



Consumers  
Power

**POWERING  
MICHIGAN'S PROGRESS**

Big Rock Point Nuclear Plant, 10269 US-31 North, Charlevoix, MI 49720

Patrick M Donnelly  
Plant Manager

March 31, 1994

Nuclear Regulatory Commission  
Document Control Desk  
Washington, DC 20555

**DOCKET 50-155 - LICENSE DPR-6 - BIG ROCK POINT PLANT - RESOLUTION OF  
CONTAINMENT ESCAPE LOCK LEAKAGE RATE TESTING**

Consumers Power Company proposed the following air lock testing program in letters dated September 15, 1975 and October 10, 1980:

*All air locks (i.e., equipment, personnel and escape) shall be tested at frequency of every six months. The test pressure for the equipment and personnel air locks shall be at Pa which is 23 psig for Big Rock Point. The test pressure for the escape air lock shall be 2 psig without strongback or 5 psig with the strongback in place.*

This proposed program was required because of the emergency air lock manufacturer's restrictions on internal pressurization (that is, the manufacturer limited pressure applied to the inner door to prevent pushing the inner door away from the seals causing a test to fail) and the Big Rock Point Plant design which necessitates frequent personnel entries. The emergency air lock internal pressurization is limited by the manufacturer to 2 psig without strongback and 5 psig with strongback in place, thereby making pressurization to Pa impossible for local leak rate tests. However, during the Integrated Leak Rate Test, the inside containment surfaces of the escape air lock are tested to half the design pressure.

The Nuclear Regulatory Commission responded in a letter dated November 23, 1982 that contained Exemptions from certain requirements of Section 50.54(o) and Appendix J to 10 CFR Part 50. The enclosed Safety Evaluation Report, in part, drew the following conclusion:

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*...A satisfactory air lock testing program, which considers the unique features of the Big Rock Point plant, has been suggested in Section 3.2.1 (Reference the Technical Evaluation Report performed by Franklin Research Center; prepared for the NRC), which reads:*

*"The escape air lock would be tested at 5 psig every 6 months and at 2 psig immediately following some periodic operational check (e.g., weekly or bi-monthly, etc.). Other than this periodic operability check/air test, the escape air lock would be restricted to use in actual emergency situations".*

For reasons undocumented, the suggested testing program has not been used at the Big Rock Point Plant. Big Rock Point Plant has only conducted the 2 psig test because it has always believed that the air lock's performance was demonstrated. The Big Rock Point Plant staff has reviewed this position and concludes that it continues to be appropriate for the following reasons:

- 1) Extrapolation of test pressures is required for both the 2 and 5 psig tests.
- 2) The required use of a strongback for the 5 psig test and its positioning on the inside of the lock which tends to assist the door in sealing is less conservative than the 2 psig test for the inner door.
- 3) Using the strongback for the 5 psig test disables the escape lock; and since the majority of the tests are performed during power operation, personnel safety is at risk during the six hour test (Operators are required to make rounds every two hours to support primary system leakage commitments. At Big Rock, the Reactor Depressurization System (RDS) is designed to blowdown into containment after a 2 minute delay in the event of an intermediate to small LOCA to assist the low pressure core spray system. The escape lock is the proven exit path for personnel that may be inside containment when the 2 minute RDS siren sounds). It is uncertain that personnel can get to the personnel lock and exit in time to avoid the blowdown hazard.

The difference in Consumers Power Company and NRC positions has gone unresolved for a number of reasons. The request for providing extrapolation methodology transmitted by NRC letter dated November 23, 1982, was assumed to be met by our submittal of ILRT testing methodology, which is the same as that used for the escape lock. Our assumption did not provide a response to the NRC that would have required final evaluation of our position. Also, the NRC SER provided by the November 23, 1982 letter indicated that this issue would be resolved by the Integrated Assessment of the SEP. The Integrated Assessment final report failed to specifically address air lock testing.

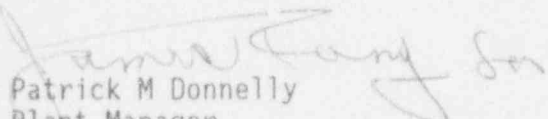
The extrapolation methodology for the escape air lock is attached. Consumers Power letters dated September 15, 1975, and October 10, 1980 indicated that a 5 psig test might be done on certain occasions. It is not the intent of

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Consumers Power Company to perform the 5 psig test because of no significant increase in value. The test pressure for the escape air lock will continue to be 2 psig. Therefore, Consumers Power Company's position on air lock testing is altered from the previous letters identified above only by the removal of the alternate 5 psig test for the escape air lock.

Patrick M Donnelly

  
Patrick M Donnelly  
Plant Manager

CC: Administrator, Region III, USNRC  
NRC Resident Inspector - Big Rock Point

ATTACHMENT

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CONSUMERS POWER COMPANY  
BIG ROCK POINT PLANT  
DOCKET 50-155

RESOLUTION OF CONTAINMENT ESCAPE LOCK LEAKAGE RATE TESTING  
Submitted March 31, 1994

## ESCAPE LOCK EXTRAPOLATION METHODOLOGY

OBJECTIVE

Verify that the extrapolation formula used for the escape lock local leak rate test is consistent with the approved extrapolation formula for integrated leak rate test as dictated in the Technical Specification.

REFERENCES

Technical Specification Section 3.7.6

Procedure T180-01D, Rev. 40, "Escape Lock Leak Rate Test"

EA-TR39-07

CALCULATION

The Extrapolation formula used for containment ILRT as dictated in the Technical Specification, Section 3.7.6 is as follows:

$$L_i = L_a \left( \frac{P_i}{P_a} \right)^{1/2} \quad (\text{Eq. 1})$$

$L_i$  and  $L_a$  are percent leak rates per day, however mass leak rates are required, hence the above equation is modified to accommodate for mass leak rate calculation as follows:

$$\text{Percent Leak Rate} = \frac{\text{Mass Leak Rate Per Day}}{\text{Total Containment Mass}}$$

Hence:

At test pressure

$$L_i = \frac{M_{24i}}{M_i}$$

At Accident Pressure

$$L_a = \frac{M_{24a}}{M_a}$$

Equation 1 Becomes

$$\frac{M_{24i}}{M_i} = \frac{M_{24a}}{M_a} \left( \frac{P_i}{P_a} \right)^{1/2} \quad (\text{Eq. 2})$$

## ESCAPE LOCK EXTRAPOLATION METHODOLOGY

From Ideal Gas Law:

$$PV = MRT$$

Assuming that V, R and T remains constant; pressure becomes directly proportional to mass.

$$P_{IA} \propto M_I \quad \text{and} \quad P_{AA} \propto M_A$$

Where  $P_{IA}$  and  $P_{AA}$  are absolute pressure

Thus Equation 3 Becomes

$$\frac{M_{24I}}{P_{IA}} = \frac{M_{24A}}{P_{AA}} \left( \frac{P_I}{P_A} \right)^{1/2} \quad (\text{Eq. 3})$$

To extrapolate leak rate to accident pressure solve for  $M_{24A}$

$$M_{24A} = M_{24I} \frac{P_{AA}}{P_{IA}} \left( \frac{P_A}{P_I} \right)^{1/2} \quad (\text{Eq. 4})$$

$$P_{AA} = \text{Absolute Accident Pressure} = P_A + P_{ATM}$$

$$P_{IA} = \text{Absolute Test Pressure} = P_I + P_{ATM}$$

$$M_{24A} = M_{24I} \left( \frac{P_A + P_{ATM}}{P_I + P_{ATM}} \right) \left( \frac{P_A}{P_I} \right)^{1/2} \quad (\text{Eq. 5})$$

The extrapolation equation from the escape leak rate test procedure is:

$$M_{24A} = M_{24I} \left[ \frac{23 + P_A}{P_{ATM} + P_A} \right] \left[ \frac{23}{P_{ATM}} \right]^{1/2}$$

Where:

$M_{24A}$  =  $M_{24A}$  (eq.5) = Mass Leak Rate Extrapolated to Accident Pressure

$M_{24I}$  =  $M_{24I}$  (eq.5) = Mass Leak Rate at Test Pressure

23 =  $P_A$  (eq.5) = Accident Pressure

$P_A$  =  $P_{ATM}$  (eq.5) = Atmospheric Pressure

$P_{ATM}$  =  $P_I$  (eq.5) = Test Pressure

## ESCAPE LOCK EXTRAPOLATION METHODOLOGY

RESULTS

In conclusion, the extrapolation formula used for escape lock testing is consistent with the extrapolation formula used for containment ILRT and in accordance with Technical Specifications methodology.