and the leak rate measurement system over the range of comparison. Analysis of the data indicates that the system uncertainty of temperature by the leak rate measurement system is better than 0.0202°F.

B. Vapor Pressure Measurement

Lithium chloride dewcels are used by the leak rate measurement system to monitor primary containment atmosphere moisture content. The principle of operation of a dewcel is that certain hygroscopic salt solutions will change the amount of water in the solution in relation to the moisture content of the air. The dewcel consists of a thin coating of lithium chloride between two gold wires. As the moisture content of the air changes, the salt solution will either absorb or liberate water. This change in moisture content of the salt solution changes the solution resistance proportionally. Passing a constant voltage through the two wires and the solution causes resistance heating. An RTD embedded in the support bobbin measures the induced heating. Since the temperature of the solution is directly related to the solution resistance, and hence the moisture content of the salt solution and the air, it is necessary only to measure this temperature to measure atmosphere moisture content.

Three-wire RTD's monitor the salt solution temperature. Before and after each CILRT, each dewcel RTD is individually compared with a standard certified to the National Bureau of Standards over a temperature range equivalent to a dewpoint from 0°F to 100°F. A unique temperature as a function of resistance calibration curve is calculated for each dewcel RTD from this comparison.

Each dewcel is connected to a separate excitation bridge (wheatstone) and constant voltage power supply by quick disconnect extension cables. As in the discussion of the air temperature measurement, a calibration curve of resistance as a function of measured bridge output is calculated by the substitution of precision resistors for the dewcel. Each dewpoint is first converted to equivalent resistance. The minicomputer then calculates the salt solution temperature from the dewcel's unique element temperature as a function of resistance curve. Equivalent dewpoint is calculated from data tabulated by the National Bureau of Standards.

C. Pressure Measurement

Precision quartz bourdon tube manometers were selected for containment total pressure measurement. Prior to the CILRT, a pressure cell is selected so that the rated pressure is just above the expected test pressure. Each manometer and cell is compared with a standard certified by the National Bureau of Standards before and after each CILRT over the range of the pressure cell. Proper selection of the pressure cell ensures the highest possible sensitivity to small changes of the primary containment pressure. The pressure measured by the quartz manometer is converted internally to digital values by a special encoder. The rated cell pressure corresponds to a digital output of four hundred thousand counts, with a resolution of one count.

To convert the digital signal acquired from the quartz manometer to pressure, the minicomputer linearly interpolates the true pressure from the pressure cell calibration data. This technique yields a certified system accuracy of better than 0.015 percent of reading.

D. Calibration of Test Instruments

All instruments included in the leak rate measurement system are compared with standards traceable to the National Bureau of Standards prior to and after each CILRT. Any instrument found to be out of tolerance in the range of measurement for the CILRT is rejected from consideration by eliminating all data collected from the sensor. Influence or volume weight factors are adjusted for the remaining sensors to compensate for the failure.

SYSTEM SOFTWARE

As a minicomputer performs all calculations required to determine the primary containment leak rate, the computer software system represents a complex element of the leak rate measurement system. This section describes the purpose and features of the software required to conduct the CILRT. Three basic tasks are performed by the software programs of the leak rate measurement system. First, before the CILRT, model definition, calibration data, and channel repeatable error correction data must be stored in the minicomputer. Secondly, software programs acquire the test data and perform the leak rate calculations during the CILRT. Finally, raw and corrected data must be summarized after the test for plant records.

A. Prior to the CILRT

Several programs are used to define the model of the primary containment before the CILRT is conducted. Based upon the number of temperature, vapor pressure, and pressure sensors, the minicomputer allocates storage space for the test data. In addition, the calibration data for each sensor must be stored prior to the test. Several programs are available to check various parts of the data entry process. The most significant is CHECK, which allows the computer to instantaneously compare the temperature of an installed RTD with a precision temperature standard. Table II lists and summarizes all software required in the preparation for the CILRT.

B. During the CILRT

As the CILRT is conducted, the raw data must be stored, corrected according to the calibration factors, and the results calculated. The

primary program, FORE, receives data from the acquisition system, corrects according to the sensor calibration factors, computes, stores, and displays the primary containment leak rate. Several other programs (BASE, TALLY, and LIST) provide the ability to change the sample considered the start of the test, provide statistical confidence intervals, and tabulate the test results.

Several unique features are included to prevent the loss of data and enhance the information provided to the test engineer. The most significant feature ensures that any time the data acquisition is prepared to transmit data, the minicomputer stops all activities so that the main data collection program, FORE, may execute. When these data have been received and results printed, the minicomputer completes the task interrupted by the acquisition of data. All programs are designed to be tolerant of power failure. No previous data is lost when power is restored. Table III lists and summarizes all software programs required during the CILRT.

C. After the CILRT

After the CILRT is completed, test data can be corrected for any instrument failure and arranged for inclusion in the permanent test record. Several software programs provide the ability to list all raw and corrected data, final test results, and calibration constants. Table IV lists and summarizes the software programs used after the CILRT is complete.

DISCUSSION OF TEST RESULTS

Two CILRT's have been conducted with the equipment and techniques described in this paper. Each type represents an extreme of conditions typically expected during the CILRT--small volume with moderately high pressure and low pressure with moderate volume. Both tests were conducted for at least 24 hours, with data collected at least every 15 minutes. This section presents a summary of the CILRT results. Complete reports have been filed with the NRC's Division of Operating Reactors.

A. Browns Ferry Nuclear Plant Unit 2, Conducted June 1978

Browns Ferry unit 2 is a boiling water reactor employing a steel pressure suppression Mark I containment. The maximum leak rate at a reduced pressure of 25 psig is limited by technical specification 4.7.a.2 to less than 0.04437 percentage per hour of containment air mass. The containment was modeled as two compartments--the pressure suppression chamber and the drywell. Twenty-nine temperature sensors, six humidity sensors, and two pressure gauges were used to measure the primary containment leak rate. The free air primary containment volume is approximately 300,000 cubic feet.

A 24-hour CILRT and a 12-hour verification test were conducted June 13-16, 1978. The final measured leak rate was 0.00949 percentage of containment air mass per hour. The observed 95-percent upper confidence limit for this measured leak rate was 0.00994 percentage of containment air mass. The mass leak rate calculated during this test is depicted in figure 4. Table 5 compares test duration with leak rate and upper confidence limit. Clearly, the primary containment leak rate was accurately determined within the first 4 hours of the test. Figure 4 indicates that data collected beyond the fourth hour of the test served only to improve the

upper confidence limit of the leak rate. Figure 5 depicts the upper confidence interval as a function of the time of data collection. The rapid approach to the asymptotic limit demonstrates the value of proper instrument selection. Complete summaries of the calculated test results are included in appendix B.

B. Sequoyah Nuclear Plant Unit 1, Conducted March 1979

Sequoyah unit 1 is a pressurized water reactor employing an ice condenser pressure suppression primary containment. The maximum leakage of air at a test pressure of 12 psig is limited by technical specification 4.6.1.2 to less than 0.0078 percentage per hour of containment air mass. The primary containment contains four compartments--the lower ice condenser compartment which houses the energy absorbing ice beds, the upper ice condenser compartment which encloses support equipment for the ice condenser system, the lower compartment which encloses the reactor and main piping systems, and the upper compartment which encloses the refueling work area. The free air mass was calculated separately for each compartment, with the calculated leak rate derived from the sum of the compartment air masses. Based upon the instrument selection guide, 46 RTD's were used for containment atmosphere temperature measurement, 10 humidity sensors were used to monitor the containment atmosphere moisture content, and four quartz manometers monitored the total pressure. Total free air volume for the primary containment is approximately 1.19 million cubic feet.

A 24-hour CILRT and a 4-hour verification test were conducted March 13-16, 1979. The final measured leak rate was 0.00011 percentage of containment air mass. The observed 95-percent upper confidence limit was 0.00024 percentage of the containment air mass. The mass leak rate calculated is

depicted in figure 6. Table 5 compares test results with the duration of data collection. Clearly, the primary containment leak rate was accurately determined within the first 8 hours of data collection. Figure 7 depicts the upper confidence interval as a function of the time of data collection. Complete summaries of the calculated test results are included in appendix C.

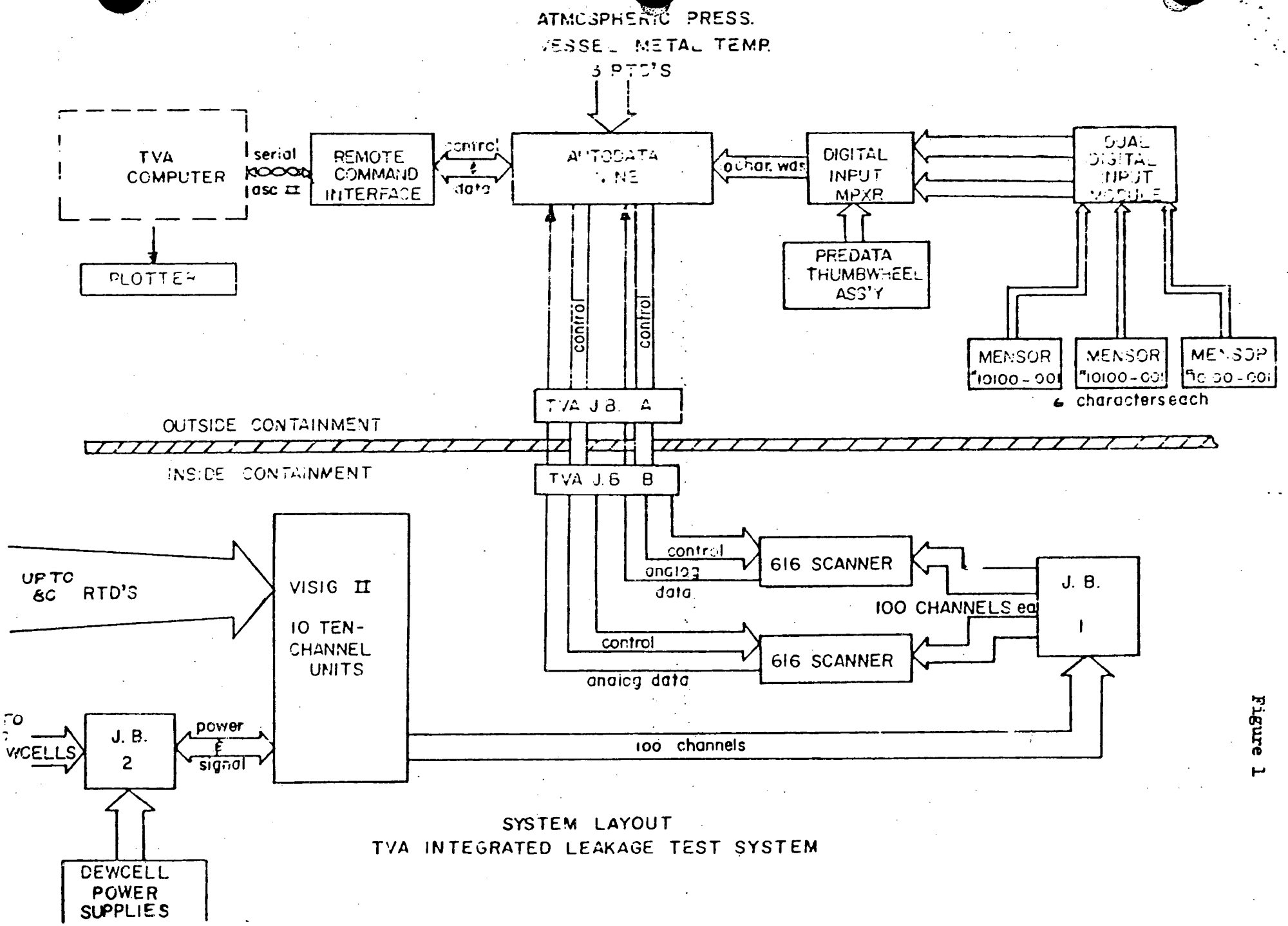
CONCLUSIONS

CILRT's conducted by TVA on a high-pressure boiling water reactor containment and a low-pressure ice condenser pressurized water reactor containment verify that the leak rate measurement system used with the techniques outlined in this paper measured the primary containment leak rate in far less than the 24 hours the tests were conducted. An analysis of the 95-percent upper confidence limit of the measured leak rate indicates that the primary containment leak rate was accurately determined with a high level of confidence within the first 4 hours of data collection.

To consistently achieve this accuracy for future CILRT's, this paper has outlined several key techniques. The model used to calculate the primary containment leak rate must compensate for areas of varying temperature, pressure, and moisture content. The test instrumentation must be capable of extremely accurate and repeatable measurement of the containment atmosphere conditions. Collected test data must be acquired quickly with reliable equipment. The test director must be provided with accurate results during the test.

TVA will conduct future CILRT's in accordance with the techniques described in this paper. Each CILRT will be conducted for at least 4 hours and extend until adequate confidence in the accuracy of the measured leak rate is achieved.

F I G U R E S



SYSTEM LAYOUT
TVA INTEGRATED LEAKAGE TEST SYSTEM

Figure 1

INTEGRATED LEAK RATE MEASUREMENT SYSTEM
DATA REDUCTION SYSTEM

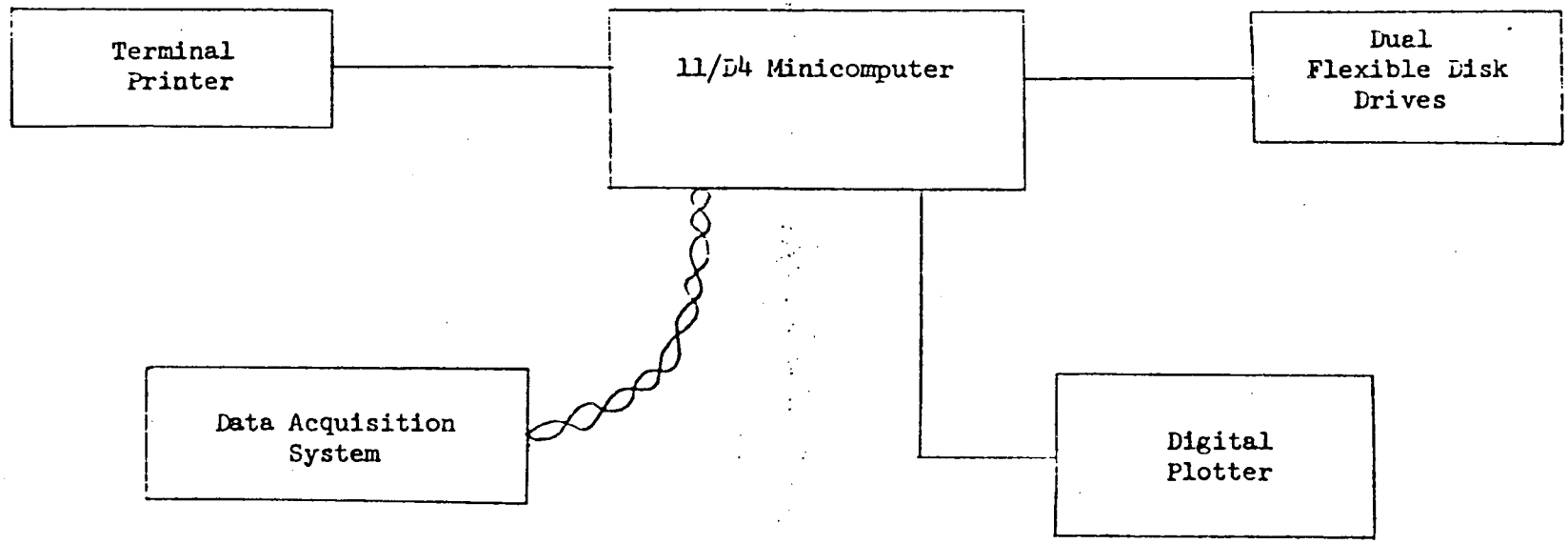


Figure 2

Figure 3

TENNESSEE VALLEY AUTHORITY
COMPARISON OF LAB AND FIELD TEMP. MEASUREMENTS

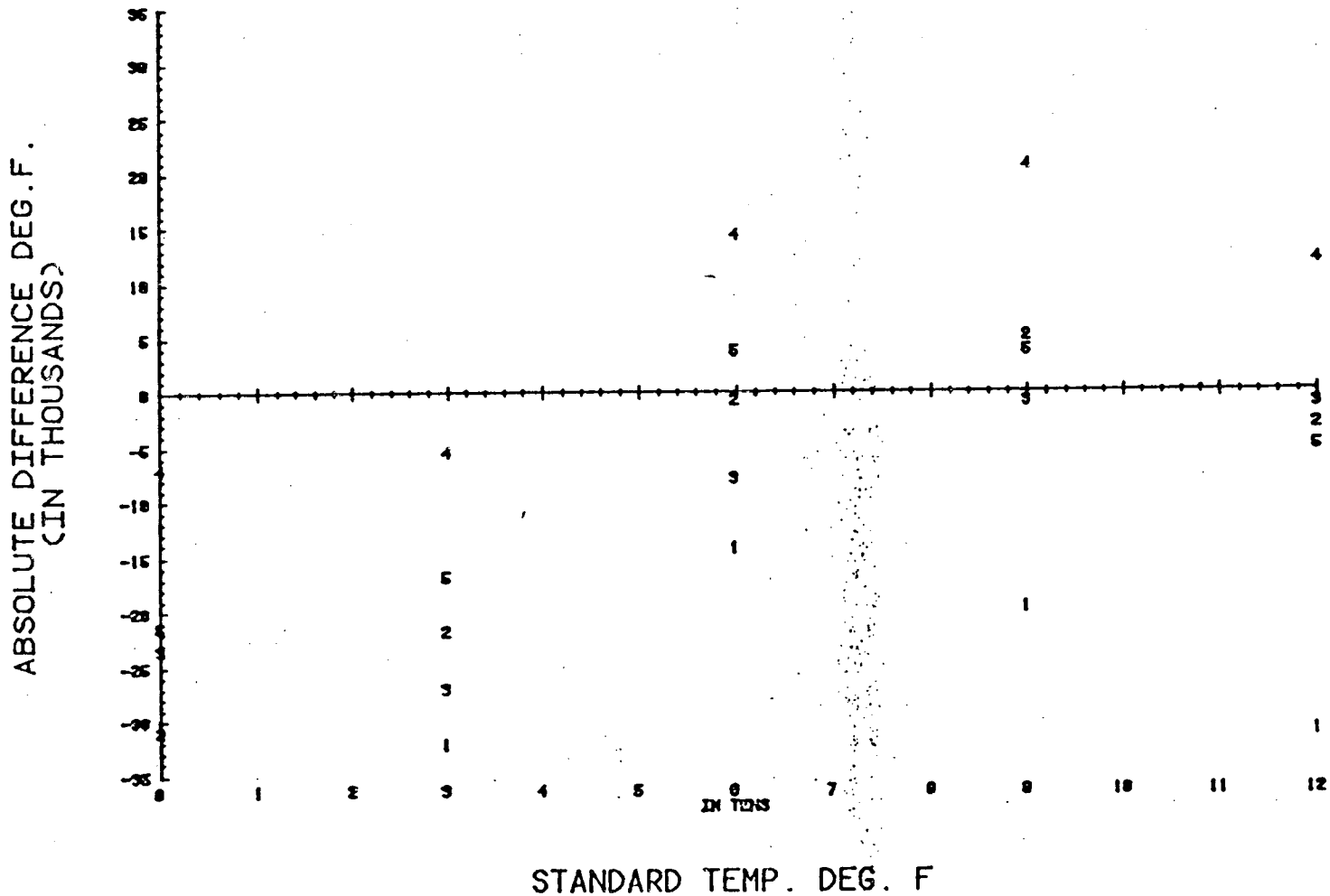


Figure 4

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT
MASS LEAK RATE PLOT
(25 PSIG TEST)

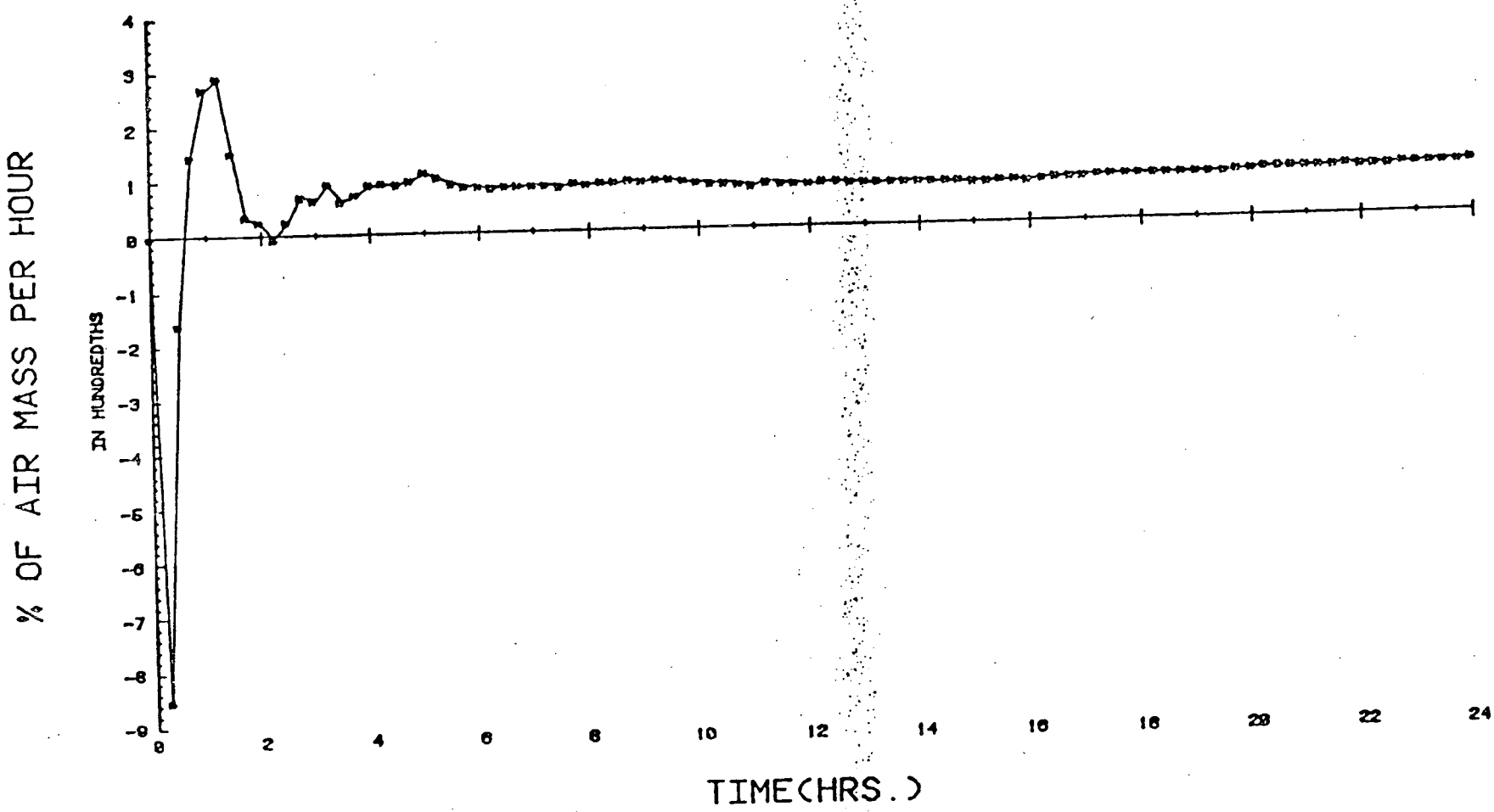


Figure 5

TENNESSEE VALLEY AUTHORITY
BROWNS FERRY NUCLEAR PLANT
UCL INTERVAL
(25 PSIG TEST PRESSURE)

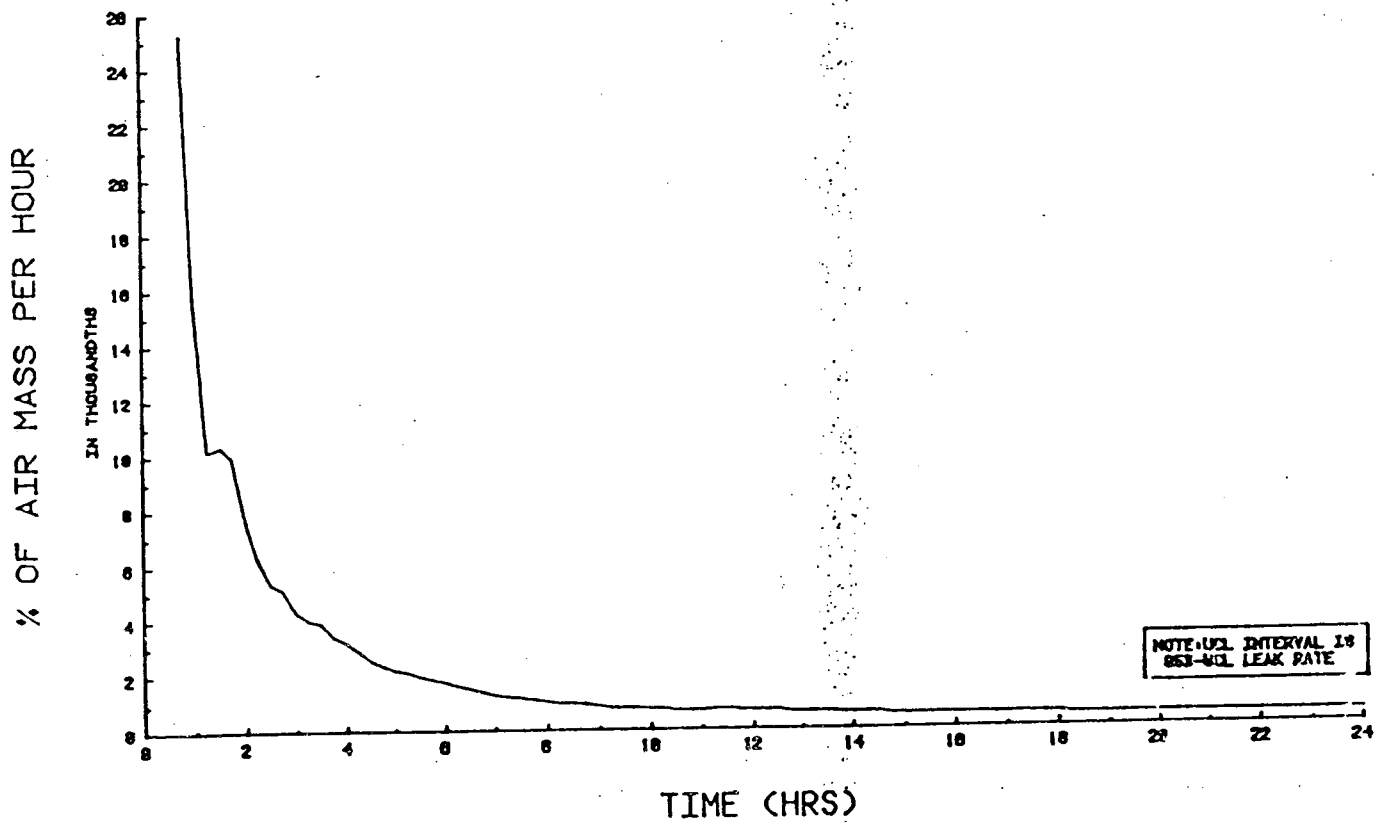


Figure 6

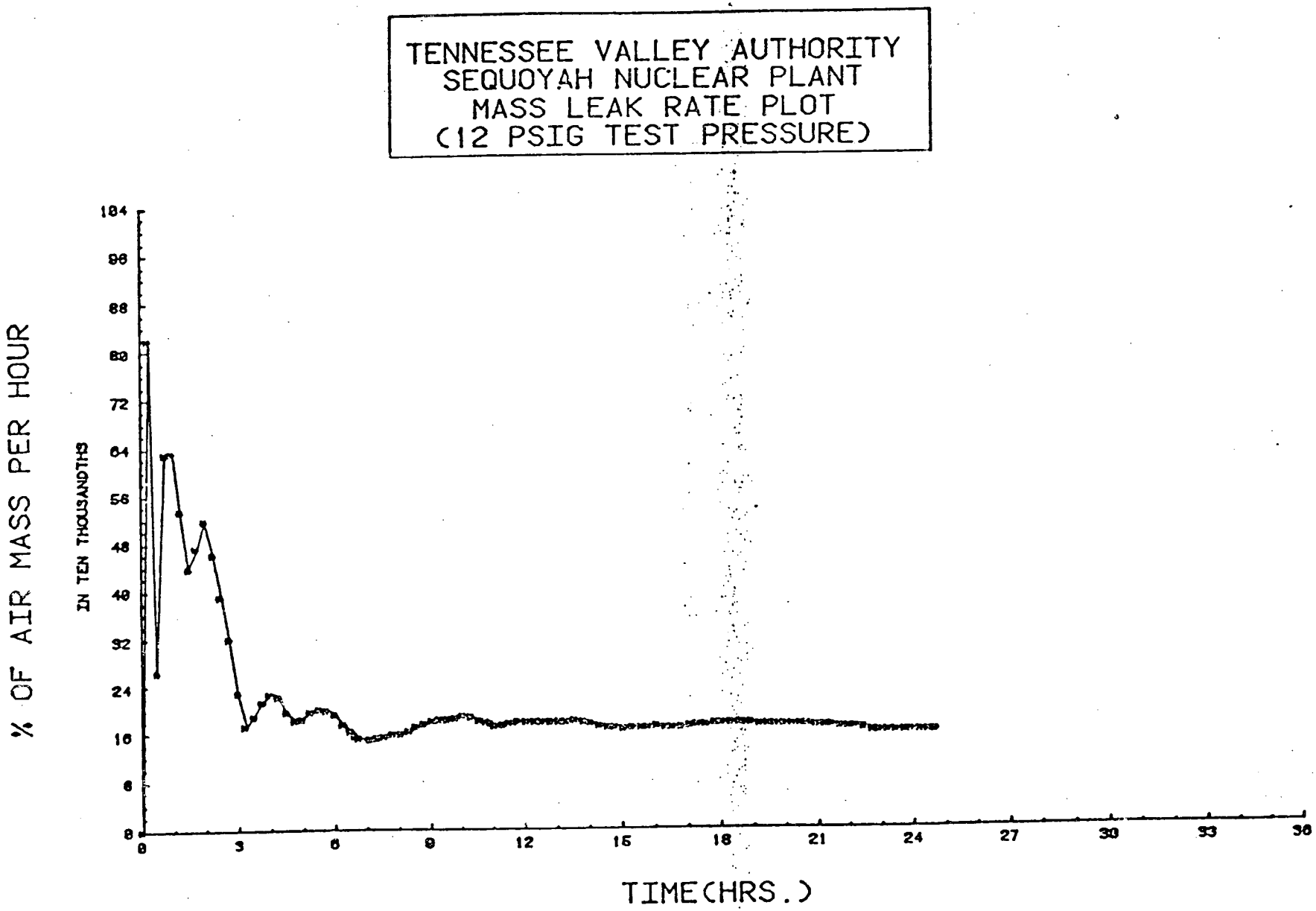
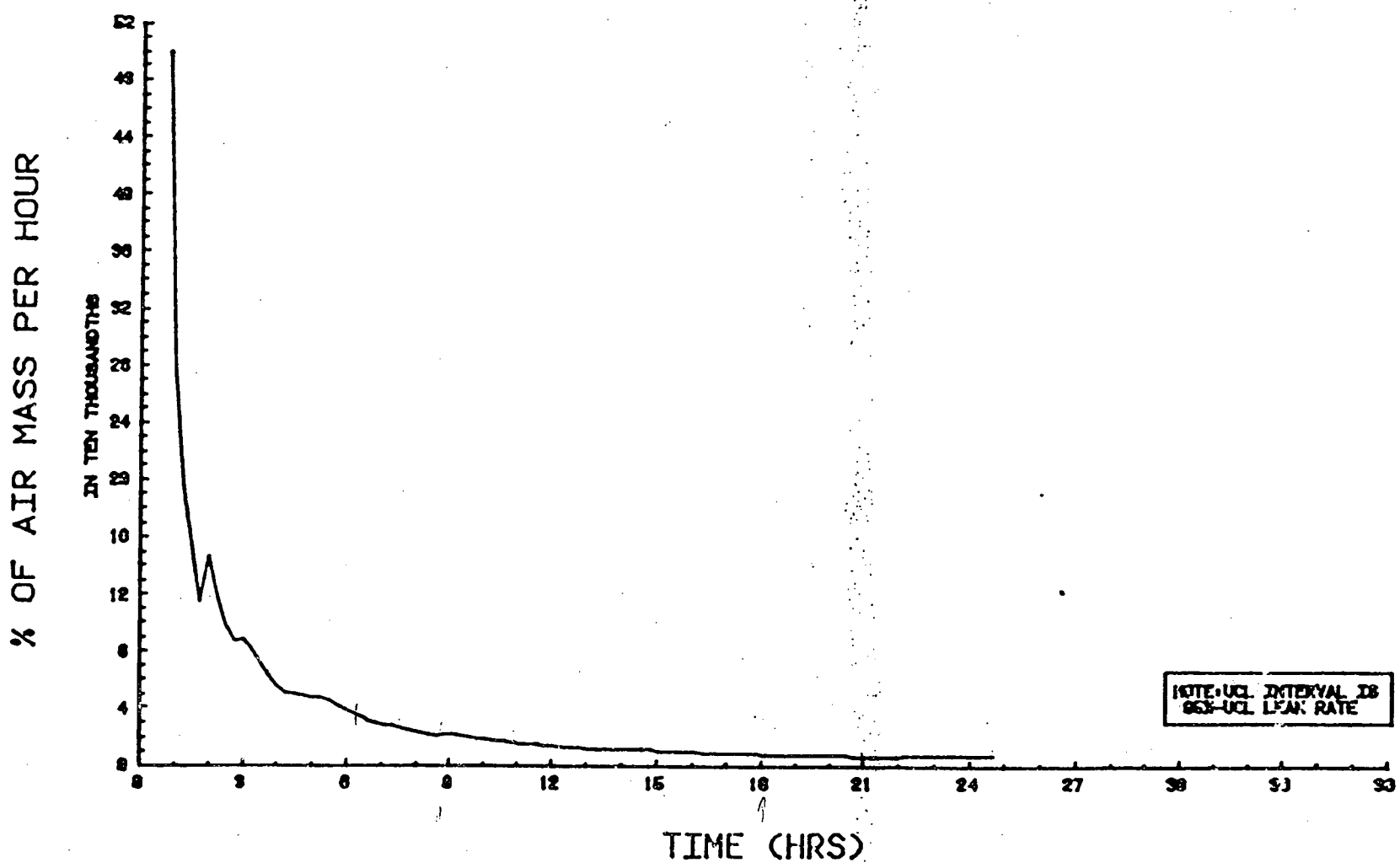

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT
MASS LEAK RATE PLOT
(12 PSIG TEST PRESSURE)
% OF AIR MASS PER HOUR
IN TEN THOUSANDTHS
104
96
88
80
72
64
56
48
40
32
24
16
8
0
0
3
6
9
12
15
18
21
24
27
30
33
36
TIME(HRS.)

Figure 7

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT
UCL INTERVAL
(12 PSIG TEST PRESSURE)



TABLES

TABLE I
DATA COLLECTED BY
AUTOMATIC ACQUISITION SYSTEM

1. Boiling Water Reactor, Pressure Suppression Containment

Quantity	Function
29	Resistance temperature detectors (RTD's) for containment atmospheric temperature measurement
6	Lithium chloride dewcels for containment atmospheric vapor pressure measurement
2	Precision quartz manometers for containment atmospheric total pressure measurement
4	RTD's for containment vessel metal temperature and test station temperature
1	Mass flowmeter for measurement of induced leak required for the verification test
1	Precision quartz manometer for atmospheric pressure
1	Suppression chamber water level
1	Reactor vessel water level

2. Pressurized Water Reactor, Ice Condenser Suppression Containment

Quantity	Function
46	RTD's for containment atmospheric temperature measurement
10	Lithium chloride dewcels for containment atmospheric vapor pressure measurement
4	Precision quartz manometers for containment atmospheric total pressure measurement
4	RTD's for containment vessel metal temperature and test station temperature measurement
1	Mass flowmeter for measurement of induced leak required for the verification test
1	Precision quartz manometer for atmospheric pressure

TABLE II
SYSTEM SOFTWARE REQUIRED PRIOR TO THE CILRT

Program Name(s)	Description
S1	Define the integrated leak rate system parameters: number of RTD's, dewcels, pressure gauges, analog inputs, and local RTD's. Create the required system files required to store the test data.
CREAM ENTAM ENTVW	Define the sensor calibration data and volume weights. Requires calibration reports on all dewcels and RTD's that may be used for the CILRT.
AM	Measure the integrated leak rate system analog to digital repeatable offset. Requires all temporary cables to be installed and integrated leak rate system to be operational.
STARTN	Define the calibration data for the quartz manometer pressure gauges and any plant process instrumentation, e.g., suppression chamber and reactor level transmitters.
CHECK	Verify in-place system temperature or dewpoint measurements. A standard for comparison is required for this program.
CHECK8	Print all stored calibration constants required to conduct the CILRT.

TABLE III
SYSTEM SOFTWARE REQUIRED DURING THE CILRT

Program Name(s)	Description
FORE	Acquire containment data from the data acquisition system, store, correct raw data, and calculate leak rate.
LIST	Print a summary of measured leak rate. Drive an online digital plotter to produce graphs of principal test results.
TALLY	Calculate confidence limits of the calculated leak rate.
BASE	Redefine the sample considered the start of the CILRT.

TABLE IV
SYSTEM SOFTWARE REQUIRED AFTER THE CILRT

Program Name(s)	Description
AM	Measure the integrated leak rate system analog to digital repeatable offset after test is completed.
DUMDEV	Print all raw and corrected test data.
AIRMASS	Print a compartment summary of the measured temperature, vapor pressure, pressure, and air mass. Correct the test results for any sensor found out of calibration.

TABLE V

CILRT RESULTS AS A FUNCTION OF TEST DURATION

Browns Ferry Nuclear Plant Unit 2

CILRT Duration (Hours)	Number of Mass Samples	PTP Leak* Rate % Per Hour	UCL PTP* Leak Rate % Per Hour	Mass Leak Rate % Per Hour	UCL Mass Leak Rate % Per Hour
8	33	0.00527	0.01693	0.00855	0.01036
12	49	0.00798	0.02318	0.00785	0.00893
24	97	0.00506	0.01921	0.00949	0.00994

Sequoyah Nuclear Plant Unit 1

CILRT Duration (Hours)	Number of Mass Samples	PTP Leak* Rate % Per Hour	UCL PTP* Leak Rate % Per Hour	Mass Leak Rate % Per Hour	UCL Mass Leak Rate % Per Hour
6	25	0.00456	0.00470	0.00193	0.00238
8	34	0.00323	0.00336	0.00159	0.00188
10	42	0.00254	0.00265	0.00190	0.00211
12	51	0.00296	0.00307	0.00178	0.00193
24	100	0.00248	0.00258	0.00162	0.00168

*As defined in ANS-274 (draft)

INSTRUMENT SELECTION GUIDE

The containment air mass is calculated by the application of the ideal gas law:

$$W = \frac{144 \times V \times (P - P_V)}{RT} \tag{1}$$

By the mass point method the primary containment leak rate is the normalized slope of the mass loss curve:

$$W = At + B,$$

$$L_R = \left(\frac{dW}{dt}\right) \times \left(\frac{1}{W_0}\right) \times 100 \tag{2}$$

The total differential of the calculated is mass is:

$$dW = 144 \frac{V}{R} \left[\frac{dP}{T} - \frac{dP_V}{T} + \frac{dT}{T^2}\right] \tag{3}$$

Therefore,

$$LR = \left[\frac{dP}{dt} - \frac{dP_V}{dt} + \frac{dT}{dt}\frac{(P - P_V)}{T}\right] \times 100 \tag{4}$$

The error in measurement of the independent variables, pressure, vapor pressure, and temperature determine the error in the leak rate. In general, an upper bound on the error in measurement of an independent variable X is:

$$E = \left[\frac{(e_x)^2 + \xi_x)^2}{\eta x}\right]^{1/2} \tag{5}$$

An upper bound on the error in a dependent variable Y, as determined by the measurement of a set of independent variables X_1, X_2, . . . X_N is:

$$E_Y \leq \left[(E_{X_1})^2 + (E_{X_2})^2 + \ldots + (E_{X_N})^2\right]^{1/2} \tag{6}$$

Therefore, the upper bound of error of the measured leak rate can be expressed as:

$$E_{LR} \leq \left[(E_P)^2 + (E_{PV})^2 + (E_T)^2\right]^{1/2} \tag{7}$$

The minimum change that may be reliably detected in the measurement of an independent variable is determined by the error of measurement. In general,

$$dX \leq \left[\frac{(e_X)^2 + (\xi_X)^2}{\eta_X} \right]^{1/2} \tag{8}$$

Substituting for each independent variable differential in equation (7) yields:

$$LR = \left[\left| \frac{E_P}{dt} \right| + \left| \frac{E_{PV}}{dt} \right| + \left| \frac{E_T}{dt} \times \frac{(P - P_V)}{T} \right| \right] \times 100 \tag{9}$$

In the paper, "Describing The Uncertainties In Single Sample Experiments," by McClintock et. al., it was shown the contribution of the measurement of each independent variable should be equal for an optimal instrumentation system. Therefore, equation (9) may be rewritten:

$$L_R = \frac{E}{dt} \left[2 + \frac{(P - P_V)}{T} \right] \times 100 \tag{10}$$

If a bound on the error in leak rate is assumed, the error in the measurement of an independent variable can be bounded.

$$E = \frac{L_R \times dt}{100} \left[\frac{T}{2T + (P - P_V)} \right] \tag{11}$$

TVA selects test instrumentation so that 25 percent of the maximum allowable leak rate can be measured within 8 hours. It is assumed that data is collected every 30 minutes. Therefore, equation (11) is rewritten:

$$E = (.5) \frac{(.25 \times L_a \times .75)}{100} \left[\frac{T}{2T + (P - P_V)} \right] \tag{12}$$

Substituting into equation (8) and solving for the number of instruments yields:

$$\eta_X \leq \left[\frac{(e_X)^2 + (\xi_X)^2}{E^2} \right]^{1/2} \tag{13}$$

Definition of Symbols

e - Absolute error of the measure of a variable

ϵ - Absolute error of the indication of the measure of a variable

E_R - Relative error of a variable

L - Absolute error of leak rate, percent of containment air mass per hour

n - Number of replications of a measurement

N - Number of independent measurements

P - Absolute pressure, psia

R - Universal gas constant

S - Deviation from the mean of a population

t - Time of sample

t_{95} - Student's t distribution for N-1 degrees

T - Temperature, degrees Rankine

V - Containment air volume, scf

W - Absolute mass of containment air, lbm

Subscripts

A - Estimate corrected for replication and sample size

L - Lower bound

U - Upper bound

APPENDIX B

SHEET NO. 0

TENNESSEE VALLEY AUTHORITY
CONTAINMENT LEAKAGE MEASUREMENT
TEST SUMMARY

HOURS SINCE START	AVERAGE TEMPERATURE DEG F.	CORRECTED PRESSURE PSIA	TOTAL MASS OF AIR LBM	P-T-P LEAK RATE % PER HOUR	TOTAL TIME LEAK RATE % PER HOUR	MASS LEAK RATE % PER HOUR
0.000	83.1390	39.8887	57471.22	0.0000000	0.0000000	0.0000000
0.250	83.1489	39.8871	57483.46	-0.0851788	-0.0851788	-0.0851520
0.500	83.1452	39.8794	57475.82	0.0531127	-0.0160270	-0.0160397
0.750	83.1445	39.8893	57466.83	0.0626601	0.0101863	0.0144839
1.000	83.1462	39.8810	57460.21	0.0460322	0.0191468	0.0268793
1.250	83.1499	39.8850	57457.78	0.0169681	0.0187194	0.0289792
1.500	83.1369	39.8845	57473.14	-0.1059811	-0.0222339	0.0151926
1.750	83.1367	39.8837	57481.28	-0.0566627	-0.0160811	0.0034592
2.000	83.1307	39.8792	57471.81	0.0714629	0.0061835	0.0025374
2.250	83.1247	39.8818	57477.35	-0.0441257	-0.0047397	-0.0005062
2.500	83.1487	39.8729	57462.74	0.1016709	0.0059024	0.0024834
2.750	83.1501	39.8743	57451.62	0.0773865	0.0121990	0.0071055
3.000	83.1455	39.8790	57466.25	-0.1018252	0.0028841	0.0063095
3.250	83.1486	39.8779	57447.68	0.1292346	0.0126025	0.0093382
3.500	83.1362	39.8760	57475.41	-0.1930818	-0.0020937	0.0062264
3.750	83.1307	39.8796	57454.47	0.1457422	0.0077720	0.0072359
4.000	83.1124	39.8684	57445.92	0.0608908	0.0110968	0.0089636
4.250	83.1059	39.8757	57452.00	-0.0437366	0.0078668	0.0092504
4.500	83.1078	39.8688	57454.09	-0.0144959	0.0066247	0.0096639
4.750	83.1097	39.8710	57445.59	0.0591587	0.0093083	0.0096987
5.000	83.0903	39.8683	57434.01	0.0026464	0.0129494	0.0110533
5.250	83.0602	39.8694	57454.77	-0.1445763	0.0054530	0.0102247
5.500	83.0517	39.8690	57459.68	-0.0341042	0.0036518	0.0091119
5.750	83.0340	39.8655	57453.00	0.0408707	0.0052696	0.0085874
6.000	83.0535	39.8651	57449.51	0.0298036	0.0062950	0.0083621
6.250	83.0301	39.8615	57447.34	0.0150947	0.0066460	0.0082420
6.500	83.0135	39.8592	57441.44	0.0411243	0.0079722	0.0084126
6.750	82.9983	39.8578	57442.87	-0.0099559	0.0073034	0.0084184
7.000	82.9699	39.8593	57439.53	0.0232294	0.0078766	0.0085228
7.250	82.9800	39.8578	57439.18	0.0024482	0.0076894	0.0085650
7.500	83.9856	39.8626	57447.29	-0.0564464	0.0055526	0.0082111
7.750	83.0115	39.8583	57428.45	0.1311519	0.0096025	0.0086126
8.000	83.0052	39.8573	57437.93	-0.0660686	0.0072395	0.0085458
8.250	83.0060	39.8530	57438.57	0.0512790	0.0085731	0.0087107
8.500	82.9951	39.8533	57432.39	-0.0126783	0.0079484	0.0087412
8.750	82.9729	39.8564	57425.57	0.0474739	0.0090767	0.0089496
9.000	82.9495	39.8543	57433.45	-0.0548544	0.0073021	0.0089436
9.250	82.9492	39.8490	57425.03	0.0586272	0.0086083	0.0089553
9.500	82.9252	39.8453	57425.41	-0.0026121	0.0083999	0.0090162
9.750	82.9030	39.8515	57438.31	-0.0899086	0.0058725	0.0087013
10.000	82.8863	39.8430	57434.27	0.0281550	0.0064292	0.0084969
10.250	82.8605	39.8443	57434.49	-0.0015597	0.0062344	0.0082831
10.500	82.8753	39.8393	57427.15	0.0511460	0.0073031	0.0082438
10.750	82.8576	39.8393	57438.32	-0.0778154	0.0053259	0.0079415
11.000	82.8378	39.8384	57436.94	0.0096298	0.0054227	0.0076841
11.250	82.8487	39.8341	57395.25	0.2983228	0.0117498	0.0082442
11.500	82.8263	39.8361	57436.32	-0.2862530	0.0052797	0.0079511
11.750	82.8126	39.8293	57419.78	0.1152682	0.0076171	0.0079659
12.000	82.8037	39.8287	57426.47	-0.0465974	0.0064898	0.0078516

TENNESSEE VALLEY AUTHORITY
CONTAINMENT LEAKAGE MEASUREMENT
TEST SUMMARY

HOURS SINCE START	AVERAGE TEMPERATURE DEG F.	CORRECTED PRESSURE PSIA	TOTAL MASS OF AIR LBM	P-T-P LEAK RATE % PER HOUR	TOTAL TIME LEAK RATE % PER HOUR	MASS LEAK RATE % PER HOUR
12.250	82.7857	39.8330	57404.26	0.1546803	0.0895106	0.0088962
12.500	82.7856	39.8291	57414.71	-0.0728391	0.0078653	0.0081222
12.750	82.7836	39.8290	57422.94	-0.0573141	0.0065864	0.0080095
13.000	82.7835	39.8315	57426.73	-0.0263939	0.0059546	0.0078340
13.250	82.8026	39.8340	57413.41	0.0927534	0.0075910	0.0078481
13.500	82.7961	39.8344	57403.37	0.0699706	0.0087448	0.0079779
13.750	82.8102	39.8244	57409.07	-0.0397132	0.0078646	0.0080109
14.000	82.7988	39.8300	57417.85	-0.0611832	0.0066328	0.0079106
14.250	82.7961	39.8266	57416.57	0.0088987	0.0066723	0.0078235
14.500	82.7893	39.8296	57417.32	-0.0052249	0.0064673	0.0077229
14.750	82.7957	39.8214	57404.39	0.0961017	0.0078335	0.0077692
15.000	82.7551	39.8263	57418.58	-0.0988889	0.0061059	0.0076496
15.250	82.7528	39.8200	57399.67	0.1317344	0.0081634	0.0077170
15.500	82.7442	39.8250	57391.89	0.0542246	0.0089052	0.0078550
15.750	82.7573	39.8196	57402.79	-0.0759592	0.0075599	0.0078570
16.000	82.7697	39.8263	57417.83	-0.1048232	0.0058258	0.0077017
16.250	82.7791	39.8165	57378.92	0.2710918	0.0090833	0.0079172
16.500	82.7841	39.8198	57377.47	0.0100757	0.0098060	0.0081189
16.750	82.7868	39.8190	57394.93	-0.0528126	0.0009634	0.0082270
17.000	82.7945	39.8287	57386.59	-0.0115175	0.0086624	0.0082954
17.250	82.7959	39.8173	57372.55	0.0978575	0.0099530	0.0084709
17.500	82.8002	39.8106	57392.13	-0.1365516	0.0078634	0.0084615
17.750	82.8046	39.8167	57398.66	-0.0454654	0.0071132	0.0083895
18.000	82.8053	39.8262	57396.35	0.0160612	0.0072372	0.0083311
18.250	82.8792	39.8205	57382.52	0.0963686	0.0094564	0.0083739
18.500	82.9081	39.8205	57388.52	-0.0417698	0.0077786	0.0083632
18.750	82.9200	39.8279	57379.11	0.0655357	0.0085474	0.0084057
19.000	82.9219	39.8319	57393.38	-0.0994282	0.0071289	0.0083430
19.250	83.0521	39.8277	57380.05	0.0928617	0.0082406	0.0083641
19.500	83.1159	39.8361	57357.46	0.1574504	0.0101504	0.0085247
19.750	83.1730	39.8413	57359.34	-0.0138758	0.0090567	0.0086553
20.000	83.2399	39.8475	57357.60	0.0116044	0.0098782	0.0087786
20.250	83.2960	39.8444	57350.43	0.0591521	0.0103742	0.0089314
20.500	83.3316	39.8587	57370.59	-0.1402004	0.0085415	0.0087420
20.750	83.3057	39.8589	57375.78	-0.0362226	0.0088030	0.0089172
21.000	83.4327	39.8582	57359.07	0.1165035	0.0092923	0.0089604
21.250	83.4315	39.8609	57357.80	0.0080804	0.0092873	0.0090185
21.500	83.4112	39.8536	57346.43	0.0792715	0.0100992	0.0091543
21.750	83.4259	39.8495	57351.63	-0.0362659	0.0095672	0.0092202
22.000	83.4113	39.8543	57376.63	-0.1743344	0.0074815	0.0091482
22.250	83.4034	39.8474	57363.13	0.0940598	0.0084526	0.0091415
22.500	83.4099	39.8477	57352.77	0.0722855	0.0091601	0.0091821
22.750	83.4451	39.8521	57348.70	0.0278156	0.0093645	0.0092308
23.000	83.4787	39.8500	57336.15	0.0886642	0.0102101	0.0093315
23.250	83.4685	39.8537	57336.25	-0.0096540	0.0101012	0.0094165
23.500	83.5183	39.8440	57352.77	-0.1152458	0.0087786	0.0094183
23.750	83.5733	39.8613	57348.91	0.0269165	0.0089610	0.0094291
24.000	83.6182	39.8651	57336.96	0.0874867	0.0097770	0.0094889

A P P E N D I X C

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT -- UNIT 1
CONTAINMENT LEAKAGE MEASUREMENT
TEST SUMMARY
ALL COMPARTMENTS
12 PSIG CILRT

HOURS SINCE START	AIR MASS LOWER COMP. LBM	AIR MASS UPPER COMP. LBM	AIR MASS UPPER ICE LBM	AIR MASS LOWER ICE LBM	P-T-P LEAK RATE % PER HOUR	TOTAL TIME LEAK RATE % PER HOUR	MASS LEAK RATE % PER HOUR
0.000	[illegible]	91142.5	7101.3	16969.5	0.00000	0.00000	0.00000
0.250	53932.8	91140.7	7100.0	16968.0	0.00820	0.00820	0.00821
0.500	53932.1	91144.1	7100.7	16966.7	-0.00208	0.00266	0.00266
0.750	53931.2	91139.6	7100.8	16965.0	0.01666	0.00733	0.00630
1.000	53930.1	91139.4	7102.8	16963.2	0.00277	0.00619	0.00633
1.250	53930.9	91139.4	7103.0	16962.1	-0.00046	0.00486	0.00534
1.500	53936.3	91142.5	7102.4	16963.6	-0.00037	0.00398	0.00439
1.750	53930.7	91142.5	7097.9	16959.1	0.01334	0.00532	0.00473
2.000	53929.8	91141.3	7097.6	16957.7	0.00887	0.00576	0.00518
2.250	53930.6	91142.6	7100.5	16956.6	-0.00921	0.00412	0.00463
2.500	53932.1	91143.2	7101.4	16955.6	-0.00401	0.00323	0.00391
2.750	53932.0	91145.0	7101.8	16954.6	-0.00277	0.00268	0.00322
3.000	53933.6	91148.9	7102.6	16953.8	-0.01278	0.00139	0.00229
3.250	53934.2	91151.2	7097.7	16952.4	0.00318	0.00153	0.00173
3.500	53932.4	91145.6	7098.9	16950.5	0.02373	0.00312	0.00191
3.750	53931.7	91146.2	7097.8	16949.3	0.00598	0.00331	0.00213
4.000	53931.9	91146.9	7097.4	16947.7	0.00248	0.00326	0.00228
4.250	53933.3	91148.9	7097.6	16947.1	-0.00728	0.00264	0.00223
4.500	53934.1	91149.7	7101.3	16946.6	-0.01130	0.00186	0.00197
4.750	53934.1	91151.4	7098.1	16945.5	0.00621	0.00209	0.00184
5.000	53934.4	91153.6	7092.6	16944.3	0.00991	0.00248	0.00186
5.250	53934.0	91150.1	7090.7	16943.1	0.01171	0.00292	0.00198
5.500	53933.3	91151.9	7094.1	16941.7	-0.00205	0.00266	0.00202
5.750	53935.4	91152.1	7096.2	16940.8	-0.00337	0.00241	0.00200
6.000	53934.4	91151.4	7098.6	16940.0	-0.00495	0.00210	0.00193
6.250	53935.0	91156.6	7098.0	16939.5	-0.01072	0.00159	0.00176
6.500	53934.9	91151.9	7096.8	16938.5	0.00459	0.00172	0.00164
6.630	53935.7	91155.0	7097.5	16937.9	0.00376	0.00176	0.00156
6.750	53935.1	91156.0	7095.9	16937.0	0.01057	0.00192	0.00152
7.000	53935.7	91155.7	7097.1	16935.3	0.00040	0.00185	0.00149
7.314	53935.1	91156.2	7093.7	16934.2	0.01178	0.00217	0.00153
7.564	53935.6	91156.3	7093.2	16932.9	0.00244	0.00218	0.00155
7.814	53935.0	91155.8	7093.4	16931.8	0.00499	0.00227	0.00160
8.064	53937.8	91157.9	7091.1	16931.3	-0.00525	0.00203	0.00159
8.314	53937.6	91157.9	7087.0	16930.1	0.01124	0.00231	0.00164

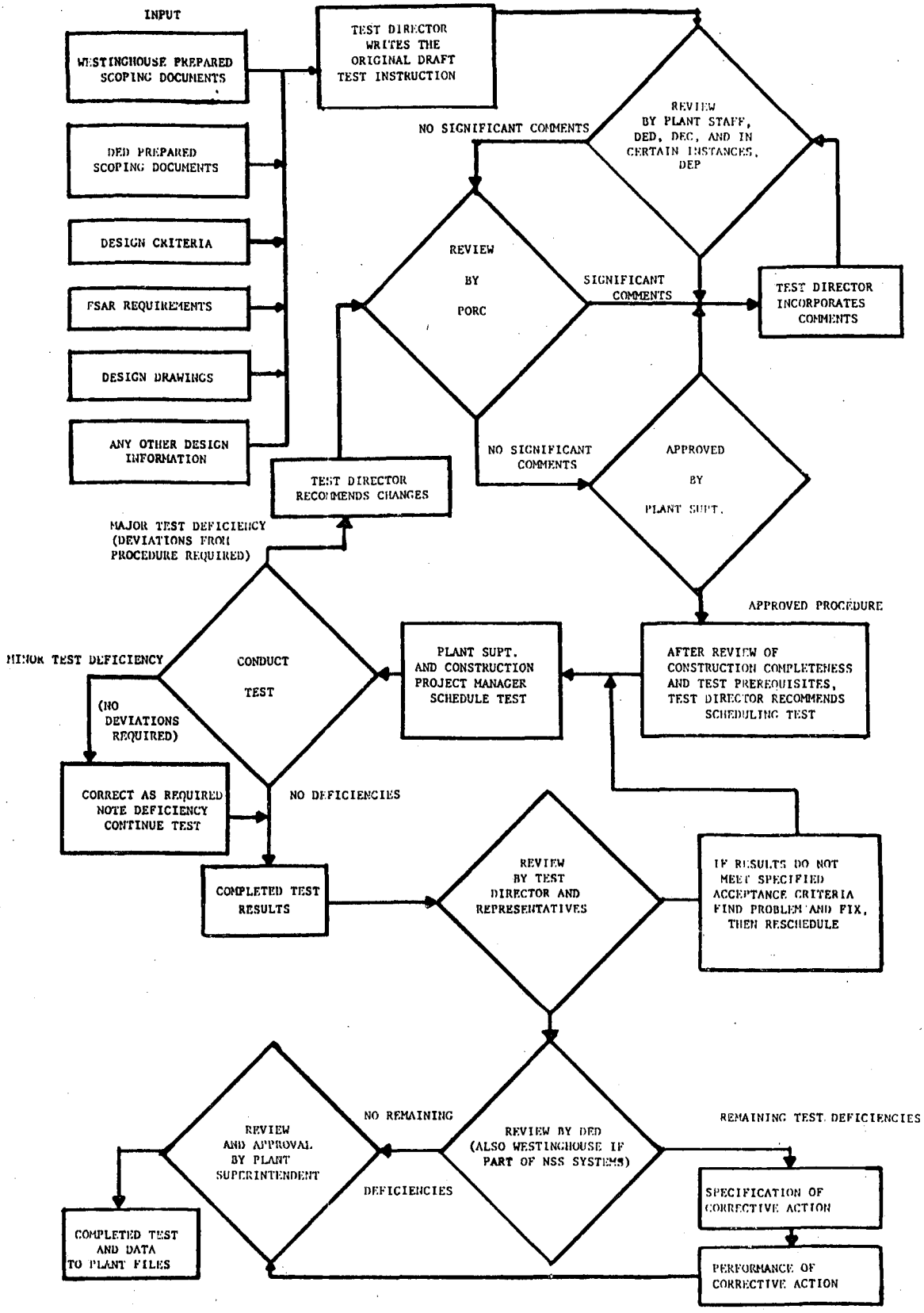
TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT -- UNIT 1
CONTAINMENT LEAKAGE MEASUREMENT
TEST SUMMARY
ALL COMPARTMENTS
12 PSIG CILRT

HOURS SINCE START	AIR MASS LOWER COMP. LBM	AIR MASS UPPER COMP. LBM	AIR MASS UPPER ICE LBM	AIR MASS LOWER ICE LBM	P-T-P LEAK RATE % PER HOUR	TOTAL TIME LEAK RATE % PER HOUR	MASS LEAK RATE % PER HOUR
8.564	53934.5	91156.0	7090.9	16928.5	0.00839	0.00249	0.00171
8.814	53936.0	91155.5	7091.1	16927.1	0.00826	0.00243	0.00177
9.064	53936.3	91155.7	7091.5	16926.2	0.00822	0.00236	0.00180
9.314	53937.2	91156.1	7092.4	16925.5	-0.00384	0.00229	0.00182
9.564	53938.1	91156.8	7090.3	16924.8	0.00311	0.00222	0.00184
9.814	53938.4	91159.3	7085.3	16924.1	0.00673	0.00234	0.00186
10.064	53938.5	91160.4	7083.7	16922.8	0.00425	0.00238	0.00190
10.314	53939.1	91159.2	7091.7	16921.8	-0.01527	0.00196	0.00187
10.564	53939.7	91162.3	7093.2	16921.2	-0.01116	0.00165	0.00181
10.814	53941.2	91163.6	7086.6	16920.5	0.01060	0.00185	0.00178
10.924	53940.8	91167.5	7084.0	16920.2	-0.00278	0.00181	0.00175
11.064	[illegible]	91169.6	7080.7	16920.2	0.00389	0.00183	0.00172
11.314	53941.2	91166.2	7070.3	16918.6	0.01737	0.00218	0.00174
11.564	53939.7	[illegible]	7082.8	16916.5	0.00173	0.00223	0.00177
11.814	53939.0	91163.9	7085.8	16915.2	-0.00396	0.00210	0.00178
12.064	53939.6	91163.5	7087.1	16914.3	-0.00122	0.00203	0.00178
12.314	53940.3	91164.5	7085.5	16913.5	0.00166	0.00202	0.00178
12.564	53939.7	91163.5	7086.0	16912.6	0.00133	0.00197	0.00179
12.814	[illegible]	91164.2	7088.9	16911.0	0.00096	0.00205	0.00179
13.064	53937.5	91163.2	7090.1	16910.1	0.00155	0.00204	0.00179
13.314	53937.2	91163.7	7090.8	16909.1	0.00007	0.00206	0.00179
13.564	53937.0	91163.8	7089.9	16908.3	0.00036	0.00205	0.00180
13.814	53937.6	91164.9	7090.5	16907.5	-0.00835	0.00186	0.00179
14.064	53938.8	91169.4	7096.6	16906.9	-0.00758	0.00169	0.00175
14.314	53939.7	91170.3	7090.1	16906.2	-0.00152	0.00163	0.00172
14.564	53939.8	91168.5	7088.7	16905.3	0.00949	0.00177	0.00170
14.814	53941.6	91172.6	7085.6	16904.4	-0.00446	0.00167	0.00168
15.064	53941.9	91173.7	7079.9	16903.4	0.01231	0.00184	0.00167
15.314	53940.1	91172.5	7079.6	16902.1	0.01101	0.00199	0.00168
15.564	53939.9	91171.9	7079.6	16900.6	0.00573	0.00205	0.00169
15.814	53939.2	91172.3	7080.0	16899.6	0.00174	0.00205	0.00170
16.064	53940.3	91174.6	7078.4	16899.2	-0.00314	0.00197	0.00171
16.314	53941.4	91175.7	7079.8	16898.4	-0.00665	0.00183	0.00170
16.564	53941.1	91178.3	7079.8	16897.3	-0.00288	0.00176	0.00169
16.814	53942.4	91176.6	7074.3	16896.3	0.01640	0.00198	0.00170

TENNESSEE VALLEY AUTHORITY
SEQUOYAH NUCLEAR PLANT -- UNIT 1
CONTAINMENT LEAKAGE MEASUREMENT
TEST SUMMARY
ALL COMPARTMENTS
12 PSIG CILRT

HOURS SINCE START	AIR MASS LOWER COMP. LBM	AIR MASS UPPER COMP. LBM	AIR MASS UPPER ICE LBM	AIR MASS LOWER ICE LBM	P-T-P LEAK RATE % PER HOUR	TOTAL TIME LEAK RATE % PER HOUR	MASS LEAK RATE % PER HOUR
17.064	53941.1	91178.1	7072.9	16895.1	0.00551	0.00203	0.00171
17.314	53940.0	91174.6	7074.6	16893.8	0.00987	0.00215	0.00173
17.564	53940.4	91175.7	7077.8	16892.7	-0.01060	0.00196	0.00173
17.814	53940.6	91177.3	7073.2	16891.8	0.01102	0.00209	0.00175
18.064	53940.6	91177.6	7073.3	16890.7	0.00174	0.00209	0.00176
18.314	53940.4	91176.5	7079.8	16889.4	-0.00916	0.00193	0.00176
18.564	53940.2	91174.7	7081.2	16888.2	0.00399	0.00196	0.00176
18.814	53940.3	91176.9	7082.2	16887.4	-0.00569	0.00186	0.00176
18.936	53941.3	91178.2	7081.8	16887.4	-0.00562	0.00178	0.00175
19.186	53943.5	91179.3	7080.3	16886.7	-0.00255	0.00173	0.00173
19.436	53947.0	91180.1	7079.1	16885.5	0.00710	0.00180	0.00173
19.686	53948.9	91177.8	7079.1	16884.2	0.01135	0.00192	0.00173
19.936	53942.4	91178.4	7076.0	16883.3	-0.00041	0.00189	0.00173
20.186	53947.4	91177.6	7078.5	16882.4	0.00311	0.00190	0.00173
20.436	53942.5	91179.2	7078.6	16881.7	-0.00270	0.00165	0.00173
20.686	53942.3	91179.1	7076.6	16880.7	0.00303	0.00166	0.00173
20.936	53943.5	91179.6	7078.7	16880.2	-0.00299	0.00180	0.00172
21.186	53943.5	91180.5	7077.7	16879.3	0.00251	0.00181	0.00172
21.436	53943.6	91181.2	7077.9	16878.4	-0.00033	0.00179	0.00171
21.686	53943.4	91182.3	7078.7	16877.3	0.00299	0.00180	0.00170
21.936	53944.7	91181.9	7079.8	16876.7	-0.00780	0.00169	0.00169
22.186	53945.4	91184.1	7078.8	16876.5	-0.00397	0.00163	0.00168
22.436	53947.3	91187.3	7078.6	16876.0	-0.01020	0.00150	0.00166
22.686	53948.8	91188.9	7078.5	16875.6	-0.00683	0.00141	0.00163
22.936	53949.8	91191.7	7068.8	16875.1	0.01500	0.00156	0.00162
23.186	53949.6	91191.5	7062.2	16873.5	0.02026	0.00176	0.00162
23.436	53947.3	91189.3	7067.1	16871.9	0.00281	0.00177	0.00162
23.686	53945.6	91187.3	7070.8	16870.3	0.00356	0.00179	0.00162
23.936	53946.0	91183.1	7074.0	16869.3	0.00181	0.00179	0.00162
24.186	53946.0	91185.4	7074.0	16868.3	-0.00081	0.00177	0.00162
24.436	53946.6	91187.3	7073.8	16867.5	-0.00392	0.00171	0.00162
24.686	53946.0	91187.9	7074.8	16866.6	0.00022	0.00169	0.00161

Attachment 3



Added by Amendment 32

WATTS BAR NUCLEAR PLANT
FINAL SAFETY ANALYSIS REPORT

PREOPERATIONAL TEST INSTRUCTION FLOW CHART

FIGURE 14.2-6

at least ~~1~~ 2 months before the date the test is to be started.

14.2.11.2 Startup Test Program Schedule

Startup testing will begin after completion of the prerequisite preoperational and 14.2-3b tests and receipt of an operating license. Figure 14.2-3 shows the sequence of startup testing for unit 1 and 2, for which at least 3 months will be necessary for completion. The minimum specific tests and acceptance criteria which must be completed on each plateau prior to ascension to the next power level are contained in the plant instructions. These startup test instructions will be completed and available for NRC review at least ~~one~~ 2 months before fuel loading. Figure 14.2-3a and 14.2-3b will be revised prior to fuel loading to indicate these minimum test requirements. 44

14.2.11.3 Test Program Overlap

Unit 2 of the Watts Bar Nuclear Plant is not scheduled for fuel loading until 9 months after unit 1 fuel loading. The major portion of preoperational testing will, therefore, have been completed on unit 1 before significant testing is begun on unit 2. There will be sufficient personnel to cover any overlap of responsibilities which might occur. Startup testing on unit 1 should be completed before fuel loading of unit.

Revision 1

Attachment 5

TOPICAL REPORT

BN-TOP-1

TESTING CRITERIA FOR INTEGRATED LEAKAGE RATE TESTING OF PRIMARY CONTAINMENT STRUCTURES FOR NUCLEAR POWER PLANTS

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1.0 INTRODUCTION

It has been customary to conduct integrated leakage rate tests on primary containment structures for a duration of at least 24 hours. The basis for the 24 hour test duration came from AEC guidelines and recommendations made in preliminary issues of ANS 7.60 (now ANSI N45.4-1972), "Leakage Rate Testing of Containment Structures for Nuclear Reactors."

However, several primary containment tests have been conducted over the past two years providing additional information in regards to containment leakage rate test duration. Test results have shown that a successful primary containment leakage rate test can be conducted in considerably less than 24 hours.

Bechtel Corporation personnel have conducted, commencing with the Palisades Nuclear Plant, fourteen primary containment leakage rate tests on seven containments to date. It became apparent early in the containment testing program that the acceptability or nonacceptability of the leakage rate measurements could be determined within a few hours (4 to 6) after the start of the test. Early tests were still conducted for 24 hours in accordance with the original guidelines until sufficient data was collected to confirm previous observations. Twenty-four hour primary containment tests were conducted at peak test pressure and at reduced test pressure at Palisades, Point Beach Unit 1, Point Beach Unit 2 and Pilgrim Unit 1. At Turkey Point Unit 3, the reduced pressure test was run for six hours. The peak pressure test was run for twenty-two hours, but the test results were reported based on six hours of test data.

Subsequent to the Turkey Point Unit 3 containment test, a formal presentation was made by Bechtel Corporation personnel to the AEC in Washington, D.C. on July 20, 1971. The AEC was represented by individuals from the Division of Compliance, the Division of Reactor Licensing and the Division of Reactor Standards. Data from previous containment tests conducted by Bechtel was presented in tabular and graphical form illustrating the ability of the leak rate measurement system and computer program to determine the containment leakage rate after approximatley six hours of testing.

As a result of the July 20, 1971 meeting, it was agreed to conduct the Oconee Nuclear Station Unit 1 containment leakage rate test for a duration of ten hours. In August 1971 the reduced pressure test and peak pressure test were successfully conducted at Oconee, each for a duration of ten hours.

The data indicated that a containment leakage rate test can be successfully run in less than twenty four hours and it seems neither necessary nor desirable from a practical standpoint for a utility to commit to a 24 hour leak rate test.

In March 1972 the Turkey Point Plant Unit 4 containment integrated leak rate test was satisfactorily completed in less than twenty four hours. The test durations for the peak and reduced pressure tests were 8¼ hours and six hours respectively.

Though data presented to justify containment leakage rate tests for durations of less than 24 hours was originally based on pressurized water reactor containments, similar criteria can be applied to boiling water reactor containments. In June 1972 the primary containment integrated leak rate test was satisfactorily completed at Pilgrim Unit 1. At the request of the client both the peak and reduced pressure tests were run for twenty four hours. However, review of the data confirmed that the criteria previously applied to pressurized water reactor containments also applies to boiling water reactor (BWR) containments. The Pilgrim Unit 1 containment integrated leak rate tests could have been satisfactorily run is less than twenty four hours. The instrumentation used and the method used to measure the leakage are the same. In general, only the containment size and maximum allowable leakage rate vary from site to site.

The recommended criteria for determining when a containment integrated leak rate test is successfully completed is presented in Section 2.0.

Detailed explanations as to how the leak rate is determined and reported are presented in subsequent sections.

Section 4.0 describes instrumentation previously and currently used by Bechtel personnel. However, different instrumentation may be used on future containment integrated leak rate tests if it can be shown that the instrumentation provides equal or better test progress and results.

2.0 TEST DURATION CRITERIA

2.1 Historical Data

This discussion is based on fourteen containment integrated leak rate tests conducted on seven containments during the past two years. Peak pressure and reduced pressure tests were conducted at: Palisades Nuclear Power Station; Point Beach Nuclear Power Plant Unit 1; Point Beach Nuclear Power Plant Unit 2; Turkey Point Plant Unit 3; Oconee Nuclear Power Plant Unit 1; Turkey Point Plant Unit 4; and, Pilgrim Nuclear Power Station Unit 1.

A computer printout of the test report for each of these tests is provided in Appendix B of this report. Additionally, a graph of the Calculated Leak Rate versus Test Duration is provided for the reduced pressure tests (Figure B.1) and for the peak pressure tests (Figure B.2).

2.2 General Discussion

The objective of conducting a containment integrated leak rate test is to verify that the integrity of the containment is in compliance with the criteria set forth in the plant Final Safety Analysis Report and Technical Specifications.

This objective is accomplished by pressurizing containment and measuring the resulting leakage of contained air. Data is accumulated at least hourly during the containment test period. The data is then statistically compiled and reported to enable test personnel to make a decision as to the test results based on the data presented.

hourly periods 1/10 - 1/10 hr

A review of the data shows that in practically every case the magnitude and the trend of the calculated leak rate indicates a satisfactorily completed test in less than twenty-four hours of test duration. Based upon this review the following containment integrated leak rate test duration criteria were formulated.

A. Bechtel Computer Program

implement test initiator algorithm.

The decision as to whether or not the leak rate is satisfactorily completed is determined from the values and trends of the measured data, the magnitude and trend of the calculated leak rate, the statistical analysis of the data as provided by the Bechtel Corporation computer program, and the judgment of test personnel based on an overall review of test data and on previous testing experience.

Additionally, it should be noted that analysis of data is based on information received from the Bechtel containment structure integrated leakage rate test computer program printouts.

are we ok?

The Total Time, Point to Point and Trend Reports are computed using formulas presented in ANSI N45.4-1972 as described in Section 6 of this topical report. In addition to computing the leakage rate, the Bechtel computer printouts provide information concerning the mean, standard deviation and 95% confidence limits of the measured data.

Consequently, the below listed criteria may not be useable by others using different methods to analyze data and compute the containment structure integrated leakage rate.

B. Containment Atmosphere Stabilization

After the containment has been pressurized to test pressure a plot shall be made of the average containment air temperature versus time.

This plot yields a farily smooth curve which will approach a straight line. A sloped straight line indicates that a heat sink or heat source (due to ventilation system operation for example) exists inside the containment. If heat sources or heat sinks are insignificant the plot will become horizontal.

If the status of heat sinks or sources changes during the test (starting or stopping ventilation system fans or cooling water for example) the slope of the line will of course change.

A plot of containment air absolute pressure versus time is also plotted. The pressure-time curve should follow the temperature-time curve. For example if the current containment air temperature and pressure are 70°F and 65 psia, respectively, and the temperature drops 0.1°F in one hour, the pressure should drop 0.012 psi or more (depending on the leak rate) during the same hour.

C. Sensor Malfunction

In addition to the above plots the recorded data of individual sensors must also be continuously reviewed. The trend of each sensor should follow the trend of the average. Deviation from the trend may indicate a faulty sensor.

In general, the number of sensors that can be lost without having to abort the test is a function of the number of sensors used, the sensor locations, and the volume fractions assigned to the sensors.

However, if data recorded over the past five hours indicates that dewpoint temperatures, i.e. partial pressure of water vapor, have stabilized and any changes are not of an order to cause error in leak rate calculations, then malfunction of any or all of the dewpoint sensors shall not require aborting the test (See ANSI N45.4-1972, section 7.9). Otherwise, at least two thirds of the dewpoint temperature sensors must be functioning properly during the test.

At least two-thirds of the drybulb temperature sensors must be functioning properly during the test.

At least one precision pressure gage must be functioning properly during the test.

D. System Verification

Subsequent to calculating the leak rate a superimposed leak rate of known magnitude is established. Data for verification portion of the test is reviewed and analyzed in the same manner as the data for leak rate portion of the test.

2.3 Duration Criteria

Specifically, the following criteria shall be met in order to consider an integrated leak rate test satisfactorily completed:

A. Containment Atmosphere Stabilization

Once the containment is at test pressure the containment atmosphere shall be allowed to stabilize for about four hours. The atmosphere is considered stabilized when:

1. The rate of change of average temperature is less than 1.0°F/hour averaged over the last two hours.

or

2. The rate of change of temperature changes less than 0.5°F/hour/hour averaged over the last two hours.

B. Data Recording and Analysis

1. The Trend Report based on Total Time calculations shall indicate that the magnitude of the calculated leak rate is tending to stabilize at a value less than the maximum allowable leak rate (L_a). (Note: The magnitude of the calculated leak rate may be increasing slightly as it tends to stabilize. In this case the average rate of increase of the calculated leak rate shall be determined from the accumulated data over the last five hours or last twenty data points, which ever provides the most points. Using this average rate the calculated leak rate can then be linearly extrapolated to the 24th hour data point. If this extrapolated value of the calculated leak rate exceeds 75% of the maximum allowable leak rate (L_a) then the leak rate test is continued.)

and

2. The end of test upper 95% confidence limit for the calculated leak rate based on Total Time calculations shall be less than the maximum allowable leak rate.

and

3. The mean of the measured leak rates based on Total Time calculations over the last five hours of test or last twenty data points, whichever provides the most data, shall be less than the maximum allowable leak rate.

and

4. Data shall be recorded at approximately equal intervals and in no case at intervals greater than one hour.

and

5. At least twenty (20) data points shall be provided for proper statistical analysis.

and

6. In no case shall the minimum test duration be less than six (6) hours.

C. Verification

1. Containment atmospheric conditions shall be allowed to stabilize for about one hour after superimposing the known leak rate.

2. The verification test duration shall be approximately equal to half the integrated leak rate test duration.

3. Results of this verification test shall be acceptable provided the correlation between the verification test data and the integrated leak rate test data demonstrate an agreement within plus or minus 25 percent.

3.0 ANALYSIS METHODS

3.1 General Discussion

The two methods of leakage rate testing generally applied to primary containment systems are the Reference Vessel Method and the Absolute Method. Both methods are described in ANSI N45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Power Plants."

Once the method of leakage rate testing has been selected, two procedures for calculating the leakage rate are available. Both procedures, Total-Time and Point-to-Point, are described in ANSI N45.4-1972.

3.2 Absolute Method

The method of leakage rate testing employed by Bechtel Corporation for primary containment structures is the Absolute Method since Bechtel testing experience has shown that the Absolute Method is currently more practical for the testing situations encountered.

Using instrumentation of comparable accuracy and repeatability both the Absolute Method and Reference Vessel Method provide comparable leakage rate measurement results. However, the Absolute Method is preferred by Bechtel for the following reasons:

A. To accurately determine containment atmosphere conditions all regions of the containment should be sampled. This can be accomplished easily and relatively inexpensively using the Absolute Method.

B. The leakage rate formula for the Reference Vessel Method presented in ANSI N45.4-1972 assumes that reference vessel atmosphere and containment atmosphere temperatures are equal. This temperature equalization is generally difficult to attain. Therefore, the usual Reference Vessel Method can make the reference vessel a gas thermometer and the shorter the time interval between taking data the greater the error associated with a variable temperature lag.

C. Reference Vessel Method instrumentation located inside the containment is susceptable to leakage. Consequently, an additional leak rate test must be conducted on the reference vessel system. Also, due to their complexity, a minimum number of vessels would be built and installed. Should a small leak occur in a reference vessel the containment must be depressurized to make repairs - a time consuming and costly operation. Absolute Method instrumentation located inside the containment is not susceptible to such failure.

D. Due to redundancy provided by the number of sensors installed for the Absolute Method, should a small percentage of the sensors malfunction the test need not be aborted. The inoperative sensors are simply factored out of the program, volume fractions recomputed for the remaining sensors and the test continued.

3.3 Total-Time and Point-to-Point Calculations

The Bechtel Computer program uses both the Total-Time and Point-to-Point procedures for calculating containment structure leakage rate. These procedures are described in ANSI N45.4-1972. Leakage rate test reports were originally based on the Point-to-Point calculations as recommended by the April 1970 issue of ANS 7.60 (now ANSI N45.4-1972). Now, however, as recommended by Appendix J to 10CFR Part 50, "Reactor Containment Leakage Testing for Water Cooled Power Reactors," leakage rate test reports are based on the Total-Time calculations. Experience has shown that Total-Time calculations provide better results. Additionally, the current revision of ANSI N45.4-1972 recommends the Total-Time procedure.

The Total-Time procedure is preferred since it reduces the effect of instrument errors on leakage rate computations as the total test duration increases. Additionally, any other errors which occur at one data point affect only that data point.

For the Point-to-Point calculation the magnitude of the effect of the error on calculations is greater for a given data point and also affects subsequent data points. As an example, the following illustration is provided for a time distortion effect called time parallax:

> Assume that the 1400 data was actually taken at 1402 but recorded as taken at 1400. The 1430 data was taken on time. The test started at 0800. Data is taken every half hour.
>
> The 1400 Measured Leak Rate using Total-Time calculations would be in error by a factor of
>
> $$\frac{+2 \text{ min}}{6 \text{ hours}} = \frac{+2 \text{ min}}{360 \text{ min}} = +0.0056$$
>
> or about +½%. The 1430 Measured Leak Rate would be correct.
>
> On the other hand, the 1400 Measured Leak Rate using Point-to-Point calculations would be in error by a factor of
>
> $$\frac{+2 \text{ min}}{0.5 \text{ hours}} = \frac{+2 \text{ min}}{30 \text{ min}} = +0.067$$
>
> or about 6.7%. The 1430 Measured Leak Rate would be in error by about the same amount except opposite in sign.

The Point-to-Point procedure is retained as part of the computer report printout since this method of calculation will more rapidly indicate departures from the trend late in the test period.

4.0 TEST INSTRUMENTATION

4.1 Parameters Monitored

During the primary containment leakage rate tests, measurements are made of containment atmosphere drybulb temperature, dewpoint temperature (for vapor pressure determination), and absolute pressure.

4.2 Drybulb Temperature

Temperature sensors generally used are 100 ohm copper thermohm detectors employing a sensitive element of extremely pure copper wire, wound and annealed to minimize strains. This construction provides a definite resistance value at each temperature within the range of the detector. This stability and accuracy assures the repeatibility so important in leakage rate calculations since computations are based primarily on measuring the change in temperature and not on measuring the actual temperature. Response time for 90% of a temperature change is about 40 seconds. The limit of error of the detector is $\pm 0.5^{o}F$ over a range of $32^{o}F$ to $250^{o}F$ with a repeatability of $0.1^{o}F$.

Generally, twelve to twenty-four resistance thermometers are located throughout the containment. The number selected is a function of the containment free air volume, the containment configuration, and the redundancy desired to insure a representative containment air sampling should there be temperature sensor malfunctions. The locations of the sensors are selected, based on a temperature survey, to provide a representative sampling of containment atmosphere temperature. Each temperature sensor is assigned a volume fraction which is based on the fraction of the containment total internal free air volume, i.e. temperature zone determined by temperature survey, that the sensor is monitoring.

The recorded values of temperature for each temperature sensor are fed into the computer. The computer program then corrects for volume fractions, calibration curves and conversion tables, as required, and computes one total, corrected, average containment atmosphere temperature in degrees F.

4.3 Dewpoint Temperature (Vapor Pressure)

Dewpoint temperature sensors generally used are described as follows:

a. Aluminum oxide humidity sensors which consist of an aluminum strip which is anodized by a special process to provide a porus oxide layer. A very thin coating of gold is evaporated over this structure. The aluminum base and the gold layer form the two electrodes of what is essentially an aluminum oxide capacitor. Water pressure directly affects the electrical capacitance and hence the sensor output. System accuracy is $\pm 1^{o}C$ or $\pm 1.8^{o}F$ over a Dew/Frost point temperature range of $-110^{o}C$ to $+20^{o}C$, with a repeatability of $\pm 0.5^{o}C$ in the humidity range commonly encountered during the test.

b. Resistance dependent humidity sensors which have an insulator surface consisting of an epoxy filled fiberglass cloth on which are deposited a pair of intermeshing gold fingers. The disc is mounted on a two-stage thermoelectric cooler. Current to the cooler is controlled by comparing the sensor impedance to a fixed resistor. The dewpoint determinination is based on conductivity. System range is -20°F to 140°F with an accuracy of ±1°F over a dewpoint range of +60°F to +100°F with a repeatability of ±0.5°F.

Generally, six dewpoint temperature sensors are located throughout the containment. Dewpoint temperature sensors are located following a temperature survey and each sensor is assigned a volume fraction corresponding to the fraction of the containment internal free air volume monitored by that sensor.

The recorded values of dewpoint temperature for each sensor are fed into the computer. The computer program then corrects for volume fractions, calibration curves and conversion tables and computes one total, corrected, average containment atmosphere water vapor pressure in PSIA.

4.4 Absolute Pressure

The pressure sensor generally used is a precision pressure gage which consists of two parts: an interchangeable fused-quartz Bourdon tube capsule and a null-sensing optical readout unit. Optical coupling between pressure sensor and readout eliminates reactive and frictional forces on the sensor, assuring optimum repeatibility. Range is 100,000 counts full scale; resolution 0.001% of full scale; repeatibility 0.001% of full scale; and, accuracy of 0.015% of full scale.

The recorded value of pressure is fed into the computer. The computer program corrects for a tube constant associated with the Bourdon tube and computes one total, corrected containment atmosphere absolute pressure in PSIA.

4.5 Instrument Error Analysis

The error analysis is conducted twice. The analyses are used primarily to select a balanced integrated leak rate measurement system and evaluate, in advance, the figure of merit for the system. The first error analysis determines the range of expected error based on the instrumentation calibration tolerances. The second error analysis determines the range of expected error based on instrumentation repeatability.

Since containment leakage rate computations are a function of changes in temperature and pressure and not the absolute value, the repeatability error analysis is more meaningful. However, both analyses are provided.

ACCURACY ERROR ANALYSIS

The measured leak rate in weight percent per day is computed using the absolute method by the formula:

$$M = (100)\left(\frac{24}{H}\right)\left[1 - \frac{T_1\,\bar{P}_n}{T_n\,\bar{P}_1}\right].$$

by this formula, the leakrate is always calculated (1) wrt the initial data point (max) of the test.

where:

$\bar{P}_1 = P_1 - P_{v1}$ = total containment atmosphere absolute pressure, in psia, at the start of the test, corrected for water vapor pressure.

$\bar{P}_n = P_n - P_{v2}$ vn = total containment atmosphere absolute pressure, in psia, at data point n after start of the test, corrected for water vapor pressure.

T_1, T_n = containment mean atmospheric temperature in °R, at the start and at data point n, respectively.

H = test interval in hours between time 1 and time n.

R = gas constant (assumed to be a constant for the entire range of pressure and temperature).

The change or uncertainty interval in M due to uncertainties in the measured variables is given by:

$$\delta_M = \frac{2400}{H}\left[\left(\frac{dM}{dP_2}\cdot\delta_{P_2}\right)^2 + \left(\frac{dM}{dP_1}\cdot\delta_{P_1}\right)^2 + \left(\frac{dM}{dT_1}\cdot\delta_{T_1}\right)^2 + \left(\frac{dM}{dT_2}\cdot\delta_{T_2}\right)^2\right]^{1/2} \qquad (2)$$

where δ is the standard error for each variable. This formula assumes that all errors are systematic rather than random in character. Even though the formula is deterministic it does, however, allow assessment of figure of merit for various equipment to be used in the measuring system without the need for assembling and calibrating the system as an entity.

The error in M after differentiating is:

$$e_M = \frac{2400}{H}\left[\left(-\frac{T_1}{\bar{P}_1 T_2}\cdot e_{\bar{P}_2}\right)^2 + \left(\frac{\bar{P}_2 T_1}{\bar{P}_1^{\,2} T_2}\cdot e_{\bar{P}_1}\right)^2 + \left(-\frac{\bar{P}_2}{\bar{P}_1 T_2}\, e_T\right)^2 + \left(\frac{\bar{P}_2 T_1}{\bar{P}_1\, T_2^{\,2}}\cdot e_T\right)^2\right]^{1/2} \qquad (3)*$$

where:

$$e_{\bar{P}_1} = \delta_{P_1}$$

$$e_{\bar{P}_2} = \delta_{P_2}$$

$$e_T = e_{T_1} = e_{T_2}$$

For the purpose of developing a finite number for e_M using equation (3), it is necessary to assume certain containment conditions based on historical data encountered in previous Bechtel tested containment vessels. Therefore, the following conditions will be assumed to exist:

1. For purposes of comparison to other tests H=24 hours.

2. Containment leak rate is essentially zero, that is:

   $P_1 = P_2$

   $T_1 = T_2$

   $P_{V1} = P_{V2}$

3. Containment mean absolute pressure = 60 psig.

4. Containment mean atmosphere temperature (drybulb) = 80°F = 539.7°R based on 20 volume weighted temperature sensors.

---

* Equation (3) has been verified by K. Joroshek and E. Weipport, Tightness Investigations on Reactor Safety Pressure Vessels," Vo. 13, No. 3, March 1961.

5. Containment mean dewpoint temperature = 70°F based on 6 volume weighted dewpoint temperature sensors.

Equation (3) becomes:

$$e_M = 100\left[2\left(\frac{e_P}{\bar{P}}\right)^2 + 2\left(\frac{e_T}{T}\right)^2\right]^{1/2} \qquad (4)$$

where:

e_P = the error in pressure which accounts for the error in the total pressure measurement system; both total absolute pressure and water vapor pressure.

$$e_P = \left[(e_{P_T})^2 + (e_{P_V})^2\right]^{1/2}$$

e_{P_T} = inst. accuracy error/ $\sqrt{\text{no. inst.}}$ = error in total absolute pressure in psia.

e_{P_V} = inst. accuracy error/ $\sqrt{\text{no. inst.}}$ = error in water vapor pressure (dewpoint) indicator in psia at 70°F.

e_T = inst. accuracy error/ $\sqrt{\text{no. inst.}}$ = error in temperature, °R.

Substituting the instrument accuracy values for the instrumentation previously described in this section into above equations yields:

$$e_{P_T} = \pm(0.015\%)(\text{scale reading})/\sqrt{1}$$

$$= \pm(0.00015)(74.700 \text{ psia})$$

$$e_{P_T} = \pm 0.0112 \text{ psia}$$

$$e_{P_V} = \frac{\pm 1^\circ C}{\sqrt{6}} = \frac{\pm 1.8^\circ F}{\sqrt{6}} = \pm 0.735^\circ F$$

and from the steam tables at a dewpoint of 70°F

$$e_{P_V} = \pm 0.00918 \text{ psia}$$

and,

$$e_P = \pm\sqrt{(0.0112\ \text{psia})^2 + (0.00918\ \text{psia})^2}$$

$$e_P = \pm 0.0145\ \text{psia}$$

$$e_T = \pm\frac{0.3^\circ F}{\sqrt{20}} = \frac{0.3^\circ R}{\sqrt{20}}$$

$$e_T = \pm 0.0671^\circ R$$

Substituting into equation (4) yields:

$$e_M = \pm 100\left[2\left(\frac{0.0145}{74.700}\right)^2 + 2\left(\frac{0.067}{539.7}\right)^2\right]^{\frac{1}{2}}$$

$$e_M = \pm 0.0326\ \text{weight percent/day}$$

REPEATIBILITY ERROR ANALYSIS

Using the same formulas as before the repeatibility error is substituted for the accuracy error.

$$e_{P_T} = \pm(0.001\%)(\text{scale reading})$$

$$= \pm(0.00001)(74.700\ \text{psia})$$

$$e_{P_T} = \pm 0.000747\ \text{psia}$$

$$e_{P_V} = \pm\frac{0.5^\circ C}{\sqrt{6}} = \frac{0.9^\circ F}{\sqrt{6}}$$

$$e_{P_V} = \pm 0.367^\circ F$$

and from the steam tables at a dewpoint of 70°F:

$$e_{P_V} = \pm 0.00465\ \text{psia}$$

$$e_P = \pm\left[(0.000747)^2 + (0.00465)^2\right]^{\frac{1}{2}}$$

$$e_P = \pm 0.00471\ \text{psia}$$

$$e_T = \frac{\pm 0.1^\circ F}{\sqrt{20}} = \frac{\pm 0.1^\circ R}{\sqrt{20}}$$

$$e_T = 0.0223^\circ R$$

Substituting into equation (4):

$$e_M = \pm 100 \quad 2\left[\left(\frac{0.00471}{74.700}\right)^2 + 2\left(\frac{0.0223}{539.7}\right)^2\right]^{\frac{1}{2}}$$

$$e_M = \pm 0.0107 \text{ weight percent/day}$$

It should be noted that the errors associated with the above analyses are the worst possible or worst probable errors caused by the instruments. For measurements systems with multiple componenets, system calibrations typically show higher precision than inferred from the so called worst possible or worst probable error analyses.

5.0 COMPUTER PROGRAM AND PRINTOUTS

5.1 General Discussion

The computer program used was developed by Bechtel Corporation specifically for the purpose of computing containment structure integrated leak rates. The formulas used in the Bechtel Integrated Leak Rate Test Program are taken from formulas and guidelines presented in ANSI N45.4-1972.

The primary computer system currently used is the GE635 time share system. The computer is located in San Francisco. A remote terminal is taken to the jobsite and is linked to the Bechtel computer via telephone. The remote terminal is used to input data and receive leak rate reports at the jobsite thereby providing leak rate status reports immediately after data insertion.

The computer program is basically a two step program. The first step consists of computing the total, corrected, average containment atmospheric temperature and absolute pressure and providing a printout of this information. The second step then utilizes this information, called the Corrected Data Summary, to compute the leakage rate and provide a printout in report format.

5.2 Corrected Data Summary

The uncorrected value of each containment atmosphere parameter monitored (drybulb temperature, dewpoint temperature, and absolute pressure) is fed into the computer program. (See Appendix A, pages A-2 and A-4). The data is then corrected as explained in Section 4.0 and a Summary of Measured Data is printed out listing each sensor and the corrected value. This gives the operator an opportunity to verify that the instrumentation is functioning as expected.

5.3 Report Printout

The second step of the computer program computes the leakage rate and provides a report as shown in Appendix A, pages A-6 through A-8. The report is divided into three sections as follows:

A. Leak Rate Based on Total-Time Calculations.

B. Leak Rate Based on Point-to-Point Calculations.

C. Trends Based on Total-Time Calculations.

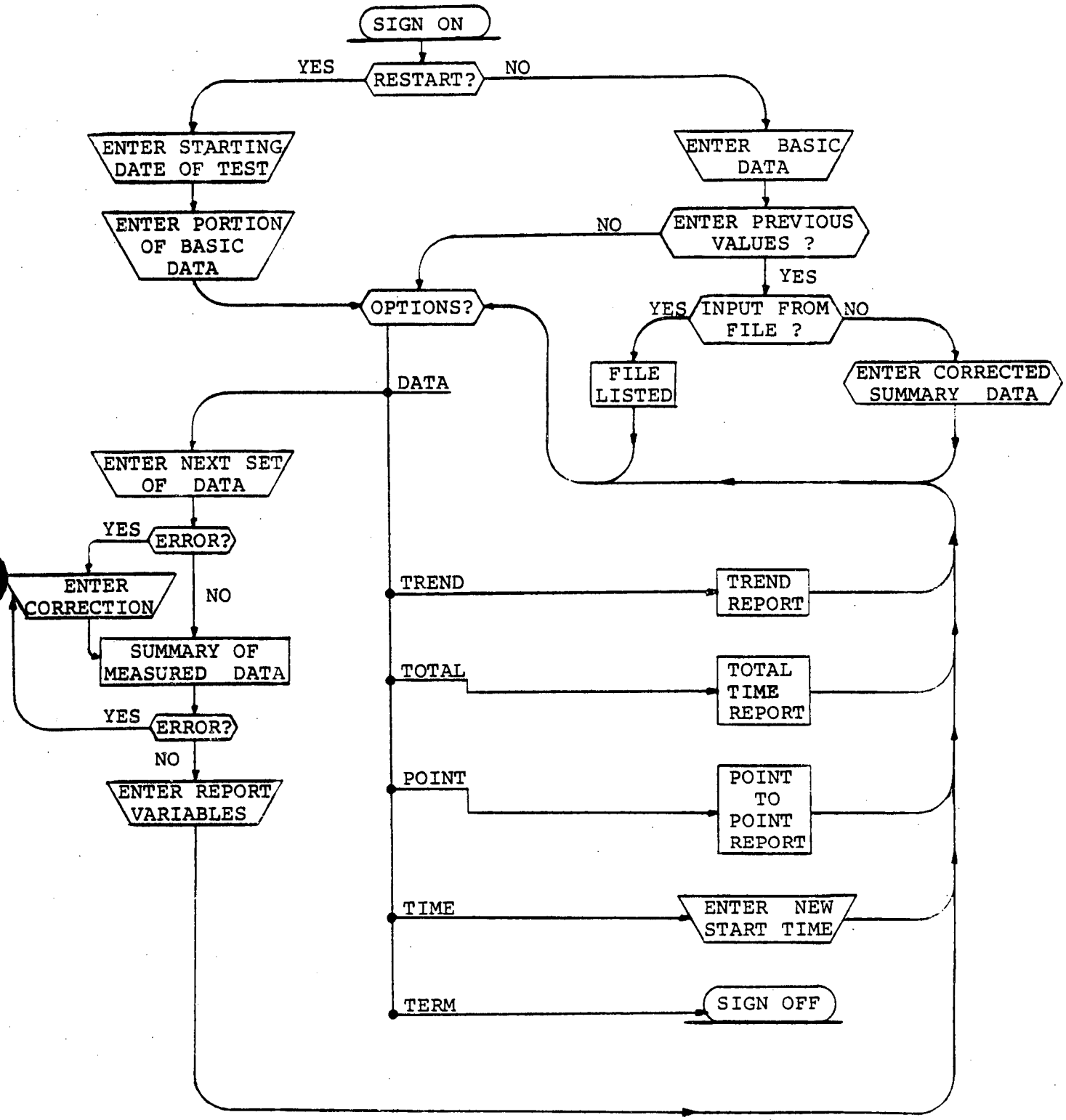
The Time, Temperature, and Pressure column data in the leak rate reports are obtained from the Corrected Data Summary blocks explained previously. The Measured Leak Rate, Calculated Leak Rate and 95% Confidence Limits column data are computed from the Corrected Data Summary as shown in Section 6.0.

The Time column in the Trend Report is not the time the data was taken as in the leak rate reports, but the elapsed time since the start of the test. The number of data entries since the start of the test is shown in column two. The Mean, Calculated Leak Rate, and Change in Calculated Leak Rate column data are computed as shown in Section 6.0.

The Trend Report has recently been added as a computer program report printout and is provided to give test personnel a better indication of how the test is progressing.

5.4 Computer Program Logic Diagram

A computer program logic diagram is shown on Figure 5.1, page 5-3 to illustrate the general flow of the user's decisions.



CONTAINMENT INTEGRATED LEAK RATE TEST PROCEDURE
COMPUTER PROGRAM LOGIC DIAGRAM

Figure 5.1

6.0 LEAK RATE COMPUTATIONS

6.1 Measured Leak Rate

The formula for computing the measured leak rate (M) is taken from ANSI N45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Reactors." The derivation of the formula is also given in ANSI N45.4-1972.

The formula is as follows:

$$M = \frac{2400}{H}\left[1 - \frac{T_1\,(P_2 - P_{v2})}{T_2\,(P_1 - P_{v1})}\right] \qquad (1)$$

where,

M = measured leak rate in weight percent per day.

H = time interval, in hours, between measurements.

T_1, T_2 = mean absolute temperature, ^{o}R, of the containment atmosphere at the beginning and the end of the test interval (H) respectively.

P_1, P_2 = mean total absolute pressure, PSIA, of the containment atmosphere at the beginning and end of the test interval (H) respectively.

P_{v1}, P_{v2} = mean total water vapor pressure, PSIA, of the containment atmosphere at the beginning and end of the test interval (H) respectively.

$\bar{P}_1 = P_1 - P_{v1}$

$\bar{P}_2 = P_2 - P_{v2}$

Since the computer program corrects the containment atmosphere absolute pressure for water vapor pressure prior to computing the leak rate M, equation (1) becomes:

$$M = \frac{2400}{H}\left[1 - \frac{T_1\,\bar{P}_2}{T_2\,\bar{P}_1}\right] \qquad (2)$$

The values of time, temperature, and pressure required to calculate M using equation (2) are taken from "Temperature and Pressure Corrected Data Summary" block of the computer printout for both the Total-Time and Point-to-Point calculations.

An explanation of the origin of the "Temperature and Pressure Corrected Data Summary" block is presented in Section 5.2.

Appendix A to this report provides a computer printout report of an actual leak rate test with a known leak. A tabular listing of measured leak rates is shown on pages A-7 and A-8. A plot of the measured leak rates for leak rate based on Total-Time calculations is provided on Figure A.1, page A-9.

Appendix C provides a sample problem illustrating how the measured leak rates (M) were calculated in the ILRT Demonstration Report (Appendix A).

6.2 Calculated Leak Rate

Since it is assumed that the leak rate is constant during the testing period, a plot of the Measured Leak Rate versus Time would ideally yield a horizontal, straight line. Obviously, sampling techniques and test conditions are not perfect and consequently the values of measured leak rate deviate from the ideal straight line plot situation.

The method of Least Squares is a statistical procedure for finding the "best fitting" straight line, commonly called a regression line, for a set of measured data such that the sum of the squares of the deviations of each measured data point from the straight line is minimized.

Using this statistical process a regression line is "best fit" to the calculated values of measured leak rates. The value of leak rate based on the regression line is called the calculated leak rate (L).

The regression line equation for the Least Squares "best fit" straight line is:

$$L = A + Bt \qquad (3)$$

and therefore, the calculated leak rate at some specific time (t) is expressed as:

$$L_i = A + Bt_i \qquad (3A)$$

The deviation of the measured leak rate (M) from the calculated leak rate (L) is shown graphically on Figure A.1 in Appendix A and is expressed as:

$$\text{Deviation} = M_i - L_i$$

It was mentioned previously that the regression line is "best-fit" to the measured leak rate data by minimizing the sum of the squares of the deviations (i.e., the sum of the squares for error). Expressed mathematically we wish to minimize:

$$SSQ = \sum (M_i - L_i)^2 \qquad (4)$$

were SSQ is the sum of the squares of the deviations and

$$\sum = \sum_{i=1}^{n} .$$

Substituting equation (3A) into equation (4) yields:

$$SSQ = \sum \left[M_i - (A + Bt_i) \right]^2 \tag{5}$$

Using differential calculus, the numerical values of A and B that will minimize SSQ can be determined. It can be shown that A and B are the solutions to the following pair of simultaneous linear equations:

$$B = \frac{(t_i - \bar{t})(M_i - \bar{M})}{(t_i - t)^2}$$

$$B = \frac{n\sum t_i M_i - (\sum t_i)(\sum M_i)}{n\sum t_i^2 - (\sum t_i)^2} \tag{6}$$

$$A = \bar{M} - B\bar{t} \tag{7}$$

where,

$$\bar{M} = \frac{\sum M_i}{n} \tag{8}$$

$$\bar{t} = \frac{\sum t_i}{n} \tag{9}$$

Substituting equations (6), (8) and (9) into equation (7) yields an alternate equation for A:

$$A = \frac{(\sum M_i)(\sum t_i^2) - (\sum t_i)(\sum t_i M_i)}{n\sum t_i^2 - (\sum t_i)^2} \tag{10}$$

Equations (6) and (7) are referred to as the Least Square Equations and are used by the computer program to compute the calculated leak rate for the Total-Time and Point-to-Point calculations.

Appendix A to this report provides a computer printout report of an actual leak rate test with a known leak. A tabular listing of calculated leak rates is shown on pages A-7 and A-8. A plot of the calculated leak rates for leak rate based on Total-Time calculations is provided on Figure A.1, page A-9.

Appendix D provides a sample problem illustrating how the calculated leak rates (1) were computed in the ILRT Demonstration Report (Appendix A).

6.3 Confidence Limits

Even though the regression line is statistically determined to minimize the sum of the squares of error, the values of calculated leak rate cannot be considered to be exactly correct. If the containment integrated leak rate test were run a number of times, under the same conditions, the calculated leak rates would be close in value but not exactly the same each time.

However, based on statistics we can establish confidence limits associated with the regression line such that the limits of the calculated leak rate computed would successfully enclose the true value of the desired parameter a large fraction of the time. This fraction is called the confidence coefficient and the interval within the confidence limits is the confidence interval.

Confidence limits for the integrated leak test computer program are determined based on a confidence coefficient of 95%. This means that the probability that the value of calculated leak rate will fall within the upper and lower confidence limits, or confidence interval, is 95%.

To determine the value of the confidence limits the following statistical information is required: the variance, standard deviation, and Students' T-distribution.

The variance, as the name implies, is a measure of the variability of individually measured data points from the mean, or in this case, from the regression line. The variance of the measured leak rate (M) from the calculated leak rate (L) is given by:

$$s^2 = \frac{SSQ}{n-2} \qquad (11)$$

where s^2 is the variance and s is the standard deviation based on (n-2) degrees of freedom. SSQ is computed from equation (4).

The standard deviation has more practical significance since computing the standard deviation returns the measure of variability to the original units of measurement. Additionally, it can be shown that given a normal distribution of measurements, approximately 95% of the measurements will fall within two standard deviations of the mean.

The number of standard deviations either side of the regression line which establish a 95% confidence interval are more accurately determined using a statistical table called a "Table of Percentage Points of the T-Distribution" and provide increased confidence in outcomes for small and large sample sizes.

Since we are interested in reporting a single value of calculated leak rate based on measurements taken over a specific time period, an additional factor is applied to the formula for computing the variance and hence, the standard deviation.

For additional information concerning the use of the T-distribution and the use of the factor applied to the formula for determining variance and standard deviation consult reference 1 or any similar publication on probability and statistics.

The Table of T-Distributions has been formulized for use by the computer program as follows:

$$T = 1.95996 + \frac{2.37226}{(n-2)} + \frac{2.8225}{(n-2)^2} \qquad (12)$$

where the value of T is based on 95% Confidence Limits and (n-2) degreees of freedom.

The application of the additional factor to the variance formula yields:

$$\sigma^2 = s^2 \left[1 + \frac{1}{n} + \frac{(t_p - t)^2}{(t_i - t)^2} \right] \qquad (13)$$

where t_p is the time after start of test.

Taking the square root of equation (13) yields the standard deviation:

$$\sigma = s \left[1 + \frac{1}{n} + \frac{(t_p - t)^2}{(t_i - t)^2} \right]^{\frac{1}{2}} \qquad (14)$$

The upper and lower confidence limits can now be determined, the confidence limits being equal to T standard deviations above and below the regression line. Combining equations (12) and (14) yields:

$$\text{Confidence Limits} = L \pm T \qquad (15)$$

or

$$UCL = L + T \qquad (16)$$

$$LCL = L - T \qquad (17)$$

where UCL and LCL are the upper and lower confidence limits respectively.

Equation (16) and (17) are used by the computer program to compute the 95% Confidence Limits for both the Total-Time and Point-to-Point Calculations.

Appendix A provides a computer printout report of an actual leak rate test with a known leak. A tabular listing of 95% Confidence Limits is shown on pages A-7 and A-8. A plot of UCL and LCL for leak rate based on Total-Time calculations is provided on Figure A.1, page A-9.

Appendix E provides a sample problem illustrating how the 95% Confidence Limits were computed in the ILRT Demonstration Report (Appendix A).

It should be noted that the standard deviation computed by equation (14) will not yield the same value for standard deviation reported at the bottom of the tabulated data on the ILRT Demonstration Report printout, Appendix A, page A-7 and A-8. The standard deviation reported on the computer printout is the standard deviation of the measured leak rates from the mean and is computed by:

$$\sigma_m = \sqrt{\frac{\sum (M_i - M)^2}{n-1}}$$

The standard deviation is equation (14) is related not to the mean but to the regression line.

6.4 Trend Report

The trend report uses values previously calculated, with the exception of the change in calculated leak rate column, to provide a printout which indicates the trend of the mean of the measured leak rates, the trend of the calculated leak rates and the trend in the change of the calculated leak rate.

The change in calculated leak rate is computed by taking the difference between the latest calculated leak rate and calculated leak rate immediately preceeding.

The trend report is used primarily to determine when the leak rate is stabilizing.

Trend report values of calculated leak rate are the least squares "best-fit" values described in Section 6.2.

7.0 REFERENCES

7.1 "Introduction to Probability and Statistics," by William Mendenhall. Wadsworth Publishing Company, Inc., Belmont, California. July 1969. L. C. Cat. Card No.: 67-19290.

7.2 Appendix J to 10 CFR Part 50, "Reactor Containment Leakage Testing for Water Cooled Power Reactors."

7.3 ANSI N45.4-1972, "Leakage Rate Testing of Containment Structures for Nuclear Reactors." (Formerly ANS 7.60.)

7.4 ORNL-NSIC-26, "Testing of Containment Systems used with Light-Water-Cooled Power Reactors", by Frank C. Zapp, August 1968.

7.5 "Final Results of the Carolinas Virginia Tube Reactor Containment Leakage Rate Tests", by G. E. Bingham, IN-1399, June 1970.

ILRT DEMONSTRATION REPORT

The demonstration integrated leak rate test (ILRT) presented in this Appendix is a portion of an actual containment test. In this case there was a leak of sufficient magnitude to cause the test to fail. The source of leakage was discovered and repaired and the containment was then retested satisfactorily.

An actual containment test with an excessive leak rate was used for this demonstration report to illustrate how rapidly the system detects and reports an excessive leak rate.

Pages A-2 and A-4 illustrate how data is entered for a given time period. Pages A-3 and A-5 illustrate the computer printout of temperature, pressure, and vapor pressure after all corrections have been made for calibration curves, tube constants, etc. Temperature is in degrees F, pressure in psia and vapor pressure in psia. The average containment atmosphere temperature corrected for volume fractions and the average containment absolute pressure corrected for vapor pressure and volume fractions is shown at the bottom of Pages A-3 and A-5.

"Temperature and Pressure Corrected Data Summary" values, including those shown at the bottom of Pages A-3 and A-5, are entered into the computer in the format shown at the top of page A-6.

Three report options are available. These include a Trend Report, a Total-Time Report and a Point-to-Point Report which are shown on pages A-6, A-7 and A-8 respectively.

A plot of the Total-Time Report values is shown on page A-9.

```
 ENTER TIME,DATE
= 1330,0305
 ENTER 21 TEMP. READ. IN DEG. F
 T  1
= 77.59
 T  2
= 78.51
 T  3
= 77.72
 T  4
= 77.45
 T  5
= 77.63
 T  6
= 77.24
 T  7
= 75.86
 T  8
= 75.97
 T  9
= 75.88
 T 10
= 76.03
 T 11
= 75.88
 T 12
= 76.28
 T 13
= 73.15
 T 14
= 74.22
 T 15
= 73.48
 T 16
= 73.40
 T 17
= 73.48
 T 18
= 70.19
 T 19
= 70.27
 T 20
= 69.91
 T 21
= 69.96
ENTER 1 PRESS. IN PSIA
P  1
= 44.381
ENTER 6 VAP. PRESS. IN DEG. F
VP 1
= 64.09
VP 2
= 61.12
VP 3
= 56.12
VP 4
= 51.43
VP 5
= 54
VP 6
= 51.57
```

SUMMARY OF MEASURED DATA AT TIME 1330 305

TEMP	1	=	77.590
TEMP	2	=	78.510
TEMP	3	=	77.720
TEMP	4	=	77.450
TEMP	5	=	77.630
TEMP	6	=	77.240
TEMP	7	=	75.860
TEMP	8	=	75.970
TEMP	9	=	75.880
TEMP	10	=	76.030
TEMP	11	=	75.880
TEMP	12	=	76.280
TEMP	13	=	73.150
TEMP	14	=	74.220
TEMP	15	=	73.480
TEMP	16	=	73.400
TEMP	17	=	73.480
TEMP	18	=	70.190
TEMP	19	=	70.270
TEMP	20	=	69.910
TEMP	21	=	69.960
TPRS	1	=	44.381
VPRS	1	=	0.296
VPRS	2	=	0.257
VPRS	3	=	0.223
VPRS	4	=	0.188
VPRS	5	=	0.206
VPRS	6	=	0.189

TEMP. AND PRESS. CORRECTED DATA SUMMARY

TIME = 1330

DATE = 305

TEMP = 76.423717

PRES = 44.191677

```
 ENTER TIME,DATE
= 1400,0305
 ENTER 21 TEMP. READ. IN DEG. F
 T  1
= 77.46
 T  2
= 78.47
 T  3
= 77.54
 T  4
= 77.35
 T  5
= 77.52
 T  6
= 77.16
 T  7
= 75.75
 T  8
= 75.85
 T  9
= 75.76
 T 10
= 75.92
 T 11
= 75.72
 T 12
= 76.23
 T 13
= 73.06
 T 14
= 74.14
 T 15
= 73.39
 T 16
= 73.32
 T 17
= 73.42
 T 18
= 70.11
 T 19
= 70.23
 T 20
= 69.86
 T 21
= 69.90
 ENTER  1 PRESS. IN PSIA
P  1
= 44.370
 ENTER  6 VAP. PRESS. IN DEG. F
VP 1
= 64.09
VP 2
= 61.12
VP 3
= 56.12
VP 4
= 51.43
VP 5
= 54
VP 6
= 51.57
```

SUMMARY OF MEASURED DATA AT TIME 1400 305

TEMP	1	=	77.460
TEMP	2	=	78.470
TEMP	3	=	77.540
TEMP	4	=	77.350
TEMP	5	=	77.520
TEMP	6	=	77.160
TEMP	7	=	75.750
TEMP	8	=	75.850
TEMP	9	=	75.760
TEMP	10	=	75.920
TEMP	11	=	75.720
TEMP	12	=	76.230
TEMP	13	=	73.060
TEMP	14	=	74.140
TEMP	15	=	73.390
TEMP	16	=	73.320
TEMP	17	=	73.420
TEMP	18	=	70.110
TEMP	19	=	70.230
TEMP	20	=	69.860
TEMP	21	=	69.900
TPRS	1	=	44.370
VPRS	1	=	0.296
VPRS	2	=	0.257
VPRS	3	=	0.223
VPRS	4	=	0.188
VPRS	5	=	0.206
VPRS	6	=	0.189

TEMP. AND PRESS. CORRECTED DATA SUMMARY

TIME = 1400

DATE = 305

TEMP = 76.332724

PRES = 44.181110

```
ENTER TIME, DATE,TEMP,PRESS
WHEN FINISHED ENTER 9999,,,,
= 0800, 0305, 78.000869, 44.358173
= 0830, 0305, 77.832982, 44.340364
= 0900, 0305, 77.590568, 44.321431
= 0930, 0305, 77.496316, 44.300600
= 1000, 0305, 77.226938, 44.283097
= 1030, 0305, 77.127488, 44.267282
= 1100, 0305, 76.972475, 44.252736
= 1130, 0305, 76.822943, 44.239474
= 1200, 0305, 76.709837, 44.228717
= 1230, 0305, 76.580254, 44.213970
= 1300, 0305, 76.539358, 44.202492
= 1330, 0305, 76.423717, 44.191677
= 1400, 0305, 76.332724, 44.181110
= 9999,,,,
```

ILRT DEMONSTRATION REPORT

TIME, DATE START OF TEST 8.00 305

TIME AFTER START OF TEST = 6.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.50	4	0.387E+00	0.460E+00	
2.00	5	0.366E+00	0.373E+00	-0.874E-01
2.50	6	0.375E+00	0.397E+00	0.237E-01
3.00	7	0.374E+00	0.389E+00	-0.774E-02
3.50	8	0.368E+00	0.366E+00	-0.227E-01
4.00	9	0.361E+00	0.343E+00	-0.235E-01
4.50	10	0.357E+00	0.331E+00	-0.986E-02
5.00	11	0.360E+00	0.345E+00	0.125E-01
5.50	12	0.360E+00	0.348E+00	0.210E-02
6.00	13	0.359E+00	0.349E+00	0.983E-03

THE CALCULATED LEAK RATE IS 0.349E+00
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.283E+00
THE LAST 0 DATA POINTS ESTABLISH A NEGATIVE SLOPE

ILRT DEMONSTRATION REPORT

TIME, DATE START OF TEST 8.00 305

TIME AFTER START OF TEST = 6.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
8.50	77.83	44.340	0.428E+00	0.370E+00	0.11E+00	0.63E+00
9.00	77.59	44.321	0.156E+00	0.368E+00	0.12E+00	0.62E+00
9.50	77.50	44.301	0.576E+00	0.366E+00	0.12E+00	0.61E+00
10.00	77.23	44.283	0.304E+00	0.364E+00	0.12E+00	0.60E+00
10.50	77.13	44.267	0.409E+00	0.362E+00	0.13E+00	0.60E+00
11.00	76.97	44.253	0.372E+00	0.360E+00	0.13E+00	0.60E+00
11.50	76.82	44.239	0.333E+00	0.358E+00	0.12E+00	0.59E+00
12.00	76.71	44.229	0.311E+00	0.356E+00	0.12E+00	0.59E+00
12.50	76.58	44.214	0.325E+00	0.354E+00	0.12E+00	0.59E+00
13.00	76.54	44.202	0.381E+00	0.352E+00	0.11E+00	0.60E+00
13.50	76.42	44.192	0.359E+00	0.350E+00	0.10E+00	0.60E+00
14.00	76.33	44.181	0.357E+00	0.349E+00	0.92E-01	0.61E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.359E+00
THE STANDARD DEVIATION IS 0.968E-01
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 6.00 HOURS OF TEST IS 0.349E+00

ILRT DEMONSTRATION REPORT

TIME, DATE START OF TEST 8.00 305

TIME AFTER START OF TEST = 6.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
8.50	77.83	44.340	0.428E+00	0.354E+00	-0.98E+00	0.17E+01
9.00	77.59	44.321	-0.116E+00	0.354E+00	-0.95E+00	0.17E+01
9.50	77.50	44.301	0.141E+01	0.355E+00	-0.92E+00	0.16E+01
10.00	77.23	44.283	-0.511E+00	0.355E+00	-0.89E+00	0.16E+01
10.50	77.13	44.267	0.832E+00	0.356E+00	-0.88E+00	0.16E+01
11.00	76.97	44.253	0.185E+00	0.356E+00	-0.87E+00	0.16E+01
11.50	76.82	44.239	0.101E+00	0.357E+00	-0.87E+00	0.16E+01
12.00	76.71	44.229	0.155E+00	0.358E+00	-0.87E+00	0.16E+01
12.50	76.58	44.214	0.441E+00	0.359E+00	-0.89E+00	0.16E+01
13.00	76.54	44.202	0.880E+00	0.359E+00	-0.91E+00	0.16E+01
13.50	76.42	44.192	0.139E+00	0.359E+00	-0.94E+00	0.17E+01
14.00	76.33	44.181	0.333E+00	0.360E+00	-0.98E+00	0.17E+01

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.357E+00
THE STANDARD DEVIATION IS 0.504E+00
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 6.00 HOURS OF TEST IS 0.350E+00

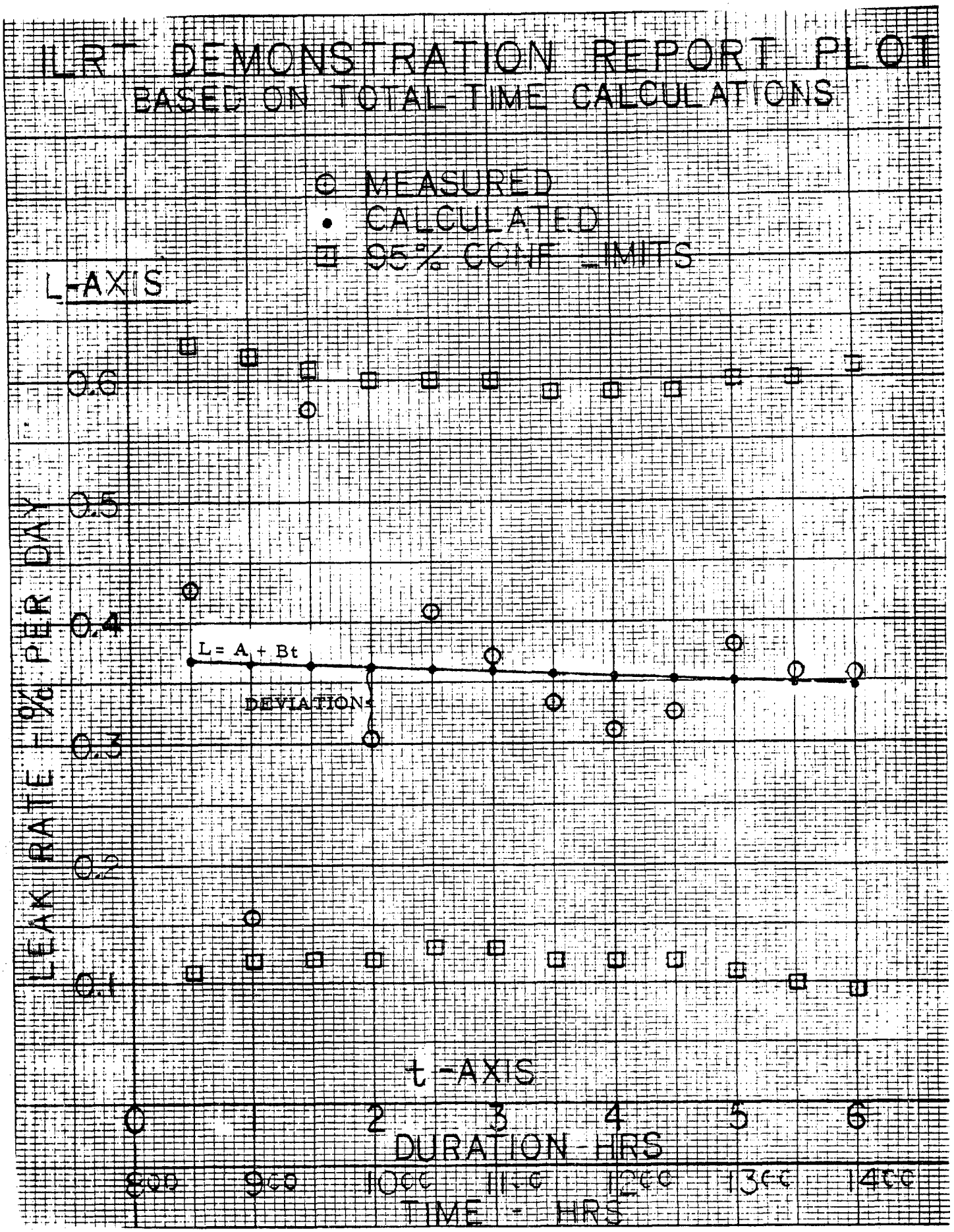

ILRT DEMONSTRATION REPORT PLOT
BASED ON TOTAL-TIME CALCULATIONS
MEASURED
CALCULATED
95% CONF LIMITS
L-AXIS
0.6
0.5
0.4
0.3
0.2
0.1
LEAK RATE - % PER DAY
L = A + Bt
DEVIATION
t-AXIS
0
1
2
3
4
5
6
DURATION - HRS
800
900
1000
1100
1200
1300
1400
TIME - HRS

FIG A.1

CONTAINMENT INTEGRATED LEAK RATE TEST RESULTS

Appendix B consists of computer printouts of the integrated leak rate test results for seven containments tested by Bechtel personnel.

The computer printouts appear in the following order:

			Page
Palisades	28	psig ILRT	B-4 thru B-8
Palisades	55	psig ILRT	B-9 thru B-13
Point Beach Unit 1	30	psig ILRT	B-14 thru B-18
Point Beach Unit 1	60	psig ILRT	B-19 thru B-23
Point Beach Unit 2	30	psig ILRT	B-24 thru B-28
Point Beach Unit 2	60	psig ILRT	B-29 thru B-33
Turkey Point Unit 3	25	psig ILRT	B-34 thru B-37
Turkey Point Unit 3	50	psig ILRT	B-38 thru B-42
Oconee Unit 1	29.5	psig ILRT	B-43 thru B-46
Oconee Unit 1	59	psig ILRT	B-47 thru B-50
Turkey Point Unit 4	25	psig ILRT	B-51 thru B-54
Turkey Point Unit 4	50	psig ILRT	B-55 thru B-58
Pilgrim Station Unit 1	23	psig ILRT	B-59 thru B-66
Pilgrim Station Unit 1	45	psig ILRT	B-67 thru B-74

Each printout consists of a listing of the Temperature and Pressure Corrected Data Summary, the Trend Report, the Total-Time Calculations Report and the Point-to-Point Calculations Report.

Figures B.1 and B.2, on pages B-2 and B-3 respectively, graphically present the Trend Reports for each containment test. These graphs are provided to concisely illustrate the integrated leak rate test result trends for the containments included in Appendix B.

Containment integrated leak rate test results are currently reported based on Total-Time Calculations.

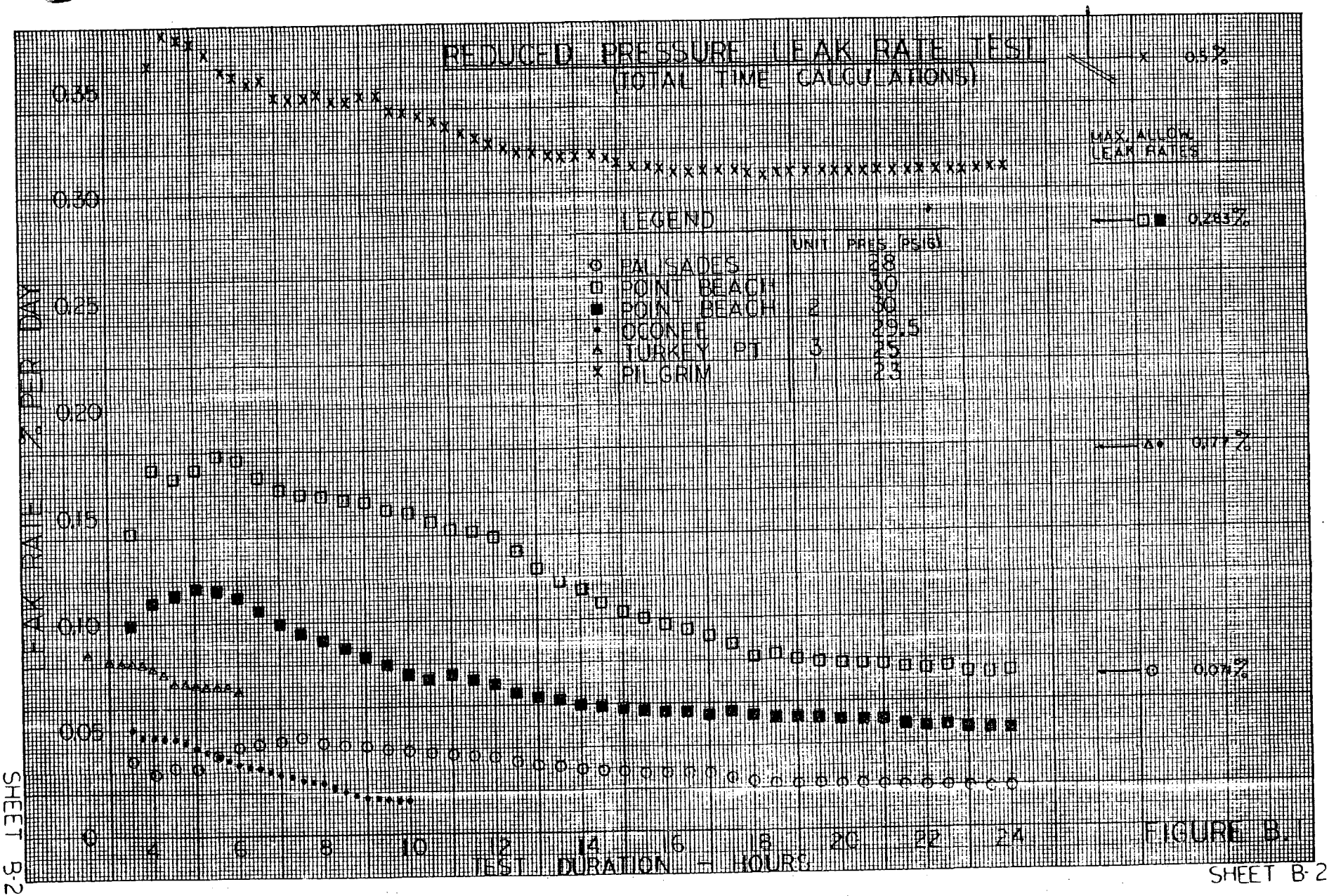


FIGURE B.1

SHEET B-2

SHEET B-2

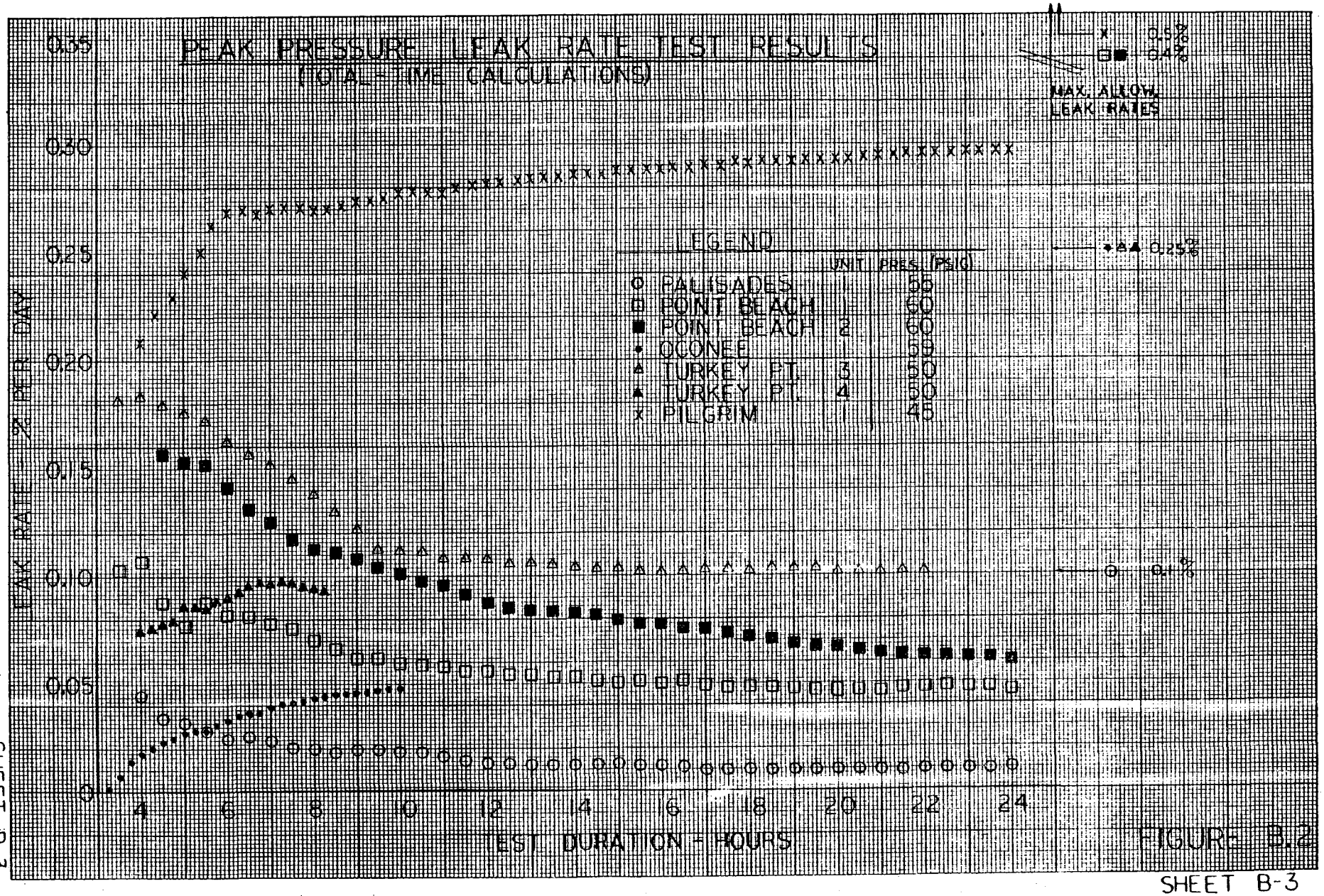


FIGURE B.2

SHEET B-3

SHEET B-3

PALISADES 28 PSIG ILRT

```
ENTER TIME, DATE, TEMP, PRESS
WHEN FINISHED ENTER 9999,,,,
= 0800,0524,76.515710,43.800968
= 0830,0524,76.510129,43.800234
= 0900,0524,76.509181,43.800698
= 0930,0524,76.522330,43.800429
= 1000,0524,76.518581,43.800932
= 1030,0524,76.518448,43.799203
= 1100,0524,76.508528,43.798681
= 1130,0524,76.528888,43.800265
= 1200,0524,76.509138,43.799022
= 1230,0524,76.522077,43.798635
= 1300,0524,76.513416,43.798643
= 1330,0524,76.511632,43.797055
= 1400,0524,76.509263,43.796762
= 1430,0524,76.511373,43.794152
= 1500,0524,76.509291,43.795151
= 1530,0524,76.511458,43.794138
= 1600,0524,76.499705,43.795765
= 1630,0524,76.492436,43.794138
= 1700,0524,76.500337,43.793972
= 1730,0524,76.497284,43.794227
= 1800,0524,76.469676,43.791420
= 1830,0524,76.483112,43.794051
= 1900,0524,76.487583,43.792702
= 1930,0524,76.481813,43.793079
= 2000,0524,76.480240,43.791157
= 2030,0524,76.454731,43.791013
= 2100,0524,76.452633,43.790710
= 2130,0524,76.452804,43.790449
= 2200,0524,76.445662,43.790346
= 2230,0524,76.459216,43.790196
= 2300,0524,76.444523,43.789135
= 2330,0524,76.451384,43.787488
= 2400,0524,76.452312,43.789277
= 0030,0525,76.449400,43.788275
= 0100,0525,76.445625,43.789865
= 0130,0525,76.434468,43.789661
= 0200,0525,76.455931,43.789637
= 0230,0525,76.429556,43.788603
= 0300,0525,76.457891,43.788121
= 0330,0525,76.433954,43.787339
= 0400,0525,76.436507,43.788946
= 0430,0525,76.443572,43.787570
= 0500,0525,76.434651,43.786322
= 0530,0525,76.437989,43.787262
= 0600,0525,76.447623,43.786217
= 0630,0525,76.438611,43.786209
= 0700,0525,76.450584,43.787111
= 0730,0525,76.444549,43.786575
= 0800,0525,76.435616,43.784291
= 9999,,,,
```

PALISADES 28 PSIG ILRT

TIME, DATE START OF TEST 8.00 524

TIME AFTER START OF TEST = 24.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.50	4	0.185E-01	0.230E-01	
2.00	5	0.153E-01	0.134E-01	-0.956E-02
2.50	6	0.213E-01	0.309E-01	0.175E-01
3.00	7	0.229E-01	0.333E-01	0.236E-02
3.50	8	0.237E-01	0.330E-01	-0.294E-03
4.00	9	0.231E-01	0.291E-01	-0.389E-02
4.50	10	0.244E-01	0.323E-01	0.320E-02
5.00	11	0.243E-01	0.305E-01	-0.177E-02
5.50	12	0.253E-01	0.331E-01	0.258E-02
6.00	13	0.260E-01	0.343E-01	0.124E-02
6.50	14	0.282E-01	0.410E-01	0.663E-02
7.00	15	0.292E-01	0.427E-01	0.170E-02
7.50	16	0.304E-01	0.454E-01	0.271E-02
8.00	17	0.301E-01	0.428E-01	-0.261E-02
8.50	18	0.302E-01	0.417E-01	-0.105E-02
9.00	19	0.305E-01	0.415E-01	-0.244E-03
9.50	20	0.305E-01	0.403E-01	-0.116E-02
10.00	21	0.305E-01	0.396E-01	-0.708E-03
10.50	22	0.301E-01	0.373E-01	-0.231E-02
11.00	23	0.301E-01	0.366E-01	-0.694E-03
11.50	24	0.299E-01	0.351E-01	-0.148E-02
12.00	25	0.300E-01	0.350E-01	-0.156E-03
12.50	26	0.296E-01	0.334E-01	-0.162E-02
13.00	27	0.293E-01	0.319E-01	-0.146E-02
13.50	28	0.290E-01	0.307E-01	-0.123E-02
14.00	29	0.287E-01	0.292E-01	-0.145E-02
14.50	30	0.285E-01	0.285E-01	-0.746E-03
15.00	31	0.283E-01	0.277E-01	-0.826E-03
15.50	32	0.283E-01	0.278E-01	0.137E-03
16.00	33	0.281E-01	0.271E-01	-0.685E-03
16.50	34	0.280E-01	0.267E-01	-0.399E-03
17.00	35	0.277E-01	0.256E-01	-0.113E-02
17.50	36	0.273E-01	0.243E-01	-0.131E-02
18.00	37	0.271E-01	0.236E-01	-0.655E-03
18.50	38	0.268E-01	0.226E-01	-0.992E-03
19.00	39	0.267E-01	0.225E-01	-0.127E-03
19.50	40	0.265E-01	0.220E-01	-0.498E-03
20.00	41	0.262E-01	0.211E-01	-0.870E-03
20.50	42	0.261E-01	0.208E-01	-0.338E-03
21.00	43	0.260E-01	0.206E-01	-0.227E-03
21.50	44	0.258E-01	0.202E-01	-0.403E-03
22.00	45	0.257E-01	0.201E-01	-0.162E-04
22.50	46	0.256E-01	0.199E-01	-0.198E-03
23.00	47	0.255E-01	0.197E-01	-0.203E-03
23.50	48	0.254E-01	0.195E-01	-0.213E-03
24.00	49	0.253E-01	0.196E-01	0.577E-04

THE CALCULATED LEAK RATE IS 0.196E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.714E-01
THE LAST 0 DATA POINTS ESTABLISH A NEGATIVE SLOPE

PALISADES 28 PSIG ILRT

TIME, DATE START OF TEST 8.00 524

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
8.50	76.51	43.800	0.305E-01	0.311E-01	0.96E-02	0.53E-01
9.00	76.51	43.801	-0.144E-01	0.308E-01	0.94E-02	0.52E-01
9.50	76.52	43.800	0.395E-01	0.306E-01	0.92E-02	0.52E-01
10.00	76.52	43.801	0.742E-02	0.303E-01	0.90E-02	0.52E-01
10.50	76.52	43.799	0.436E-01	0.301E-01	0.88E-02	0.51E-01
11.00	76.51	43.799	0.311E-01	0.299E-01	0.86E-02	0.51E-01
11.50	76.53	43.800	0.279E-01	0.296E-01	0.84E-02	0.51E-01
12.00	76.51	43.799	0.193E-01	0.294E-01	0.82E-02	0.51E-01
12.50	76.52	43.799	0.347E-01	0.291E-01	0.80E-02	0.50E-01
13.00	76.51	43.799	0.234E-01	0.289E-01	0.78E-02	0.50E-01
13.50	76.51	43.797	0.357E-01	0.286E-01	0.75E-02	0.50E-01
14.00	76.51	43.797	0.336E-01	0.284E-01	0.73E-02	0.49E-01
14.50	76.51	43.794	0.545E-01	0.281E-01	0.71E-02	0.49E-01
15.00	76.51	43.795	0.414E-01	0.279E-01	0.69E-02	0.49E-01
15.50	76.51	43.794	0.474E-01	0.277E-01	0.67E-02	0.49E-01
16.00	76.50	43.796	0.267E-01	0.274E-01	0.64E-02	0.48E-01
16.50	76.49	43.794	0.318E-01	0.272E-01	0.62E-02	0.48E-01
17.00	76.50	43.794	0.350E-01	0.269E-01	0.60E-02	0.48E-01
17.50	76.50	43.794	0.302E-01	0.267E-01	0.58E-02	0.48E-01
18.00	76.47	43.791	0.317E-01	0.264E-01	0.55E-02	0.47E-01
18.50	76.48	43.794	0.222E-01	0.262E-01	0.53E-02	0.47E-01
19.00	76.49	43.793	0.297E-01	0.259E-01	0.51E-02	0.47E-01
19.50	76.48	43.793	0.244E-01	0.257E-01	0.48E-02	0.47E-01
20.00	76.48	43.791	0.316E-01	0.255E-01	0.46E-02	0.46E-01
20.50	76.45	43.791	0.218E-01	0.252E-01	0.43E-02	0.46E-01
21.00	76.45	43.791	0.215E-01	0.250E-01	0.41E-02	0.46E-01
21.50	76.45	43.790	0.218E-01	0.247E-01	0.38E-02	0.46E-01
22.00	76.45	43.790	0.192E-01	0.245E-01	0.36E-02	0.45E-01
22.50	76.46	43.790	0.233E-01	0.242E-01	0.33E-02	0.45E-01
23.00	76.44	43.789	0.220E-01	0.240E-01	0.31E-02	0.45E-01
23.50	76.45	43.787	0.291E-01	0.237E-01	0.28E-02	0.45E-01
24.00	76.45	43.789	0.223E-01	0.235E-01	0.26E-02	0.44E-01
24.50	76.45	43.788	0.242E-01	0.233E-01	0.23E-02	0.44E-01
25.00	76.45	43.790	0.173E-01	0.230E-01	0.20E-02	0.44E-01
25.50	76.43	43.790	0.146E-01	0.228E-01	0.18E-02	0.44E-01
26.00	76.46	43.790	0.196E-01	0.225E-01	0.15E-02	0.44E-01
26.50	76.43	43.789	0.158E-01	0.223E-01	0.12E-02	0.43E-01
27.00	76.46	43.788	0.234E-01	0.220E-01	0.95E-03	0.43E-01

27.50	76.43	43.787	0.195E-01	0.218E-01	0.67E-03	0.43E-01
28.00	76.44	43.789	0.152E-01	0.215E-01	0.39E-03	0.43E-01
28.50	76.44	43.788	0.201E-01	0.213E-01	0.11E-03	0.42E-01
29.00	76.43	43.786	0.209E-01	0.211E-01	-0.17E-03	0.42E-01
29.50	76.44	43.787	0.188E-01	0.208E-01	-0.45E-03	-0.42E-01
30.00	76.45	43.786	0.228E-01	0.206E-01	-0.74E-03	0.42E-01
30.50	76.44	43.786	0.206E-01	0.203E-01	-0.10E-02	0.42E-01
31.00	76.45	43.787	0.203E-01	0.201E-01	-0.13E-02	0.41E-01
31.50	76.44	43.787	0.200E-01	0.198E-01	-0.16E-02	0.41E-01
32.00	76.44	43.784	0.231E-01	0.196E-01	-0.19E-02	0.41E-01

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.253E-01
THE STANDARD DEVIATION IS 0.107E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.196E-01

PALISADES 28 PSIG ILRT

TIME, DATE START OF TEST 8.00 524

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
8.50	76.51	43.800	0.305E-01	0.240E-01	-0.28E+00	0.33E+00
9.00	76.51	43.801	-0.592E-01	0.240E-01	-0.28E+00	0.33E+00
9.50	76.52	43.800	0.147E+00	0.240E-01	-0.28E+00	0.33E+00
10.00	76.52	43.801	-0.886E-01	0.239E-01	-0.28E+00	0.33E+00
10.50	76.52	43.799	0.188E+00	0.239E-01	-0.28E+00	0.33E+00
11.00	76.51	43.799	-0.316E-01	0.239E-01	-0.28E+00	0.33E+00
11.50	76.53	43.800	0.878E-02	0.238E-01	-0.28E+00	0.33E+00
12.00	76.51	43.799	-0.406E-01	0.238E-01	-0.28E+00	0.33E+00
12.50	76.52	43.799	0.158E+00	0.237E-01	-0.28E+00	0.32E+00
13.00	76.51	43.799	-0.784E-01	0.237E-01	-0.28E+00	0.32E+00
13.50	76.51	43.797	0.158E+00	0.237E-01	-0.28E+00	0.32E+00
14.00	76.51	43.797	0.110E-01	0.236E-01	-0.28E+00	0.32E+00
14.50	76.51	43.794	0.305E+00	0.236E-01	-0.28E+00	0.32E+00
15.00	76.51	43.795	-0.128E+00	0.236E-01	-0.28E+00	0.32E+00

15.50	76.51	43.794	0.131E+00	0.235E-01	-0.27E+00	0.32E+00
16.00	76.50	43.796	-0.283E+00	0.235E-01	-0.27E+00	0.32E+00
16.50	76.49	43.794	0.113E+00	0.235E-01	-0.27E+00	0.32E+00
17.00	76.50	43.794	0.890E-01	0.234E-01	-0.27E+00	0.32E+00
17.50	76.50	43.794	-0.552E-01	0.234E-01	-0.27E+00	0.32E+00
18.00	76.47	43.791	0.605E-01	0.234E-01	-0.27E+00	0.32E+00
18.50	76.48	43.794	-0.168E+00	0.233E-01	-0.27E+00	0.32E+00
19.00	76.49	43.793	0.188E+00	0.233E-01	-0.27E+00	0.32E+00
19.50	76.48	43.793	-0.929E-01	0.232E-01	-0.27E+00	0.32E+00
20.00	76.48	43.791	0.197E+00	0.232E-01	-0.27E+00	0.32E+00
20.50	76.45	43.791	-0.213E+00	0.232E-01	-0.27E+00	0.32E+00
21.00	76.45	43.791	0.145E-01	0.231E-01	-0.27E+00	0.32E+00
21.50	76.45	43.790	0.302E-01	0.231E-01	-0.27E+00	0.32E+00
22.00	76.45	43.790	-0.526E-01	0.231E-01	-0.27E+00	0.32E+00
22.50	76.46	43.790	0.138E+00	0.230E-01	-0.27E+00	0.32E+00
23.00	76.44	43.789	-0.152E-01	0.230E-01	-0.27E+00	0.32E+00
23.50	76.45	43.787	0.242E+00	0.230E-01	-0.27E+00	0.32E+00
24.00	76.45	43.789	-0.188E+00	0.229E-01	-0.27E+00	0.32E+00
24.50	76.45	43.788	0.838E-01	0.229E-01	-0.28E+00	0.32E+00
25.00	76.45	43.790	-0.208E+00	0.229E-01	-0.28E+00	0.32E+00
25.50	76.43	43.790	-0.775E-01	0.228E-01	-0.28E+00	0.32E+00
26.00	76.46	43.790	0.195E+00	0.228E-01	-0.28E+00	0.32E+00
26.50	76.43	43.789	-0.123E+00	0.227E-01	-0.28E+00	0.32E+00
27.00	76.46	43.788	0.307E+00	0.227E-01	-0.28E+00	0.32E+00
27.50	76.43	43.787	-0.129E+00	0.227E-01	-0.28E+00	0.32E+00
28.00	76.44	43.789	-0.154E+00	0.226E-01	-0.28E+00	0.32E+00
28.50	76.44	43.788	0.214E+00	0.226E-01	-0.28E+00	0.32E+00
29.00	76.43	43.786	0.570E-01	0.226E-01	-0.28E+00	0.32E+00
29.50	76.44	43.787	-0.730E-01	0.225E-01	-0.28E+00	0.32E+00
30.00	76.45	43.786	0.195E+00	0.225E-01	-0.28E+00	0.33E+00
30.50	76.44	43.786	-0.743E-01	0.225E-01	-0.28E+00	0.33E+00
31.00	76.45	43.787	0.849E-02	0.224E-01	-0.28E+00	0.33E+00
31.50	76.44	43.787	0.469E-02	0.224E-01	-0.28E+00	0.33E+00
32.00	76.44	43.784	0.171E+00	0.223E-01	-0.28E+00	0.33E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.232E-01
THE STANDARD DEVIATION IS 0.144E+00
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.223E-01

PALISADES 55 PSIG ILRT

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ENTER TIME, DATE,TEMP,PRESS
WHEN FINISHED ENTER 9999,,,,
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= 1830,0521,76.950001,70.253125
= 1900,0521,76.931413,70.249877
= 1930,0521,76.916763,70.245260
= 2000,0521,76.924393,70.246571
= 2030,0521,76.929121,70.247675
= 2100,0521,76.932914,70.244140
= 2130,0521,76.900739,70.246430
= 2200,0521,76.902620,70.245857
= 2230,0521,76.907342,70.244586
= 2300,0521,76.903403,70.245139
= 2330,0521,76.899224,70.244359
= 2400,0521,76.891999,70.242582
= 0030,0522,76.895716,70.241735
= 0100,0522,76.889139,70.242080
= 0130,0522,76.892209,70.243167
= 0200,0522,76.885014,70.242439
= 0230,0522,76.893560,70.242770
= 0300,0522,76.890189,70.240771
= 0330,0522,76.893982,70.240327
= 0400,0522,76.893201,70.242523
= 0430,0522,76.888974,70.241527
= 0500,0522,76.887478,70.243184
= 0530,0522,76.886964,70.244073
= 0600,0522,76.897911,70.244342
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= 0730,0522,76.926892,70.244681
= 0800,0522,76.912426,70.244237
= 0830,0522,76.901650,70.245054
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= 0930,0522,76.908532,70.246140
= 1000,0522,76.927203,70.246339
= 1030,0522,76.911336,70.246763
= 1100,0522,76.914252,70.246819
= 1130,0522,76.922863,70.247982
= 1200,0522,76.943158,70.245932
= 1230,0522,76.927213,70.248634
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= 1330,0522,76.946808,70.245393
= 1400,0522,76.939409,70.250061
= 1430,0522,76.932377,70.246043
= 1500,0522,76.955042,70.249502
= 1530,0522,76.953078,70.247111
= 1600,0522,76.963270,70.248009
= 1630,0522,76.968282,70.248755
= 1700,0522,76.969040,70.248868
= 1730,0522,76.963612,70.248425
= 1800,0522,76.975155,70.251495
= 9999,,,,
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PALISADES 55 PSIG ILRT

TIME, DATE START OF TEST 18.00 521

TIME AFTER START OF TEST = 24.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.50	4	-0.518E-01	0.361E-01	
2.00	5	-0.341E-01	0.503E-01	0.143E-01
2.50	6	-0.256E-01	0.477E-01	-0.264E-02
3.00	7	-0.125E-01	0.679E-01	0.202E-01
3.50	8	-0.133E-01	0.452E-01	-0.227E-01
4.00	9	-0.128E-01	0.341E-01	-0.111E-01
4.50	10	-0.106E-01	0.320E-01	-0.209E-02
5.00	11	-0.973E-02	0.274E-01	-0.458E-02
5.50	12	-0.883E-02	0.243E-01	-0.305E-02
6.00	13	-0.770E-02	0.232E-01	-0.107E-02
6.50	14	-0.606E-02	0.247E-01	0.141E-02
7.00	15	-0.529E-02	0.233E-01	-0.131E-02
7.50	16	-0.485E-02	0.214E-01	-0.198E-02
8.00	17	-0.453E-02	0.195E-01	-0.190E-02
8.50	18	-0.406E-02	0.185E-01	-0.940E-03
9.00	19	-0.332E-02	0.189E-01	0.335E-03
9.50	20	-0.251E-02	0.196E-01	0.784E-03
10.00	21	-0.220E-02	0.187E-01	-0.969E-03
10.50	22	-0.186E-02	0.180E-01	-0.637E-03
11.00	23	-0.183E-02	0.164E-01	-0.160E-02
11.50	24	-0.192E-02	0.146E-01	-0.185E-02
12.00	25	-0.185E-02	0.135E-01	-0.108E-02
12.50	26	-0.153E-02	0.135E-01	0.390E-04
13.00	27	-0.158E-02	0.122E-01	-0.129E-02
13.50	28	-0.121E-02	0.127E-01	0.411E-03
14.00	29	-0.100E-02	0.125E-01	-0.175E-03
14.50	30	-0.997E-03	0.116E-01	-0.879E-03
15.00	31	-0.595E-03	0.123E-01	0.715E-03
15.50	32	-0.615E-03	0.114E-01	-0.881E-03
16.00	33	-0.482E-03	0.112E-01	-0.224E-03
16.50	34	-0.518E-03	0.104E-01	-0.824E-03
17.00	35	-0.531E-03	0.971E-02	-0.672E-03
17.50	36	-0.544E-03	0.909E-02	-0.621E-03
18.00	37	-0.308E-03	0.948E-02	0.386E-03
18.50	38	-0.329E-03	0.888E-02	-0.597E-03
19.00	39	-0.256E-03	0.869E-02	-0.191E-03
19.50	40	-0.153E-04	0.917E-02	0.480E-03
20.00	41	-0.330E-04	0.865E-02	-0.516E-03
20.50	42	0.764E-04	0.866E-02	0.847E-05
21.00	43	0.159E-03	0.858E-02	-0.802E-04
21.50	44	0.315E-03	0.880E-02	0.219E-03
22.00	45	0.475E-03	0.904E-02	0.244E-03
22.50	46	0.622E-03	0.924E-02	0.195E-03
23.00	47	0.759E-03	0.940E-02	0.162E-03
23.50	48	0.878E-03	0.950E-02	0.102E-03
24.00	49	0.943E-03	0.941E-02	-0.985E-04

THE CALCULATED LEAK RATE IS 0.941E-02
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.100E+00
THE LAST 1 DATA POINTS ESTABLISH A NEGATIVE SLOPE

PALISADES 55 PSIG ILRT

TIME, DATE START OF TEST 18.00 521

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
18.50	76.95	70.253	-0.144E+00	-0.752E-02	-0.58E-01	0.43E-01
19.00	76.93	70.250	-0.440E-01	-0.716E-02	-0.58E-01	0.44E-01
19.50	76.92	70.245	0.321E-01	-0.680E-02	-0.58E-01	0.44E-01
20.00	76.92	70.247	0.188E-01	-0.644E-02	-0.57E-01	0.44E-01
20.50	76.93	70.248	0.839E-02	-0.608E-02	-0.57E-01	0.44E-01
21.00	76.93	70.244	0.529E-01	-0.572E-02	-0.56E-01	0.45E-01
21.50	76.90	70.246	-0.181E-01	-0.536E-02	-0.56E-01	0.45E-01
22.00	76.90	70.246	-0.886E-02	-0.500E-02	-0.55E-01	0.45E-01
22.50	76.91	70.245	0.647E-02	-0.464E-02	-0.55E-01	0.46E-01
23.00	76.90	70.245	-0.149E-02	-0.428E-02	-0.54E-01	0.46E-01
23.50	76.90	70.244	0.107E-03	-0.392E-02	-0.54E-01	0.46E-01
24.00	76.89	70.243	0.482E-02	-0.356E-02	-0.53E-01	0.46E-01
24.50	76.90	70.242	0.135E-01	-0.320E-02	-0.53E-01	0.47E-01
25.00	76.89	70.242	0.476E-02	-0.284E-02	-0.53E-01	0.47E-01
25.50	76.89	70.243	0.132E-02	-0.248E-02	-0.52E-01	0.47E-01
26.00	76.89	70.242	0.323E-03	-0.212E-02	-0.52E-01	0.48E-01
26.50	76.89	70.243	0.347E-02	-0.176E-02	-0.51E-01	0.48E-01
27.00	76.89	70.241	0.919E-02	-0.140E-02	-0.51E-01	0.48E-01
27.50	76.89	70.240	0.121E-01	-0.104E-02	-0.51E-01	0.49E-01
28.00	76.89	70.243	0.363E-02	-0.677E-03	-0.50E-01	0.49E-01
28.50	76.89	70.241	0.490E-02	-0.317E-03	-0.50E-01	0.49E-01
29.00	76.89	70.243	-0.108E-02	0.431E-04	-0.49E-01	0.50E-01
29.50	76.89	70.244	-0.387E-02	0.403E-03	-0.49E-01	0.50E-01
30.00	76.90	70.244	-0.391E-03	0.763E-03	-0.49E-01	0.50E-01
30.50	76.91	70.244	0.624E-02	0.112E-02	-0.48E-01	0.51E-01
31.00	76.89	70.245	-0.276E-02	0.148E-02	-0.48E-01	0.51E-01
31.50	76.93	70.245	0.839E-02	0.184E-02	-0.48E-01	0.51E-01
32.00	76.91	70.244	0.456E-02	0.220E-02	-0.47E-01	0.52E-01
32.50	76.90	70.245	-0.849E-03	0.256E-02	-0.47E-01	0.52E-01
33.00	76.92	70.243	0.110E-01	0.292E-02	-0.47E-01	0.53E-01
33.50	76.91	70.246	-0.120E-02	0.328E-02	-0.46E-01	0.53E-01
34.00	76.93	70.246	0.363E-02	0.364E-02	-0.46E-01	0.53E-01
34.50	76.91	70.247	-0.166E-02	0.400E-02	-0.46E-01	0.54E-01
35.00	76.91	70.247	-0.957E-03	0.436E-02	-0.45E-01	0.54E-01
35.50	76.92	70.248	-0.100E-02	0.472E-02	-0.45E-01	0.55E-01
36.00	76.94	70.246	0.796E-02	0.508E-02	-0.45E-01	0.55E-01

36.50	76.93	70.249	-0.110E-02	0.544E-02	-0.44E-01	0.55E-01
37.00	76.94	70.248	0.245E-02	0.580E-02	-0.44E-01	0.56E-01
37.50	76.95	70.245	0.913E-02	0.617E-02	-0.44E-01	0.56E-01
38.00	76.94	70.250	-0.724E-03	0.653E-02	-0.44E-01	0.57E-01
38.50	76.93	70.246	0.445E-02	0.689E-02	-0.43E-01	0.57E-01
39.00	76.95	70.250	0.355E-02	0.725E-02	-0.43E-01	0.58E-01
39.50	76.95	70.247	0.686E-02	0.761E-02	-0.43E-01	0.58E-01
40.00	76.96	70.248	0.738E-02	0.797E-02	-0.43E-01	0.58E-01
40.50	76.97	70.249	0.708E-02	0.833E-02	-0.42E-01	0.59E-01
41.00	76.97	70.249	0.690E-02	0.869E-02	-0.42E-01	0.59E-01
41.50	76.96	70.248	0.637E-02	0.905E-02	-0.42E-01	0.60E-01
42.00	76.98	70.252	0.402E-02	0.941E-02	-0.42E-01	0.60E-01

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.943E-03
THE STANDARD DEVIATION IS 0.246E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.941E-02

PALISADES 55 PSIG ILRT

TIME, DATE START OF TEST 18.00 521

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
18.50	76.95	70.253	-0.144E+00	0.333E-02	-0.37E+00	0.38E+00
19.00	76.93	70.250	0.558E-01	0.336E-02	-0.37E+00	0.38E+00
19.50	76.92	70.245	0.185E+00	0.340E-02	-0.37E+00	0.38E+00
20.00	76.92	70.247	-0.212E-01	0.343E-02	-0.37E+00	0.38E+00
20.50	76.93	70.248	-0.331E-01	0.346E-02	-0.37E+00	0.38E+00
21.00	76.93	70.244	0.276E+00	0.349E-02	-0.37E+00	0.38E+00
21.50	76.90	70.246	-0.444E+00	0.352E-02	-0.37E+00	0.38E+00
22.00	76.90	70.246	0.561E-01	0.355E-02	-0.37E+00	0.38E+00
22.50	76.91	70.245	0.129E+00	0.359E-02	-0.37E+00	0.38E+00
23.00	76.90	70.245	-0.730E-01	0.362E-02	-0.37E+00	0.38E+00
23.50	76.90	70.244	0.160E-01	0.365E-02	-0.37E+00	0.37E+00
24.00	76.89	70.243	0.568E-01	0.368E-02	-0.37E+00	0.37E+00

24.50	76.90	70.242	0.118E+00	0.371E-02	-0.37E+00	0.37E+00
25.00	76.89	70.242	-0.109E+00	0.374E-02	-0.37E+00	0.37E+00
25.50	76.89	70.243	-0.468E-01	0.377E-02	-0.37E+00	0.37E+00
26.00	76.89	70.242	-0.146E-01	0.381E-02	-0.37E+00	0.37E+00
26.50	76.89	70.243	0.539E-01	0.384E-02	-0.36E+00	0.37E+00
27.00	76.89	70.241	0.106E+00	0.387E-02	-0.36E+00	0.37E+00
27.50	76.89	70.240	0.644E-01	0.390E-02	-0.36E+00	0.37E+00
28.00	76.89	70.243	-0.157E+00	0.393E-02	-0.36E+00	0.37E+00
28.50	76.89	70.241	0.304E-01	0.396E-02	-0.36E+00	0.37E+00
29.00	76.89	70.243	-0.127E+00	0.400E-02	-0.36E+00	0.37E+00
29.50	76.89	70.244	-0.652E-01	0.403E-02	-0.36E+00	0.37E+00
30.00	76.90	70.244	0.796E-01	0.406E-02	-0.36E+00	0.37E+00
30.50	76.91	70.244	0.165E+00	0.409E-02	-0.36E+00	0.37E+00
31.00	76.89	70.245	-0.228E+00	0.412E-02	-0.36E+00	0.37E+00
31.50	76.93	70.245	0.298E+00	0.415E-02	-0.36E+00	0.37E+00
32.00	76.91	70.244	-0.990E-01	0.419E-02	-0.36E+00	0.37E+00
32.50	76.90	70.245	-0.152E+00	0.422E-02	-0.36E+00	0.37E+00
33.00	76.92	70.243	0.356E+00	0.425E-02	-0.36E+00	0.37E+00
33.50	76.91	70.246	-0.368E+00	0.428E-02	-0.36E+00	0.37E+00
34.00	76.93	70.246	0.153E+00	0.431E-02	-0.36E+00	0.37E+00
34.50	76.91	70.247	-0.171E+00	0.434E-02	-0.36E+00	0.37E+00
35.00	76.91	70.247	0.223E-01	0.438E-02	-0.36E+00	0.37E+00
35.50	76.92	70.248	-0.243E-02	0.441E-02	-0.37E+00	0.37E+00
36.00	76.94	70.246	0.322E+00	0.444E-02	-0.37E+00	0.37E+00
36.50	76.93	70.249	-0.327E+00	0.447E-02	-0.37E+00	0.38E+00
37.00	76.94	70.248	0.134E+00	0.450E-02	-0.37E+00	0.38E+00
37.50	76.95	70.245	0.263E+00	0.453E-02	-0.37E+00	0.38E+00
38.00	76.94	70.250	-0.385E+00	0.457E-02	-0.37E+00	0.38E+00
38.50	76.93	70.246	0.212E+00	0.460E-02	-0.37E+00	0.38E+00
39.00	76.95	70.250	-0.335E-01	0.463E-02	-0.37E+00	0.38E+00
39.50	76.95	70.247	0.146E+00	0.466E-02	-0.37E+00	0.38E+00
40.00	76.96	70.248	0.299E-01	0.469E-02	-0.37E+00	0.38E+00
40.50	76.97	70.249	-0.616E-02	0.472E-02	-0.37E+00	0.38E+00
41.00	76.97	70.249	-0.746E-03	0.476E-02	-0.37E+00	0.38E+00
41.50	76.96	70.248	-0.182E-01	0.479E-02	-0.37E+00	0.38E+00
42.00	76.98	70.252	-0.107E+00	0.482E-02	-0.37E+00	0.38E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.408E-02
THE STANDARD DEVIATION IS 0.179E+00
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.482E-02

PT BEACH 30 PSIG ILRT UNIT 1

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ENTER TIME, DATE,TEMP,PRESS
WHEN FINISHED ENTER 9999,,,,
= 1600,0620,78.423035,44.420290
= 1630,0620,78.600925,44.427489
= 1700,0620,78.734396,44.437696
= 1730,0620,78.810790,44.446536
= 1800,0620,78.972382,44.455280
= 1830,0620,79.056769,44.461041
= 1900,0620,79.152800,44.468009
= 1930,0620,79.316851,44.477383
= 2000,0620,79.483258,44.483478
= 2030,0620,79.534680,44.491430
= 2100,0620,79.655984,44.497546
= 2130,0620,79.750051,44.502773
= 2200,0620,79.818421,44.508996
= 2230,0620,79.865309,44.515541
= 2300,0620,79.988725,44.520822
= 2330,0620,80.065310,44.525507
= 2400,0620,80.146129,44.530092
= 0030,0621,80.220605,44.533754
= 0100,0621,80.295960,44.539237
= 0130,0621,80.347296,44.544997
= 0200,0621,80.435738,44.547890
= 0230,0621,80.482946,44.552948
= 0300,0621,80.539396,44.556129
= 0330,0621,80.618874,44.561156
= 0400,0621,80.686994,44.565345
= 0430,0621,80.774212,44.578251
= 0500,0621,80.813314,44.585028
= 0530,0621,80.899473,44.588097
= 0600,0621,80.952883,44.591452
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= 0700,0621,81.043177,44.598647
= 0730,0621,81.124962,44.602584
= 0800,0621,81.170886,44.605671
= 0830,0621,81.267930,44.609908
= 0900,0621,81.283105,44.612584
= 0930,0621,81.195437,44.615481
= 1000,0621,81.258679,44.618138
= 1030,0621,81.487157,44.621177
= 1100,0621,81.490232,44.623396
= 1130,0621,81.516430,44.626976
= 1200,0621,81.545518,44.629353
= 1230,0621,81.606030,44.632498
= 1300,0621,81.676995,44.636539
= 1330,0621,81.719791,44.639948
= 1400,0621,81.795461,44.641351
= 1430,0621,81.789786,44.642854
= 1500,0621,81.841445,44.647033
= 1530,0621,81.909349,44.648601
= 1600,0621,81.980265,44.652030
= 9999,,,,
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PT BEACH 30 PSIG ILRT UNIT 1

TIME, DATE START OF TEST 16.00 620

TIME AFTER START OF TEST = 24.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.50	4	0.488E+00	0.188E+00	
2.00	5	0.436E+00	0.162E+00	-0.257E-01
2.50	6	0.399E+00	0.142E+00	-0.204E-01
3.00	7	0.370E+00	0.124E+00	-0.173E-01
3.50	8	0.354E+00	0.133E+00	0.920E-02
4.00	9	0.351E+00	0.172E+00	0.383E-01
4.50	10	0.339E+00	0.168E+00	-0.325E-02
5.00	11	0.332E+00	0.174E+00	0.527E-02
5.50	12	0.326E+00	0.179E+00	0.522E-02
6.00	13	0.318E+00	0.176E+00	-0.327E-02
6.50	14	0.310E+00	0.167E+00	-0.905E-02
7.00	15	0.304E+00	0.163E+00	-0.374E-02
7.50	16	0.298E+00	0.160E+00	-0.308E-02
8.00	17	0.293E+00	0.158E+00	-0.186E-02
8.50	18	0.289E+00	0.157E+00	-0.443E-03
9.00	19	0.285E+00	0.156E+00	-0.160E-02
9.50	20	0.280E+00	0.151E+00	-0.486E-02
10.00	21	0.276E+00	0.150E+00	-0.115E-02
10.50	22	0.272E+00	0.146E+00	-0.351E-02
11.00	23	0.269E+00	0.143E+00	-0.299E-02
11.50	24	0.265E+00	0.141E+00	-0.251E-02
12.00	25	0.262E+00	0.139E+00	-0.219E-02
12.50	26	0.258E+00	0.132E+00	-0.654E-02
13.00	27	0.253E+00	0.124E+00	-0.853E-02
13.50	28	0.249E+00	0.118E+00	-0.575E-02
14.00	29	0.245E+00	0.113E+00	-0.506E-02
14.50	30	0.242E+00	0.108E+00	-0.483E-02
15.00	31	0.238E+00	0.103E+00	-0.477E-02
15.50	32	0.235E+00	0.997E-01	-0.345E-02
16.00	33	0.232E+00	0.965E-01	-0.321E-02
16.50	34	0.229E+00	0.947E-01	-0.183E-02
17.00	35	0.227E+00	0.922E-01	-0.253E-02
17.50	36	0.223E+00	0.862E-01	-0.602E-02
18.00	37	0.220E+00	0.813E-01	-0.484E-02
18.50	38	0.218E+00	0.815E-01	0.161E-03
19.00	39	0.216E+00	0.807E-01	-0.727E-03
19.50	40	0.214E+00	0.794E-01	-0.132E-02
20.00	41	0.212E+00	0.780E-01	-0.144E-02
20.50	42	0.210E+00	0.769E-01	-0.109E-02
21.00	43	0.208E+00	0.761E-01	-0.795E-03
21.50	44	0.206E+00	0.752E-01	-0.915E-03
22.00	45	0.205E+00	0.752E-01	-0.307E-05
22.50	46	0.203E+00	0.746E-01	-0.612E-03
23.00	47	0.202E+00	0.738E-01	-0.733E-03
23.50	48	0.200E+00	0.737E-01	-0.914E-04
24.00	49	0.199E+00	0.739E-01	0.177E-03

THE CALCULATED LEAK RATE IS 0.739E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.283E+00
THE LAST 0 DATA POINTS ESTABLISH A NEGATIVE SLOPE

PT BEACH 30 PSIG ILRT UNIT 1

TIME, DATE START OF TEST 16.00 620

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP.* (F)	PRESSURE* (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
16.50	78.60	44.427	0.809E+00	0.324E+00	0.15E+00	0.50E+00
17.00	78.73	44.438	0.448E+00	0.319E+00	0.15E+00	0.49E+00
17.50	78.81	44.446	0.208E+00	0.314E+00	0.14E+00	0.49E+00
18.00	78.97	44.455	0.280E+00	0.308E+00	0.14E+00	0.48E+00
18.50	79.06	44.461	0.250E+00	0.303E+00	0.13E+00	0.47E+00
19.00	79.15	44.468	0.225E+00	0.298E+00	0.13E+00	0.47E+00
19.50	79.32	44.477	0.257E+00	0.292E+00	0.12E+00	0.46E+00
20.00	79.48	44.484	0.328E+00	0.287E+00	0.12E+00	0.46E+00
20.50	79.53	44.491	0.247E+00	0.282E+00	0.11E+00	0.45E+00
21.00	79.66	44.497	0.265E+00	0.276E+00	0.11E+00	0.45E+00
21.50	79.75	44.503	0.265E+00	0.271E+00	0.10E+00	0.44E+00
22.00	79.82	44.509	0.238E+00	0.266E+00	0.96E-01	0.44E+00
22.50	79.89	44.516	0.211E+00	0.260E+00	0.91E-01	0.43E+00
23.00	79.99	44.521	0.221E+00	0.255E+00	0.86E-01	0.42E+00
23.50	80.07	44.525	0.218E+00	0.250E+00	0.80E-01	0.42E+00
24.00	80.15	44.530	0.219E+00	0.244E+00	0.75E-01	0.41E+00
24.50	80.22	44.534	0.221E+00	0.239E+00	0.70E-01	0.41E+00
25.00	80.30	44.539	0.213E+00	0.234E+00	0.65E-01	0.40E+00
25.50	80.35	44.545	0.194E+00	0.228E+00	0.60E-01	0.40E+00
26.00	80.44	44.548	0.208E+00	0.223E+00	0.54E-01	0.39E+00
26.50	80.48	44.553	0.192E+00	0.218E+00	0.49E-01	0.39E+00
27.00	80.54	44.556	0.190E+00	0.212E+00	0.44E-01	0.38E+00
27.50	80.62	44.561	0.189E+00	0.207E+00	0.39E-01	0.38E+00
28.00	80.69	44.565	0.188E+00	0.202E+00	0.33E-01	0.37E+00
28.50	80.77	44.578	0.156E+00	0.196E+00	0.28E-01	0.36E+00
29.00	80.81	44.585	0.135E+00	0.191E+00	0.23E-01	0.36E+00
29.50	80.90	44.588	0.146E+00	0.186E+00	0.17E-01	0.35E+00
30.00	80.95	44.591	0.145E+00	0.180E+00	0.12E-01	0.35E+00
30.50	80.99	44.594	0.141E+00	0.175E+00	0.64E-02	0.34E+00
31.00	81.04	44.599	0.136E+00	0.170E+00	0.10E-02	0.34E+00
31.50	81.12	44.603	0.141E+00	0.164E+00	-0.44E-02	0.33E+00
32.00	81.17	44.606	0.139E+00	0.159E+00	-0.98E-02	0.33E+00
32.50	81.27	44.610	0.147E+00	0.154E+00	-0.15E-01	0.32E+00
33.00	81.23	44.613	0.139E+00	0.148E+00	-0.21E-01	0.32E+00
33.50	81.20	44.615	0.104E+00	0.143E+00	-0.26E-01	0.31E+00
34.00	81.26	44.618	0.108E+00	0.138E+00	-0.32E-01	0.31E+00
34.50	81.49	44.621	0.151E+00	0.132E+00	-0.37E-01	0.30E+00
35.00	81.49	44.623	0.142E+00	0.127E+00	-0.43E-01	0.30E+00
35.50	81.52	44.627	0.134E+00	0.122E+00	-0.48E-01	0.29E+00
36.00	81.55	44.629	0.131E+00	0.117E+00	-0.54E-01	0.29E+00

* Temperature and pressure increasing due to heat input from containment fan motors. Containment fans run during the ILRT.

36.50	81.61	44.633	0.133E+00	0.111E+00	-0.60E-01	0.28E+00
37.00	81.68	44.636	0.134E+00	0.106E+00	-0.65E-01	0.28E+00
37.50	81.72	44.640	0.131E+00	0.101E+00	-0.71E-01	0.27E+00
38.00	81.80	44.641	0.140E+00	0.952E-01	-0.77E-01	0.27E+00
38.50	81.79	44.643	0.132E+00	0.899E-01	-0.82E-01	0.26E+00
39.00	81.84	44.647	0.130E+00	0.846E-01	-0.88E-01	0.26E+00
39.50	81.91	44.649	0.136E+00	0.792E-01	-0.94E-01	0.25E+00
40.00	81.98	44.652	0.139E+00	0.739E-01	-0.99E-01	0.25E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.199E+00
THE STANDARD DEVIATION IS 0.111E+00
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.739E-01

PT BEACH 30 PSIG ILRT UNIT 1

TIME, DATE START OF TEST 16.00 620

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP.* (F)	PRESSURE* (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
16.50	78.60	44.427	0.809E+00	0.195E+00	-0.67E+00	0.11E+01
17.00	78.73	44.438	0.876E-01	0.193E+00	-0.67E+00	0.11E+01
17.50	78.81	44.446	-0.274E+00	0.190E+00	-0.67E+00	0.11E+01
18.00	78.97	44.455	0.496E+00	0.188E+00	-0.67E+00	0.10E+01
18.50	79.06	44.461	0.130E+00	0.185E+00	-0.67E+00	0.10E+01
19.00	79.15	44.468	0.103E+00	0.183E+00	-0.67E+00	0.10E+01
19.50	79.32	44.477	0.450E+00	0.181E+00	-0.67E+00	0.10E+01
20.00	79.48	44.484	0.824E+00	0.178E+00	-0.67E+00	0.10E+01
20.50	79.53	44.491	-0.400E+00	0.176E+00	-0.68E+00	0.10E+01
21.00	79.66	44.497	0.420E+00	0.173E+00	-0.68E+00	0.10E+01
21.50	79.75	44.503	0.273E+00	0.171E+00	-0.68E+00	0.10E+01
22.00	79.82	44.509	-0.627E-01	0.169E+00	-0.68E+00	0.10E+01
22.50	79.89	44.516	-0.111E+00	0.166E+00	-0.68E+00	0.10E+01

* See note page B-16

23.00	79.99	44.521	0.351E+00	0.164E+00	-0.68E+00	0.10E+01
23.50	80.07	44.525	0.176E+00	0.161E+00	-0.68E+00	0.10E+01
24.00	80.15	44.530	0.225E+00	0.159E+00	-0.68E+00	0.10E+01
24.50	80.22	44.534	0.268E+00	0.157E+00	-0.69E+00	0.10E+01
25.00	80.30	44.539	0.791E-01	0.154E+00	-0.69E+00	0.10E+01
25.50	80.35	44.545	-0.164E+00	0.152E+00	-0.69E+00	0.99E+00
26.00	80.44	44.548	0.474E+00	0.149E+00	-0.69E+00	0.99E+00
26.50	80.48	44.553	-0.125E+00	0.147E+00	-0.69E+00	0.99E+00
27.00	80.54	44.556	0.159E+00	0.145E+00	-0.70E+00	0.99E+00
27.50	80.62	44.561	0.165E+00	0.142E+00	-0.70E+00	0.98E+00
28.00	80.69	44.565	0.154E+00	0.140E+00	-0.70E+00	0.98E+00
28.50	80.77	44.578	-0.615E+00	0.137E+00	-0.70E+00	0.98E+00
29.00	80.81	44.585	-0.382E+00	0.135E+00	-0.71E+00	0.98E+00
29.50	80.90	44.588	0.435E+00	0.133E+00	-0.71E+00	0.97E+00
30.00	80.95	44.591	0.113E+00	0.130E+00	-0.71E+00	0.97E+00
30.50	80.99	44.594	0.321E-01	0.128E+00	-0.71E+00	0.97E+00
31.00	81.04	44.599	-0.467E-02	0.126E+00	-0.72E+00	0.97E+00
31.50	81.12	44.603	0.302E+00	0.123E+00	-0.72E+00	0.97E+00
32.00	81.17	44.606	0.755E-01	0.121E+00	-0.72E+00	0.96E+00
32.50	81.27	44.610	0.405E+00	0.118E+00	-0.73E+00	0.96E+00
33.00	81.28	44.613	-0.153E+00	0.116E+00	-0.73E+00	0.96E+00
33.50	81.20	44.615	-0.109E+01	0.114E+00	-0.73E+00	0.96E+00
34.00	81.26	44.618	0.275E+00	0.111E+00	-0.74E+00	0.96E+00
34.50	81.49	44.621	0.170E+01	0.109E+00	-0.74E+00	0.96E+00
35.00	81.49	44.623	-0.211E+00	0.106E+00	-0.74E+00	0.95E+00
35.50	81.52	44.627	-0.153E+00	0.104E+00	-0.75E+00	0.95E+00
36.00	81.55	44.629	0.243E-02	0.102E+00	-0.75E+00	0.95E+00
36.50	81.61	44.633	0.199E+00	0.992E-01	-0.75E+00	0.95E+00
37.00	81.68	44.636	0.195E+00	0.968E-01	-0.76E+00	0.95E+00
37.50	81.72	44.640	0.129E-01	0.944E-01	-0.76E+00	0.95E+00
38.00	81.80	44.641	0.520E+00	0.920E-01	-0.77E+00	0.95E+00
38.50	81.79	44.643	-0.212E+00	0.896E-01	-0.77E+00	0.95E+00
39.00	81.84	44.647	0.873E-02	0.872E-01	-0.77E+00	0.95E+00
39.50	81.91	44.649	0.433E+00	0.848E-01	-0.78E+00	0.95E+00
40.00	81.98	44.652	0.260E+00	0.824E-01	-0.78E+00	0.95E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.139E+00
THE STANDARD DEVIATION IS 0.410E+00
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.824E-01

PT BEACH 60 PSIG ILRT UNIT 1

```
ENTER TIME, DATE, TEMP, PRESS
WHEN FINISHED ENTER 9999,,,,
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= 2100,0623,84.456942,74.432835
= 2130,0623,84.531450,74.437081
= 2200,0623,84.520251,74.440649
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= 2300,0623,84.589811,74.447778
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= 0930,0624,85.169929,74.496600
= 1000,0624,85.155035,74.506167
= 1030,0624,85.184975,74.506972
= 1100,0624,85.206080,74.509151
= 1130,0624,85.215932,74.512340
= 1200,0624,85.233538,74.515267
= 9999,,,,
```

PT BEACH 60 PSIG ILRT UNIT 1

TIME, DATE START OF TEST 12.00 623

TIME AFTER START OF TEST = 24.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.50	4	0.120E+00	0.601E-01	
2.00	5	0.129E+00	0.111E+00	0.510E-01
2.50	6	0.114E+00	0.721E-01	-0.391E-01
3.00	7	0.122E+00	0.107E+00	0.352E-01
3.50	8	0.119E+00	0.103E+00	-0.408E-02
4.00	9	0.119E+00	0.107E+00	0.354E-02
4.50	10	0.113E+00	0.878E-01	-0.189E-01
5.00	11	0.108E+00	0.768E-01	-0.110E-01
5.50	12	0.110E+00	0.877E-01	0.109E-01
6.00	13	0.108E+00	0.824E-01	-0.534E-02
6.50	14	0.106E+00	0.806E-01	-0.180E-02
7.00	15	0.104E+00	0.775E-01	-0.304E-02
7.50	16	0.103E+00	0.757E-01	-0.184E-02
8.00	17	0.100E+00	0.702E-01	-0.552E-02
8.50	18	0.985E-01	0.664E-01	-0.375E-02
9.00	19	0.965E-01	0.623E-01	-0.406E-02
9.50	20	0.956E-01	0.624E-01	0.239E-04
10.00	21	0.937E-01	0.587E-01	-0.369E-02
10.50	22	0.927E-01	0.581E-01	-0.537E-03
11.00	23	0.913E-01	0.557E-01	-0.250E-02
11.50	24	0.902E-01	0.547E-01	-0.939E-03
12.00	25	0.896E-01	0.553E-01	0.551E-03
12.50	26	0.887E-01	0.546E-01	-0.708E-03
13.00	27	0.879E-01	0.538E-01	-0.780E-03
13.50	28	0.870E-01	0.530E-01	-0.782E-03
14.00	29	0.864E-01	0.529E-01	-0.448E-04
14.50	30	0.854E-01	0.514E-01	-0.159E-02
15.00	31	0.845E-01	0.501E-01	-0.128E-02
15.50	32	0.840E-01	0.507E-01	0.581E-03
16.00	33	0.833E-01	0.499E-01	-0.750E-03
16.50	34	0.829E-01	0.501E-01	0.171E-03
17.00	35	0.821E-01	0.491E-01	-0.101E-02
17.50	36	0.813E-01	0.480E-01	-0.112E-02
18.00	37	0.809E-01	0.481E-01	0.108E-03
18.50	38	0.803E-01	0.476E-01	-0.462E-03
19.00	39	0.797E-01	0.469E-01	-0.683E-03
19.50	40	0.791E-01	0.464E-01	-0.535E-03
20.00	41	0.787E-01	0.464E-01	0.128E-04
20.50	42	0.783E-01	0.463E-01	-0.597E-04
21.00	43	0.779E-01	0.461E-01	-0.265E-03
21.50	44	0.778E-01	0.474E-01	0.131E-02
22.00	45	0.774E-01	0.470E-01	-0.399E-03
22.50	46	0.770E-01	0.469E-01	-0.595E-04
23.00	47	0.767E-01	0.468E-01	-0.701E-04
23.50	48	0.762E-01	0.465E-01	-0.367E-03
24.00	49	0.758E-01	0.460E-01	-0.480E-03

THE CALCULATED LEAK RATE IS 0.460E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.400E+00
THE LAST 5 DATA POINTS ESTABLISH A NEGATIVE SLOPE

PT BEACH 60 PSIG ILRT UNIT 1

TIME, DATE START OF TEST 12.00 623

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP.* (F)	PRESSURE* (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
12.50	83.57	74.326	0.149E+00	0.106E+00	0.53E-01	0.16E+00
13.00	83.70	74.341	0.180E+00	0.104E+00	0.51E-01	0.16E+00
13.50	83.75	74.351	0.300E-01	0.103E+00	0.50E-01	0.16E+00
14.00	83.88	74.361	0.159E+00	0.102E+00	0.49E-01	0.15E+00
14.50	83.91	74.371	0.541E-01	0.101E+00	0.48E-01	0.15E+00
15.00	84.03	74.377	0.158E+00	0.993E-01	0.47E-01	0.15E+00
15.50	84.05	74.383	0.105E+00	0.980E-01	0.46E-01	0.15E+00
16.00	84.11	74.388	0.119E+00	0.967E-01	0.44E-01	0.15E+00
16.50	84.13	74.396	0.625E-01	0.955E-01	0.43E-01	0.15E+00
17.00	84.17	74.400	0.679E-01	0.942E-01	0.42E-01	0.15E+00
17.50	84.29	74.406	0.126E+00	0.929E-01	0.41E-01	0.15E+00
18.00	84.27	74.410	0.803E-01	0.917E-01	0.40E-01	0.14E+00
18.50	84.32	74.414	0.879E-01	0.904E-01	0.38E-01	0.14E+00
19.00	84.35	74.418	0.810E-01	0.891E-01	0.37E-01	0.14E+00
19.50	84.39	74.422	0.828E-01	0.879E-01	0.36E-01	0.14E+00
20.00	84.44	74.432	0.646E-01	0.866E-01	0.35E-01	0.14E+00
20.50	84.45	74.432	0.674E-01	0.853E-01	0.34E-01	0.14E+00
21.00	84.46	74.433	0.622E-01	0.841E-01	0.32E-01	0.14E+00
21.50	84.53	74.437	0.791E-01	0.828E-01	0.31E-01	0.13E+00
22.00	84.52	74.441	0.587E-01	0.815E-01	0.30E-01	0.13E+00
22.50	84.58	74.443	0.728E-01	0.803E-01	0.29E-01	0.13E+00
23.00	84.59	74.448	0.604E-01	0.790E-01	0.27E-01	0.13E+00
23.50	84.64	74.451	0.673E-01	0.777E-01	0.26E-01	0.13E+00
24.00	84.68	74.453	0.756E-01	0.764E-01	0.25E-01	0.13E+00
24.50	84.70	74.457	0.674E-01	0.752E-01	0.24E-01	0.13E+00
25.00	84.72	74.460	0.659E-01	0.739E-01	0.22E-01	0.13E+00
25.50	84.76	74.464	0.649E-01	0.726E-01	0.21E-01	0.12E+00
26.00	84.79	74.465	0.694E-01	0.714E-01	0.20E-01	0.12E+00
26.50	84.79	74.470	0.573E-01	0.701E-01	0.18E-01	0.12E+00
27.00	84.81	74.472	0.580E-01	0.688E-01	0.17E-01	0.12E+00
27.50	84.90	74.476	0.717E-01	0.676E-01	0.16E-01	0.12E+00
28.00	84.88	74.478	0.608E-01	0.663E-01	0.15E-01	0.12E+00
28.50	84.92	74.479	0.678E-01	0.650E-01	0.13E-01	0.12E+00
29.00	84.92	74.484	0.572E-01	0.638E-01	0.12E-01	0.12E+00
29.50	84.94	74.487	0.552E-01	0.625E-01	0.11E-01	0.11E+00
30.00	85.00	74.488	0.654E-01	0.612E-01	0.92E-02	0.11E+00
30.50	85.01	74.491	0.598E-01	0.600E-01	0.79E-02	0.11E+00
31.00	85.06	74.499	0.570E-01	0.587E-01	0.66E-02	0.11E+00
31.50	85.05	74.496	0.577E-01	0.574E-01	0.52E-02	0.11E+00
32.00	85.09	74.498	0.627E-01	0.561E-01	0.39E-02	0.11E+00

* See note page B-16

32.50	85.11	74.500	0.617E-01	0.549E-01	0.25E-02	0.11E+00
33.00	85.11	74.501	0.592E-01	0.536E-01	0.12E-02	0.11E+00
33.50	85.17	74.497	0.763E-01	0.523E-01	-0.21E-03	0.10E+00
34.00	85.15	74.506	0.579E-01	0.511E-01	-0.16E-02	0.10E+00
34.50	85.19	74.507	0.613E-01	0.498E-01	-0.30E-02	0.10E+00
35.00	85.21	74.509	0.610E-01	0.485E-01	-0.43E-02	0.10E+00
35.50	85.22	74.512	0.571E-01	0.473E-01	-0.57E-02	0.10E+00
36.00	85.23	74.515	0.553E-01	0.460E-01	-0.71E-02	0.99E-01

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.758E-01
THE STANDARD DEVIATION IS 0.308E-01
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.460E-01

PT BEACH 60 PSIG ILRT UNIT 1

TIME, DATE START OF TEST 12.00 623

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP.* (F)	PRESSURE * (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
12.50	83.57	74.326	0.149E+00	0.872E-01	-0.57E+00	0.75E+00
13.00	83.70	74.341	0.211E+00	0.858E-01	-0.57E+00	0.74E+00
13.50	83.75	74.351	-0.269E+00	0.844E-01	-0.57E+00	0.74E+00
14.00	83.88	74.361	0.544E+00	0.831E-01	-0.57E+00	0.74E+00
14.50	83.91	74.371	-0.364E+00	0.817E-01	-0.57E+00	0.74E+00
15.00	84.03	74.377	0.680E+00	0.804E-01	-0.57E+00	0.73E+00
15.50	84.05	74.383	-0.215E+00	0.790E-01	-0.57E+00	0.73E+00
16.00	84.11	74.388	0.218E+00	0.777E-01	-0.57E+00	0.73E+00
16.50	84.13	74.396	-0.391E+00	0.763E-01	-0.57E+00	0.73E+00
17.00	84.17	74.400	0.117E+00	0.750E-01	-0.57E+00	0.72E+00
17.50	84.29	74.406	0.709E+00	0.736E-01	-0.57E+00	0.72E+00
18.00	84.27	74.410	-0.484E+00	0.723E-01	-0.58E+00	0.72E+00
18.50	84.32	74.414	0.180E+00	0.709E-01	-0.58E+00	0.72E+00
19.00	84.35	74.418	-0.834E-02	0.695E-01	-0.58E+00	0.72E+00
19.50	84.39	74.422	0.108E+00	0.682E-01	-0.58E+00	0.71E+00
20.00	84.44	74.432	-0.209E+00	0.668E-01	-0.58E+00	0.71E+00
20.50	84.45	74.432	0.113E+00	0.655E-01	-0.58E+00	0.71E+00

* See note page B-16

21.00	84.46	74.433	-0.273E-01	0.641E-01	-0.58E+00	0.71E+00
21.50	84.53	74.437	0.383E+00	0.628E-01	-0.58E+00	0.71E+00
22.00	84.52	74.441	-0.329E+00	0.614E-01	-0.58E+00	0.70E+00
22.50	84.58	74.443	0.354E+00	0.601E-01	-0.58E+00	0.70E+00
23.00	84:59	74.448	-0.200E+00	0.587E-01	-0.58E+00	0.70E+00
23.50	84.64	74.451	0.220E+00	0.574E-01	-0.58E+00	0.70E+00
24.00	84.68	74.453	0.267E+00	0.560E-01	-0.59E+00	0.70E+00
24.50	84.70	74.457	-0.130E+00	0.546E-01	-0.59E+00	0.70E+00
25.00	84.72	74.460	0.296E-01	0.533E-01	-0.59E+00	0.70E+00
25.50	84.76	74.464	0.385E-01	0.519E-01	-0.59E+00	0.69E+00
26.00	84.79	74.465	0.189E+00	0.506E-01	-0.59E+00	0.69E+00
26.50	84.79	74.470	-0.282E+00	0.492E-01	-0.59E+00	0.69E+00
27.00	84.81	74.472	0.786E-01	0.479E-01	-0.60E+00	0.69E+00
27.50	84.90	74.476	0.484E+00	0.465E-01	-0.60E+00	0.69E+00
28.00	84.88	74.478	-0.277E+00	0.452E-01	-0.60E+00	0.69E+00
28.50	84.92	74.479	0.293E+00	0.438E-01	-0.60E+00	0.69E+00
29.00	84.92	74.484	-0.293E+00	0.425E-01	-0.60E+00	0.69E+00
29.50	84.94	74.487	-0.151E-01	0.411E-01	-0.60E+00	0.69E+00
30.00	85.00	74.488	0.425E+00	0.397E-01	-0.61E+00	0.69E+00
30.50	85.01	74.491	-0.142E+00	0.384E-01	-0.61E+00	0.69E+00
31.00	85.06	74.499	-0.468E-01	0.370E-01	-0.61E+00	0.69E+00
31.50	85.05	74.496	0.838E-01	0.357E-01	-0.61E+00	0.68E+00
32.00	85.09	74.498	0.258E+00	0.343E-01	-0.62E+00	0.68E+00
32.50	85.11	74.500	0.234E-01	0.330E-01	-0.62E+00	0.68E+00
33.00	85.11	74.501	-0.423E-01	0.316E-01	-0.62E+00	0.68E+00
33.50	85.17	74.497	0.793E+00	0.303E-01	-0.62E+00	0.68E+00
34.00	85.15	74.506	-0.735E+00	0.289E-01	-0.63E+00	0.68E+00
34.50	85.19	74.507	0.212E+00	0.276E-01	-0.63E+00	0.68E+00
35.00	85.21	74.509	0.456E-01	0.262E-01	-0.63E+00	0.68E+00
35.50	85.22	74.512	-0.119E+00	0.249E-01	-0.63E+00	0.68E+00
36.00	85.23	74.515	-0.334E-01	0.235E-01	-0.64E+00	0.68E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.553E-01
THE STANDARD DEVIATION IS 0.313E+00
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.235E-01

PT BEACH 30 PSIG ILRT UNIT 2

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ENTER TIME, DATE, TEMP, PRESS
WHEN FINISHED ENTER 9999,,,,
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= 0600,0309,71.044540,44.300004
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= 1200,0309,69.908348,44.205479
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= 1430,0309,69.566335,44.175483
= 1500,0309,69.475998,44.170567
= 1530,0309,69.429524,44.164530
= 1600,0309,69.396626,44.160643
= 1630,0309,69.299474,44.155362
= 1700,0309,69.311485,44.152079
= 1730,0309,69.245187,44.147162
= 1800,0309,69.183680,44.141649
= 1830,0309,69.098082,44.135916
= 1900,0309,69.035880,44.129558
= 1930,0309,68.999205,44.126765
= 2000,0309,68.981489,44.122627
= 2030,0309,68.921166,44.118279
= 2100,0309,68.834377,44.114044
= 2130,0309,68.824947,44.108170
= 2200,0309,68.784266,44.105014
= 2230,0309,68.687088,44.101036
= 2300,0309,68.677061,44.093846
= 2330,0309,68.612984,44.091951
= 2400,0309,68.553089,44.087929
= 0030,0310,68.507418,44.084513
= 0100,031,68.493443,44.080553
= 0130,0310,68.428702,44.075863
= 0200,0310,68.384331,44.071597
= 0230,0310,68.300365,44.066278
= 9999,,,,
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PT BEACH 30 PSIG ILRT UNIT 2

TIME, DATE START OF TEST 2.50 309

TIME AFTER START OF TEST = 24.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.50	4	-0.125E+00	0.110E+00	
2.00	5	-0.895E-01	0.115E+00	0.541E-02
2.50	6	-0.825E-01	0.682E-01	-0.472E-01
3.00	7	-0.721E-01	0.578E-01	-0.104E-01
3.50	8	-0.494E-01	0.989E-01	0.412E-01
4.00	9	-0.370E-01	0.107E+00	0.830E-02
4.50	10	-0.268E-01	0.113E+00	0.600E-02
5.00	11	-0.189E-01	0.115E+00	0.179E-02
5.50	12	-0.130E-01	0.113E+00	-0.156E-02
6.00	13	-0.821E-02	0.111E+00	-0.262E-02
6.50	14	-0.496E-02	0.105E+00	-0.538E-02
7.00	15	-0.268E-02	0.989E-01	-0.652E-02
7.50	16	-0.495E-03	0.942E-01	-0.478E-02
8.00	17	0.157E-02	0.905E-01	-0.362E-02
8.50	18	0.333E-02	0.871E-01	-0.341E-02
9.00	19	0.454E-02	0.828E-01	-0.437E-02
9.50	20	0.588E-02	0.799E-01	-0.287E-02
10.00	21	0.649E-02	0.751E-01	-0.476E-02
10.50	22	0.770E-02	0.734E-01	-0.176E-02
11.00	23	0.945E-02	0.742E-01	0.849E-03
11.50	24	0.981E-02	0.702E-01	-0.405E-02
12.00	25	0.107E-01	0.685E-01	-0.162E-02
12.50	26	0.109E-01	0.652E-01	-0.340E-02
13.00	27	0.115E-01	0.633E-01	-0.183E-02
13.50	28	0.122E-01	0.622E-01	-0.116E-02
14.00	29	0.124E-01	0.594E-01	-0.272E-02
14.50	30	0.131E-01	0.590E-01	-0.431E-03
15.00	31	0.136E-01	0.582E-01	-0.856E-03
15.50	32	0.142E-01	0.574E-01	-0.763E-03
16.00	33	0.145E-01	0.560E-01	-0.141E-02
16.50	34	0.149E-01	0.550E-01	-0.942E-03
17.00	35	0.152E-01	0.540E-01	-0.107E-02
17.50	36	0.157E-01	0.538E-01	-0.173E-03
18.00	37	0.161E-01	0.533E-01	-0.505E-03
18.50	38	0.163E-01	0.518E-01	-0.149E-02
19.00	39	0.167E-01	0.518E-01	0.381E-04
19.50	40	0.172E-01	0.517E-01	-0.141E-03
20.00	41	0.173E-01	0.504E-01	-0.131E-02
20.50	42	0.177E-01	0.507E-01	0.314E-03
21.00	43	0.180E-01	0.501E-01	-0.634E-03
21.50	44	0.181E-01	0.492E-01	-0.881E-03
22.00	45	0.182E-01	0.482E-01	-0.963E-03
22.50	46	0.185E-01	0.479E-01	-0.368E-03
23.00	47	0.187E-01	0.473E-01	-0.549E-03
23.50	48	0.188E-01	0.468E-01	-0.462E-03
24.00	49	0.189E-01	0.460E-01	-0.797E-03

THE CALCULATED LEAK RATE IS 0.460E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.283E+00
THE LAST 7 DATA POINTS ESTABLISH A NEGATIVE SLOPE

PT BEACH 30 PSIG ILRT UNIT 2

TIME, DATE START OF TEST 2.50 309

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
3.00	71.97	44.387	-0.403E+00	-0.818E-02	-0.14E+00	0.13E+00
3.50	71.76	44.366	-0.381E-01	-0.703E-02	-0.14E+00	0.13E+00
4.00	71.60	44.351	0.665E-01	-0.587E-02	-0.14E+00	0.13E+00
4.50	71.43	44.337	0.170E-01	-0.472E-02	-0.14E+00	0.13E+00
5.00	71.23	44.324	-0.544E-01	-0.357E-02	-0.14E+00	0.13E+00
5.50	71.12	44.313	-0.201E-01	-0.241E-02	-0.14E+00	0.13E+00
6.00	71.04	44.300	0.865E-01	-0.126E-02	-0.13E+00	0.13E+00
6.50	70.89	44.289	0.496E-01	-0.106E-03	-0.13E+00	0.13E+00
7.00	70.79	44.280	0.552E-01	0.105E-02	-0.13E+00	0.13E+00
7.50	70.70	44.272	0.521E-01	0.220E-02	-0.13E+00	0.14E+00
8.00	70.58	44.262	0.463E-01	0.336E-02	-0.13E+00	0.14E+00
8.50	70.49	44.254	0.441E-01	0.451E-02	-0.13E+00	0.14E+00
9.00	70.39	44.247	0.341E-01	0.566E-02	-0.13E+00	0.14E+00
9.50	70.30	44.240	0.269E-01	0.682E-02	-0.13E+00	0.14E+00
10.00	70.22	44.233	0.301E-01	0.797E-02	-0.12E+00	0.14E+00
10.50	70.14	44.225	0.325E-01	0.912E-02	-0.12E+00	0.14E+00
11.00	70.06	44.218	0.316E-01	0.103E-01	-0.12E+00	0.14E+00
11.50	69.97	44.212	0.251E-01	0.114E-01	-0.12E+00	0.14E+00
12.00	69.91	44.206	0.300E-01	0.126E-01	-0.12E+00	0.14E+00
12.50	69.80	44.199	0.182E-01	0.137E-01	-0.12E+00	0.15E+00
13.00	69.76	44.192	0.317E-01	0.149E-01	-0.12E+00	0.15E+00
13.50	69.73	44.187	0.463E-01	0.160E-01	-0.12E+00	0.15E+00
14.00	69.60	44.181	0.177E-01	0.172E-01	-0.11E+00	0.15E+00
14.50	69.57	44.175	0.303E-01	0.184E-01	-0.11E+00	0.15E+00
15.00	69.48	44.171	0.177E-01	0.195E-01	-0.11E+00	0.15E+00
15.50	69.43	44.165	0.260E-01	0.207E-01	-0.11E+00	0.15E+00
16.00	69.40	44.161	0.296E-01	0.218E-01	-0.11E+00	0.15E+00
16.50	69.30	44.155	0.176E-01	0.230E-01	-0.11E+00	0.15E+00
17.00	69.31	44.152	0.330E-01	0.241E-01	-0.11E+00	0.16E+00
17.50	69.25	44.147	0.297E-01	0.253E-01	-0.11E+00	0.16E+00
18.00	69.18	44.142	0.301E-01	0.264E-01	-0.11E+00	0.16E+00
18.50	69.10	44.136	0.243E-01	0.276E-01	-0.10E+00	0.16E+00
19.00	69.04	44.130	0.274E-01	0.287E-01	-0.10E+00	0.16E+00
19.50	69.00	44.127	0.258E-01	0.299E-01	-0.10E+00	0.16E+00
20.00	68.98	44.123	0.333E-01	0.310E-01	-0.10E+00	0.16E+00
20.50	68.92	44.118	0.303E-01	0.322E-01	-0.10E+00	0.16E+00
21.00	68.83	44.114	0.206E-01	0.334E-01	-0.99E-01	0.17E+00
21.50	68.82	44.108	0.346E-01	0.345E-01	-0.98E-01	0.17E+00
22.00	68.78	44.105	0.331E-01	0.357E-01	-0.97E-01	0.17E+00
22.50	68.69	44.101	0.210E-01	0.368E-01	-0.96E-01	0.17E+00
23.00	68.68	44.094	0.374E-01	0.380E-01	-0.95E-01	0.17E+00

23.50	68.61	44.092	0.275E-01	0.391E-01	-0.94E-01	0.17E+00
24.00	68.55	44.088	0.244E-01	0.403E-01	-0.93E-01	0.17E+00
24.50	68.51	44.084	0.229E-01	0.414E-01	-0.93E-01	0.18E+00
25.00	68.49	44.081	0.291E-01	0.426E-01	-0.92E-01	0.18E+00
25.50	68.43	44.076	0.268E-01	0.437E-01	-0.91E-01	0.18E+00
26.00	68.38	44.072	0.275E-01	0.449E-01	-0.90E-01	0.18E+00
26.50	68.30	44.066	0.231E-01	0.460E-01	-0.89E-01	0.18E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.189E-01
THE STANDARD DEVIATION IS 0.659E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.460E-01

PT BEACH 30 PSIG ILRT UNIT 2

TIME, DATE START OF TEST 2.50 309

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
3.00	71.97	44.387	-0.403E+00	0.377E-01	-0.56E+00	0.64E+00
3.50	71.76	44.366	0.327E+00	0.371E-01	-0.56E+00	0.64E+00
4.00	71.60	44.351	0.276E+00	0.365E-01	-0.56E+00	0.64E+00
4.50	71.43	44.337	-0.132E+00	0.359E-01	-0.56E+00	0.63E+00
5.00	71.23	44.324	-0.340E+00	0.352E-01	-0.56E+00	0.63E+00
5.50	71.12	44.313	0.151E+00	0.346E-01	-0.56E+00	0.63E+00
6.00	71.04	44.300	0.726E+00	0.340E-01	-0.56E+00	0.63E+00
6.50	70.89	44.289	-0.208E+00	0.334E-01	-0.56E+00	0.63E+00
7.00	70.79	44.280	0.100E+00	0.328E-01	-0.56E+00	0.63E+00
7.50	70.70	44.272	0.238E-01	0.321E-01	-0.56E+00	0.62E+00
8.00	70.58	44.262	-0.111E-01	0.315E-01	-0.56E+00	0.62E+00
8.50	70.49	44.254	0.195E-01	0.309E-01	-0.56E+00	0.62E+00
9.00	70.39	44.247	-0.857E-01	0.303E-01	-0.56E+00	0.62E+00
9.50	70.30	44.240	-0.661E-01	0.297E-01	-0.56E+00	0.62E+00
10.00	70.22	44.233	0.743E-01	0.290E-01	-0.56E+00	0.62E+00
10.50	70.14	44.225	0.680E-01	0.284E-01	-0.56E+00	0.62E+00
11.00	70.06	44.218	0.178E-01	0.278E-01	-0.56E+00	0.62E+00

11.50	69.97	44.212	-0.860E-01	0.272E-01	-0.56E+00	0.61E+00
12.00	69.91	44.206	0.119E+00	0.266E-01	-0.56E+00	0.61E+00
12.50	69.80	44.199	-0.206E+00	0.260E-01	-0.56E+00	0.61E+00
13.00	69.76	44.192	0.302E+00	0.253E-01	-0.56E+00	0.61E+00
13.50	69.73	44.187	0.352E+00	0.247E-01	-0.56E+00	0.61E+00
14.00	69.60	44.181	-0.611E+00	0.241E-01	-0.56E+00	0.61E+00
14.50	69.57	44.175	0.319E+00	0.235E-01	-0.56E+00	0.61E+00
15.00	69.48	44.171	-0.285E+00	0.229E-01	-0.56E+00	0.61E+00
15.50	69.43	44.165	0.234E+00	0.222E-01	-0.56E+00	0.61E+00
16.00	69.40	44.161	0.124E+00	0.216E-01	-0.56E+00	0.61E+00
16.50	69.30	44.155	-0.308E+00	0.210E-01	-0.57E+00	0.61E+00
17.00	69.31	44.152	0.466E+00	0.204E-01	-0.57E+00	0.61E+00
17.50	69.25	44.147	-0.671E-01	0.198E-01	-0.57E+00	0.61E+00
18.00	69.18	44.142	0.413E-01	0.191E-01	-0.57E+00	0.61E+00
18.50	69.10	44.136	-0.154E+00	0.185E-01	-0.57E+00	0.61E+00
19.00	69.04	44.130	0.127E+00	0.179E-01	-0.57E+00	0.61E+00
19.50	69.00	44.127	-0.291E-01	0.173E-01	-0.57E+00	0.61E+00
20.00	68.98	44.123	0.289E+00	0.167E-01	-0.57E+00	0.61E+00
20.50	68.92	44.118	-0.747E-01	0.161E-01	-0.57E+00	0.61E+00
21.00	68.83	44.114	-0.327E+00	0.154E-01	-0.58E+00	0.61E+00
21.50	68.82	44.108	0.554E+00	0.148E-01	-0.58E+00	0.61E+00
22.00	68.78	44.105	-0.260E-01	0.142E-01	-0.58E+00	0.61E+00
22.50	68.69	44.101	-0.450E+00	0.136E-01	-0.58E+00	0.61E+00
23.00	68.68	44.094	0.691E+00	0.130E-01	-0.58E+00	0.61E+00
23.50	68.61	44.092	-0.376E+00	0.123E-01	-0.58E+00	0.61E+00
24.00	68.55	44.088	-0.106E+00	0.117E-01	-0.58E+00	0.61E+00
24.50	68.51	44.084	-0.432E-01	0.111E-01	-0.59E+00	0.61E+00
25.00	68.49	44.081	0.304E+00	0.105E-01	-0.59E+00	0.61E+00
25.50	68.43	44.076	-0.777E-01	0.986E-02	-0.59E+00	0.61E+00
26.00	68.38	44.072	0.613E-01	0.924E-02	-0.59E+00	0.61E+00
26.50	68.30	44.066	-0.184E+00	0.863E-02	-0.59E+00	0.61E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.232E-01
THE STANDARD DEVIATION IS 0.285E+00
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.863E-02

POINT BEACH 60 PSIG ILRT UNIT 2

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ENTER TIME, DATE, TEMP, PRESS
WHEN FINISHED ENTER 9999,,,,
= 0230,0311,71.458415,74.370142
= 0300,0311,71.092902,74.317745
= 0330,0311,70.799562,74.271122
= 0400,0311,70.530866,74.235528
= 0430,0311,70.329601,74.202582
= 0500,0311,70.154878,74.175247
= 0530,0311,69.996996,74.150776
= 0600,0311,69.833169,74.126367
= 0630,0311,69.727304,74.108846
= 0700,0311,69.586536,74.088672
= 0730,0311,69.479271,74.071033
= 0800,0311,69.380254,74.054053
= 0830,0311,69.227122,74.037246
= 0900,0311,69.150277,74.025388
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= 1130,0311,68.747490,73.960988
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= 0100,0312,67.355528,73.740682
= 0130,0312,67.294052,73.736477
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= 0230,0312,67.199024,73.722932
= 9999,,,,
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PT BEACH 60 PSIG ILRT UNIT 2

TIME, DATE START OF TEST 2.50 311

TIME AFTER START OF TEST = 24.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.50	4	0.133E+00	0.144E+00	
2.00	5	0.138E+00	0.154E+00	0.969E-02
2.50	6	0.142E+00	0.162E+00	0.771E-02
3.00	7	0.145E+00	0.165E+00	0.298E-02
3.50	8	0.146E+00	0.162E+00	-0.283E-02
4.00	9	0.147E+00	0.161E+00	-0.683E-03
4.50	10	0.146E+00	0.156E+00	-0.576E-02
5.00	11	0.145E+00	0.153E+00	-0.301E-02
5.50	12	0.146E+00	0.152E+00	-0.483E-03
6.00	13	0.143E+00	0.141E+00	-0.114E-01
6.50	14	0.140E+00	0.131E+00	-0.943E-02
7.00	15	0.138E+00	0.124E+00	-0.686E-02
7.50	16	0.135E+00	0.118E+00	-0.662E-02
8.00	17	0.134E+00	0.113E+00	-0.480E-02
8.50	18	0.132E+00	0.111E+00	-0.248E-02
9.00	19	0.131E+00	0.108E+00	-0.301E-02
9.50	20	0.129E+00	0.104E+00	-0.312E-02
10.00	21	0.128E+00	0.102E+00	-0.227E-02
10.50	22	0.126E+00	0.977E-01	-0.444E-02
11.00	23	0.125E+00	0.950E-01	-0.265E-02
11.50	24	0.123E+00	0.910E-01	-0.403E-02
12.00	25	0.122E+00	0.882E-01	-0.280E-02
12.50	26	0.120E+00	0.855E-01	-0.267E-02
13.00	27	0.119E+00	0.839E-01	-0.165E-02
13.50	28	0.118E+00	0.837E-01	-0.178E-03
14.00	29	0.118E+00	0.827E-01	-0.102E-02
14.50	30	0.117E+00	0.811E-01	-0.159E-02
15.00	31	0.115E+00	0.794E-01	-0.173E-02
15.50	32	0.115E+00	0.782E-01	-0.117E-02
16.00	33	0.114E+00	0.775E-01	-0.666E-03
16.50	34	0.113E+00	0.761E-01	-0.145E-02
17.00	35	0.112E+00	0.743E-01	-0.179E-02
17.50	36	0.111E+00	0.726E-01	-0.168E-02
18.00	37	0.110E+00	0.717E-01	-0.919E-03
18.50	38	0.109E+00	0.701E-01	-0.164E-02
19.00	39	0.108E+00	0.692E-01	-0.898E-03
19.50	40	0.108E+00	0.680E-01	-0.120E-02
20.00	41	0.107E+00	0.668E-01	-0.121E-02
20.50	42	0.106E+00	0.656E-01	-0.121E-02
21.00	43	0.105E+00	0.644E-01	-0.116E-02
21.50	44	0.105E+00	0.638E-01	-0.612E-03
22.00	45	0.104E+00	0.627E-01	-0.104E-02
22.50	46	0.103E+00	0.624E-01	-0.318E-03
23.00	47	0.103E+00	0.615E-01	-0.945E-03
23.50	48	0.102E+00	0.607E-01	-0.744E-03
24.00	49	0.101E+00	0.597E-01	-0.999E-03

THE CALCULATED LEAK RATE IS 0.597E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.400E+00
THE LAST 42 DATA POINTS ESTABLISH A NEGATIVE SLOPE

PT BEACH 60 PSIG ILRT UNIT 2

TIME, DATE START OF TEST 2.50 311

TIME AFTER START OF TEST = 24.00 HR

. LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
3.00	71.09	74.318	0.781E-01	0.143E+00	0.10E+00	0.18E+00
3.50	70.80	74.271	0.218E+00	0.141E+00	0.10E+00	0.18E+00
4.00	70.53	74.236	0.102E+00	0.139E+00	0.98E-01	0.18E+00
4.50	70.33	74.203	0.153E+00	0.137E+00	0.97E-01	0.18E+00
5.00	70.15	74.175	0.160E+00	0.136E+00	0.95E-01	0.18E+00
5.50	70.00	74.151	0.159E+00	0.134E+00	0.93E-01	0.17E+00
6.00	69.83	74.126	0.150E+00	0.132E+00	0.92E-01	0.17E+00
6.50	69.73	74.109	0.153E+00	0.130E+00	0.90E-01	0.17E+00
7.00	69.59	74.089	0.139E+00	0.129E+00	0.88E-01	0.17E+00
7.50	69.48	74.071	0.142E+00	0.127E+00	0.87E-01	0.17E+00
8.00	69.38	74.054	0.148E+00	0.125E+00	0.85E-01	0.17E+00
8.50	69.23	74.037	0.110E+00	0.123E+00	0.83E-01	0.16E+00
9.00	69.15	74.025	0.107E+00	0.122E+00	0.81E-01	0.16E+00
9.50	69.05	74.010	0.109E+00	0.120E+00	0.80E-01	0.16E+00
10.00	68.96	73.996	0.103E+00	0.118E+00	0.78E-01	0.16E+00
10.50	68.88	73.984	0.105E+00	0.116E+00	0.76E-01	0.16E+00
11.00	68.82	73.971	0.111E+00	0.114E+00	0.75E-01	0.15E+00
11.50	68.75	73.961	0.106E+00	0.113E+00	0.73E-01	0.15E+00
12.00	68.68	73.950	0.103E+00	0.111E+00	0.71E-01	0.15E+00
12.50	68.61	73.939	0.104E+00	0.109E+00	0.69E-01	0.15E+00
13.00	68.52	73.930	0.898E-01	0.107E+00	0.68E-01	0.15E+00
13.50	68.48	73.921	0.960E-01	0.106E+00	0.66E-01	0.15E+00
14.00	68.39	73.911	0.849E-01	0.104E+00	0.64E-01	0.14E+00
14.50	68.35	73.902	0.888E-01	0.102E+00	0.62E-01	0.14E+00
15.00	68.29	73.894	0.869E-01	0.100E+00	0.61E-01	0.14E+00
15.50	68.25	73.884	0.912E-01	0.986E-01	0.59E-01	0.14E+00
16.00	68.23	73.876	0.999E-01	0.968E-01	0.57E-01	0.14E+00
16.50	68.15	73.867	0.933E-01	0.951E-01	0.55E-01	0.13E+00
17.00	68.08	73.858	0.877E-01	0.933E-01	0.53E-01	0.13E+00
17.50	68.02	73.849	0.849E-01	0.915E-01	0.52E-01	0.13E+00
18.00	67.99	73.843	0.876E-01	0.898E-01	0.50E-01	0.13E+00
18.50	67.94	73.833	0.905E-01	0.880E-01	0.48E-01	0.13E+00
19.00	67.87	73.826	0.829E-01	0.862E-01	0.46E-01	0.13E+00
19.50	67.81	73.818	0.783E-01	0.845E-01	0.44E-01	0.12E+00
20.00	67.76	73.811	0.775E-01	0.827E-01	0.43E-01	0.12E+00
20.50	67.73	73.802	0.829E-01	0.809E-01	0.41E-01	0.12E+00
21.00	67.67	73.797	0.749E-01	0.792E-01	0.39E-01	0.12E+00
21.50	67.65	73.790	0.805E-01	0.774E-01	0.37E-01	0.12E+00
22.00	67.58	73.781	0.764E-01	0.756E-01	0.35E-01	0.12E+00
22.50	67.54	73.775	0.750E-01	0.739E-01	0.34E-01	0.11E+00
23.00	67.48	73.767	0.737E-01	0.721E-01	0.32E-01	0.11E+00
23.50	67.44	73.760	0.728E-01	0.703E-01	0.30E-01	0.11E+00

24.00	67.43	73.754	0.777E-01	0.686E-01	0.28E-01	0.11E+00
24.50	67.36	73.747	0.721E-01	0.668E-01	0.26E-01	0.11E+00
25.00	67.36	73.741	0.793E-01	0.650E-01	0.24E-01	0.11E+00
25.50	67.29	73.736	0.714E-01	0.633E-01	0.23E-01	0.10E+00
26.00	67.26	73.730	0.728E-01	0.615E-01	0.21E-01	0.10E+00
26.50	67.20	73.723	0.688E-01	0.597E-01	0.19E-01	0.10E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.101E+00
THE STANDARD DEVIATION IS 0.314E-01
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.597E-01

PT BEACH 60 PSIG ILRT UNIT 2

TIME, DATE START OF TEST 2.50 311

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
3.00	71.09	74.318	0.781E-01	0.125E+00	-0.23E+00	0.48E+00
3.50	70.80	74.271	0.358E+00	0.122E+00	-0.23E+00	0.48E+00
4.00	70.53	74.236	-0.131E+00	0.120E+00	-0.23E+00	0.47E+00
4.50	70.33	74.203	0.308E+00	0.118E+00	-0.24E+00	0.47E+00
5.00	70.15	74.175	0.186E+00	0.115E+00	-0.24E+00	0.47E+00
5.50	70.00	74.151	0.153E+00	0.113E+00	-0.24E+00	0.46E+00
6.00	69.83	74.126	0.953E-01	0.110E+00	-0.24E+00	0.46E+00
6.50	69.73	74.109	0.175E+00	0.108E+00	-0.24E+00	0.46E+00
7.00	69.59	74.089	0.302E-01	0.106E+00	-0.24E+00	0.46E+00
7.50	69.48	74.071	0.170E+00	0.103E+00	-0.25E+00	0.45E+00
8.00	69.38	74.054	0.202E+00	0.101E+00	-0.25E+00	0.45E+00
8.50	69.23	74.037	-0.300E+00	0.986E-01	-0.25E+00	0.45E+00
9.00	69.15	74.025	0.714E-01	0.962E-01	-0.25E+00	0.44E+00
9.50	69.05	74.010	0.127E+00	0.938E-01	-0.25E+00	0.44E+00
10.00	68.96	73.996	0.287E-01	0.914E-01	-0.26E+00	0.44E+00
10.50	68.88	73.984	0.133E+00	0.891E-01	-0.26E+00	0.44E+00
11.00	68.82	73.971	0.210E+00	0.867E-01	-0.26E+00	0.43E+00

11.50	68.75	73.961	0.200E-01	0.843E-01	-0.26E+00	0.43E+00
12.00	68.68	73.950	0.386E-01	0.819E-01	-0.26E+00	0.43E+00
12.50	68.61	73.939	0.133E+00	0.795E-01	-0.27E+00	0.43E+00
13.00	68.52	73.930	-0.201E+00	0.772E-01	-0.27E+00	0.42E+00
13.50	68.48	73.921	0.227E+00	0.748E-01	-0.27E+00	0.42E+00
14.00	68.39	73.911	-0.160E+00	0.724E-01	-0.27E+00	0.42E+00
14.50	68.35	73.902	0.180E+00	0.700E-01	-0.28E+00	0.42E+00
15.00	68.29	73.894	0.401E-01	0.676E-01	-0.28E+00	0.41E+00
15.50	68.25	73.884	0.200E+00	0.653E-01	-0.28E+00	0.41E+00
16.00	68.23	73.876	0.326E+00	0.629E-01	-0.28E+00	0.41E+00
16.50	68.15	73.867	-0.867E-01	0.605E-01	-0.29E+00	0.41E+00
17.00	68.08	73.858	-0.688E-01	0.581E-01	-0.29E+00	0.40E+00
17.50	68.02	73.849	0.433E-02	0.557E-01	-0.29E+00	0.40E+00
18.00	67.99	73.843	0.170E+00	0.534E-01	-0.29E+00	0.40E+00
18.50	67.94	73.833	0.181E+00	0.510E-01	-0.30E+00	0.40E+00
19.00	67.87	73.826	-0.160E+00	0.486E-01	-0.30E+00	0.40E+00
19.50	67.81	73.818	-0.733E-01	0.462E-01	-0.30E+00	0.39E+00
20.00	67.76	73.811	0.483E-01	0.438E-01	-0.30E+00	0.39E+00
20.50	67.73	73.802	0.272E+00	0.414E-01	-0.31E+00	0.39E+00
21.00	67.67	73.797	-0.212E+00	0.391E-01	-0.31E+00	0.39E+00
21.50	67.65	73.790	0.287E+00	0.367E-01	-0.31E+00	0.39E+00
22.00	67.58	73.781	-0.791E-01	0.343E-01	-0.31E+00	0.38E+00
22.50	67.54	73.775	0.212E-01	0.319E-01	-0.32E+00	0.38E+00
23.00	67.48	73.767	0.201E-01	0.295E-01	-0.32E+00	0.38E+00
23.50	67.44	73.760	0.395E-01	0.272E-01	-0.32E+00	0.38E+00
24.00	67.43	73.754	0.283E+00	0.248E-01	-0.33E+00	0.38E+00
24.50	67.36	73.747	-0.170E+00	0.224E-01	-0.33E+00	0.37E+00
25.00	67.36	73.741	0.398E+00	0.200E-01	-0.33E+00	0.37E+00
25.50	67.29	73.736	-0.286E+00	0.176E-01	-0.34E+00	0.37E+00
26.00	67.26	73.730	0.136E+00	0.153E-01	-0.34E+00	0.37E+00
26.50	67.20	73.723	-0.120E+00	0.129E-01	-0.34E+00	0.37E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.688E-01
THE STANDARD DEVIATION IS 0.171E+00
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.129E-01

TURKEY PT 25 PSIG ILRT UNIT 3

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ENTER TIME, DATE,TEMP,PRESS
WHEN FINISHED ENTER 9999,,,,
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= 0730,0705,92.752210,39.912188
= 0800,0705,92.614319,39.900290
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= 0830,0705,92.485982,39.890100
= 0845,0705,92.426083,39.886656
= 0900,0705,92.378101,39.882979
= 0915,0705,92.323061,39.878280
= 0930,0705,92.283657,39.874763
= 0945,0705,92.229054,39.871161
= 1000,0705,92.190999,39.868011
= 1015,0705,92.155950,39.865191
= 1030,0705,92.118731,39.862060
= 1045,0705,92.080656,39.859273
= 1100,0705,92.049235,39.857009
= 1115,0705,92.013302,39.854298
= 1130,0705,91.974201,39.852149
= 1145,0705,91.947372,39.848802
= 1200,0705,91.917453,39.846760
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= 1230,0705,91.867023,39.842538
= 1245,0705,91.837394,39.840276
= 1300,0705,91.811493,39.838500
= 9999,,,,
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TURKEY PT 25PSIG ILRT UNIT 3

TIME, DATE START OF TEST 7.00 705

TIME AFTER START OF TEST = 6.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.25	4	0.327E-02	0.549E-01	
1.50	5	0.243E-01	0.899E-01	0.350E-01
1.75	6	0.283E-01	0.836E-01	-0.619E-02
2.00	7	0.311E-01	0.788E-01	-0.481E-02
2.25	8	0.352E-01	0.808E-01	0.203E-02
2.50	9	0.395E-01	0.854E-01	0.455E-02
2.75	10	0.413E-01	0.828E-01	-0.254E-02
3.00	11	0.431E-01	0.819E-01	-0.987E-03
3.25	12	0.446E-01	0.810E-01	-0.815E-03
3.50	13	0.462E-01	0.811E-01	0.761E-04
3.75	14	0.472E-01	0.800E-01	-0.112E-02
4.00	15	0.478E-01	0.780E-01	-0.200E-02
4.25	16	0.482E-01	0.759E-01	-0.211E-02
4.50	17	0.479E-01	0.714E-01	-0.449E-02
4.75	18	0.484E-01	0.710E-01	-0.430E-03
5.00	19	0.487E-01	0.697E-01	-0.129E-02
5.25	20	0.494E-01	0.701E-01	0.400E-03
5.50	21	0.497E-01	0.692E-01	-0.909E-03
5.75	22	0.499E-01	0.681E-01	-0.101E-02
6.00	23	0.499E-01	0.667E-01	-0.143E-02

THE CALCULATED LEAK RATE IS 0.667E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.177E+00
THE LAST 3 DATA POINTS ESTABLISH A NEGATIVE SLOPE

TURKEY PT 25PSIG ILRT UNIT 3

TIME, DATE START OF TEST 7.00 705

TIME AFTER START OF TEST = 6.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
7.50	92.75	39.912	-0.611E-01	0.316E-01	-0.39E-01	0.10E+00
8.00	92.61	39.900	0.758E-01	0.348E-01	-0.35E-01	0.10E+00
8.25	92.54	39.896	0.151E-01	0.364E-01	-0.33E-01	0.11E+00
8.50	92.49	39.890	0.873E-01	0.380E-01	-0.31E-01	0.11E+00
8.75	92.43	39.887	0.445E-01	0.396E-01	-0.28E-01	0.11E+00
9.00	92.38	39.883	0.452E-01	0.412E-01	-0.26E-01	0.11E+00
9.25	92.32	39.878	0.595E-01	0.428E-01	-0.25E-01	0.11E+00
9.50	92.28	39.875	0.697E-01	0.444E-01	-0.23E-01	0.11E+00
9.75	92.23	39.871	0.554E-01	0.460E-01	-0.21E-01	0.11E+00
10.00	92.19	39.868	0.592E-01	0.476E-01	-0.19E-01	0.11E+00
10.25	92.16	39.865	0.600E-01	0.492E-01	-0.17E-01	0.12E+00
10.50	92.12	39.862	0.633E-01	0.508E-01	-0.16E-01	0.12E+00
10.75	92.08	39.859	0.597E-01	0.524E-01	-0.14E-01	0.12E+00
11.00	92.05	39.857	0.558E-01	0.540E-01	-0.13E-01	0.12E+00
11.25	92.01	39.854	0.542E-01	0.556E-01	-0.12E-01	0.12E+00
11.50	91.97	39.852	0.421E-01	0.571E-01	-0.10E-01	0.12E+00
11.75	91.95	39.849	0.578E-01	0.587E-01	-0.90E-02	0.13E+00
12.00	91.92	39.847	0.534E-01	0.603E-01	-0.78E-02	0.13E+00
12.25	91.89	39.844	0.614E-01	0.619E-01	-0.67E-02	0.13E+00
12.50	91.87	39.843	0.549E-01	0.635E-01	-0.56E-02	0.13E+00
12.75	91.84	39.840	0.538E-01	0.651E-01	-0.46E-02	0.13E+00
13.00	91.81	39.839	0.506E-01	0.667E-01	-0.37E-02	0.14E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.499E-01
THE STANDARD DEVIATION IS 0.322E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 6.00 HOURS OF TEST IS 0.667E-01

TURKEY PT 25PSIG ILRT UNIT 3

TIME, DATE START OF TEST 7.00 705

TIME AFTER START OF TEST = 6.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
7.50	92.75	39.912	-0.811E-01	0.580E-01	-0.34E+00	0.45E+00
8.00	92.61	39.900	0.233E+00	0.563E-01	-0.33E+00	0.44E+00
8.25	92.54	39.896	-0.228E+00	0.555E-01	-0.33E+00	0.44E+00
8.50	92.49	39.890	0.449E+00	0.546E-01	-0.33E+00	0.43E+00
8.75	92.43	39.887	-0.213E+00	0.538E-01	-0.32E+00	0.43E+00
9.00	92.38	39.883	0.507E-01	0.530E-01	-0.32E+00	0.43E+00
9.25	92.32	39.878	0.174E+00	0.521E-01	-0.32E+00	0.43E+00
9.50	92.28	39.875	0.161E+00	0.513E-01	-0.32E+00	0.42E+00
9.75	92.23	39.871	-0.873E-01	0.505E-01	-0.32E+00	0.42E+00
10.00	92.19	39.868	0.101E+00	0.496E-01	-0.32E+00	0.42E+00
10.25	92.16	39.865	0.694E-01	0.488E-01	-0.32E+00	0.42E+00
10.50	92.12	39.862	0.107E+00	0.480E-01	-0.32E+00	0.42E+00
10.75	92.08	39.859	0.874E-02	0.471E-01	-0.32E+00	0.42E+00
11.00	92.05	39.857	-0.128E-02	0.463E-01	-0.32E+00	0.42E+00
11.25	92.01	39.854	0.277E-01	0.454E-01	-0.33E+00	0.42E+00
11.50	91.97	39.852	-0.163E+00	0.446E-01	-0.33E+00	0.42E+00
11.75	91.95	39.849	0.340E+00	0.438E-01	-0.33E+00	0.42E+00
12.00	91.92	39.847	-0.287E-01	0.429E-01	-0.33E+00	0.42E+00
12.25	91.89	39.844	0.221E+00	0.421E-01	-0.34E+00	0.42E+00
12.50	91.87	39.843	-0.818E-01	0.413E-01	-0.34E+00	0.42E+00
12.75	91.84	39.840	0.293E-01	0.404E-01	-0.35E+00	0.43E+00
13.00	91.81	39.839	-0.228E-01	0.396E-01	-0.35E+00	0.43E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.484E-01
THE STANDARD DEVIATION IS 0.169E+00
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 6.00 HOURS OF TEST IS 0.396E-01

TURKEY PT 50 PSIG ILRT UNIT 3

```
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= 0630,0707,92.395983,64.000404
= 0700,0707,92.375192,63.997763
= 0730,0707,92.346584,63.994420
= 9999,,,,
```

TURKEY PT 50PSIG ILRT UNIT 3

TIME, DATE START OF TEST 9.50 < 706

TIME AFTER START OF TEST = 22.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
0.75	4	-0.110E+00	-0.115E+00	
1.00	5	-0.887E-01	-0.547E-01	0.607E-01
1.25	6	-0.626E-01	0.121E-01	0.669E-01
1.50	7	-0.377E-01	0.692E-01	0.571E-01
1.75	8	-0.139E-01	0.120E+00	0.503E-01
2.00	9	0.192E-02	0.143E+00	0.232E-01
2.25	10	0.154E-01	0.160E+00	0.177E-01
2.50	11	0.245E-01	0.166E+00	0.518E-02
2.75	12	0.308E-01	0.164E+00	-0.155E-02
3.00	13	0.381E-01	0.169E+00	0.520E-02
3.50	14	0.435E-01	0.182E+00	0.126E-01
4.00	15	0.479E-01	0.184E+00	0.169E-02
4.50	16	0.511E-01	0.178E+00	-0.534E-02
5.00	17	0.546E-01	0.175E+00	-0.309E-02
5.50	18	0.578E-01	0.172E+00	-0.296E-02
6.00	19	0.592E-01	0.162E+00	-0.976E-02
6.50	20	0.609E-01	0.156E+00	-0.632E-02
7.00	21	0.627E-01	0.152E+00	-0.408E-02
7.50	22	0.636E-01	0.145E+00	-0.670E-02
8.00	23	0.643E-01	0.139E+00	-0.646E-02
8.50	24	0.643E-01	0.131E+00	-0.819E-02
9.00	25	0.641E-01	0.123E+00	-0.791E-02
9.50	26	0.644E-01	0.118E+00	-0.455E-02
10.00	27	0.646E-01	0.114E+00	-0.417E-02
10.50	28	0.651E-01	0.112E+00	-0.257E-02
11.00	29	0.655E-01	0.109E+00	-0.205E-02
11.50	30	0.663E-01	0.109E+00	-0.219E-03
12.00	31	0.668E-01	0.108E+00	-0.100E-02
12.50	32	0.672E-01	0.107E+00	-0.154E-02
13.00	33	0.677E-01	0.106E+00	-0.776E-03
13.50	34	0.680E-01	0.105E+00	-0.110E-02
14.00	35	0.685E-01	0.104E+00	-0.453E-03
14.50	36	0.688E-01	0.103E+00	-0.115E-02
15.00	37	0.692E-01	0.103E+00	-0.337E-03
15.50	38	0.696E-01	0.103E+00	-0.334E-03
16.00	39	0.701E-01	0.102E+00	-0.191E-03
16.50	40	0.705E-01	0.103E+00	0.184E-03
17.00	41	0.710E-01	0.103E+00	0.233E-03
17.50	42	0.715E-01	0.103E+00	0.279E-03
18.00	43	0.719E-01	0.103E+00	0.854E-05
18.50	44	0.723E-01	0.103E+00	-0.387E-04
19.00	45	0.726E-01	0.103E+00	-0.122E-03
19.50	46	0.729E-01	0.103E+00	-0.102E-03
20.00	47	0.732E-01	0.103E+00	-0.233E-03
20.50	48	0.735E-01	0.102E+00	-0.345E-03
21.00	49	0.738E-01	0.102E+00	0.151E-03
21.50	50	0.741E-01	0.102E+00	-0.139E-04
22.00	51	0.744E-01	0.102E+00	-0.185E-03

THE CALCULATED LEAK RATE IS 0.102E+00
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.250E+00
THE LAST 2 DATA POINTS ESTABLISH A NEGATIVE SLOPE

TURKEY PT 50PSIG ILRT UNIT 3

TIME, DATE START OF TEST 9.50 706

TIME AFTER START OF TEST = 22.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
9.75	94.50	64.296	-0.128E+00	0.514E-01	-0.54E-01	0.16E+00
10.00	94.46	64.291	-0.601E-01	0.520E-01	-0.53E-01	0.16E+00
10.25	94.41	64.287	-0.140E+00	0.526E-01	-0.53E-01	0.16E+00
10.50	94.38	64.282	-0.262E-01	0.532E-01	-0.52E-01	0.16E+00
10.75	94.36	64.278	0.417E-01	0.538E-01	-0.51E-01	0.16E+00
11.00	94.35	64.275	0.871E-01	0.544E-01	-0.50E-01	0.16E+00
11.25	94.34	64.271	0.128E+00	0.549E-01	-0.50E-01	0.16E+00
11.50	94.32	64.268	0.113E+00	0.555E-01	-0.49E-01	0.16E+00
11.75	94.31	64.266	0.123E+00	0.561E-01	-0.48E-01	0.16E+00
12.00	94.29	64.264	0.107E+00	0.567E-01	-0.48E-01	0.16E+00
12.25	94.27	64.262	0.936E-01	0.573E-01	-0.47E-01	0.16E+00
12.50	94.27	64.258	0.118E+00	0.578E-01	-0.46E-01	0.16E+00
13.00	94.24	64.255	0.108E+00	0.590E-01	-0.45E-01	0.16E+00
13.50	94.23	64.252	0.105E+00	0.602E-01	-0.44E-01	0.16E+00
14.00	94.21	64.250	0.963E-01	0.613E-01	-0.42E-01	0.17E+00
14.50	94.20	64.246	0.107E+00	0.625E-01	-0.41E-01	0.17E+00
15.00	94.19	64.244	0.109E+00	0.637E-01	-0.40E-01	0.17E+00
15.50	94.16	64.243	0.841E-01	0.648E-01	-0.38E-01	0.17E+00
16.00	94.16	64.240	0.913E-01	0.660E-01	-0.37E-01	0.17E+00
16.50	94.16	64.238	0.966E-01	0.672E-01	-0.36E-01	0.17E+00
17.00	93.78 *	64.196	0.824E-01	0.683E-01	-0.35E-01	0.17E+00
17.50	93.59	64.173	0.784E-01	0.695E-01	-0.34E-01	0.17E+00
18.00	93.43	64.157	0.647E-01	0.707E-01	-0.32E-01	0.17E+00
18.50	93.32	64.144	0.594E-01	0.718E-01	-0.31E-01	0.17E+00
19.00	93.24	64.131	0.713E-01	0.730E-01	-0.30E-01	0.18E+00
19.50	93.17	64.122	0.698E-01	0.742E-01	-0.29E-01	0.18E+00
20.00	93.10	64.112	0.761E-01	0.753E-01	-0.28E-01	0.18E+00
20.50	93.04	64.102	0.775E-01	0.765E-01	-0.26E-01	0.18E+00
21.00	92.99	64.094	0.880E-01	0.777E-01	-0.25E-01	0.18E+00
21.50	92.94	64.088	0.827E-01	0.788E-01	-0.24E-01	0.18E+00
22.00	92.89	64.083	0.783E-01	0.800E-01	-0.23E-01	0.18E+00
22.50	92.86	64.076	0.828E-01	0.812E-01	-0.22E-01	0.18E+00
23.00	92.82	64.072	0.798E-01	0.823E-01	-0.21E-01	0.19E+00
23.50	92.78	64.064	0.842E-01	0.835E-01	-0.20E-01	0.19E+00
24.00	92.74	64.061	0.783E-01	0.847E-01	-0.19E-01	0.19E+00
24.50	92.71	64.054	0.843E-01	0.858E-01	-0.18E-01	0.19E+00
25.00	92.68	64.049	0.843E-01	0.870E-01	-0.17E-01	0.19E+00
25.50	92.65	64.044	0.854E-01	0.882E-01	-0.16E-01	0.19E+00
26.00	92.62	64.038	0.889E-01	0.893E-01	-0.15E-01	0.19E+00
26.50	92.59	64.033	0.897E-01	0.905E-01	-0.14E-01	0.19E+00
27.00	92.56	64.028	0.905E-01	0.917E-01	-0.13E-01	0.20E+00
27.50	92.54	64.025	0.882E-01	0.928E-01	-0.12E-01	0.20E+00
28.00	92.51	64.021	0.879E-01	0.940E-01	-0.11E-01	0.20E+00
28.50	92.49	64.018	0.872E-01	0.952E-01	-0.95E-02	0.20E+00
29.00	92.47	64.014	0.874E-01	0.963E-01	-0.86E-02	0.20E+00

*** Step change in temperature was due to starting of containment ventilation fans which ran for remainder of test.**

29.50	92.44	64.010	0.860E-01	0.975E-01	-0.76E-02	0.20E+00
30.00	92.42	64.008	0.847E-01	0.987E-01	-0.67E-02	0.20E+00
30.50	92.40	64.000	0.903E-01	0.998E-01	-0.57E-02	0.21E+00
31.00	92.38	63.998	0.886E-01	0.101E+00	-0.48E-02	0.21E+00
31.50	92.35	63.994	0.866E-01	0.102E+00	-0.39E-02	0.21E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.744E-01
THE STANDARD DEVIATION IS 0.526E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 22.00 HOURS OF TEST IS 0.102E+00

OPTIONS ?
= POIN

TURKEY PT 50PSIG ILRT UNIT 3

TIME, DATE START OF TEST 9.50 706

TIME AFTER START OF TEST = 22.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
9.75	94.50	64.296	-0.128E+00	0.925E-01	-0.23E+00	0.41E+00
10.00	94.46	64.291	0.829E-02	0.925E-01	-0.23E+00	0.41E+00
10.25	94.41	64.287	-0.300E+00	0.924E-01	-0.23E+00	0.41E+00
10.50	94.38	64.282	0.316E+00	0.924E-01	-0.23E+00	0.41E+00
10.75	94.36	64.278	0.313E+00	0.923E-01	-0.23E+00	0.41E+00
11.00	94.35	64.275	0.315E+00	0.923E-01	-0.23E+00	0.41E+00
11.25	94.34	64.271	0.376E+00	0.922E-01	-0.23E+00	0.41E+00
11.50	94.32	64.268	0.553E-02	0.922E-01	-0.23E+00	0.41E+00
11.75	94.31	64.266	0.206E+00	0.921E-01	-0.22E+00	0.41E+00
12.00	94.29	64.264	-0.421E-01	0.921E-01	-0.22E+00	0.41E+00
12.25	94.27	64.262	-0.379E-01	0.920E-01	-0.22E+00	0.41E+00
12.50	94.27	64.258	0.387E+00	0.920E-01	-0.22E+00	0.41E+00
13.00	94.24	64.255	0.505E-01	0.919E-01	-0.22E+00	0.41E+00

13.50	94.23	64.252	0.792E-01	0.918E-01	-0.22E+00	0.41E+00
14.00	94.21	64.250	0.292E-01	0.917E-01	-0.22E+00	0.41E+00
14.50	94.20	64.246	0.201E+00	0.915E-01	-0.22E+00	0.41E+00
15.00	94.19	64.244	0.132E+00	0.914E-01	-0.22E+00	0.41E+00
15.50	94.16	64.243	-0.191E+00	0.913E-01	-0.22E+00	0.41E+00
16.00	94.16	64.240	0.178E+00	0.912E-01	-0.22E+00	0.41E+00
16.50	94.16	64.238	0.166E+00	0.911E-01	-0.22E+00	0.40E+00
17.00	93.78*	64.196	-0.116E+00	0.910E-01	-0.22E+00	0.40E+00
17.50	93.59	64.173	0.188E-01	0.909E-01	-0.22E+00	0.40E+00
18.00	93.43	64.157	-0.155E+00	0.908E-01	-0.22E+00	0.40E+00
18.50	93.32	64.144	-0.309E-01	0.907E-01	-0.22E+00	0.40E+00
19.00	93.24	64.131	0.286E+00	0.906E-01	-0.22E+00	0.40E+00
19.50	93.17	64.122	0.415E-01	0.905E-01	-0.22E+00	0.40E+00
20.00	93.10	64.112	0.202E+00	0.904E-01	-0.22E+00	0.40E+00
20.50	93.04	64.102	0.105E+00	0.903E-01	-0.22E+00	0.40E+00
21.00	92.99	64.094	0.320E+00	0.902E-01	-0.22E+00	0.40E+00
21.50	92.94	64.088	-0.391E-01	0.901E-01	-0.22E+00	0.40E+00
22.00	92.89	64.083	-0.277E-01	0.900E-01	-0.22E+00	0.40E+00
22.50	92.86	64.076	0.195E+00	0.899E-01	-0.22E+00	0.40E+00
23.00	92.82	64.072	0.291E-02	0.898E-01	-0.22E+00	0.40E+00
23.50	92.78	64.064	0.203E+00	0.897E-01	-0.22E+00	0.40E+00
24.00	92.74	64.061	-0.872E-01	0.895E-01	-0.22E+00	0.40E+00
24.50	92.71	64.054	0.260E+00	0.894E-01	-0.23E+00	0.40E+00
25.00	92.68	64.049	0.820E-01	0.893E-01	-0.23E+00	0.40E+00
25.50	92.65	64.044	0.122E+00	0.892E-01	-0.23E+00	0.40E+00
26.00	92.62	64.038	0.200E+00	0.891E-01	-0.23E+00	0.40E+00
26.50	92.59	64.033	0.117E+00	0.890E-01	-0.23E+00	0.41E+00
27.00	92.56	64.028	0.119E+00	0.889E-01	-0.23E+00	0.41E+00
27.50	92.54	64.025	0.776E-02	0.888E-01	-0.23E+00	0.41E+00
28.00	92.51	64.021	0.765E-01	0.887E-01	-0.23E+00	0.41E+00
28.50	92.49	64.018	0.591E-01	0.886E-01	-0.23E+00	0.41E+00
29.00	92.47	64.014	0.972E-01	0.885E-01	-0.23E+00	0.41E+00
29.50	92.44	64.010	0.316E-01	0.884E-01	-0.23E+00	0.41E+00
30.00	92.42	64.008	0.309E-01	0.883E-01	-0.23E+00	0.41E+00
30.50	92.40	64.000	0.320E+00	0.882E-01	-0.23E+00	0.41E+00
31.00	92.38	63.998	0.174E-01	0.881E-01	-0.23E+00	0.41E+00
31.50	92.35	63.994	0.199E-02	0.880E-01	-0.23E+00	0.41E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.905E-01
THE STANDARD DEVIATION IS 0.153E+00
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 22.00 HOURS OF TEST IS 0.880E-01

* See note on page B-40

OCONEE 29.5 PSIG ILRT UNIT 1

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ENTER TIME, DATE, TEMP, PRESS
WHEN FINISHED ENTER 9999,,,,
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0200,0731,79.762799,43.789139
0215,0731,79.755898,43.789139
0230,0731,79.755198,43.789139
0245,0731,79.754398,43.789139
0300,0731,79.753698,43.789139
0315,0731,79.767998,43.790156
0330,0731,79.764799,43.790156
0345,0731,79.776298,43.790156
0400,0731,79.768898,43.791173
0415,0731,79.771098,43.791173
0430,0731,79.767497,43.791173
0445,0731,79.791819,43.792191
0500,0731,79.779098,43.792191
0515,0731,79.787198,43.792191
0530,0731,79.798398,43.793208
0545,0731,79.789498,43.794224
0600,0731,79.797797,43.794224
0615,0731,79.803497,43.794224
0630,0731,79.804699,43.795241
0645,0731,79.813498,43.795241
0700,0731,79.817298,43.796258
0715,0731,79.822598,43.796258
0730,0731,79.822198,43.796258
9999,,,,
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OCONEE 29.5 PSIG ILRT UNIT 1

TIME, DATE START OF TEST 21.50 730

TIME AFTER START OF TEST = 10.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
0.75	4	-0.240E+00	-0.924E-01	
1.00	5	-0.182E+00	0.105E-01	0.103E+00
1.25	6	-0.159E+00	0.138E-01	0.330E-02
1.50	7	-0.148E+00	0.211E-03	-0.136E-01
1.75	8	-0.132E+00	0.152E-01	0.150E-01
2.00	9	-0.119E+00	0.241E-01	0.883E-02
2.25	10	-0.105E+00	0.440E-01	0.199E-01
2.50	11	-0.951E-01	0.516E-01	0.764E-02
2.75	12	-0.886E-01	0.497E-01	-0.189E-02
3.00	13	-0.830E-01	0.485E-01	-0.121E-02
3.25	14	-0.773E-01	0.499E-01	0.143E-02
3.50	15	-0.729E-01	0.487E-01	-0.126E-02
3.75	16	-0.694E-01	0.464E-01	-0.229E-02
4.00	17	-0.656E-01	0.465E-01	0.770E-04
4.25	18	-0.622E-01	0.465E-01	0.395E-04
4.50	19	-0.594E-01	0.453E-01	-0.119E-02
4.75	20	-0.573E-01	0.429E-01	-0.239E-02
5.00	21	-0.553E-01	0.407E-01	-0.219E-02
5.25	22	-0.535E-01	0.387E-01	-0.202E-02
5.50	23	-0.518E-01	0.368E-01	-0.186E-02
5.75	24	-0.502E-01	0.354E-01	-0.141E-02
6.00	25	-0.488E-01	0.338E-01	-0.163E-02
6.25	26	-0.472E-01	0.336E-01	-0.204E-03
6.50	27	-0.462E-01	0.314E-01	-0.223E-02
6.75	28	-0.452E-01	0.296E-01	-0.174E-02
7.00	29	-0.443E-01	0.278E-01	-0.184E-02
7.25	30	-0.433E-01	0.271E-01	-0.672E-03
7.50	31	-0.425E-01	0.255E-01	-0.158E-02
7.75	32	-0.416E-01	0.247E-01	-0.824E-03
8.00	33	-0.407E-01	0.239E-01	-0.834E-03
8.25	34	-0.403E-01	0.218E-01	-0.209E-02
8.50	35	-0.397E-01	0.204E-01	-0.136E-02
8.75	36	-0.391E-01	0.195E-01	-0.895E-03
9.00	37	-0.386E-01	0.181E-01	-0.140E-02
9.25	38	-0.381E-01	0.173E-01	-0.810E-03
9.50	39	-0.376E-01	0.162E-01	-0.114E-02
9.75	40	-0.371E-01	0.154E-01	-0.784E-03
10.00	41	-0.366E-01	0.147E-01	-0.723E-03

THE CALCULATED LEAK RATE IS 0.147E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.177E+00
THE LAST 23 DATA POINTS ESTABLISH A NEGATIVE SLOPE

OCONEE 29.5 PSIG ILRT UNIT 1

TIME, DATE START OF TEST 21.50 730

TIME AFTER START OF TEST = 10.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
21.75	79.82	43.794	-0.377E+00	-0.880E-01	-0.22E+00	0.45E-01
22.00	79.80	43.793	-0.259E+00	-0.853E-01	-0.22E+00	0.48E-01
22.25	79.80	43.792	-0.827E-01	-0.827E-01	-0.22E+00	0.50E-01
22.50	79.80	43.791	-0.851E-02	-0.801E-01	-0.21E+00	0.52E-01
22.75	79.78	43.791	-0.695E-01	-0.774E-01	-0.21E+00	0.54E-01
23.00	79.77	43.791	-0.908E-01	-0.748E-01	-0.21E+00	0.57E-01
23.25	79.77	43.790	-0.358E-01	-0.722E-01	-0.20E+00	0.59E-01
23.50	79.77	43.790	-0.322E-01	-0.695E-01	-0.20E+00	0.61E-01
23.75	79.78	43.789	0.918E-02	-0.669E-01	-0.20E+00	0.64E-01
24.00	79.77	43.789	-0.455E-02	-0.643E-01	-0.19E+00	0.66E-01
24.25	79.76	43.789	-0.242E-01	-0.616E-01	-0.19E+00	0.68E-01
24.50	79.76	43.789	-0.206E-01	-0.590E-01	-0.19E+00	0.71E-01
24.75	79.77	43.789	-0.939E-02	-0.564E-01	-0.19E+00	0.73E-01
25.00	79.76	43.789	-0.162E-01	-0.538E-01	-0.18E+00	0.76E-01
25.25	79.76	43.789	-0.195E-01	-0.511E-01	-0.18E+00	0.78E-01
25.50	79.77	43.789	-0.930E-02	-0.485E-01	-0.18E+00	0.81E-01
25.75	79.77	43.789	-0.770E-02	-0.459E-01	-0.17E+00	0.83E-01
26.00	79.76	43.789	-0.121E-01	-0.432E-01	-0.17E+00	0.86E-01
26.25	79.76	43.789	-0.179E-01	-0.406E-01	-0.17E+00	0.88E-01
26.50	79.76	43.789	-0.177E-01	-0.380E-01	-0.17E+00	0.91E-01
26.75	79.75	43.789	-0.175E-01	-0.353E-01	-0.16E+00	0.94E-01
27.00	79.75	43.789	-0.173E-01	-0.327E-01	-0.16E+00	0.96E-01
27.25	79.77	43.790	-0.152E-01	-0.301E-01	-0.16E+00	0.99E-01
27.50	79.76	43.790	-0.169E-01	-0.274E-01	-0.16E+00	0.10E+00
27.75	79.78	43.790	-0.804E-02	-0.248E-01	-0.15E+00	0.10E+00
28.00	79.77	43.791	-0.214E-01	-0.222E-01	-0.15E+00	0.11E+00
28.25	79.77	43.791	-0.191E-01	-0.195E-01	-0.15E+00	0.11E+00
28.50	79.77	43.791	-0.207E-01	-0.169E-01	-0.15E+00	0.11E+00
28.75	79.79	43.792	-0.128E-01	-0.143E-01	-0.14E+00	0.12E+00
29.00	79.78	43.792	-0.199E-01	-0.116E-01	-0.14E+00	0.12E+00
29.25	79.79	43.792	-0.146E-01	-0.902E-02	-0.14E+00	0.12E+00
29.50	79.80	43.793	-0.149E-01	-0.639E-02	-0.14E+00	0.12E+00
29.75	79.79	43.794	-0.260E-01	-0.376E-02	-0.13E+00	0.13E+00
30.00	79.80	43.794	-0.209E-01	-0.112E-02	-0.13E+00	0.13E+00
30.25	79.80	43.794	-0.174E-01	0.151E-02	-0.13E+00	0.13E+00
30.50	79.80	43.795	-0.225E-01	0.414E-02	-0.13E+00	0.14E+00
30.75	79.81	43.795	-0.177E-01	0.677E-02	-0.13E+00	0.14E+00
31.00	79.82	43.796	-0.213E-01	0.940E-02	-0.12E+00	0.14E+00
31.25	79.82	43.796	-0.183E-01	0.120E-01	-0.12E+00	0.14E+00
31.50	79.82	43.796	-0.180E-01	0.147E-01	-0.12E+00	0.15E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS -0.366E-01
THE STANDARD DEVIATION IS 0.693E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 10.00 HOURS OF TEST IS 0.147E-01

OCONEE 29.5 PSIG ILRT UNIT 1

TIME, DATE START OF TEST 21.50 730

TIME AFTER START OF TEST = 10.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
21.75	79.82	43.794	-0.377E+00	-0.225E-01	-0.42E+00	0.37E+00
22.00	79.80	43.793	-0.140E+00	-0.222E-01	-0.42E+00	0.37E+00
22.25	79.80	43.792	0.269E+00	-0.220E-01	-0.41E+00	0.37E+00
22.50	79.80	43.791	0.214E+00	-0.218E-01	-0.41E+00	0.37E+00
22.75	79.78	43.791	-0.313E+00	-0.215E-01	-0.41E+00	0.37E+00
23.00	79.77	43.791	-0.197E+00	-0.213E-01	-0.41E+00	0.37E+00
23.25	79.77	43.790	0.294E+00	-0.211E-01	-0.41E+00	0.37E+00
23.50	79.77	43.790	-0.714E-02	-0.208E-01	-0.41E+00	0.37E+00
23.75	79.78	43.789	0.341E+00	-0.206E-01	-0.41E+00	0.37E+00
24.00	79.77	43.789	-0.128E+00	-0.204E-01	-0.41E+00	0.36E+00
24.25	79.76	43.789	-0.221E+00	-0.201E-01	-0.40E+00	0.36E+00
24.50	79.76	43.789	0.196E-01	-0.199E-01	-0.40E+00	0.36E+00
24.75	79.77	43.789	0.125E+00	-0.197E-01	-0.40E+00	0.36E+00
25.00	79.76	43.789	-0.105E+00	-0.195E-01	-0.40E+00	0.36E+00
25.25	79.76	43.789	-0.656E-01	-0.192E-01	-0.40E+00	0.36E+00
25.50	79.77	43.789	0.144E+00	-0.190E-01	-0.40E+00	0.36E+00
25.75	79.77	43.789	0.179E-01	-0.188E-01	-0.40E+00	0.36E+00
26.00	79.76	43.789	-0.870E-01	-0.185E-01	-0.40E+00	0.36E+00
26.25	79.76	43.789	-0.123E+00	-0.183E-01	-0.40E+00	0.36E+00
26.50	79.76	43.789	-0.124E-01	-0.181E-01	-0.40E+00	0.36E+00
26.75	79.75	43.789	-0.142E-01	-0.178E-01	-0.40E+00	0.36E+00
27.00	79.75	43.789	-0.124E-01	-0.176E-01	-0.40E+00	0.36E+00
27.25	79.77	43.790	0.318E-01	-0.174E-01	-0.40E+00	0.36E+00
27.50	79.76	43.790	-0.570E-01	-0.171E-01	-0.40E+00	0.36E+00
27.75	79.78	43.790	0.205E+00	-0.169E-01	-0.40E+00	0.37E+00
28.00	79.77	43.791	-0.354E+00	-0.167E-01	-0.40E+00	0.37E+00
28.25	79.77	43.791	0.392E-01	-0.164E-01	-0.40E+00	0.37E+00
28.50	79.77	43.791	-0.639E-01	-0.162E-01	-0.40E+00	0.37E+00
28.75	79.79	43.792	0.210E+00	-0.160E-01	-0.40E+00	0.37E+00
29.00	79.78	43.792	-0.226E+00	-0.157E-01	-0.40E+00	0.37E+00
29.25	79.79	43.792	0.144E+00	-0.155E-01	-0.40E+00	0.37E+00
29.50	79.80	43.793	-0.235E-01	-0.153E-01	-0.40E+00	0.37E+00
29.75	79.79	43.794	-0.381E+00	-0.150E-01	-0.40E+00	0.37E+00
30.00	79.80	43.794	0.148E+00	-0.148E-01	-0.40E+00	0.37E+00
30.25	79.80	43.794	0.102E+00	-0.146E-01	-0.40E+00	0.37E+00
30.50	79.80	43.795	-0.202E+00	-0.143E-01	-0.40E+00	0.38E+00
30.75	79.81	43.795	0.157E+00	-0.141E-01	-0.41E+00	0.38E+00
31.00	79.82	43.796	-0.155E+00	-0.139E-01	-0.41E+00	0.38E+00
31.25	79.82	43.796	0.944E-01	-0.137E-01	-0.41E+00	0.38E+00
31.50	79.82	43.796	-0.694E-02	-0.134E-01	-0.41E+00	0.38E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS -0.179E-01
THE STANDARD DEVIATION IS 0.184E+00
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 10.00 HOURS OF TEST IS -0.134E-01

ØCØNEE 59 PSIG ILRT UNIT 1

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 ENTER TIME, DATE,TEMP,PRESS
 WHEN FINISHED ENTER 9999,,,,
= 0215,0802,85.341498,73.375829
= 0230,0802,85.275797,73.368152
= 0245,0802,85.192797,73.360031
= 0300,0802,85.133397,73.352926
= 0315,0802,85.091396,73.344807
= 0330,0802,85.035598,73.337702
= 0345,0802,84.982897,73.330597
= 0400,0802,84.925997,73.323492
= 0415,0802,84.872097,73.316387
= 0430,0802,84.827998,73.310297
= 0445,0802,84.777897,73.303191
= 0500,0802,84.733497,73.297102
= 0515,0802,84.689298,73.291012
= 0530,0802,84.648697,73.285936
= 0545,0802,84.601697,73.278831
= 0600,0802,84.573298,73.273756
= 0615,0802,84.531898,73.268682
= 0630,0802,84.493797,73.263607
= 0645,0802,84.457897,73.258532
= 0700,0802,84.421897,73.254471
= 0715,0802,84.388097,73.249397
= 0730,0802,84.358997,73.244322
= 0745,0802,84.319696,73.241277
= 0800,0802,84.284297,73.233156
= 0815,0802,84.259697,73.230112
= 0830,0802,84.222198,73.225037
= 0845,0802,84.200197,73.221992
= 0900,0802,84.172897,73.219916
= 0915,0802,84.144998,73.212857
= 0930,0802,84.121097,73.209811
= 0945,0802,84.091698,73.205751
= 1000,0802,84.061399,73.201693
= 1015,0802,84.037398,73.198647
  1030,0802,84.014598,73.194586
= 1045,0802,83.988198,73.191542
= 1100,0802,83.965898,73.188497
= 1115,0802,83.944396,73.185452
= 1130,0802,83.929298,73.182407
= 1145,0802,83.904198,73.178347
= 1200,0802,83.881698,73.175303
= 1215,0802,83.855699,73.172256
= 9999,,,,,
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OCONEE 59PSIG ILRT UNIT 1

TIME, DATE START OF TEST 2.25 802

TIME AFTER START OF TEST = 10.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
0.75	4	-0.217E+00	-0.253E+00	
1.00	5	-0.185E+00	-0.147E+00	0.106E+00
1.25	6	-0.164E+00	-0.969E-01	0.502E-01
1.50	7	-0.148E+00	-0.651E-01	0.318E-01
1.75	8	-0.136E+00	-0.485E-01	0.166E-01
2.00	9	-0.127E+00	-0.369E-01	0.116E-01
2.25	10	-0.119E+00	-0.268E-01	0.101E-01
2.50	11	-0.111E+00	-0.172E-01	0.958E-02
2.75	12	-0.104E+00	-0.943E-02	0.779E-02
3.00	13	-0.983E-01	-0.293E-02	0.651E-02
3.25	14	-0.934E-01	0.107E-02	0.400E-02
3.50	15	-0.885E-01	0.620E-02	0.513E-02
3.75	16	-0.834E-01	0.129E-01	0.667E-02
4.00	17	-0.791E-01	0.171E-01	0.420E-02
4.25	18	-0.753E-01	0.203E-01	0.319E-02
4.50	19	-0.718E-01	0.231E-01	0.286E-02
4.75	20	-0.689E-01	0.243E-01	0.118E-02
5.00	21	-0.661E-01	0.259E-01	0.156E-02
5.25	22	-0.632E-01	0.284E-01	0.251E-02
5.50	23	-0.612E-01	0.281E-01	-0.289E-03
5.75	24	-0.584E-01	0.309E-01	0.284E-02
6.00	25	-0.560E-01	0.330E-01	0.205E-02
6.25	26	-0.537E-01	0.346E-01	0.166E-02
6.50	27	-0.516E-01	0.360E-01	0.138E-02
6.75	28	-0.500E-01	0.360E-01	0.246E-06
7.00	29	-0.479E-01	0.380E-01	0.202E-02
7.25	30	-0.460E-01	0.396E-01	0.155E-02
7.50	31	-0.442E-01	0.409E-01	0.131E-02
7.75	32	-0.425E-01	0.419E-01	0.104E-02
8.00	33	-0.410E-01	0.427E-01	0.730E-03
8.25	34	-0.394E-01	0.437E-01	0.101E-02
8.50	35	-0.380E-01	0.443E-01	0.589E-03
8.75	36	-0.367E-01	0.447E-01	0.459E-03
9.00	37	-0.355E-01	0.451E-01	0.390E-03
9.25	38	-0.342E-01	0.458E-01	0.646E-03
9.50	39	-0.329E-01	0.465E-01	0.742E-03
9.75	40	-0.317E-01	0.471E-01	0.605E-03
10.00	41	-0.307E-01	0.474E-01	0.322E-03

THE CALCULATED LEAK RATE IS 0.474E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.250E+00
THE LAST 0 DATA POINTS ESTABLISH A NEGATIVE SLOPE

OCONEE 59PSIG ILRT UNIT 1

TIME, DATE START OF TEST 2.25 802

TIME AFTER START OF TEST = 10.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
2.50	85.28	73.368	-0.153E+00	-0.109E+00	-0.20E+00	-0.21E-01
2.75	85.19	73.360	-0.276E+00	-0.105E+00	-0.19E+00	-0.17E-01
3.00	85.13	73.353	-0.223E+00	-0.101E+00	-0.19E+00	-0.14E-01
3.25	85.09	73.345	-0.868E-01	-0.967E-01	-0.18E+00	-0.10E-01
3.50	85.04	73.338	-0.802E-01	-0.927E-01	-0.18E+00	-0.62E-02
3.75	84.98	73.331	-0.666E-01	-0.887E-01	-0.17E+00	-0.25E-02
4.00	84.93	73.323	-0.675E-01	-0.847E-01	-0.17E+00	0.13E-02
4.25	84.87	73.316	-0.616E-01	-0.807E-01	-0.17E+00	0.51E-02
4.50	84.83	73.310	-0.525E-01	-0.767E-01	-0.16E+00	0.90E-02
4.75	84.78	73.303	-0.426E-01	-0.727E-01	-0.16E+00	0.13E-01
5.00	84.73	73.297	-0.374E-01	-0.687E-01	-0.15E+00	0.17E-01
5.25	84.69	73.291	-0.327E-01	-0.647E-01	-0.15E+00	0.21E-01
5.50	84.65	73.286	-0.342E-01	-0.607E-01	-0.15E+00	0.24E-01
5.75	84.60	73.279	-0.245E-01	-0.567E-01	-0.14E+00	0.28E-01
6.00	84.57	73.274	-0.119E-01	-0.527E-01	-0.14E+00	0.32E-01
6.25	84.53	73.269	-0.153E-01	-0.487E-01	-0.13E+00	0.36E-01
6.50	84.49	73.264	-0.148E-01	-0.447E-01	-0.13E+00	0.40E-01
6.75	84.46	73.259	-0.122E-01	-0.407E-01	-0.13E+00	0.44E-01
7.00	84.42	73.255	-0.170E-01	-0.367E-01	-0.12E+00	0.48E-01
7.25	84.39	73.249	-0.127E-01	-0.327E-01	-0.12E+00	0.52E-01
7.50	84.36	73.244	-0.490E-02	-0.287E-01	-0.11E+00	0.56E-01
7.75	84.32	73.241	-0.181E-01	-0.247E-01	-0.11E+00	0.60E-01
8.00	84.28	73.233	0.184E-02	-0.207E-01	-0.11E+00	0.64E-01
8.25	84.26	73.230	0.303E-03	-0.166E-01	-0.10E+00	0.68E-01
8.50	84.22	73.225	0.423E-03	-0.126E-01	-0.97E-01	0.72E-01
8.75	84.20	73.222	0.822E-03	-0.864E-02	-0.94E-01	0.76E-01
9.00	84.17	73.220	-0.698E-02	-0.463E-02	-0.90E-01	0.80E-01
9.25	84.15	73.213	0.874E-02	-0.627E-03	-0.86E-01	0.84E-01
9.50	84.12	73.210	0.765E-02	0.338E-02	-0.82E-01	0.89E-01
9.75	84.09	73.206	0.785E-02	0.738E-02	-0.78E-01	0.93E-01
10.00	84.06	73.202	0.750E-02	0.114E-01	-0.74E-01	0.97E-01
10.25	84.04	73.199	0.650E-02	0.154E-01	-0.70E-01	0.10E+00
10.50	84.01	73.195	0.102E-01	0.194E-01	-0.66E-01	0.11E+00
10.75	83.99	73.191	0.798E-02	0.234E-01	-0.63E-01	0.11E+00
11.00	83.97	73.189	0.791E-02	0.274E-01	-0.59E-01	0.11E+00
11.25	83.94	73.186	0.823E-02	0.314E-01	-0.55E-01	0.12E+00
11.50	83.93	73.182	0.116E-01	0.354E-01	-0.51E-01	0.12E+00
11.75	83.90	73.178	0.136E-01	0.394E-01	-0.48E-01	0.13E+00
12.00	83.88	73.175	0.134E-01	0.434E-01	-0.44E-01	0.13E+00
12.25	83.86	73.172	0.115E-01	0.474E-01	-0.40E-01	0.13E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS -0.307E-01
THE STANDARD DEVIATION IS 0.621E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 10.00 HOURS OF TEST IS 0.474E-01

OCONEE 59PSIG ILRT UNIT 1

TIME, DATE START OF TEST 2.25 802

TIME AFTER START OF TEST = 10.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
2.50	85.28	73.368	-0.153E+00	-0.368E-01	-0.37E+00	0.29E+00
2.75	85.19	73.360	-0.400E+00	-0.344E-01	-0.36E+00	0.30E+00
3.00	85.13	73.353	-0.117E+00	-0.319E-01	-0.36E+00	0.30E+00
3.25	85.09	73.345	0.323E+00	-0.294E-01	-0.36E+00	0.30E+00
3.50	85.04	73.338	-0.534E-01	-0.269E-01	-0.35E+00	0.30E+00
3.75	84.98	73.331	0.129E-02	-0.244E-01	-0.35E+00	0.30E+00
4.00	84.93	73.323	-0.728E-01	-0.219E-01	-0.35E+00	0.30E+00
4.25	84.87	73.316	-0.200E-01	-0.194E-01	-0.34E+00	0.30E+00
4.50	84.83	73.310	0.200E-01	-0.170E-01	-0.34E+00	0.31E+00
4.75	84.78	73.303	0.472E-01	-0.145E-01	-0.34E+00	0.31E+00
5.00	84.73	73.297	0.144E-01	-0.120E-01	-0.33E+00	0.31E+00
5.25	84.69	73.291	0.183E-01	-0.950E-02	-0.33E+00	0.31E+00
5.50	84.65	73.286	-0.511E-01	-0.701E-02	-0.33E+00	0.31E+00
5.75	84.60	73.279	0.102E+00	-0.453E-02	-0.33E+00	0.32E+00
6.00	84.57	73.274	0.164E+00	-0.204E-02	-0.32E+00	0.32E+00
6.25	84.53	73.269	-0.655E-01	0.446E-03	-0.32E+00	0.32E+00
6.50	84.49	73.264	-0.705E-02	0.293E-02	-0.32E+00	0.32E+00
6.75	84.46	73.259	0.318E-01	0.542E-02	-0.31E+00	0.33E+00
7.00	84.42	73.255	-0.103E+00	0.790E-02	-0.31E+00	0.33E+00
7.25	84.39	73.249	0.686E-01	0.104E-01	-0.31E+00	0.33E+00
7.50	84.36	73.244	0.152E+00	0.129E-01	-0.31E+00	0.33E+00
7.75	84.32	73.241	-0.294E+00	0.154E-01	-0.30E+00	0.33E+00
8.00	84.28	73.233	0.440E+00	0.178E-01	-0.30E+00	0.34E+00
8.25	84.26	73.230	-0.350E-01	0.203E-01	-0.30E+00	0.34E+00
8.50	84.22	73.225	0.341E-02	0.228E-01	-0.30E+00	0.34E+00
8.75	84.20	73.222	0.111E-01	0.253E-01	-0.30E+00	0.35E+00
9.00	84.17	73.220	-0.210E+00	0.278E-01	-0.29E+00	0.35E+00
9.25	84.15	73.213	0.433E+00	0.303E-01	-0.29E+00	0.35E+00
9.50	84.12	73.210	-0.225E-01	0.328E-01	-0.29E+00	0.35E+00
9.75	84.09	73.206	0.135E-01	0.352E-01	-0.29E+00	0.36E+00
10.00	84.06	73.202	-0.271E-02	0.377E-01	-0.28E+00	0.36E+00
10.25	84.04	73.199	-0.243E-01	0.402E-01	-0.28E+00	0.36E+00
10.50	84.01	73.195	0.130E+00	0.427E-01	-0.28E+00	0.37E+00
10.75	83.99	73.191	-0.668E-01	0.452E-01	-0.28E+00	0.37E+00
11.00	83.97	73.189	0.577E-02	0.477E-01	-0.28E+00	0.37E+00
11.25	83.94	73.186	0.197E-01	0.502E-01	-0.28E+00	0.38E+00
11.50	83.93	73.182	0.133E+00	0.527E-01	-0.27E+00	0.38E+00
11.75	83.90	73.178	0.894E-01	0.551E-01	-0.27E+00	0.38E+00
12.00	83.88	73.175	0.542E-02	0.576E-01	-0.27E+00	0.39E+00
12.25	83.86	73.172	-0.629E-01	0.601E-01	-0.27E+00	0.39E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.116E-01
THE STANDARD DEVIATION IS 0.157E+00
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 10.00 HOURS OF TEST IS 0.601E-01

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 ENTER TITLE OF LESS THAN 28 CHARACTERS
= TURKEY PT 4 ILRT 25 PSIG
 ENTER MAX ALLOWABLE LEAK RATE
= .132
 ENTER NO. OF VARIABLES TO BE PRINTED ON EACH REPORT
=
 ENTER PRESSURE CONSTANT
= .492
 ENTER PREVIOUS VALUES ?
= YES
 INPUT FROM FILE ?
= YES
  245   221   84.464198   39.735508
  300   221   84.420846   39.733594
  315   221   84.396072   39.732040
  330   221   84.382883   39.729757
  345   221   84.332073   39.728596
  400   221   84.305953   39.726725
  415   221   84.293841   39.724837
  430   221   84.261681   39.723820
  445   221   84.247468   39.721734
  500   221   84.221296   39.720305
  515   221   84.189256   39.719458
  530   221   84.173001   39.717378
  545   221   84.138927   39.716389
  600   221   84.123601   39.714870
  615   221   84.104048   39.713886
  630   221   84.071678   39.712701
  645   221   84.045058   39.710863
  700   221   84.041249   39.709715
  715   221   84.020317   39.709219
  730   221   84.003307   39.707622
  745   221   83.994328   39.705791
  800   221   83.978843   39.704865
  815   221   83.969664   39.704208
  830   221   83.948784   39.702156
  845   221   83.923644   39.700832
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OPTIONS ?
= TEQREND

TURKEY PT 4 ILRT 25 PSIG

TIME, DATE START OF TEST 2.75 221

TIME AFTER START OF TEST = 6.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
0.75	4	-0.167E+00	-0.228E-01	
1.00	5	-0.166E+00	-0.795E-01	-0.567E-01
1.25	6	-0.160E+00	-0.891E-01	-0.962E-02
1.50	7	-0.145E+00	-0.630E-01	0.262E-01
1.75	8	-0.140E+00	-0.659E-01	-0.291E-02
2.00	9	-0.130E+00	-0.499E-01	0.159E-01
2.25	10	-0.123E+00	-0.426E-01	0.735E-02
2.50	11	-0.121E+00	-0.484E-01	-0.577E-02
2.75	12	-0.116E+00	-0.440E-01	0.438E-02
3.00	13	-0.114E+00	-0.484E-01	-0.445E-02
3.25	14	-0.111E+00	-0.481E-01	0.298E-03
3.50	15	-0.109E+00	-0.487E-01	-0.595E-03
3.75	16	-0.108E+00	-0.527E-01	-0.401E-02
4.00	17	-0.107E+00	-0.552E-01	-0.243E-02
4.25	18	-0.105E+00	-0.535E-01	0.168E-02
4.50	19	-0.104E+00	-0.543E-01	-0.789E-03
4.75	20	-0.102E+00	-0.533E-01	0.938E-03
5.00	21	-0.998E-01	-0.493E-01	0.399E-02
5.25	22	-0.977E-01	-0.460E-01	0.331E-02
5.50	23	-0.956E-01	-0.429E-01	0.311E-02
5.75	24	-0.934E-01	-0.391E-01	0.384E-02
6.00	25	-0.916E-01	-0.364E-01	0.271E-02

THE CALCULATED LEAK RATE IS -0.364E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.132E+00
THE LAST 0 DATA POINTS ESTABLISH A NEGATIVE SLOPE

OPTIONS ?
= TOTAL

TURKEY PT 4 ILRT 25 PSIG

TIME, DATE START OF TEST 2.75 221

TIME AFTER START OF TEST = 6.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
3.00	84.42	39.734	-0.302E+00	-0.147E+00	-0.25E+00	-0.39E-01
3.25	84.40	39.732	-0.182E+00	-0.142E+00	-0.25E+00	-0.35E-01
3.50	84.38	39.730	-0.151E-01	-0.137E+00	-0.24E+00	-0.31E-01
3.75	84.33	39.729	-0.165E+00	-0.132E+00	-0.24E+00	-0.27E-01
4.00	84.31	39.727	-0.134E+00	-0.128E+00	-0.23E+00	-0.23E-01
4.25	84.29	39.725	-0.713E-01	-0.123E+00	-0.23E+00	-0.19E-01
4.50	84.26	39.724	-0.107E+00	-0.118E+00	-0.22E+00	-0.15E-01
4.75	84.25	39.722	-0.621E-01	-0.113E+00	-0.22E+00	-0.10E-01
5.00	84.22	39.720	-0.681E-01	-0.108E+00	-0.21E+00	-0.58E-02
5.25	84.19	39.719	-0.974E-01	-0.104E+00	-0.21E+00	-0.13E-02
5.50	84.17	39.717	-0.689E-01	-0.988E-01	-0.20E+00	0.33E-02
5.75	84.14	39.716	-0.934E-01	-0.940E-01	-0.20E+00	0.81E-02
6.00	84.12	39.715	-0.788E-01	-0.892E-01	-0.19E+00	0.13E-01
6.25	84.10	39.714	-0.808E-01	-0.844E-01	-0.19E+00	0.18E-01
6.50	84.07	39.713	-0.945E-01	-0.796E-01	-0.18E+00	0.23E-01
6.75	84.05	39.711	-0.902E-01	-0.748E-01	-0.18E+00	0.28E-01
7.00	84.04	39.710	-0.725E-01	-0.700E-01	-0.17E+00	0.33E-01
7.25	84.02	39.709	-0.823E-01	-0.652E-01	-0.17E+00	0.38E-01
7.50	84.00	39.708	-0.735E-01	-0.604E-01	-0.16E+00	0.43E-01
7.75	83.99	39.706	-0.556E-01	-0.556E-01	-0.16E+00	0.49E-01
8.00	83.98	39.705	-0.553E-01	-0.508E-01	-0.16E+00	0.54E-01
8.25	83.97	39.704	-0.530E-01	-0.460E-01	-0.15E+00	0.60E-01
8.50	83.95	39.702	-0.451E-01	-0.412E-01	-0.15E+00	0.65E-01
8.75	83.92	39.701	-0.484E-01	-0.364E-01	-0.14E+00	0.71E-01

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS -0.916E-01
THE STANDARD DEVIATION IS 0.581E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 6.00 HOURS OF TEST IS -0.364E-01

OPTIONS ?
= POINT

TURKEY PT 4 ILRT 25 PSIG

TIME, DATE START OF TEST 2.75 221

TIME AFTER START OF TEST = 6.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
3.00	84.42	39.734	-0.302E+00	-0.123E+00	-0.68E+00	0.43E+00
3.25	84.40	39.732	-0.616E-01	-0.116E+00	-0.66E+00	0.43E+00
3.50	84.38	39.730	0.319E+00	-0.110E+00	-0.65E+00	0.43E+00
3.75	84.33	39.729	-0.616E+00	-0.103E+00	-0.64E+00	0.44E+00
4.00	84.31	39.727	-0.879E-02	-0.968E-01	-0.63E+00	0.44E+00
4.25	84.29	39.725	0.243E+00	-0.903E-01	-0.62E+00	0.44E+00
4.50	84.26	39.724	-0.322E+00	-0.838E-01	-0.62E+00	0.45E+00
4.75	84.25	39.722	0.253E+00	-0.774E-01	-0.61E+00	0.45E+00
5.00	84.22	39.720	-0.117E+00	-0.709E-01	-0.60E+00	0.46E+00
5.25	84.19	39.719	-0.361E+00	-0.645E-01	-0.59E+00	0.46E+00
5.50	84.17	39.717	0.216E+00	-0.580E-01	-0.58E+00	0.47E+00
5.75	84.14	39.716	-0.362E+00	-0.515E-01	-0.58E+00	0.47E+00
6.00	84.12	39.715	0.967E-01	-0.451E-01	-0.57E+00	0.48E+00
6.25	84.10	39.714	-0.107E+00	-0.386E-01	-0.56E+00	0.49E+00
6.50	84.07	39.713	-0.285E+00	-0.321E-01	-0.56E+00	0.49E+00
6.75	84.05	39.711	-0.258E-01	-0.257E-01	-0.55E+00	0.50E+00
7.00	84.04	39.710	0.211E+00	-0.192E-01	-0.55E+00	0.51E+00
7.25	84.02	39.709	-0.250E+00	-0.127E-01	-0.54E+00	0.52E+00
7.50	84.00	39.708	0.858E-01	-0.628E-02	-0.54E+00	0.53E+00
7.75	83.99	39.706	0.284E+00	0.180E-03	-0.54E+00	0.54E+00
8.00	83.98	39.705	-0.495E-01	0.664E-02	-0.53E+00	0.55E+00
8.25	83.97	39.704	-0.315E-02	0.131E-01	-0.53E+00	0.56E+00
8.50	83.95	39.702	0.128E+00	0.196E-01	-0.53E+00	0.57E+00
8.75	83.92	39.701	-0.124E+00	0.260E-01	-0.53E+00	0.58E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS -0.483E-01
THE STANDARD DEVIATION IS 0.247E+00
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 6.00 HOURS OF TEST IS 0.260E-01

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 ENTER TITLE OF LESS THAN 28 CHARACTERS
= TURKEY PT 4 ILRT 50 PSIG
 ENTER MAX ALLOWABLE LEAK RATE
= .187
 ENTER NO. OF VARIABLES TO BE PRINTED ON EACH REPORT
=
 ENTER PRESSURE CONSTANT
= 1.008
 ENTER PREVIOUS VALUES ?
= YES
 INPUT FROM FILE ?
= YES
  815   222   84.890917   64.575491
  830   222   84.815578   64.565991
  845   222   84.748323   64.557928
  900   222   84.680598   64.550813
  915   222   84.620767   64.543633
  930   222   84.573458   64.537400
  945   222   84.532473   64.530528
 1000   222   84.483460   64.524441
 1015   222   84.478481   64.519401
 1030   222   84.378191   64.513110
 1045   222   84.339383   64.508129
 1100   222   84.309402   64.503222
 1115   222   84.287372   64.498999
 1130   222   84.253657   64.493589
 1145   222   84.216741   64.488869
 1200   222   84.183637   64.484797
 1215   222   84.156272   64.479088
 1230   222   84.121907   64.475367
 1245   222   84.090188   64.472207
 1300   222   84.060226   64.467656
 1315   222   84.064003   64.463457
 1330   222   83.993955   64.459099
 1345   222   83.967884   64.455226
 1400   222   83.962464   64.451703
 1415   222   83.931631   64.447822
 1430   222   83.903746   64.444797
 1445   222   83.881929   64.438139
 1500   222   83.833377   64.434796
 1515   222   83.808769   64.431734
 1530   222   83.789634   64.428566
 1545   222   83.763671   64.425728
 1600   222   83.734842   64.423850
 1615   222   83.715137   64.419731
 1630   222   83.694536   64.416149

 OPTIONS ?
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TURKEY POINT 4 ILRT 50 PSIG

TIME, DATE START OF TEST 8.25 222

TIME AFTER START OF TEST = 8.25 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
0.75	4	0.398E-01	-0.876E-02	
1.00	5	0.282E-01	-0.219E-01	-0.132E-01
1.25	6	0.252E-01	-0.143E-01	0.766E-02
1.50	7	0.311E-01	0.157E-01	0.299E-01
1.75	8	0.350E-01	0.320E-01	0.163E-01
2.00	9	0.473E-01	0.737E-01	0.417E-01
2.25	10	0.449E-01	0.604E-01	-0.133E-01
2.50	11	0.433E-01	0.521E-01	-0.830E-02
2.75	12	0.434E-01	0.511E-01	-0.103E-02
3.00	13	0.449E-01	0.550E-01	0.399E-02
3.25	14	0.470E-01	0.612E-01	0.611E-02
3.50	15	0.487E-01	0.654E-01	0.425E-02
3.75	16	0.500E-01	0.679E-01	0.248E-02
4.00	17	0.523E-01	0.741E-01	0.617E-02
4.25	18	0.538E-01	0.772E-01	0.316E-02
4.50	19	0.546E-01	0.778E-01	0.612E-03
4.75	20	0.556E-01	0.791E-01	0.126E-02
5.00	21	0.580E-01	0.858E-01	0.675E-02
5.25	22	0.586E-01	0.856E-01	-0.221E-03
5.50	23	0.593E-01	0.857E-01	0.110E-03
5.75	24	0.605E-01	0.883E-01	0.257E-02
6.00	25	0.616E-01	0.901E-01	0.181E-02
6.25	26	0.624E-01	0.909E-01	0.751E-03
6.50	27	0.639E-01	0.944E-01	0.355E-02
6.75	28	0.647E-01	0.951E-01	0.677E-03
7.00	29	0.653E-01	0.953E-01	0.254E-03
7.25	30	0.659E-01	0.958E-01	0.425E-03
7.50	31	0.664E-01	0.956E-01	-0.160E-03
7.75	32	0.665E-01	0.942E-01	-0.140E-02
8.00	33	0.668E-01	0.936E-01	-0.549E-03
8.25	34	0.671E-01	0.935E-01	-0.188E-03

THE CALCULATED LEAK RATE IS 0.935E-01
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.187E+00
THE LAST 4 DATA POINTS ESTABLISH A NEGATIVE SLOPE

TURKEY POINT 4 ILRT 50 PSIG

TIME, DATE START OF TEST 8.25 222

TIME AFTER START OF TEST = 8.25 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
8.50	84.82	64.566	0.841E-01	0.408E-01	-0.15E-01	0.97E-01
8.75	84.75	64.558	0.485E-01	0.425E-01	-0.13E-01	0.98E-01
9.00	84.68	64.551	-0.131E-01	0.441E-01	-0.11E-01	0.10E+00
9.25	84.62	64.544	-0.674E-02	0.458E-01	-0.94E-02	0.10E+00
9.50	84.57	64.537	0.131E-01	0.474E-01	-0.76E-02	0.10E+00
9.75	84.53	64.531	0.608E-01	0.491E-01	-0.57E-02	0.10E+00
10.00	84.48	64.524	0.580E-01	0.507E-01	-0.39E-02	0.11E+00
10.25	84.48	64.519	0.133E+00	0.523E-01	-0.21E-02	0.11E+00
10.50	84.38	64.513	0.260E-01	0.540E-01	-0.32E-03	0.11E+00
10.75	84.34	64.508	0.290E-01	0.556E-01	0.15E-02	0.11E+00
11.00	84.31	64.503	0.447E-01	0.573E-01	0.32E-02	0.11E+00
11.25	84.29	64.499	0.609E-01	0.589E-01	0.50E-02	0.11E+00
11.50	84.25	64.494	0.724E-01	0.606E-01	0.67E-02	0.11E+00
11.75	84.22	64.489	0.709E-01	0.622E-01	0.84E-02	0.12E+00
12.00	84.18	64.485	0.676E-01	0.639E-01	0.10E-01	0.12E+00
12.25	84.16	64.479	0.863E-01	0.655E-01	0.12E-01	0.12E+00
12.50	84.12	64.475	0.781E-01	0.671E-01	0.13E-01	0.12E+00
12.75	84.09	64.472	0.688E-01	0.688E-01	0.15E-01	0.12E+00
13.00	84.06	64.468	0.730E-01	0.704E-01	0.17E-01	0.12E+00
13.25	84.06	64.463	0.104E+00	0.721E-01	0.18E-01	0.13E+00
13.50	83.99	64.459	0.710E-01	0.737E-01	0.20E-01	0.13E+00
13.75	83.97	64.455	0.731E-01	0.754E-01	0.21E-01	0.13E+00
14.00	83.96	64.452	0.886E-01	0.770E-01	0.23E-01	0.13E+00
14.25	83.93	64.448	0.863E-01	0.787E-01	0.24E-01	0.13E+00
14.50	83.90	64.445	0.811E-01	0.803E-01	0.26E-01	0.13E+00
14.75	83.88	64.438	0.101E+00	0.819E-01	0.27E-01	0.14E+00
15.00	83.83	64.435	0.843E-01	0.836E-01	0.29E-01	0.14E+00
15.25	83.81	64.432	0.820E-01	0.852E-01	0.30E-01	0.14E+00
15.50	83.79	64.429	0.838E-01	0.869E-01	0.32E-01	0.14E+00
15.75	83.76	64.426	0.798E-01	0.885E-01	0.33E-01	0.14E+00
16.00	83.73	64.424	0.698E-01	0.902E-01	0.35E-01	0.15E+00
16.25	83.72	64.420	0.760E-01	0.918E-01	0.36E-01	0.15E+00
16.50	83.69	64.416	0.788E-01	0.935E-01	0.38E-01	0.15E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.671E-01
THE STANDARD DEVIATION IS 0.301E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 8.25 HOURS OF TEST IS 0.935E-01

TURKEY POINT 4 ILRT 50 PSIG

TIME, DATE START OF TEST 8.25 222

TIME AFTER START OF TEST = 8.25 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
8.50	84.82	64.566	0.841E-01	0.703E-01	-0.61E+00	0.75E+00
8.75	84.75	64.558	0.131E-01	0.708E-01	-0.60E+00	0.74E+00
9.00	84.68	64.551	-0.136E+00	0.714E-01	-0.60E+00	0.74E+00
9.25	84.62	64.544	0.127E-01	0.719E-01	-0.60E+00	0.74E+00
9.50	84.57	64.537	0.926E-01	0.724E-01	-0.59E+00	0.74E+00
9.75	84.53	64.531	0.299E+00	0.730E-01	-0.59E+00	0.74E+00
10.00	84.48	64.524	0.410E-01	0.735E-01	-0.59E+00	0.73E+00
10.25	84.48	64.519	0.662E+00	0.741E-01	-0.59E+00	0.73E+00
10.50	84.38	64.513	-0.834E+00	0.746E-01	-0.58E+00	0.73E+00
10.75	84.34	64.508	0.564E-01	0.751E-01	-0.58E+00	0.73E+00
11.00	84.31	64.503	0.201E+00	0.757E-01	-0.58E+00	0.73E+00
11.25	84.29	64.499	0.240E+00	0.762E-01	-0.58E+00	0.73E+00
11.50	84.25	64.494	0.210E+00	0.768E-01	-0.58E+00	0.73E+00
11.75	84.22	64.489	0.512E-01	0.773E-01	-0.57E+00	0.73E+00
12.00	84.18	64.485	0.219E-01	0.778E-01	-0.57E+00	0.73E+00
12.25	84.16	64.479	0.367E+00	0.784E-01	-0.57E+00	0.73E+00
12.50	84.12	64.475	-0.525E-01	0.789E-01	-0.57E+00	0.73E+00
12.75	84.09	64.472	-0.893E-01	0.795E-01	-0.57E+00	0.73E+00
13.00	84.06	64.468	0.149E+00	0.800E-01	-0.57E+00	0.73E+00
13.25	84.06	64.463	0.692E+00	0.806E-01	-0.57E+00	0.73E+00
13.50	83.99	64.459	-0.588E+00	0.811E-01	-0.57E+00	0.73E+00
13.75	83.97	64.455	0.117E+00	0.816E-01	-0.57E+00	0.73E+00
14.00	83.96	64.452	0.429E+00	0.822E-01	-0.57E+00	0.74E+00
14.25	83.93	64.448	0.336E-01	0.827E-01	-0.57E+00	0.74E+00
14.50	83.90	64.445	-0.418E-01	0.833E-01	-0.57E+00	0.74E+00
14.75	83.88	64.438	0.607E+00	0.838E-01	-0.58E+00	0.74E+00
15.00	83.83	64.435	-0.360E+00	0.843E-01	-0.58E+00	0.75E+00
15.25	83.81	64.432	0.217E-01	0.849E-01	-0.58E+00	0.75E+00
15.50	83.79	64.429	0.134E+00	0.854E-01	-0.58E+00	0.75E+00
15.75	83.76	64.426	-0.358E-01	0.860E-01	-0.58E+00	0.75E+00
16.00	83.73	64.424	-0.229E+00	0.865E-01	-0.58E+00	0.76E+00
16.25	83.72	64.420	0.266E+00	0.870E-01	-0.59E+00	0.76E+00
16.50	83.69	64.416	0.170E+00	0.876E-01	-0.59E+00	0.76E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.789E-01
THE STANDARD DEVIATION IS 0.309E+00
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 8.25 HOURS OF TEST IS 0.876E-01

PILGRIM 23 PISG ILRT SUMMARY DATA

715	418	74.956247	37.397087
735	418	74.884465	37.391397
755	418	74.822480	37.384053
815	418	74.758759	37.377854
835	418	74.716776	37.374887
855	418	74.669914	37.367402
915	418	74.629765	37.361652
935	418	74.588752	37.356888
955	418	74.555734	37.357893
1015	418	74.525414	37.349307
1035	418	74.501325	37.348976
1055	418	74.473636	37.345291
1115	418	74.439338	37.339716
1135	418	74.489973	37.338033
1155	418	74.382644	37.331306
1215	418	74.350527	37.328240
1235	418	74.333984	37.326899
1255	418	74.324568	37.325108
1315	418	74.300512	37.320589
1335	418	74.284869	37.319066
1355	418	74.268775	37.313377
1415	418	74.251817	37.314480
1435	418	74.239738	37.309047
1455	418	74.227694	37.305922
1515	418	74.221429	37.303091
1535	418	74.211597	37.303124
1555	418	74.199554	37.298808
1615	418	74.196404	37.294480
1635	418	74.195953	37.294297
1655	418	74.176330	37.299638
1715	418	74.166501	37.289633
1735	418	74.156672	37.290367
1755	418	74.149091	37.288216
1815	418	74.142794	37.288114
1835	418	74.129364	37.284904
1855	418	74.116418	37.283180
1915	418	74.102989	37.279352
1935	418	74.092295	37.279016
1955	418	74.095825	37.275826
2015	418	74.094475	37.274938
2035	418	74.088660	37.273129
2055	418	74.085546	37.269678
2115	418	74.085060	37.267064
2135	418	74.077931	37.264915
2155	418	74.066338	37.264094
2215	418	74.052730	37.265483
2235	418	74.053808	37.260200
2255	418	74.056923	37.257604
2315	418	74.049344	37.258600
2335	418	74.038165	37.256002
2355	418	74.039480	37.251978

PILGRIM 23 PSIG ILRT SUMMARY DATA (CONTINUED)

15	419	74.031035	37.248387
35	419	74.028788	37.247786
55	419	74.026123	37.247563
115	419	74.020791	37.245894
135	419	74.021690	37.245565
155	419	74.027922	37.240999
215	419	74.027055	37.236922
235	419	74.021690	37.233720
255	419	74.023040	37.233552
315	419	74.022175	37.235061
335	419	74.021690	37.233809
355	419	74.013159	37.227861
415	419	74.011964	37.229668
435	419	74.009716	37.225339
455	419	74.007464	37.225919
515	419	74.007882	37.222779
535	419	74.004315	37.221340
555	419	74.004350	37.219682
615	419	74.003934	37.216374
635	419	74.006634	37.215075
655	419	74.005666	37.214469
715	419	73.994971	37.210235

PILGRIM 23 PSIG ILRT

TIME, DATE START OF TEST 7.25 418

TIME AFTER START OF TEST = 24.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.00	4	0.277E+00	0.386E+00	
1.33	5	0.273E+00	0.332E+00	-0.540E-01
1.67	6	0.293E+00	0.372E+00	0.395E-01
2.00	7	0.312E+00	0.408E+00	0.358E-01
2.33	8	0.324E+00	0.424E+00	0.165E-01
2.67	9	0.317E+00	0.379E+00	-0.451E-01
3.00	10	0.324E+00	0.390E+00	0.105E-01
3.33	11	0.323E+00	0.374E+00	-0.154E-01
3.67	12	0.322E+00	0.363E+00	-0.108E-01
4.00	13	0.324E+00	0.362E+00	-0.914E-03
4.33	14	0.329E+00	0.376E+00	0.132E-01
4.67	15	0.331E+00	0.376E+00	-0.757E-05
5.00	16	0.331E+00	0.372E+00	-0.333E-02
5.33	17	0.331E+00	0.365E+00	-0.715E-02
5.67	18	0.330E+00	0.358E+00	-0.720E-02
6.00	19	0.330E+00	0.355E+00	-0.334E-02
6.33	20	0.329E+00	0.349E+00	-0.534E-02
6.67	21	0.330E+00	0.350E+00	0.732E-03
7.00	22	0.329E+00	0.344E+00	-0.606E-02
7.33	23	0.329E+00	0.343E+00	-0.707E-03
7.67	24	0.329E+00	0.343E+00	0.133E-03
8.00	25	0.330E+00	0.344E+00	0.903E-03
8.33	26	0.329E+00	0.342E+00	-0.214E-02
8.67	27	0.330E+00	0.342E+00	0.558E-04
9.00	28	0.330E+00	0.345E+00	0.240E-02
9.33	29	0.331E+00	0.345E+00	0.527E-03
9.67	30	0.329E+00	0.338E+00	-0.694E-02
10.00	31	0.329E+00	0.338E+00	0.219E-03
10.33	32	0.329E+00	0.336E+00	-0.223E-02
10.67	33	0.329E+00	0.334E+00	-0.202E-02
11.00	34	0.328E+00	0.331E+00	-0.315E-02
11.33	35	0.327E+00	0.329E+00	-0.240E-02
11.67	36	0.327E+00	0.326E+00	-0.264E-02
12.00	37	0.326E+00	0.324E+00	-0.164E-02
12.33	38	0.325E+00	0.322E+00	-0.258E-02
12.67	39	0.325E+00	0.320E+00	-0.139E-02

13.00	40	0.325E+00	0.319E+00	-0.166E-02
13.33	41	0.324E+00	0.317E+00	-0.160E-02
13.67	42	0.324E+00	0.316E+00	-0.733E-03
14.00	43	0.324E+00	0.316E+00	-0.265E-03
14.33	44	0.324E+00	0.316E+00	-0.238E-03
14.67	45	0.323E+00	0.315E+00	-0.844E-03
15.00	46	0.323E+00	0.313E+00	-0.223E-02
15.33	47	0.322E+00	0.312E+00	-0.707E-03
15.67	48	0.322E+00	0.312E+00	-0.242E-03
16.00	49	0.322E+00	0.311E+00	-0.124E-02
16.33	50	0.321E+00	0.310E+00	-0.107E-02
16.67	51	0.321E+00	0.309E+00	-0.233E-03
17.00	52	0.321E+00	0.309E+00	0.185E-03
17.33	53	0.321E+00	0.309E+00	-0.156E-03
17.67	54	0.321E+00	0.309E+00	-0.565E-03
18.00	55	0.320E+00	0.308E+00	-0.602E-03
18.33	56	0.320E+00	0.307E+00	-0.857E-03
18.67	57	0.320E+00	0.307E+00	0.214E-04
19.00	58	0.320E+00	0.308E+00	0.577E-03
19.33	59	0.320E+00	0.309E+00	0.805E-03
19.67	60	0.320E+00	0.309E+00	0.453E-03
20.00	61	0.320E+00	0.309E+00	-0.246E-03
20.33	62	0.320E+00	0.309E+00	-0.309E-03
20.67	63	0.320E+00	0.309E+00	0.514E-03
21.00	64	0.320E+00	0.309E+00	-0.254E-03
21.33	65	0.320E+00	0.309E+00	0.234E-03
21.67	66	0.319E+00	0.309E+00	-0.202E-03
22.00	67	0.319E+00	0.309E+00	0.809E-04
22.33	68	0.319E+00	0.309E+00	0.402E-05
22.67	69	0.319E+00	0.309E+00	0.112E-04
23.00	70	0.319E+00	0.309E+00	0.274E-03
23.33	71	0.319E+00	0.309E+00	0.237E-03
23.67	72	0.319E+00	0.310E+00	0.809E-04
24.00	73	0.319E+00	0.310E+00	0.330E-03

THE CALCULATED LEAK RATE IS 0.310E+00
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.500E+00
THE LAST 0 DATA POINTS ESTABLISH A NEGATIVE SLOPE

PILGRIM 23 PSIG ILRT

TIME, DATE START OF TEST 7.25 418

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
7.58	74.88	37.391	0.129E+00	0.329E+00	0.26E+00	0.40E+00
7.92	74.82	37.384	0.354E+00	0.328E+00	0.26E+00	0.40E+00
8.25	74.76	37.378	0.348E+00	0.328E+00	0.26E+00	0.40E+00
8.58	74.72	37.375	0.262E+00	0.328E+00	0.26E+00	0.40E+00
8.92	74.67	37.367	0.372E+00	0.327E+00	0.26E+00	0.40E+00
9.25	74.63	37.362	0.404E+00	0.327E+00	0.26E+00	0.40E+00
9.58	74.59	37.357	0.399E+00	0.327E+00	0.26E+00	0.40E+00
9.92	74.56	37.358	0.269E+00	0.327E+00	0.26E+00	0.39E+00
10.25	74.53	37.349	0.378E+00	0.326E+00	0.26E+00	0.39E+00
10.58	74.50	37.349	0.314E+00	0.326E+00	0.26E+00	0.39E+00
10.92	74.47	37.345	0.316E+00	0.326E+00	0.26E+00	0.39E+00
11.25	74.44	37.340	0.341E+00	0.326E+00	0.26E+00	0.39E+00
11.58	74.49	37.338	0.392E+00	0.325E+00	0.26E+00	0.39E+00
11.92	74.38	37.331	0.353E+00	0.325E+00	0.26E+00	0.39E+00
12.25	74.35	37.328	0.340E+00	0.325E+00	0.26E+00	0.39E+00
12.58	74.33	37.327	0.321E+00	0.325E+00	0.26E+00	0.39E+00
12.92	74.32	37.325	0.315E+00	0.324E+00	0.26E+00	0.39E+00
13.25	74.30	37.321	0.328E+00	0.324E+00	0.26E+00	0.39E+00
13.58	74.28	37.319	0.315E+00	0.324E+00	0.26E+00	0.39E+00
13.92	74.27	37.313	0.343E+00	0.324E+00	0.26E+00	0.39E+00
14.25	74.25	37.314	0.306E+00	0.323E+00	0.26E+00	0.39E+00
14.58	74.24	37.309	0.332E+00	0.323E+00	0.26E+00	0.39E+00
14.92	74.23	37.306	0.337E+00	0.323E+00	0.26E+00	0.39E+00
15.25	74.22	37.303	0.342E+00	0.322E+00	0.26E+00	0.39E+00
15.58	74.21	37.303	0.323E+00	0.322E+00	0.25E+00	0.39E+00
15.92	74.20	37.299	0.336E+00	0.322E+00	0.25E+00	0.39E+00
16.25	74.20	37.294	0.353E+00	0.322E+00	0.25E+00	0.39E+00
16.58	74.20	37.294	0.342E+00	0.321E+00	0.25E+00	0.39E+00
16.92	74.18	37.300	0.285E+00	0.321E+00	0.25E+00	0.39E+00
17.25	74.17	37.290	0.336E+00	0.321E+00	0.25E+00	0.39E+00
17.58	74.16	37.290	0.316E+00	0.321E+00	0.25E+00	0.39E+00
17.92	74.15	37.288	0.316E+00	0.320E+00	0.25E+00	0.39E+00
18.25	74.14	37.288	0.304E+00	0.320E+00	0.25E+00	0.39E+00
18.58	74.13	37.285	0.308E+00	0.320E+00	0.25E+00	0.39E+00
18.92	74.12	37.283	0.304E+00	0.320E+00	0.25E+00	0.39E+00
19.25	74.10	37.279	0.311E+00	0.319E+00	0.25E+00	0.39E+00
19.58	74.09	37.279	0.300E+00	0.319E+00	0.25E+00	0.39E+00
19.92	74.10	37.276	0.310E+00	0.319E+00	0.25E+00	0.39E+00
20.25	74.09	37.275	0.306E+00	0.319E+00	0.25E+00	0.39E+00
20.58	74.09	37.273	0.305E+00	0.318E+00	0.25E+00	0.39E+00
20.92	74.09	37.270	0.313E+00	0.318E+00	0.25E+00	0.39E+00
21.25	74.09	37.267	0.317E+00	0.318E+00	0.25E+00	0.39E+00
21.58	74.08	37.265	0.317E+00	0.317E+00	0.25E+00	0.38E+00
21.92	74.07	37.264	0.310E+00	0.317E+00	0.25E+00	0.38E+00

22.25	74.05	37.265	0.293E+00	0.317E+00	0.25E+00	0.38E+00
22.58	74.05	37.260	0.309E+00	0.317E+00	0.25E+00	0.38E+00
22.92	74.06	37.258	0.314E+00	0.316E+00	0.25E+00	0.38E+00
23.25	74.05	37.259	0.302E+00	0.316E+00	0.25E+00	0.38E+00
23.58	74.04	37.256	0.303E+00	0.316E+00	0.25E+00	0.38E+00
23.92	74.04	37.252	0.312E+00	0.316E+00	0.25E+00	0.38E+00
24.25	74.03	37.248	0.318E+00	0.315E+00	0.25E+00	0.38E+00
24.58	74.03	37.248	0.313E+00	0.315E+00	0.25E+00	0.38E+00
24.92	74.03	37.248	0.307E+00	0.315E+00	0.25E+00	0.38E+00
25.25	74.02	37.246	0.306E+00	0.315E+00	0.25E+00	0.38E+00
25.58	74.02	37.246	0.302E+00	0.314E+00	0.25E+00	0.38E+00
25.92	74.03	37.241	0.314E+00	0.314E+00	0.25E+00	0.38E+00
26.25	74.03	37.237	0.322E+00	0.314E+00	0.25E+00	0.38E+00
26.58	74.02	37.234	0.326E+00	0.314E+00	0.25E+00	0.38E+00
26.92	74.02	37.234	0.321E+00	0.313E+00	0.25E+00	0.38E+00
27.25	74.02	37.235	0.311E+00	0.313E+00	0.25E+00	0.38E+00
27.58	74.02	37.234	0.310E+00	0.313E+00	0.24E+00	0.38E+00
27.92	74.02	37.228	0.322E+00	0.313E+00	0.24E+00	0.38E+00
28.25	74.01	37.230	0.310E+00	0.312E+00	0.24E+00	0.38E+00
28.58	74.01	37.225	0.318E+00	0.312E+00	0.24E+00	0.38E+00
28.92	74.01	37.226	0.311E+00	0.312E+00	0.24E+00	0.38E+00
29.25	74.01	37.223	0.315E+00	0.311E+00	0.24E+00	0.38E+00
29.58	74.00	37.221	0.314E+00	0.311E+00	0.24E+00	0.38E+00
29.92	74.00	37.220	0.314E+00	0.311E+00	0.24E+00	0.38E+00
30.25	74.00	37.216	0.319E+00	0.311E+00	0.24E+00	0.38E+00
30.58	74.01	37.215	0.318E+00	0.310E+00	0.24E+00	0.38E+00
30.92	74.01	37.214	0.315E+00	0.310E+00	0.24E+00	0.38E+00
31.25	73.99	37.210	0.320E+00	0.310E+00	0.24E+00	0.38E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.319E+00
THE STANDARD DEVIATION IS 0.337E-01
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.310E+00

PILGRIM 23 PSIG ILRT

TIME, DATE START OF TEST 7.25 418

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
7.58	74.88	37.391	0.129E+00	0.308E+00	-0.69E+00	0.13E+01
7.92	74.82	37.384	0.579E+00	0.308E+00	-0.69E+00	0.13E+01
8.25	74.76	37.378	0.336E+00	0.308E+00	-0.69E+00	0.13E+01
8.58	74.72	37.375	0.581E-02	0.309E+00	-0.69E+00	0.13E+01
8.92	74.67	37.367	0.811E+00	0.309E+00	-0.69E+00	0.13E+01
9.25	74.63	37.362	0.567E+00	0.309E+00	-0.68E+00	0.13E+01
9.58	74.59	37.357	0.365E+00	0.310E+00	-0.68E+00	0.13E+01
9.92	74.56	37.358	-0.639E+00	0.310E+00	-0.68E+00	0.13E+01
10.25	74.53	37.349	0.125E+01	0.311E+00	-0.68E+00	0.13E+01
10.58	74.50	37.349	-0.261E+00	0.311E+00	-0.68E+00	0.13E+01
10.92	74.47	37.345	0.337E+00	0.311E+00	-0.68E+00	0.13E+01
11.25	74.44	37.340	0.613E+00	0.312E+00	-0.68E+00	0.13E+01
11.58	74.49	37.338	0.101E+01	0.312E+00	-0.68E+00	0.13E+01
11.92	74.38	37.331	-0.150E+00	0.312E+00	-0.67E+00	0.13E+01
12.25	74.35	37.328	0.158E+00	0.313E+00	-0.67E+00	0.13E+01
12.58	74.33	37.327	0.357E-01	0.313E+00	-0.67E+00	0.13E+01
12.92	74.32	37.325	0.218E+00	0.314E+00	-0.67E+00	0.13E+01
13.25	74.30	37.321	0.547E+00	0.314E+00	-0.67E+00	0.13E+01
13.58	74.28	37.319	0.830E-01	0.314E+00	-0.67E+00	0.13E+01
13.92	74.27	37.313	0.881E+00	0.315E+00	-0.67E+00	0.13E+01
14.25	74.25	37.314	-0.441E+00	0.315E+00	-0.67E+00	0.13E+01
14.58	74.24	37.309	0.885E+00	0.315E+00	-0.67E+00	0.13E+01
14.92	74.23	37.306	0.441E+00	0.316E+00	-0.67E+00	0.13E+01
15.25	74.22	37.303	0.462E+00	0.316E+00	-0.67E+00	0.13E+01
15.58	74.21	37.303	-0.139E+00	0.317E+00	-0.66E+00	0.13E+01
15.92	74.20	37.299	0.671E+00	0.317E+00	-0.66E+00	0.13E+01
16.25	74.20	37.294	0.793E+00	0.317E+00	-0.66E+00	0.13E+01
16.58	74.20	37.294	0.293E-01	0.318E+00	-0.66E+00	0.13E+01
16.92	74.18	37.300	-0.130E+01	0.318E+00	-0.66E+00	0.13E+01
17.25	74.17	37.290	0.180E+01	0.319E+00	-0.66E+00	0.13E+01
17.58	74.16	37.290	-0.274E+00	0.319E+00	-0.66E+00	0.13E+01
17.92	74.15	37.288	0.313E+00	0.319E+00	-0.66E+00	0.13E+01
18.25	74.14	37.288	-0.651E-01	0.320E+00	-0.66E+00	0.13E+01
18.58	74.13	37.285	0.439E+00	0.320E+00	-0.66E+00	0.13E+01
18.92	74.12	37.283	0.158E+00	0.320E+00	-0.66E+00	0.13E+01
19.25	74.10	37.279	0.558E+00	0.321E+00	-0.66E+00	0.13E+01
19.58	74.09	37.279	-0.793E-01	0.321E+00	-0.66E+00	0.13E+01
19.92	74.10	37.276	0.664E+00	0.322E+00	-0.66E+00	0.13E+01

20.25	74.09	37.275	0.153E+00	0.322E+00	-0.66E+00	0.13E+01
20.58	74.09	37.273	0.271E+00	0.322E+00	-0.66E+00	0.13E+01
20.92	74.09	37.270	0.625E+00	0.323E+00	-0.66E+00	0.13E+01
21.25	74.09	37.267	0.499E+00	0.323E+00	-0.66E+00	0.13E+01
21.58	74.08	37.265	0.319E+00	0.323E+00	-0.66E+00	0.13E+01
21.92	74.07	37.264	0.239E-02	0.324E+00	-0.66E+00	0.13E+01
22.25	74.05	37.265	-0.452E+00	0.324E+00	-0.66E+00	0.13E+01
22.58	74.05	37.260	0.104E+01	0.325E+00	-0.66E+00	0.13E+01
22.92	74.06	37.258	0.544E+00	0.325E+00	-0.66E+00	0.13E+01
23.25	74.05	37.259	-0.295E+00	0.325E+00	-0.66E+00	0.13E+01
23.58	74.04	37.256	0.351E+00	0.326E+00	-0.66E+00	0.13E+01
23.92	74.04	37.252	0.795E+00	0.326E+00	-0.66E+00	0.13E+01
24.25	74.03	37.248	0.580E+00	0.326E+00	-0.66E+00	0.13E+01
24.58	74.03	37.248	0.860E-01	0.327E+00	-0.66E+00	0.13E+01
24.92	74.03	37.248	0.734E-02	0.327E+00	-0.66E+00	0.13E+01
25.25	74.02	37.246	0.251E+00	0.328E+00	-0.66E+00	0.13E+01
25.58	74.02	37.246	0.759E-01	0.328E+00	-0.66E+00	0.13E+01
25.92	74.03	37.241	0.967E+00	0.328E+00	-0.66E+00	0.13E+01
26.25	74.03	37.237	0.777E+00	0.329E+00	-0.66E+00	0.13E+01
26.58	74.02	37.234	0.547E+00	0.329E+00	-0.66E+00	0.13E+01
26.92	74.02	37.234	0.506E-01	0.330E+00	-0.66E+00	0.13E+01
27.25	74.02	37.235	-0.303E+00	0.330E+00	-0.66E+00	0.13E+01
27.58	74.02	37.234	0.236E+00	0.330E+00	-0.66E+00	0.13E+01
27.92	74.02	37.228	0.110E+01	0.331E+00	-0.66E+00	0.13E+01
28.25	74.01	37.230	-0.433E+00	0.331E+00	-0.66E+00	0.13E+01
28.58	74.01	37.225	0.807E+00	0.331E+00	-0.66E+00	0.13E+01
28.92	74.01	37.226	-0.142E+00	0.332E+00	-0.66E+00	0.13E+01
29.25	74.01	37.223	0.613E+00	0.332E+00	-0.66E+00	0.13E+01
29.58	74.00	37.221	0.230E+00	0.333E+00	-0.66E+00	0.13E+01
29.92	74.00	37.220	0.321E+00	0.333E+00	-0.66E+00	0.13E+01
30.25	74.00	37.216	0.634E+00	0.333E+00	-0.66E+00	0.13E+01
30.58	74.01	37.215	0.288E+00	0.334E+00	-0.66E+00	0.13E+01
30.92	74.01	37.214	0.104E+00	0.334E+00	-0.66E+00	0.13E+01
31.25	73.99	37.210	0.675E+00	0.334E+00	-0.66E+00	0.13E+01

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.321E+00
THE STANDARD DEVIATION IS 0.484E+00
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.334E+00

PILGRIM 45 PSIG ILRT SUMMARY DATA

815	420	75.530509	59.493123
835	420	75.465268	59.479157
855	420	75.378119	59.474186
915	420	75.321808	59.465077
935	420	75.278406	59.456510
955	420	75.234967	59.449432
1015	420	75.167063	59.445488
1035	420	75.129025	59.433773
1055	420	75.086038	59.430581
1115	420	75.052466	59.424549
1135	420	75.015398	59.415545
1155	420	74.988990	59.402711
1215	420	74.973277	59.400989
1235	420	74.945069	59.397480
1255	420	74.914613	59.392164
1315	420	74.887752	59.384505
1335	420	74.863111	59.379062
1355	420	74.840268	59.371660
1415	420	74.812961	59.368823
1435	420	74.792818	59.366491
1455	420	74.768590	59.363531
1515	420	74.746199	59.356734
1535	420	74.717054	59.352393
1555	420	74.699645	59.347544
1615	420	74.687947	59.346126
1635	420	74.676732	59.340964
1655	420	74.666835	59.335658
1715	420	74.649356	59.329447
1735	420	74.639042	59.329026
1755	420	74.636759	59.325980
1815	420	74.625579	59.320415
1835	420	74.613429	59.318282
1855	420	74.602633	59.315822
1915	420	74.589652	59.311317
1935	420	74.582904	59.305324
1955	420	74.571654	59.302150
2015	420	74.562691	59.299856
2035	420	74.549228	59.294548
2055	420	74.542892	59.292763
2115	420	74.536179	59.287955
2135	420	74.529914	59.282415
2155	420	74.524480	59.280928
2215	420	74.530225	59.273963
2235	420	74.520811	59.276377
2255	420	74.523026	59.271748
2315	420	74.529222	59.268713
2335	420	74.526522	59.263216
2355	420	74.524687	59.262844

PILGRIM 45 PSIG ILRT SUMMARY
DATA (CONTINUED)

15	421	74.521538	59.258831
35	421	74.517939	59.253901
55	421	74.518354	59.252742
115	421	74.516037	59.247725
135	421	74.511606	59.242919
155	421	74.505756	59.241808
215	421	74.509252	59.240819
235	421	74.502122	59.233835
255	421	74.499422	59.232433
315	421	74.501152	59.232405
335	421	74.494438	59.229040
355	421	74.489073	59.226974
415	421	74.490354	59.225880
435	421	74.484089	59.221130
455	421	74.484956	59.213707
515	421	74.485405	59.213853
535	421	74.477791	59.214845
555	421	74.474191	59.206680
615	421	74.471040	59.202733
635	421	74.469657	59.204212
655	421	74.463392	59.202150
715	421	74.464706	59.198134
735	421	74.461143	59.190996
755	421	74.462457	59.191835
815	421	74.454427	59.191020

PILGRIM 45 PSIG ILRT

TIME, DATE START OF TEST 8.25 420

TIME AFTER START OF TEST = 24.00 HR

TRENDS BASED ON TOTAL-TIME CALCULATIONS

HOURS OF TEST	DATA ENTRIES	MEAN OF CALC LR	CALCULATED LEAK RATE	CHG IN CALC LR FROM LAST POINT
1.00	4	0.372E+00	0.667E-01	
1.33	5	0.344E+00	0.110E+00	0.432E-01
1.67	6	0.328E+00	0.139E+00	0.298E-01
2.00	7	0.297E+00	0.974E-01	-0.417E-01
2.33	8	0.291E+00	0.127E+00	0.297E-01
2.67	9	0.280E+00	0.125E+00	-0.235E-02
3.00	10	0.272E+00	0.129E+00	0.394E-02
3.33	11	0.269E+00	0.146E+00	0.172E-01
3.67	12	0.275E+00	0.187E+00	0.407E-01
4.00	13	0.277E+00	0.209E+00	0.223E-01
4.33	14	0.278E+00	0.221E+00	0.117E-01
4.67	15	0.278E+00	0.229E+00	0.833E-02
5.00	16	0.280E+00	0.240E+00	0.114E-01
5.33	17	0.281E+00	0.250E+00	0.959E-02
5.67	18	0.283E+00	0.262E+00	0.115E-01
6.00	19	0.284E+00	0.267E+00	0.569E-02
6.33	20	0.284E+00	0.269E+00	0.175E-02
6.67	21	0.283E+00	0.268E+00	-0.795E-03
7.00	22	0.283E+00	0.270E+00	0.148E-02
7.33	23	0.283E+00	0.270E+00	0.909E-04
7.67	24	0.283E+00	0.270E+00	0.679E-03
8.00	25	0.283E+00	0.269E+00	-0.115E-02
8.33	26	0.282E+00	0.270E+00	0.222E-03
8.67	27	0.282E+00	0.271E+00	0.151E-02
9.00	28	0.283E+00	0.274E+00	0.260E-02
9.33	29	0.283E+00	0.274E+00	0.430E-03
9.67	30	0.283E+00	0.275E+00	0.627E-03
10.00	31	0.283E+00	0.276E+00	0.160E-02
10.33	32	0.283E+00	0.277E+00	0.638E-03
10.67	33	0.283E+00	0.277E+00	0.103E-02
11.00	34	0.283E+00	0.277E+00	0.418E-03
11.33	35	0.283E+00	0.279E+00	0.155E-02
11.67	36	0.284E+00	0.280E+00	0.122E-02
12.00	37	0.284E+00	0.281E+00	0.677E-03
12.33	38	0.284E+00	0.282E+00	0.114E-02
12.67	39	0.284E+00	0.283E+00	0.578E-03

13.00	40	0.284E+00	0.284E+00	0.104E-02
13.33	41	0.285E+00	0.285E+00	0.168E-02
13.67	42	0.285E+00	0.286E+00	0.110E-02
14.00	43	0.286E+00	0.289E+00	0.236E-02
14.33	44	0.286E+00	0.289E+00	0.646E-03
14.67	45	0.286E+00	0.291E+00	0.120E-02
15.00	46	0.287E+00	0.292E+00	0.139E-02
15.33	47	0.287E+00	0.294E+00	0.188E-02
15.67	48	0.288E+00	0.295E+00	0.124E-02
16.00	49	0.288E+00	0.297E+00	0.138E-02
16.33	50	0.289E+00	0.298E+00	0.166E-02
16.67	51	0.289E+00	0.299E+00	0.129E-02
17.00	52	0.290E+00	0.301E+00	0.160E-02
17.33	53	0.290E+00	0.303E+00	0.179E-02
17.67	54	0.291E+00	0.304E+00	0.130E-02
18.00	55	0.291E+00	0.305E+00	0.102E-02
18.33	56	0.292E+00	0.307E+00	0.152E-02
18.67	57	0.292E+00	0.308E+00	0.119E-02
19.00	58	0.292E+00	0.309E+00	0.762E-03
19.33	59	0.293E+00	0.309E+00	0.724E-03
19.67	60	0.293E+00	0.310E+00	0.520E-03
20.00	61	0.293E+00	0.310E+00	0.314E-03
20.33	62	0.293E+00	0.311E+00	0.493E-03
20.67	63	0.294E+00	0.312E+00	0.107E-02
21.00	64	0.294E+00	0.312E+00	0.675E-03
21.33	65	0.294E+00	0.313E+00	0.134E-03
21.67	66	0.295E+00	0.313E+00	0.704E-03
22.00	67	0.295E+00	0.314E+00	0.776E-03
22.33	68	0.295E+00	0.314E+00	0.282E-03
22.67	69	0.295E+00	0.314E+00	0.146E-03
23.00	70	0.296E+00	0.315E+00	0.295E-03
23.33	71	0.296E+00	0.315E+00	0.678E-03
23.67	72	0.296E+00	0.316E+00	0.334E-03
24.00	73	0.296E+00	0.316E+00	0.700E-04

THE CALCULATED LEAK RATE IS 0.316E+00
THE MAXIMUM ALLOWABLE LEAK RATE IS 0.500E+00
THE LAST 0 DATA POINTS ESTABLISH A NEGATIVE SLOPE

PILGRIM 45 PSIG ILRT

TIME, DATE START OF TEST 8.25 420

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON TOTAL-TIME CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
8.58	75.47	59.479	0.805E+00	0.277E+00	0.13E+00	0.42E+00
8.92	75.38	59.474	0.119E+00	0.277E+00	0.13E+00	0.42E+00
9.25	75.32	59.465	0.194E+00	0.278E+00	0.13E+00	0.42E+00
9.58	75.28	59.457	0.260E+00	0.278E+00	0.13E+00	0.42E+00
9.92	75.23	59.449	0.263E+00	0.279E+00	0.13E+00	0.42E+00
10.25	75.17	59.445	0.145E+00	0.279E+00	0.13E+00	0.42E+00
10.58	75.13	59.434	0.254E+00	0.280E+00	0.14E+00	0.42E+00
10.92	75.09	59.431	0.198E+00	0.281E+00	0.14E+00	0.42E+00
11.25	75.05	59.424	0.208E+00	0.281E+00	0.14E+00	0.43E+00
11.58	75.02	59.416	0.246E+00	0.282E+00	0.14E+00	0.43E+00
11.92	74.99	59.403	0.333E+00	0.282E+00	0.14E+00	0.43E+00
12.25	74.97	59.401	0.304E+00	0.283E+00	0.14E+00	0.43E+00
12.58	74.95	59.398	0.284E+00	0.283E+00	0.14E+00	0.43E+00
12.92	74.91	59.392	0.281E+00	0.284E+00	0.14E+00	0.43E+00
13.25	74.89	59.385	0.300E+00	0.284E+00	0.14E+00	0.43E+00
13.58	74.86	59.379	0.301E+00	0.285E+00	0.14E+00	0.43E+00
13.92	74.84	59.372	0.318E+00	0.286E+00	0.14E+00	0.43E+00
14.25	74.81	59.369	0.300E+00	0.286E+00	0.14E+00	0.43E+00
14.58	74.79	59.366	0.284E+00	0.287E+00	0.14E+00	0.43E+00
14.92	74.77	59.364	0.272E+00	0.287E+00	0.14E+00	0.43E+00
15.25	74.75	59.357	0.284E+00	0.288E+00	0.14E+00	0.43E+00
15.58	74.72	59.352	0.277E+00	0.288E+00	0.15E+00	0.43E+00
15.92	74.70	59.347	0.281E+00	0.289E+00	0.15E+00	0.43E+00
16.25	74.69	59.346	0.269E+00	0.289E+00	0.15E+00	0.43E+00
16.58	74.68	59.341	0.277E+00	0.290E+00	0.15E+00	0.43E+00
16.92	74.67	59.336	0.286E+00	0.290E+00	0.15E+00	0.43E+00
17.25	74.65	59.329	0.295E+00	0.291E+00	0.15E+00	0.43E+00
17.58	74.64	59.329	0.281E+00	0.292E+00	0.15E+00	0.43E+00
17.92	74.64	59.326	0.283E+00	0.292E+00	0.15E+00	0.43E+00
18.25	74.63	59.320	0.291E+00	0.293E+00	0.15E+00	0.44E+00
18.58	74.61	59.318	0.285E+00	0.293E+00	0.15E+00	0.44E+00
18.92	74.60	59.316	0.281E+00	0.294E+00	0.15E+00	0.44E+00
19.25	74.59	59.311	0.284E+00	0.294E+00	0.15E+00	0.44E+00
19.58	74.58	59.305	0.294E+00	0.295E+00	0.15E+00	0.44E+00
19.92	74.57	59.302	0.292E+00	0.295E+00	0.15E+00	0.44E+00

20.25	74.56	59.300	0.288E+00	0.296E+00	0.15E+00	0.44E+00
20.58	74.55	59.294	0.293E+00	0.297E+00	0.15E+00	0.44E+00
20.92	74.54	59.293	0.289E+00	0.297E+00	0.15E+00	0.44E+00
21.25	74.54	59.288	0.294E+00	0.298E+00	0.16E+00	0.44E+00
21.58	74.53	59.282	0.301E+00	0.298E+00	0.16E+00	0.44E+00
21.92	74.52	59.281	0.297E+00	0.299E+00	0.16E+00	0.44E+00
22.25	74.53	59.274	0.311E+00	0.299E+00	0.16E+00	0.44E+00
22.58	74.52	59.276	0.295E+00	0.300E+00	0.16E+00	0.44E+00
22.92	74.52	59.272	0.301E+00	0.300E+00	0.16E+00	0.44E+00
23.25	74.53	59.269	0.305E+00	0.301E+00	0.16E+00	0.44E+00
23.58	74.53	59.263	0.312E+00	0.302E+00	0.16E+00	0.44E+00
23.92	74.52	59.263	0.306E+00	0.302E+00	0.16E+00	0.44E+00
24.25	74.52	59.259	0.308E+00	0.303E+00	0.16E+00	0.45E+00
24.58	74.52	59.254	0.313E+00	0.303E+00	0.16E+00	0.45E+00
24.92	74.52	59.253	0.310E+00	0.304E+00	0.16E+00	0.45E+00
25.25	74.52	59.248	0.315E+00	0.304E+00	0.16E+00	0.45E+00
25.58	74.51	59.243	0.319E+00	0.305E+00	0.16E+00	0.45E+00
25.92	74.51	59.242	0.314E+00	0.305E+00	0.16E+00	0.45E+00
26.25	74.51	59.241	0.312E+00	0.306E+00	0.16E+00	0.45E+00
26.58	74.50	59.234	0.320E+00	0.306E+00	0.16E+00	0.45E+00
26.92	74.50	59.232	0.316E+00	0.307E+00	0.16E+00	0.45E+00
27.25	74.50	59.232	0.311E+00	0.308E+00	0.16E+00	0.45E+00
27.58	74.49	59.229	0.311E+00	0.308E+00	0.16E+00	0.45E+00
27.92	74.49	59.227	0.309E+00	0.309E+00	0.17E+00	0.45E+00
28.25	74.49	59.226	0.306E+00	0.309E+00	0.17E+00	0.45E+00
28.58	74.48	59.221	0.309E+00	0.310E+00	0.17E+00	0.45E+00
28.92	74.48	59.214	0.319E+00	0.310E+00	0.17E+00	0.45E+00
29.25	74.49	59.214	0.314E+00	0.311E+00	0.17E+00	0.45E+00
29.58	74.48	59.215	0.306E+00	0.311E+00	0.17E+00	0.46E+00
29.92	74.47	59.207	0.315E+00	0.312E+00	0.17E+00	0.46E+00
30.25	74.47	59.203	0.317E+00	0.313E+00	0.17E+00	0.46E+00
30.58	74.47	59.204	0.309E+00	0.313E+00	0.17E+00	0.46E+00
30.92	74.46	59.202	0.307E+00	0.314E+00	0.17E+00	0.46E+00
31.25	74.46	59.198	0.310E+00	0.314E+00	0.17E+00	0.46E+00
31.58	74.46	59.191	0.317E+00	0.315E+00	0.17E+00	0.46E+00
31.92	74.46	59.192	0.312E+00	0.315E+00	0.17E+00	0.46E+00
32.25	74.45	59.191	0.307E+00	0.316E+00	0.17E+00	0.46E+00

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.296E+00
THE STANDARD DEVIATION IS 0.714E-01
SKEW IS POSITIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.316E+00

PILGRIM 45 PSIG ILRT

TIME, DATE START OF TEST 8.25 420

TIME AFTER START OF TEST = 24.00 HR

LEAK RATE BASED ON POINT-TO-POINT CALCULATIONS

TIME	TEMP. (F)	PRESSURE (PSIA)	MEASURED LEAK RATE	CALCULATED LEAK RATE	95% CONFIDENCE LIMITS	
8.58	75.47	59.479	0.813E+00	0.294E+00	-0.42E+00	0.10E+01
8.92	75.38	59.474	-0.571E+00	0.294E+00	-0.42E+00	0.10E+01
9.25	75.32	59.465	0.345E+00	0.295E+00	-0.42E+00	0.10E+01
9.58	75.28	59.457	0.453E+00	0.295E+00	-0.42E+00	0.10E+01
9.92	75.23	59.449	0.272E+00	0.296E+00	-0.41E+00	0.10E+01
10.25	75.17	59.445	-0.436E+00	0.296E+00	-0.41E+00	0.10E+01
10.58	75.13	59.434	0.907E+00	0.296E+00	-0.41E+00	0.10E+01
10.92	75.09	59.431	-0.192E+00	0.297E+00	-0.41E+00	0.10E+01
11.25	75.05	59.425	0.279E+00	0.297E+00	-0.41E+00	0.10E+01
11.58	75.02	59.416	0.592E+00	0.297E+00	-0.41E+00	0.10E+01
11.92	74.99	59.403	0.120E+01	0.298E+00	-0.41E+00	0.10E+01
12.25	74.97	59.401	-0.277E-02	0.298E+00	-0.41E+00	0.10E+01
12.58	74.95	59.397	0.455E-01	0.299E+00	-0.41E+00	0.10E+01
12.92	74.91	59.392	0.234E+00	0.299E+00	-0.41E+00	0.10E+01
13.25	74.89	59.385	0.567E+00	0.299E+00	-0.40E+00	0.10E+01
13.58	74.86	59.379	0.328E+00	0.300E+00	-0.40E+00	0.10E+01
13.92	74.84	59.372	0.590E+00	0.300E+00	-0.40E+00	0.10E+01
14.25	74.81	59.369	-0.237E-01	0.301E+00	-0.40E+00	0.10E+01
14.58	74.79	59.366	0.115E-01	0.301E+00	-0.40E+00	0.10E+01
14.92	74.77	59.364	0.325E-01	0.301E+00	-0.40E+00	0.10E+01
15.25	74.75	59.357	0.523E+00	0.302E+00	-0.40E+00	0.10E+01
15.58	74.72	59.352	0.134E+00	0.302E+00	-0.40E+00	0.10E+01
15.92	74.70	59.348	0.354E+00	0.303E+00	-0.40E+00	0.10E+01
16.25	74.69	59.346	0.145E-01	0.303E+00	-0.40E+00	0.10E+01
16.58	74.68	59.341	0.475E+00	0.303E+00	-0.40E+00	0.10E+01
16.92	74.67	59.336	0.510E+00	0.304E+00	-0.40E+00	0.10E+01
17.25	74.65	59.329	0.518E+00	0.304E+00	-0.40E+00	0.10E+01
17.58	74.64	59.329	-0.879E-01	0.305E+00	-0.39E+00	0.10E+01
17.92	74.64	59.326	0.339E+00	0.305E+00	-0.39E+00	0.10E+01
18.25	74.63	59.320	0.525E+00	0.305E+00	-0.39E+00	0.10E+01
18.58	74.61	59.318	0.952E-01	0.306E+00	-0.39E+00	0.10E+01
18.92	74.60	59.316	0.153E+00	0.306E+00	-0.39E+00	0.10E+01
19.25	74.59	59.311	0.372E+00	0.306E+00	-0.39E+00	0.10E+01
19.58	74.58	59.305	0.637E+00	0.307E+00	-0.39E+00	0.10E+01
19.92	74.57	59.302	0.234E+00	0.307E+00	-0.39E+00	0.10E+01

20.25	74.56	59.300	0.158E+00	0.308E+00	-0.39E+00	0.10E+01
20.58	74.55	59.295	0.463E+00	0.308E+00	-0.39E+00	0.10E+01
20.92	74.54	59.293	0.131E+00	0.308E+00	-0.39E+00	0.10E+01
21.25	74.54	59.288	0.493E+00	0.309E+00	-0.39E+00	0.10E+01
21.58	74.53	59.282	0.588E+00	0.309E+00	-0.39E+00	0.10E+01
21.92	74.52	59.281	0.107E+00	0.310E+00	-0.39E+00	0.10E+01
22.25	74.53	59.274	0.923E+00	0.310E+00	-0.39E+00	0.10E+01
22.58	74.52	59.276	-0.420E+00	0.310E+00	-0.39E+00	0.10E+01
22.92	74.52	59.272	0.592E+00	0.311E+00	-0.39E+00	0.10E+01
23.25	74.53	59.269	0.452E+00	0.311E+00	-0.39E+00	0.10E+01
23.58	74.53	59.263	0.631E+00	0.312E+00	-0.39E+00	0.10E+01
23.92	74.52	59.263	0.204E-01	0.312E+00	-0.39E+00	0.10E+01
24.25	74.52	59.259	0.445E+00	0.312E+00	-0.39E+00	0.10E+01
24.58	74.52	59.254	0.551E+00	0.313E+00	-0.39E+00	0.10E+01
24.92	74.52	59.253	0.146E+00	0.313E+00	-0.39E+00	0.10E+01
25.25	74.52	59.248	0.578E+00	0.314E+00	-0.39E+00	0.10E+01
25.58	74.51	59.243	0.524E+00	0.314E+00	-0.39E+00	0.10E+01
25.92	74.51	59.242	0.562E-01	0.314E+00	-0.39E+00	0.10E+01
26.25	74.51	59.241	0.167E+00	0.315E+00	-0.39E+00	0.10E+01
26.58	74.50	59.234	0.753E+00	0.315E+00	-0.39E+00	0.10E+01
26.92	74.50	59.232	0.134E+00	0.315E+00	-0.39E+00	0.10E+01
27.25	74.50	59.232	0.267E-01	0.316E+00	-0.39E+00	0.10E+01
27.58	74.49	59.229	0.319E+00	0.316E+00	-0.39E+00	0.10E+01
27.92	74.49	59.227	0.179E+00	0.317E+00	-0.39E+00	0.10E+01
28.25	74.49	59.226	0.150E+00	0.317E+00	-0.39E+00	0.10E+01
28.58	74.48	59.221	0.493E+00	0.317E+00	-0.39E+00	0.10E+01
28.92	74.48	59.214	0.914E+00	0.318E+00	-0.39E+00	0.10E+01
29.25	74.49	59.214	-0.116E-01	0.318E+00	-0.39E+00	0.10E+01
29.58	74.48	59.215	-0.223E+00	0.319E+00	-0.39E+00	0.10E+01
29.92	74.47	59.207	0.944E+00	0.319E+00	-0.39E+00	0.10E+01
30.25	74.47	59.203	0.438E+00	0.319E+00	-0.39E+00	0.10E+01
30.58	74.47	59.204	-0.199E+00	0.320E+00	-0.39E+00	0.10E+01
30.92	74.46	59.202	0.166E+00	0.320E+00	-0.39E+00	0.10E+01
31.25	74.46	59.198	0.506E+00	0.321E+00	-0.39E+00	0.10E+01
31.58	74.46	59.191	0.820E+00	0.321E+00	-0.39E+00	0.10E+01
31.92	74.46	59.192	-0.842E-01	0.321E+00	-0.39E+00	0.10E+01
32.25	74.45	59.191	-0.912E-02	0.322E+00	-0.39E+00	0.10E+01

IF IT IS ASSUMED THAT THE LEAK RATE IS CONSTANT:

THE MEAN IS 0.308E+00
THE STANDARD DEVIATION IS 0.346E+00
SKEW IS NEGATIVE

THE CALCULATED LEAK RATE AFTER 24.00 HOURS OF TEST IS 0.322E+00

CALCULATION OF MEASURED LEAK RATE

The following sample problem is provided to illustrate how the measured leak rates (M) for time 1400 were calculated in the ILRT Demonstration Report (Appendix A). The "Temp. and Press. Corrected Data Summary" values required to calculate M are reproduced below. The 1330 and 1400 values can be compared with the computer printout values shown in Appendix A, Pages A-3 and A-5.

CORRECTED DATA SUMMARY

TIME HRS	DATE MONTH/DAY	TEMPERATURE °F	PRESSURE PSIA
0800	0305	78.000869	44.358173
1330	0305	76.423717	44.191677
1400	0305	76.332724	44.181110

From equation (2), Page 6-1:

$$M = \frac{2400}{H}\left[1 - \frac{T_1 \ \overline{P}_2}{T_2 \ \overline{P}_1}\right]$$

For Total-Time Calculations:

$$H = 1400 - 0800 = 6.0 \text{ hours}$$

$$T_1 = 78.000869^{\circ}F + 459.7 = 537.700869^{\circ}R$$

$$T_2 = 76.332724^{\circ}F + 459.7 = 536.032724^{\circ}R$$

$$\overline{P}_1 = 44.358173 \text{ psia}$$

$$\overline{P}_2 = 44.181110 \text{ psia}$$

$$M = \frac{2400}{6}\left[1 - \frac{(537.700869)(44.181110)}{(44.358173)\ (536.032724)}\right]$$

$$M = 0.357 \text{ weight percent/day (Total-Time)}$$

BN-TOP-1

For Point-to-Point Calculations:

$H = 1400-1330 = 0.5$ hours

$T_1 = 76.423717^{o}F + 459.7 = 536.123717^{o}R$

$T_2 = 76.332724^{o}F + 459.7 = 536.032724^{o}R$

$P_1 = 44.191677$ psia

$P_2 = 44.181110$ psia

$$M = \frac{2400}{H}\left[1 - \frac{(536.123717)(44.181110)}{(44.191677)(536.032724)}\right]$$

$M = 0.333$ weight percent/day (Point-to-Point)

CALCULATION OF CALCULATED LEAK RATE

The following sample problem is provided to illustrate how the calculated leak rates (L) were calculated in the ILRT Demonstration Report (Appendix A).

Portions of the data from Appendix A for leak rate computations based on Total-Time calculations are reproduced in Table D.1 which follows. Time is expressed as time after start of test. Therefore, since the test was started at 0800 (8:00), data for time 10:00 (two hours after start of test) will be listed as time 2. Columns (1), (2) and (5) are from Appendix A, Page A-7. Columns (3) and (4) are computed from Columns (1) and (2). Column (5) is provided to compare the computer printout values of Calculated Leak Rate with the values determined subsequently.

From equation (8), Page 6-3 and Table D.1:

$$\bar{M} = \frac{\sum M_i}{n} = \frac{4.311}{12} = 0.359$$

TABLE D.1

LEAK RATE DATA
FOR TOTAL-TIME CALCULATIONS

Column	1	2	3	4		5
n	TIME (Hrs) t_i	MEASURED LEAK RATE M_i	$t_i M_i$	t_i^2		CALCULATED LEAK RATE (% per day) L_i
1	0.5	0.428	0.214	0.25		0.370
2	1.0	0.156	0.156	1.00		0.368
3	1.5	0.576	0.864	2.25		0.366
4	2.0	0.304	0.608	4.00		0.364
5	2.5	0.409	1.023	6.25		0.362
6	3.0	0.372	1.116	9.00		0.360
7	3.5	0.333	1.166	12.25		0.358
8	4.0	0.311	1.244	16.00		0.356
9	4.5	0.325	1.462	20.25		0.354
10	5.0	0.381	1.905	25.00		0.352
11	5.5	0.359	1.974	30.25		0.350
12	6.0	0.357	2.142	36.00		0.349
$\sum =$	39.0	4.311	13.874	162.50		

BN-TOP-1

From equation (9) and Table D.1:

$$\bar{t} = \frac{\sum t_i}{n} = \frac{39}{12} = 3.250$$

Now solving for B using equation (6):

$$B = \frac{n \sum t_i M_i - (\sum t_i)(\sum M_i)}{n \sum t_i^2 - (\sum t_i)^2}$$

$$B = \frac{(12)(13.874) - (39)(4.311)}{12(162.50) - (39)^2}$$

$$B = -0.004$$

Solving for A using equation (7) yields:

$$A = M - Bt$$

$$A = 0.359 - (-0.004)(3.250)$$

$$A = 0.372$$

Therefore, the regression line equation for the Least Squares "best fit" straight line is (from equation 3A):

$$L_i = A + Bt_i$$

$$L_i = 0.372 - 0.004\, t_i$$

By referring back to Table D.1 and applying the above equation, the values of calculated leak rate appearing in Column 5 of Table D.1 can be computed for any given time as can the values of calculated leak rate on the computer printout report in Appendix A.

EXAMPLE 1

for t_i = 2 hours (equivalent to time 10:00)

$$L_2 = 0.372 - (0.004)(2)$$

$$L_2 = 0.364$$

EXAMPLE 2

for t_i = 5 hours (equivalent to time 13:00)

L_2 = 0.372 - (0.004)(5)

L_5 = 0.352

It should be noted from the preceeding discussion that the values of A and B are recomputed each time additional data is entered into the computer program.

CALCULATION OF 95% CONFIDENCE LIMITS

The following sample problem is provided to illustrate how the 95% Confidence Limits are calculated in the ILRT Demonstration Report in Appendix A.

Portions of the data from Appendix A for leak rate based on Total-Time calculations are reproduced in Table E. 1 which follows. Time is expressed as time after start of test. Columns (1), (2) and (3) are from Appendix A, page A-7. Columns (4) and (5) are computed from columns (1), (2) and (3).

From equation (4), page 6-2 and equation (11), page 6-4:

$$s^2 = \frac{SSQ}{n-2} = \frac{\sum(M_i - L_i)^2}{n-2}$$

TABLE E.1

LEAK RATE DATA FOR 95% CONFIDENCE LIMITS

Column	1	2	3	4	5
n	TIME t_i	Measured Leak Rate M_i	Calculated Leak Rate L_i	$(M_i - L_i)^2$	$(t_i - t)^2$
1	0.5	0.428	0.370	0.003364	7.5625
2	1.0	0.156	0.368	0.044944	5.0625
3	1.5	0.576	0.366	0.044100	3.0625
4	2.0	0.304	0.364	0.003600	1.5625
5	2.5	0.409	0.362	0.002209	0.5625
6	3.0	0.372	0.360	0.000144	0.0625
7	3.5	0.333	0.358	0.000625	0.0625
8	4.0	0.311	0.356	0.002025	0.5625
9	4.5	0.325	0.354	0.000841	1.5625
10	5.0	0.381	0.352	0.000841	3.0625
11	5.5	0.359	0.350	0.000081	5.0625
12	6.0	0.357	0.349	0.000064	7.5625
$\sum =$	39.0			0.102838	35.7500

$$\bar{t} = \frac{\sum t_i}{n} = \frac{39}{12} = 3.250$$

$$s^2 = \frac{0.1028}{10} = 0.01028$$

and

$$s = 0.1014$$

From equation (12):

$$T = 1.95996 + \frac{2.37226}{10} + \frac{2.8225}{(10)^2}$$

$$T = 2.2254$$

From equation (14) and Table E.1:

$$\sigma = s \left[1 + \frac{1}{n} + \frac{(t_p - t)^2}{(t_i - t)^2} \right]^{1/2}$$

$$\sigma = 0.1014 \left[1 + \frac{1}{12} + \frac{(6 - 3.25)^2}{35.75} \right]^{1/2}$$

$$\sigma = 0.1153$$

and

$$T\sigma = 0.257$$

Therefore at 6 hours after start of test:

$$UCL = L + T\sigma$$

$$UCL = 0.349 + 0.257$$

$$UCL = 0.606 = \underline{0.61}$$

$$LCL = L - T\sigma$$

$$LCL = 0.349 - 0.257$$

$$LCL = \underline{0.092}$$

LIST OF PREOPERATIONAL TESTS

Test No.	Title of Test	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria
TVA-1	Shield Building Inleakage Rate Tests, Emergency Gas Treatment System Functional Tests	The containment building, shield building, and the Emergency Gas Treatment System (EGTS) operable in preparation for testing. Penetrations fully installed and operable. Containment vessel isolated by means of a simulated containment isolation signal. Power and control circuitry for the EGTS operable and associated instrumentation calibrated and available for service.	The test demonstrates that the shield building and the Emergency Gas Treatment System are capable of restricting LOCA generated activity releases to or below the limits specified in 10 CFR 100. See Section 6.2.3 for a description of system operation and parameters. Test methods will be in accordance with Regulatory Guide 1.52 and ANSI N510-1975. The following tests will be performed to demonstrate fulfillment of system requirements: 1) Determination of shield building inleakage at 0.5 inches and 5.0 inches water negative pressure levels. Total infiltration will be shown to be less than the expected values listed in Section 6.2.3.2.1. 2) Startup tests of annulus vacuum control subsystem, verification of automatic switchover to backup train for component failure, and verification of rated flow rates and vacuum level. 3) Verification that a simulated containment isolation signal results in the following: a) Shutdown of the annulus vacuum control subsystem serving the unit where the simulated signal originated. The annulus vacuum control subsystem for the unaffected unit remains in operation. b) Isolation of the air cleanup subsystem from the annulus vacuum control subsystem shutdown by the simulated isolation signal. c) Startup of both air cleanup subsystem relative humidity heaters and fans.

LIST OF PREOPERATIONAL TESTS

Test No.	Title of Test	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria
TVA-1 (Cont.)	Shield Building Inleakage Rate Tests, Emergency Gas Treatment System Functional Tests		d) Activation of the designated train flow control dampers located in the annulus of the reactor unit in which the simulated isolation signal originated. The dampers in the other train are not activated. A similar capability is demonstrated with the same containment isolation signal with the other train selected as the designated train. A similar capability is demonstrated by simulating the containment isolation signal from the other reactor unit. 4) Verification that automatic switchover to the backup train occurs after failure of the operating air cleanup train. 5) Verification that each air cleanup subsystem flow rate meets or exceeds the design flow rate. 6) Verification of air cleanup subsystem filter cooling capability. Airflow induced through the inactive filter train will be shown to be at least equal to the design value specified in Section 6.2.3.3.2. 7) Verification that each train of the air cleanup subsystem has the capability to establish and maintain the design negative pressure in the annulus within 2.0 minutes after subsystem start. 8) Leak tightness and efficiency tests of the HEPA and charcoal filter banks in accordance with Regulatory Guide 1.52. Refer to Section 6.5.1 for additional information. 9) Verification tests of relative humidity heater performance to confirm rated output.

Attachment 7

TABLE 14.2-1 (C

LIST OF PREOPERATI... TESTS

Test No.	Title of Test	Test Prerequisites	Test Objectives Summary of Testing and Acceptance Criteria
TVA-11A	Communications System (Emergency Sound-Powered Telephone System)	Installation and construction testing of the plant Communication System completed.	~~The emergency sound-powered telephone system will be tested to demonstrate intelligible reception and transmission of voice communications at all stations of the system.~~
TVA-11B	Communications System (Evacuation Alarm System)	Installation and construction testing of the plant evacuation alarm system must be complete.	The plant Evacuation Alarm System will be tested to demonstrate that the evacuation signal can be heard in all areas normally habitable of the plant. ~~The plant Evacuation Alarm System will be tested to demonstrate that the evacuation signal can be heard in all areas of the plant.~~
TVA-12A	TVA Offsite Power (161-kV Switch-Yard)	Construction wiring and functional checks on the 161-kV switchyard and 6.9-kV start boards and unit boards are completed. Relays set and electrical tests completed by DPSO on the 161-kV switchyard. AC and DC control power is available and in service.	The test will demonstrate that simulated faults in one or two separate and independent electrical power circuits, capable of delivering immediate offsite 161-kV power to the onsite 6.9-kV System, does not lead to simultaneous failure of both circuits. Tests will be conducted by simulating phase-to-phase and phase-to-ground faults and power circuit breaker failure. The acceptance criteria for the test is that there is no interaction between separate and independent power circuits, and that the offsite power system meets the requirements of GDC 17 as described in paragraph 8.2.1.8.

The test will verify the adequacy of the plant emergency sound-powered telephone Communications System. Intelligible reception and transmission of voice communications will be demonstrated. Particular emphasis will be placed on demonstrating that communications at all stations required for the initial fuel loading are functioning properly.