

ADDITIONAL TEST PROGRAM BY PRESRAY
CORPORATION OF SEALS BETWEEN ICE
CONDENSER AND CONTAINMENT VESSEL FOR
REACTOR BUILDINGS AT SEQUOYAH AND
WATTS BAR NUCLEAR PLANTS

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1. INTRODUCTION

- A. The seal material for this test program is in one piece with dimensions of 15 inches by 24 feet 0 inches and was furnished from the test pieces shipped to Sequoyah by the Presray Corporation under contract 76X73-S20648 - N2H-51. On March 21, 1980, this seal material was returned to the Presray Corporation for the additional testing required by this program.
- B. By proper cutting, Presray should produce 48 sample specimens 5 inches by 11 inches in size from this material. If 48 samples cannot be realized, Presray will supply the makeup requirements from their own supply which was excess to either the Sequoyah or Watts Bar Nuclear Plant contracts and is still stored at Presray.

2. TEST PROGRAM BY PRESRAY

Presray will test 33 specimens as outlined below (15 will remain as spares).

- A. First 21 specimens. Each specimen will receive the following tests in the following sequence.

First test - No rupture at 15 psi
Second test - No rupture at 30 psi
Third test - No rupture at 60 psi

1. 12 specimens of the first 21 for return to Sequoyah.

No further testing; return all 12 specimens to Sequoyah marking for later identification those specimens that may have ruptured showing location of rupture and pressure value. Sequoyah will replace ruptured specimens with untested replacements from their test stock of seal material to bring the total number back up to 12 for positioning in the reactor building.

2. Radiation exposure of 9 specimens of the first 21.

- a. Level 1 exposure. Expose three specimens to 6.0×10^6 Rads (total) at 250°F for the first hour and 220°F for the next 11 hours.
- b. Level 2 exposure. Expose three other specimens to 1.3×10^7 Rads (total) at 250°F for the first hour and 220°F for the next 11 hours.
- c. Level 3 exposure. Expose three other specimens to 1.3×10^8 Rads (total) at 250°F for the first hour and 220°F for the next 11 hours.

3. Additional testing of the nine exposed specimens.

- a. Repeat pressure testing outlined in section 2.A.2.a. above on all

of the nine exposed specimens. Perform this testing before that required by section 2.A.3.b. below.

- b. Perform standard "grab method" breaking strength test as outlined in ASTM D751 for both the warp end fill directions of each of the nine exposed specimens. Care should be taken not to cut any sample for grab testing from a ruptured portion of a specimen.

B. Additional testing of 12 unexposed specimens.

- 1. With the remaining 12 unused samples from the total of 33 specimens, perform a standard "grab method" breaking strength test on these specimens as outlined in section 2.A.3.b. above.

3. Test Program at Sequoyah.

Sequoyah Nuclear Plant will use 12 of the sample specimens after the specimens have been qualified by testing at Presray (see section 2.A.1.) and returned to Sequoyah. Three each of these specimens will be hung in the reactor building at four locations 90° apart for periodic retesting to confirm that the seal has the ability to withstand rupture at the required pressure. The retest specifications are as follows.

A. Specimens required by Sequoyah for each life test (worst case conditions) approximately every 16 months.

Two specimens will be tested at 60 psi. With no failures testing will cease. With failures, four specimens will be tested at 30 psi. With no failures testing will cease. With failures, five specimens will be sent to Presray. One specimen will be used as a spare. A total of 12 specimens will be required approximately every 18 months. Attachment 1 contains the criteria for replacement of the divider barrier seals.

B. Specimens required to support 10-year life.

Sequoyah will also hang additional untested specimens at each location to provide for at least ten years duration of testing. EN DES recommends that this additional amount be at least 18 specimens at each position, thereby bringing the total specimens at each of the four positions to 21, and the total hung in a reactor building to 84. This will allow for 10 years of worst condition life testing. It is expected that the seals will have to be replaced between 8 and 10 years; however need will be determined only by results from tests and inspections for cracks and not by age.

4. Test Program at Watts Bar.

A. The material used for the seals between the ice condenser and containment vessels in the reactor buildings at Watts Bar Nuclear Plant was furnished by the Presray Corporation under contract 77N64-821732 - N3H-38. These seals were fabricated from identical materials used for similar seals at Sequoyah Nuclear Plant. Because Presray will have tested these identical materials for rupture, exposure, pressure testing of exposed specimens, and standard grab method for breaking strength of unexposed samples on the Sequoyah Nuclear Plant materials, the same testing procedures by Presray Corporation are waived for the Watts Bar Nuclear Plant materials.

B. Watts Bar Nuclear Plant will be required to furnish their own sample

specimens from the test pieces furnished under contract 77K64-821732 and implement a test program at Watts Bar Nuclear Plant as described for Sequoyah Nuclear Plant in section 3.

5. FINAL REPORT

Presray will submit a "draft" copy of a final report to TVA for review and approval within 15 days after all testing outlined in section 2 is completed. The draft copy will be in final form requiring only TVA's approval signatures. All raw test data will be included as an appendix to the report. Wording of conclusions and recommendations are subject to joint agreement between Presray and TVA. Fifteen copies of the published final report will be furnished to TVA by Presray.

This report will supplement and supercede portions (where applicable) of the Presray Corporation's report "Sequoyah Nuclear Plant Units 1 and 2, Testing and Evaluation of Seal and Gasket Material, TVA Contract 72C33-75424 - N2H-15" dated April 7, 1972.

6. TEST FIXTURES

Presray will fabricate, qualify by actual testing, and ship two test fixtures in the final configuration used for the pressure testing outlined in section 2. One fixture will be shipped to Sequoyah Nuclear Plant and the other will be shipped to Watts Bar Nuclear Plant. Both fixtures are to be shipped within four months of receipt of go ahead approval from TVA. Three copies of a report covering the qualification testing of each fixture will be shipped separately to TVA at the time each test fixture is shipped. Figures 1-3 are sketches of the pressure test fixture for the ice condenser seals.

Attachment: "Criteria for Replacement of Seals Between Ice Condenser and Containment Vessel for Reactor Building."

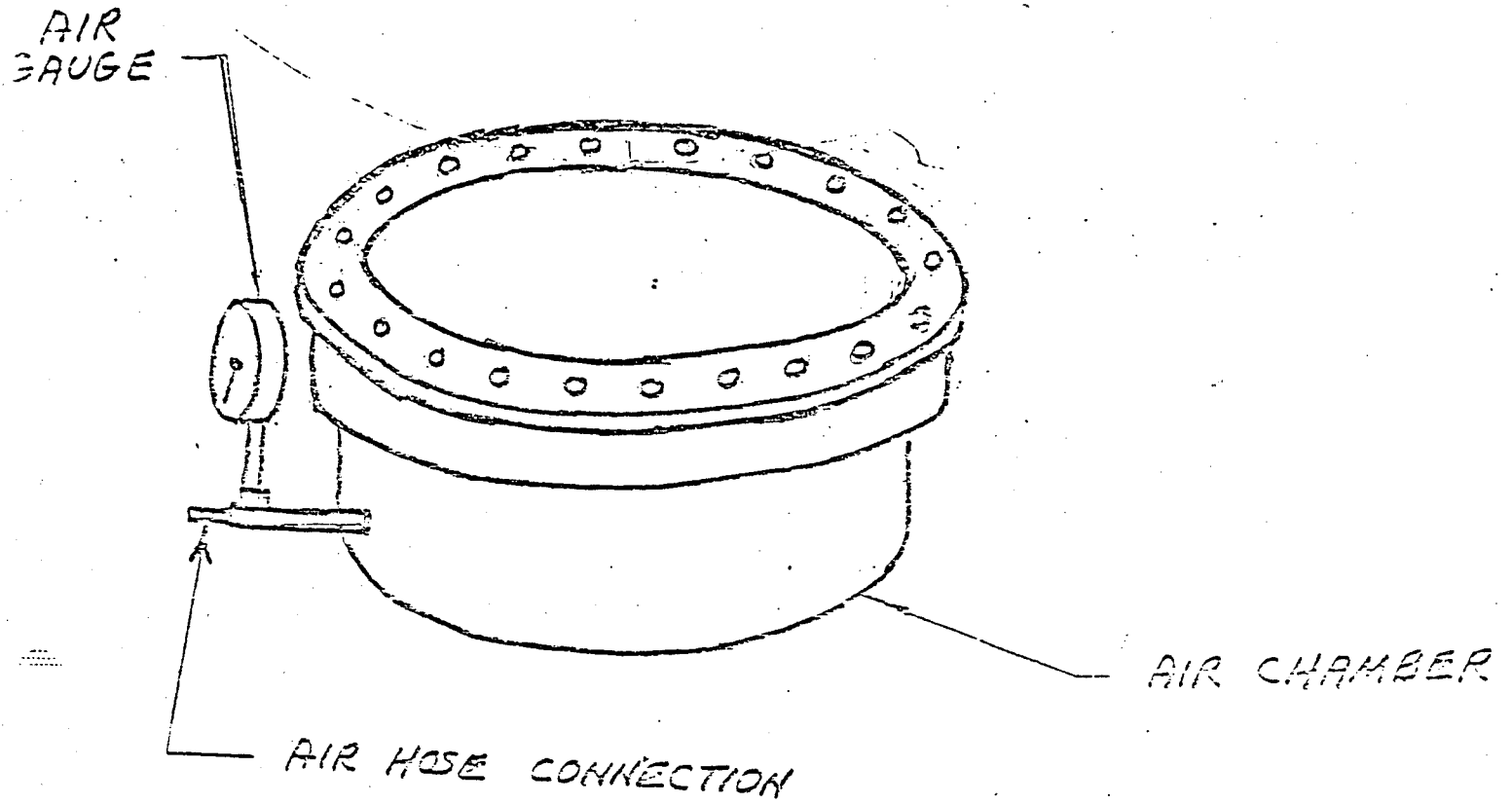


Figure 1. "Sketch of Pressure Test Fixture for Ice Condenser Seals"

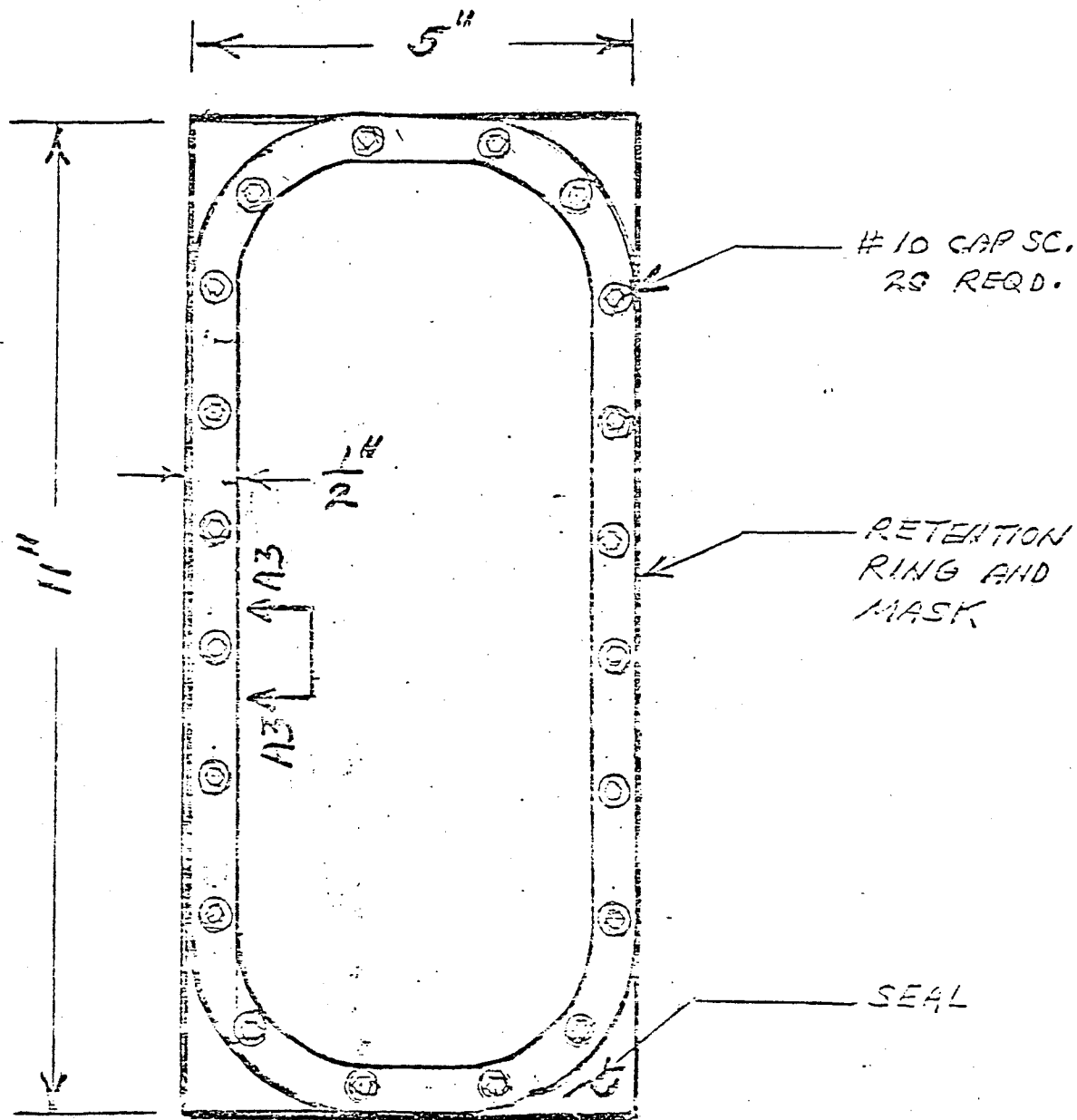


Figure 1 "Sketch of Retention Ring, Mask and Seal"

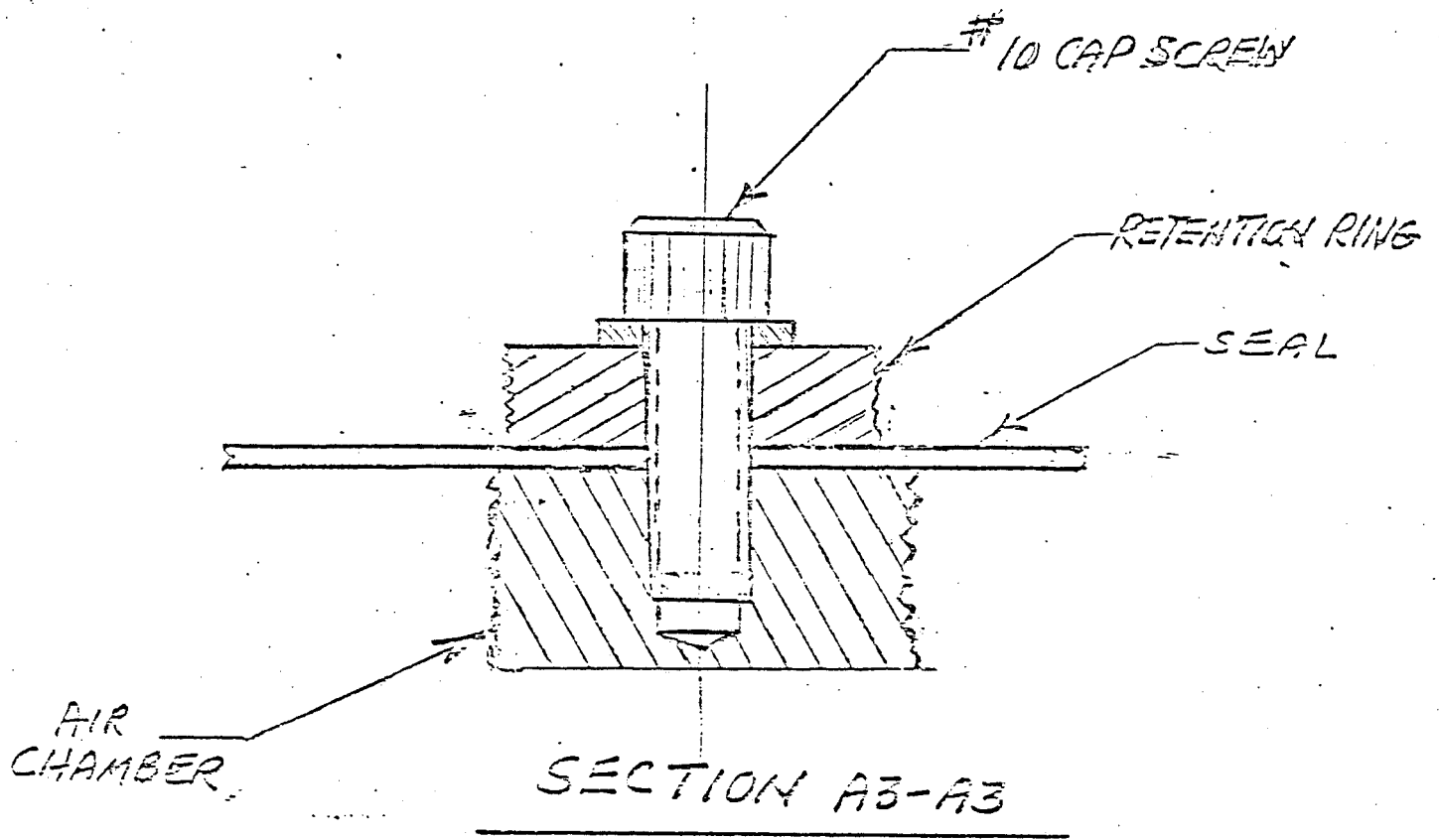


Figure 3 "Sketch of Hold-down Assembly - Section A3-A3

Attachment 1

CRITERIA FOR REPLACEMENT OF SEALS BETWEEN ICE CONDENSER AND CONTAINMENT VESSEL FOR REACTOR BUILDINGS REVISION 1

1.0 INTRODUCTION

Because no test data are available concerning the ability of the seals to withstand high pressure without a gross failure due to either long term exposure to low radiation levels and 120° F temperatures during normal operation or the effects of long term storage on the seals designated and packaged as spares and replacements, we recommend the following procedure for determining when changeout or replacement of the seals should be effected.

2.0 SPECIMENS

- 2.1 Sample material specimens, 5 inches by 11 inches, from the same batch and calendar run as the ice condenser seals, are to be kept in each package of spares and replacements.
- 2.2 Sample material specimens, 5 inches by 11 inches, from the same batch and calendar run as the ice condenser seals, are to be positioned at 90° intervals around the containment, adjacent to the operating seals. These specimens will be identified as to azimuth location and so marked.

3.0 TESTS

The following tests are to be performed on the sample material specimens from each package of spares and replacements, and on the sample material specimens at each location adjacent to the operating seals. The initial testing should be conducted after delivery of the seals to the project but before initial plant startup and then at 18-month intervals thereafter on positioned seals and on packaged spares and replacements before use.

- 3.1 Pressure testing at 60 lb/in² is to be performed using shop air and the seal contractor's approved test fixture on two of the 5 inches by 11 inches listed in paragraph 2.2 above. If neither specimens ruptures, the seals are not to be replaced.
- 3.2 If a rupture occurs, four additional specimens are to be pressure tested at 30 lb/in². If none of these additional specimens rupture, the seals are not to be replaced.
- 3.3 If any specimen ruptures at 30 lb/in², five specimens are to be returned to the seal contractor for his further testing of the samples after exposure to simulated accident conditions as outlined below.

Radiation of 1.3×10^7 rads (total) for a duration of 12 hours, the first hour at 250° F, the next 11 hours at 220° F.

After exposure to the above simulated accident conditions, tests at 15 lb/in² are to be conducted by the seal contractor on the exposed samples. If any sample ruptures, the seals are to be replaced.

4.0 EXAMINATIONS

The following examinations are to be performed on the installed seals and the packaged spares and replacements after delivery and before initial plant startup and then at 18-month intervals thereafter.

- 4.1 Visual examination to determine if there is any evidence of cracking which would result in establishing a leak path for air. If any cracking of the seals is observed, the seals are to be replaced.