Arizona Nuclear Power Project
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July 2, 1986
ANPP-37195-EEVB/LAS/DRL-92.11

U. S. Nuclear Regulatory Commission
Region V
1450 Maria Lane - Suite 210
Walnut Creek, CA 94596-5368

Attention: Mr. D. F. Kirsch, Acting Director
Division of Reactor Safety and Projects
Palo Verde Nuclear Generating Station (PVNGS)
Unit 3
Docket No. 50/530

Subject: Interim Report - DER 86-20
A 50.55(e) Potentially Reportable Deficiency Relating To Damper Seals Not Meeting Required Specifications
File: 86-019-026; D.4.33.2

Reference: Telephone Conversation between R. C. Sorenson and D. R. Larkin on June 3, 1986 (Initial Notification - DER 86-20)

Dear Sir:

The NRC was notified of a potentially reportable deficiency in the referenced telephone conversation. At that time, it was estimated that a determination of reportability would be made within thirty (30) days, July 3, 1986.

Due to the extensive investigation and evaluation required, an Interim Report is attached. It is now expected that this information will be finalized by September 26, 1986, at which time a complete report will be submitted.

Very truly yours,

E. E. Van Brunt

E. E. Van Brunt, Jr.
Executive Vice President
Project Director

EEVB/DRL:kp

Attachment

cc: See Page Two

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IE-27

cc: Mr. J. M. Taylor, Director
Office of Inspection and Enforcement
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

A. C. Gehr (4141)
R. P. Zimmerman (6295)

Records Center
Institute of Nuclear Power Operations
1100 Circle 75 Parkway - Suite 1500
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INTERIM REPORT - DER 86-20
POTENTIAL REPORTABLE DEFICIENCY
ARIZONA NUCLEAR POWER PROJECT (ANPP)
PVNGS UNIT 3

I. Potential Problem

The Control Room Isolation Dampers used for isolation of the Control Room during emergency conditions are required by FSAR Section 6.4.2.2.2.J to be bubble-tight (zero leakage). Additionally, the Control Room must be maintained at 1/8-inch water gage pressure above atmospheric to prevent infiltration of outside air (FSAR Section 6.4.2.4.A).

Damper 3M-HJB-M57 is a normally closed 40-inch diameter bubble-tight damper serving the Control Room smoke exhaust system and is used for Control Room isolation. Waldinger (HVAC subcontractor), while doing rework to close out NCR SM-6272, discovered that the blade seal on this damper had a tear. The tear condition was documented on NCR MJ-3108. The seal material was replaced and, after the damper was cycled a few times, the seal failed again by tearing. The tear would allow some leakage of air through the damper. Because of this air leakage, the requirement to maintain a positive pressure inside the Control Room may not be met.

Further investigation revealed that, when the damper blade of 3M-HJB-M57 is in the closed position, the clearance (gap) between the damper blade perimeter and the housing ranges from a minimum of 3/64-inch to a maximum of 1/4-inch. These clearances are not consistent with the manufacturer's (Ruskin) fabrication standard applied to a damper that was used during qualification testing. Inspection of an additional seventeen (17) bubble-tight dampers in Unit 3 (sizes 14-inch round and larger) also revealed that the blade edge to housing clearances were either larger and/or smaller than Ruskin's fabrication standard and the blade seals on some were damaged.

II. Approach To and Status of Proposed Resolution

Unit 3

The Ruskin Manufacturing Company (damper supplier) representatives, after preliminary investigation, could not determine the cause of the failure. It was postulated that the tear may have been the result of inadequate seal material or insufficient clearance between damper blade edge and housing.

A. Seal Material

The seal material used on bubble-tight dampers for Palo Verde is gray commercial grade, silicon rubber, supplied by Mosites Rubber Company and made to Federal Specification ZZ-R-765, Class IIA and IIB, Grades fifty (50) and sixty (60), AMS-3302 and 3303.

To reassure the adequacy of the seal material for this application, samples from the blade seal of 3M-HJB-M67 and from torn seal material, taken from defective damper seal 3M-HJB-M57 were sent by Waldinger to Mosite Lab and two other independent labs for analysis.

The blade seals of these two dampers were made from the same material batch. Tests were done to determine if tensile, tear and hardness characteristics of the seal material were comparable with the batch of the seal material originally used for environmental qualification of the bubble-tight damper.

Results of the test are tabulated below:

Laboratory	Tensile (PSI)	Tear (LBS/IN)	Hardness (Durometer)
Mosite	1,000	65	51
Smithers	920	56	49
Weldon	858	32.67	49.7
Qualification Data	1,140	49	59

Ruskin considers hardness of major importance for bubble-tight application followed by tear and tensile.

Since test results revealed that the tear and material hardness on a test sample were generally lower than the data established in the qualification test, Waldinger, Ruskin, and Mosite researched their purchase order records on all Q-Class bubble-tight dampers supplied to Units 1, 2, and 3 and determined that the batch of seal material as used on 3M-HJB-M57 and 3M-HJA-M67 was installed on only four other dampers (3M-HJB-M56, 3M-HJA-M67, 3M-HJA-M57 and 2M-HJB-M67). All six (6) of these dampers were recently purchased as replacement for Unit 3 dampers used in Units 1 and 2. Further review, of purchase order records, revealed that two (2) other dampers (3M-HJA-M02 and 3M-HJB-M02) cannot be traced to a specific batch of seal material.

Waldinger, per direction of SWA 10391, performed an onsite damper cycle test using "unaged" seal material to determine:

(a) Whether blade edge to housing clearance is a factor in tear.

(b) Whether seal material is a factor in tear.

(c) The minimum/maximum gap dimension between blade edge and the frame that will not tear the seal while maintaining leak-tight integrity.

To accomplish this, new seals were installed on dampers 3M-HJB-M57 and 3M-HJB-M67. The seals were made from two batches of seal material made to Mosite's original specifications as supplied to Palo Verde. Both Hard Seal (60 Durometer) and Soft Seal (50 Durometer) were used in the test.

A preliminary evaluation of the Waldinger test results indicates that after dampers are cycled thirty (30) times, the fifty (50) Durometer material is susceptible to failure when used with small blade to frame clearances. These tests also demonstrated that with the proper gap both the hard and soft seal material can sustain the cycle test.

From the Waldinger test it appears that the fix to the tear problem is to use Hard Seal Material and the correct blade edge to frame clearance.

To get more definitive data on the root cause of the problem, Ruskin will perform tests on "environmentally aged" seal material. The scope and object of the test is:

(1) Test a damper with a blade to frame clearance as small as those found on the dampers in Unit 3.

(2) Determine the minimum/maximum clearance for blade installation (using both hard and soft seal material) that will not tear the seal while maintaining leak tight integrity during damper cycling.

B. Blade/Frame Clearance

Of the twenty-five (25) Q-Class bubble-tight dampers used in each unit, four (4) dampers serve the Auxiliary Feedwater Pump Rooms located in the Main Steam Support Structure and twenty-one (21) serve the Control Room Essential Ventilation System.

The clearance between the damper blade and frame is another area being investigated since an adequate clearance is required for the damper to stroke and the material to seal properly. In order to verify if the clearances on the installed dampers in Unit 3 are the same or greater than the ones used by Ruskin for seismic and environmental qualification testing, a plan was developed to measure and record the blade to frame clearances.

Inspection of blade clearance on Unit 3 dampers was conducted by Waldinger under SWA 10391. The procedure used to measure field clearances on the dampers was provided in SFR 3757 and is the same procedure used by Ruskin to measure the clearance on the dampers used for qualification.

Since maintaining a uniform blade to frame clearance during fabrication is more difficult in larger dampers, and since removal of the smaller dampers (sizes 12-inch and under) would be required for measurements, only dampers of 14-inch diameter and larger were surveyed and cycled in Unit 3. There are seventeen (17) dampers (14-inch diameter and larger) in each unit. In Unit 3, thirteen (13) of the seventeen (17) dampers had their blade edge to housing clearances measured and cycled. However, due to access restriction, the remaining four dampers were not cycled. Their blade, clearance, and seals were either visually verified and/or measured and found acceptable.

The minimum sample gap for qualification of a 48-inch diameter damper was 0.094 inches. A 48-inch diameter damper, 3M-HJB-M55, was measured in the field and found to have a blade to frame clearance of 0.047 inches. Damper 3M-HJB-M55 was then cycled thirty (30) times with no evidence of seal damage found. Three (3) out of the thirteen (13) dampers measured had blade to frame clearances smaller than the gap on previously qualified dampers and four (4) out of thirteen (13) had clearances larger than the qualification gap.

Since it is unknown what effect the smaller clearance will have on the performance test of the damper, Ruskin has agreed to perform additional qualification/performance testing on a damper with a blade to frame clearance of 0.047 inches, the smallest clearance measured in Unit 3.

Units 1 and 2

A review of Ruskin purchase orders indicated that all but one (1) of the damper silicone seals used in Units 1 and 2 have higher hardness ratings than the seal material used in Unit 3 (60$\pm$5 Durometer A vs. 50$\pm$5 Durometer A).

However, the clearances between the blade and the frame for the dampers in Units 1 and 2 are unknown. Also, it is not known if the harder silicone rubber will tear in conjunction with small clearances (less than 11/64-inch).

The tears in some Unit 3 damper seals have been observed by BPC to be propagating at a maximum rate of 1/4-inch per cycle in each direction. Assuming the same tear rate of a 1/2-inch per cycle for the dampers in Units 1 and 2, it can be seen that excessive cycling of the dampers could result in the complete seal failure of the damper seals. If all the seals in all the HVAC dampers would fail, then a substantial safety hazard could exist under normal operating conditions.

Justification for Interim Operation

In order to justify the interim operation of the PVNGS Units 1 and 2, BPC performed a calculation to show the adequacy of the bubble-tight dampers at their present state to perform their intended safety function in the event of a CREFAS, CRVIAS, a Computer Room halon release or an Auxiliary Feedwater Pump Room flooding. This calculation conservatively assumes that all the bubble-tight dampers will develop a tear of approximately 1/2-inch every time the damper is cycled. Furthermore, this calculation conservatively assumes that only one of the two in-series dampers will close to provide isolation. Finally, the calculation shows that even after performance of all the surveillance tests for eighteen (18) months, with tears propogating with each cycle, the Control Room habitability and Auxiliary Feedwater Pump Room flooding is not compromised.

Additionally, Waldinger performed a preliminary test of a damper with a hard silicone rubber seal (60+5 Durometer A) and a minimum clearance of 1/16-inch vs. 11/64-inch. The preliminary test indicates satisfactory damper performance even after three hundred (300) cycles.

The qualification report and Instruction Manual, for these dampers, indicates that the seals shall be replaced every five (5) years. If the results obtained from the Ruskin test requires rework on the damper blades, the work can be performed during the next scheduled outage.

Each individual event (i.e., CREFAS, CRVIAS, Computer Room fire, and Auxiliary Feedwater Room flooding will be justified separately for interim operation:

1. CREFAS and CRVIAS

   The Control Room habitability in this mode is not compromised because:

   a. If the clearance between the damper blade and frame is greater than 1/16-inch, then preliminary testing by Waldinger indicates satisfactory performance of the damper in conjunction with the harder silicone rubber seal which is currently installed in Units 1 and 2 CREFAS related dampers.

   b. Calculation No. 13-MC-HJ-803, Rev. 0, verifies the adequacy of the Control Room Essential HVAC unit to perform its intended safety function at its present state for eighteen (18) months within the bounds of the assumptions made in the calculation.

c. The FSAR and Calculation No. 13-MC-HJ-803, Rev. 0 assume one (1) of the two (2) in-series dampers will provide isolation. However, both dampers will close in the event of a CREFAS which will provide a more difficult path for air to leak out.

d. The last Control Room pressurization test (73 ST-9HJ01) performed in Units 1 and 2 proved the capability still existed for the Essential HVAC system to pressurize the Control Room. Tech Spec 4.7.7.d.3 minimum requirements were satisfied by a wide margin.

	Tech. Spec. Req'd.	Minimum Actual
Unit 1	1/8" W.G.	.65" W.G.
Unit 2	1/8" W.G.	.375" W.G.

3. Computer Room Fire

A bubble-tight damper is installed in the Computer Room normal HVAC supply line to isolate the air supply to prevent halon dilution and to "bottle-up" the halon in the Computer Room for ten (10) minutes. The first line of defense for the HVAC system is fire damper HJB-M15 which will close to prevent some of the air from traveling into the Computer Room. The bubble-tight damper, HJA-M67, is used as the second line of defense. Calculation 13-MC-HJ-803, Rev. 0 shows that even with an assumed tear of 1/4-inch, propogating for five (5) years, the quantity of leakage is so minimal that the capability of the halon system to perform its function is not compromised.

4. Auxiliary Feedwater Room Flooding

Calculation No. 13-MC-HJ-803, Rev. 0 verifies the adequacy of Auxiliary Feedwater Room isolation dampers to perform their intended safety function at its present state within the bounds of the assumptions made in the calculation. Additionally, this calculation shows that if operator action is taken in thirty (30) minutes to isolate the flood source, the HVAC damper would not be submerged and leakage through the dampers would not happen.

III. Projected Completion of Corrective Action and Submittal of the Final Report

The complete evaluation and final report are forecast for September 26, 1986.