SYSTEM ENERGY RESOURCES, INC.

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April 15, 1988

U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Attention: Document Control Desk

Gentlemen:

SUBJECT: Grand Gulf Nuclear Station
Unit 1
Docket No. 50-416
License No. NPF-29
Containment Air locks
AECM-88/0078

Attached is a description and diagram of the design of the Containment air lock seal air system at Grand Gulf Nuclear Station (GGNS). This information was requested in a telephone conversation with Mr. L. L. Kintner and other members of the NRC staff on April 4, 1988. System Energy Resources, Inc. (SERI) is providing this information to support NRC review of the GGNS air lock configuration as followup to our April 4 discussion.

If additional information is required, please contact this office.

Yours truly,

ODK:bms
Attachment

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AIR SUPPLY LINES FOR CONTAINMENT AIR LOCKS

Background

This information is provided by SERI as follow-up to a conversation held with the NRC staff on April 4, 1988. SERI and NRC staff discussed the containment air lock design at GGNS. These discussions resulted from a recently identified issue related to a air lock design installed at the South Texas Project.

GGNS Containment Airlocks

The Grand Gulf Nuclear Station design has a different arrangement for the air locks. A simplified diagram of key components in the GGNS design is attached. The GGNS air locks have two lines that enter the outer bulkhead and go to air tanks and then exit the inner bulkhead to provide air to the inner door seals. Between the outer bulkhead and the air tanks there is a check valve, which is leak tested during air lock Technical Specification surveillance test 4.6.1.3.d.3. The tubing and fittings from the outer bulkhead to the inner and outer door seals are ASME material, installed under the SERI and W. J. Woolley Company QA program, and have been seismically analyzed to verify that structural integrity is maintained under design basis conditions. The door seal system utilizes a redundant design in that the complete loss of one seal air supply line still leaves one seal on each door inflated.

In the Grand Gulf design, the containment air locks are considered access openings as defined by GDC 50, Containment Design Basis and not penetrations (i.e., process piping penetrations) governed by GDC 54 through 57. This interpretation is consistent with 10CFR50, Appendix J that has distinguished between the treatment of "air lock door seals, including door operating mechanism penetrations..." under "Type B Tests" (Ref.: Section II.G.2) and "Containment Isolation Valves" under "Type C Tests" (Ref: Section II.H). Consistent with this interpretation, the Grand Gulf UFSAR does not describe the air locks in Section 6.2.4 (Containment Isolation System) and does not list the air locks in Table 6.2-44 dealing with containment isolation valve data and application of GDC 54 through 57.

Specific design requirements for the containment air locks are contained in Purchase Specification 9645-C-153.0. The specification requirements are based on GGNS design criteria in UFSAR Section 3.8 for the containment structure and requires portions of the air lock which contribute to maintaining primary containment integrity to be designed to resist the effects of thermal, seismic, hydrodynamic, and accident loads and conditions. Stresses in applicable portions of the air lock are required to be within the allowables of ASME Section III, Subsection NE.

GGNS Technical Specification and 10CFR50 Appendix J Testing

10CFR50 Appendix J, III.D.2 provides testing requirements and test intervals for containment air locks and specifies that the acceptance criteria for air lock testing shall be stated in the Technical Specifications. Testing requirements for the GGNS containment air locks are contained in GGNS Technical Specification 4.6.1.3, and meet the requirements of 10CFR50 Appendix J. Specific tests performed are as follows:

1. Seal annulus testing every 72 hours except during periods of multiple entries.

2. Air lock overall leakage test every 6 months or after air lock maintenance.

3. Door interlock verification once per 6 months.

4. Inflatable seal air supply system testing.

   a. Seal pressure monitoring system channel functional test every 31 days.

   b. Seal pressure monitoring system channel calibration test every 18 months.

   c. Verify accumulator pressure is greater than or equal to 90 psig at least once per 7 days.

   d. Seal system pneumatic leakage test once per 18 months.

Containment Airlock Seal Air System Integrity

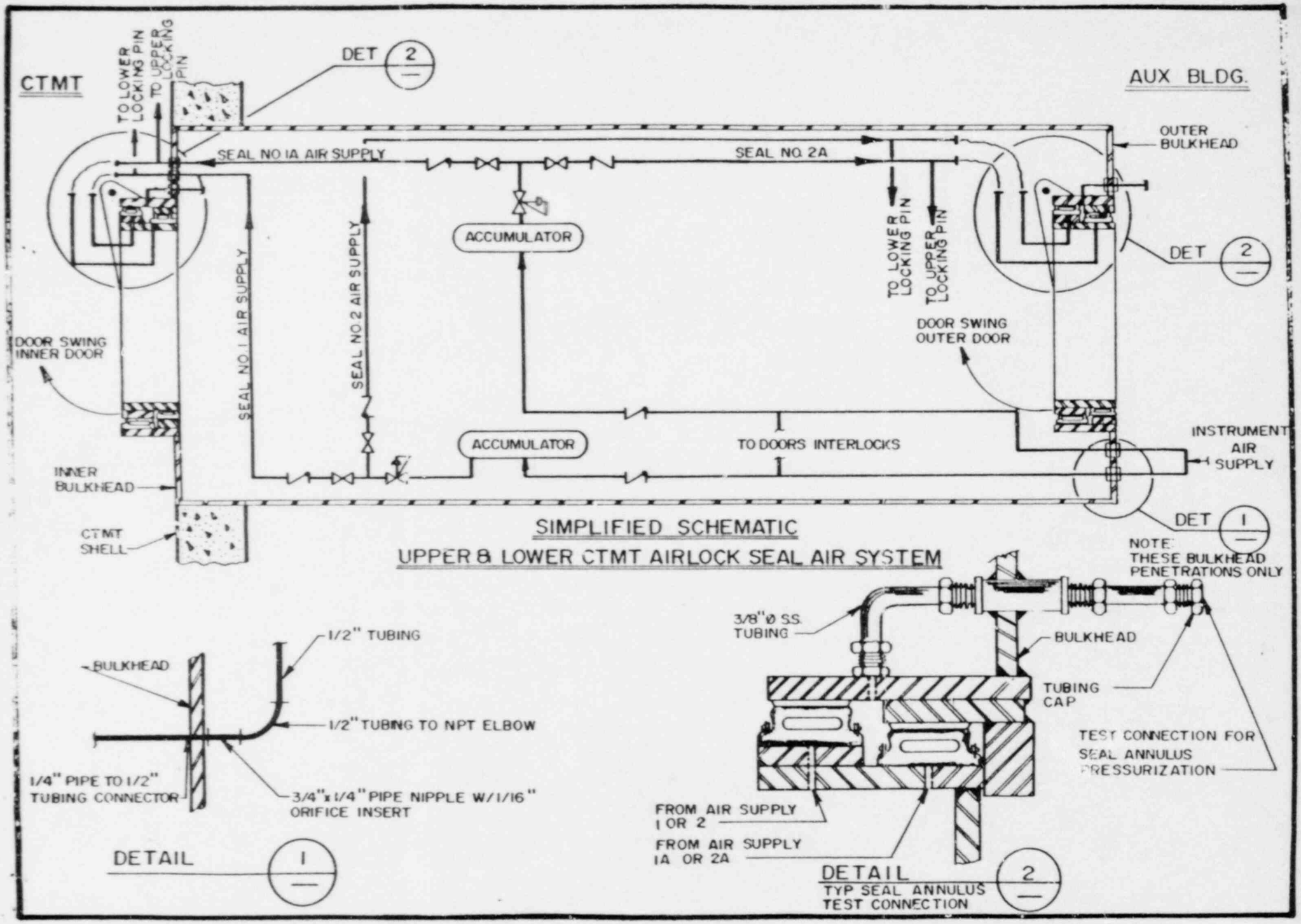
Since the structural integrity and leak tightness of the air supply tubing that goes through both bulkheads has been verified by the above, no conceivable single failure mechanism exists that will allow these air supply lines to provide a leakage path from the Containment to the Auxiliary Building. The establishment of such a leakage path would require the coincident failure of seal No. 1 on the inner door or a seal air supply line inside containment, reverse flow through two check valves (one of which is leak tested), and failure of the instrument air supply line outside containment.

This sequence of multiple failures is considered beyond the Grand Gulf design basis. However, even if this multiple failure scenario is postulated, the consequences are not significant. A 1/16 inch diameter orifice is utilized in the air supply lines at the outer bulkhead that will greatly restrict backflow from containment in the unlikely occurrence of the above failure scenario. This provides a much tighter flow restriction than is currently allowed for instrument lines penetrating containment. ANSI N-271 and GGNS UFSAR Section 6.2.4.2.4 utilize a 1/4 inch orifice as an acceptable containment boundary for instrument lines.

The NRC staff also questioned the potential for a leakage path outside containment associated with automatic features provided in some plant designs. GGNS does not have this automatic testing feature. The GGNS annulus testing mechanism is separate for each door (see Detail 2 of attached sketch). Multiple failures would be required for these annulus test connections to provide a leak path outside of the containment. Seal No. 1 on the inner door or the test connection tubing inside the containment would have to fail. Then the tubing cap would have to fail or leak followed by a failure of the remaining outer door seal, air supply tubing, or outer door test connection tubing to complete the leakage path.

Summary

In summary, the air supply lines are considered an integral part of the air lock containment access opening per GDC 50. GDC 55, 56, and 57 are not considered applicable to GGNS containment airlock design. The air locks are a unique part of the containment boundary, the integrity of which is ensured by design, GGNS Technical Specification 3/4.6.1.3 and 10CFR50 Appendix J testing.


CTMT
AUX BLDG.
TO LOWER LOCKING PIN
TO UPPER LOCKING PIN
DET 2
SEAL NO 1A AIR SUPPLY
SEAL NO. 2A
OUTER BULKHEAD
ACCUMULATOR
TO LOWER LOCKING PIN
TO UPPER LOCKING PIN
DET 2
SEAL NO. 1 AIR SUPPLY
SEAL NO 2 AIR SUPPLY
DOOR SWING INNER DOOR
DOOR SWING OUTER DOOR
ACCUMULATOR
TO DOORS INTERLOCKS
INSTRUMENT AIR SUPPLY
INNER BULKHEAD
CTMT SHELL
DET 1
NOTE: THESE BULKHEAD PENETRATIONS ONLY
SIMPLIFIED SCHEMATIC
UPPER & LOWER CTMT AIRLOCK SEAL AIR SYSTEM
1/2" TUBING
BULKHEAD
1/2" TUBING TO NPT ELBOW
1/4" PIPE TO 1/2" TUBING CONNECTOR
3/4" x 1/4" PIPE NIPPLE W/1/16" ORIFICE INSERT
DETAIL 1
3/8" Ø S.S. TUBING
BULKHEAD
TUBING CAP
TEST CONNECTION FOR SEAL ANNULUS PRESSURIZATION
FROM AIR SUPPLY 1 OR 2
FROM AIR SUPPLY 1A OR 2A
DETAIL 2
TYP SEAL ANNULUS TEST CONNECTION