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## Arizona Nuclear Power Project

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December 28, 1984  
ANPP-31598-TDS/TRB

REGION V MAIL •

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

Subject: Final Report, Revision 1 - DER 84-53  
A 50.55(e) Reportable Condition Relating to Bonnet and  
Diaphragm Nuts and Bolts Loose on PC and CH Valves  
File: 84-019-026; D.4.33.2

Reference: A) Telephone Conversation between P. Narbut and T. Bradish on  
August 17, 1984  
B) ANPP-30533, dated September 17, 1984, (Interim Report)  
C) ANPP-31045, dated November 2, 1984, (Time Extension)  
D) ANPP-31161, dated November 16, 1984, (Time Extension)  
E) ANPP-31256, dated November 29, 1984, (Time Extension)  
E) ANPP-31527, dated December 18, 1984, (Final Report)

Dear Sir:

Attached is Revision 1 of our final written report of the deficiency  
referenced above, which has been determined to be Not Reportable under  
the requirements of 10CFR50.55(e). This Revision clarifies and updates  
the Condition Description and Corrective Action.

Very truly yours,

E. E. Van Brunt, Jr.  
APS Vice President,  
Nuclear Production  
ANPP Project Director

EEVB/TRB:dlm

Attachment

cc: See Page Two

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Mr. D. F. Kirsch  
DER 84-53  
Page Two

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FINAL REPORT - DER 84-53  
DEFICIENCY EVALUATION 50.55(e)  
ARIZONA PUBLIC SERVICE COMPANY (APS)  
PVNGS UNITS 1, 2, 3

I. Description of Deficiency

During NRC Inspection 530/84-07 valve No. 3P-SIE-V235 was discovered lacking full thread engagement on the bonnet stud nut. This nonconformance was documented on NCR No. PC-8259. As a result of this finding, APS initiated CAR No. 84-053D. The CAR recommended revising the existing procedures to give specific requirements for thread engagement. During this period of evaluation, valve No. 3P-SIE-V543 was discovered with loose nuts and documented on NCR No. PC-8509. Bechtel Construction was also inspecting a random sample of valves and discovered valve No. 3P-SIE-V245 was lacking full thread engagement. This was documented on NCR No. PC-8842. Valve No. 3P-SIE-V237 was discovered lacking full thread engagement and was documented on NCR No. PC-9321. After valve Nos. 3P-SIE-V235 and 3P-SIE-V245 were reworked per NCR Nos. PC-8259 and PC-8842, respectively, the NRC reinspected valve No. 3P-SIE-V235 and Bechtel subsequently reinspected valve No. 3P-SIE-V245 and found them to be still lacking full thread engagement. These conditions were documented on NCR Nos. PC-9320 and PC-9352.

During a Quality Assurance Audit of WPP/QCI 207.0, Rev. 9, "Disassembly and Reassembly of Quality Class "Q", "R", and "S" Valves, a number of valves were discovered with bolting deficiencies. As a result, audit No. QAF 101-S-84-37-A was initiated and forty-one additional valves were reviewed. The review discovered loose and/or missing hex bonnet nuts in twelve valves and in diaphragm valve stud nuts which were in a less than flush condition in the valve body and/or nut in nine valves. The audit also reported that Specification 13-PM-204 for "Nuclear Fuel Fabrication and Installation of Piping Systems" and Procedure WPP/QCI 207.0 for "Disassembly and Reassembly of Quality Class "Q", "R", and "S" Valves lack the requirements of the ASME Code to define the proper thread engagement. These nonconforming conditions were documented on NCR Nos. PX-9264 and PX-9265 for Units 2 and 3, respectively.

A. General

In order to determine the potential extent of the conditions described in Section I, a sampling program was conducted to assure that valves would perform their required safety function. The sampling was conducted on Unit 2 and 3 only, because access to Unit 1 for sampling is difficult; however, the results of the sampling would be applicable to Unit 1 for the following reasons:

1. The same manufacturers supplied the valves for all three units.
2. The Unit 1 valves were installed in accordance with the same procedures.
3. The Unit 1 valves have already been subjected to normal operating parameters.

The sample size was selected, similar to that necessary, to provide assurance, within a 95% confidence level, that at least 95% of the valves potentially subject to the type of deficiencies previously found would be satisfactory. Two types of deficiencies were considered:

- ° Nut/stud engagement
- ° Stud to valve bonnet engagement

In each case, a sufficient sample of valves, distributed among the applicable vendors, was established based on the total three-unit population of applicable valves to assure compliance with the stated criteria. Special CIP's were prepared to document the inspection.

B. Nut/Stud Engagement

Procedures to reinspect hex bonnet nut engagement were generated under SCIP Nos. 569.0 and 570.0. These procedures required the inspection of 125 valves in both Units 2 and 3. The sampling required the hex bonnet nuts to be checked for full thread engagement on assorted valve types (i.e., diaphragm, swing check, manual gate, etc.).

The sample consisted of valves from three suppliers: Dresser, Anchor/Darling, and Kerostat. Hex bonnet nut engagement for valves supplied from Borg Warner and ITT Grinnell were not inspected since they were addressed in the survey associated with the NRC inspection and the Bechtel Quality Assurance Audit. The inspections of B/W and ITT-Grinnell valves did not identify any safety-related conditions.

The sample size consisted of 250 valves in Units 2 and 3 out of a total valve population for all three units of 2,046 valves. For a 95% confidence that 95% of the installations are acceptable, a total of 7 deficiencies would have been allowed.

The sampling results show that no deficiencies were discovered in Unit 2 and two deficiencies in Unit 3. The deficiencies were documented on NCR No. PF-9128. Per discussion with Anchor Darling, a lack of 1/32" for one bolt will not create a safety problem. Per discussion with Dresser, a maximum permissible negative tolerance for full thread engagement would be 0.094 inches. The actual lack of full thread engagement is 0.046, therefore, this also would not be a safety problem.

As an additional measure, SCIP 569.0 and 570.0 were amended by PCN 1 to perform a like sampling on Fisher, Helix and Dragon valves. The Dragon and Helix valves were found constructed such that they were not applicable to the subject problem. A review of an additional fifteen (15) Fisher valves yielded one valve with three (3) nuts of a twelve (12) bolt circle having minor deficiencies with thread engagement. The finding was documented on NCR PA-9881. Fisher has acknowledged that the condition, as found, would not impact the functionality of the valve during its design conditions. The valve will, however, be dispositioned rework to achieve full thread engagement.

Based on the results that no safety significant conditions exist, the project has adequate confidence that valves previously installed in Units 1, 2 and 3 are acceptable for their intended use and no further sampling is required.

C. Stud to Valve Bonnet Engagement

A procedure was developed to reinspect the thread engagement from the bonnet stud into a valve. These procedures were generated under SCIP Nos. 617.0 and 618.0. The sampling required the valve bonnet studs to be checked for the required thread engagement of assorted valve types (i.e., diaphragm, swing check, manual gate, etc.). The sample consisted of valves from six suppliers: Dresser, Anchor/Darling, Fisher, Borg Warner, Crosby and ITT Grinnell.

The sample size consisted of 260 valves in Units 2 and 3 out of a total valve population for all three units of 3,186 valves. For a 95% confidence that 95% of the installations are acceptable, a total of 7 deficiencies would have been allowed.

The sampling results show that eight (8) valves were found with minor deficiencies. The conditions were reported on NCR's PC-9902, PC-9903, PC-9320 and PC-9352. (Note: PC-9320 and PC-9352 were found originally during the NRC reinspection). Based upon technical justification provided by the manufacturer, the existing condition was determined not to be safety significant. The NCR's will, however, be dispositioned rework. NRC's PA-9829 and PA-9830 were also written during this sampling to document potential problems. Based on subsequent manufacturer clarification, these are no longer nonconformances and have been dispositioned as such.

As an additional measure, SCIPs 617.0 and 618.0 were amended by PCN 1 to perform a like sampling on additional Fisher valves and to include Helix and Dragon valves. The Dragon and Helix valves were found constructed such that they were not applicable to the subject problem. An additional fifteen (15) Fisher valves were sampled and did not identify any deficiencies with thread engagement.

Based on the results that no safety significant conditions exist, the project has adequate confidence that valves previously installed in Units 1, 2 and 3 are acceptable for their intended use and no further sampling is required.

D. NRC Inspection

The NRC inspection identified potential problems with Borg Warner swing check valves. These swing check valves are designed in such a manner that the studs which are used to hold down the spacer bonnet are not a load carrying component. The studs are used only to hold the valve bonnet snug against the valve seal when the system is not pressurized. During operation of the piping system, the internal pressure will force the bonnet up against the valve seal negating the need for the studs and the requirement for the minimum thread engagement. Prior to operation, the piping system is pressurized to 125 percent of its design pressure, and any problem with the bonnet or valve seal would be detected then. Lack of minimum thread engagement will not impact the safety of the valve or system. (Reference NCR Nos. PC-8259, PC-8509, PC-8842, PC-9320, PC-9321, and PC-9352).

Even though a number of NCR's required rework as given in Paragraph III.A, the work was completed on Borg Warner manufactured valves on a discretionary basis since the rework was determined as non-safety-related. Since this rework was not required to ensure safety, no further sampling or rework is required, but will be performed when applicable under Paragraph III.C.

E. Bechtel Audit Inspection

The Bechtel Quality Assurance Audit of WPP/QCI 207.0 identified potential problems with ITT Grinnell diaphragm valves. The problem of missing/loose nuts described on the NCR's are not considered to be significant because of the type of valve involved (i.e., diaphragm valves). Until such time as rated pressure and temperature is reached, it would be possible that loose nuts would be found. The ITT Grinnell valve installation manual states "the bonnet nuts should not be overtightened. Only a slight squeezing of the diaphragm is necessary. If leakage occurs around outer edge of diaphragm after rated pressure and temperature is reached, retighten bonnet nuts". Because there is no torque value to attain and a "slight squeezing of the diaphragm" is subjective, the likelihood of loose nuts is possible but does not pose a problem. (Reference NCR Nos. PX-9262 and PX-9265).

Even though a number of NCR's required rework as given in Paragraph III.A, the work was completed on ITT Grinnell manufactured valves on a discretionary basis since the rework was determined as non-safety-related. Since this rework was not required to ensure safety, no further sampling or rework is required, but will be performed when applicable under Paragraph III.C.

F. Summary

Based on the results of the overall inspection program, it can be concluded that no safety significant deficiency exists relative to the bolting on the subject valves. Therefore, it is concluded that no further sampling is warranted.

The root cause of the deficiency was the lack of specific acceptance criteria for thread engagement. This procedural item has been corrected as discussed in Section III, Corrective Action.

Procedural requirements for system walkdowns in the WPP/QCI's that address loose/missing nuts and bolts in valves are as follows:

- A. WPP/QCI 31.0, Subsystem Transfer/Acceptance, Paragraph 6.5.7

"Where practical, inspect for loose nuts and bolts (i.e., hanger supports, flanges, etc.).

- B. WPP/QCI 202.0, Piping Systems Installation, Appendix IX C.6.D(d)

"Verify that all visible vendor bolts, studs and nuts are present and intact".

The missing nuts were all in Unit 3 and would have been identified at the time of subsystem walkdown.

## II. Analysis of Safety Implications

Based upon the above, this condition is evaluated as not reportable under 10 CFR Part 50.55(e) and Part 21 since, if left uncorrected, it would not be a significant safety hazard.

## III. Corrective Action

- A. The following NCRs were evaluated and will have the following actions:

1. NCR No. PC-8259 was dispositioned Rework.
2. NCR No. PC-8509 was dispositioned Rework.
3. NCR No. PC-8842 was dispositioned Rework.
4. NCR No. PF-9128 was dispositioned Use-As-Is/Rework.
5. NCR No. PX-9264 was dispositioned Use-As-Is/Rework.
6. NCR No. PX-9265 was dispositioned Use-As-Is/Rework.
7. NCR No. PC-9320 was dispositioned Use-As-Is.
8. NCR No. PC-9321 was dispositioned Use-As-Is.
9. NCR No. PC-9352 was dispositioned Use-As-Is/Rework.



10. NCR Nos. PA-9829 and PA-9830 are no longer nonconforming conditions due to revised criteria by the valve manufacturer.

B. To preclude recurrence of this type problem, the following documents have been generated to specify the acceptable thread engagement:

FCR No. 82,404 to Specification 3-PM-204  
FCR No. 84,746 to Specification 3-PM-204  
FCR No. 82,402 to Specification 3-MM-510  
PCN No. 15 to WPP/QCI 151.0  
PCN No. 3 to WPP/QCI 156.0  
PCN No. 152 to WPP/QCI 201.1  
PCN No. 169 to WPP/QCI 202.0  
PCN No. 24 to WPP/QCI 207.0  
PCN No. 31 to WPP/QCI 207.0  
PCN No. 20 to WPP/QCI 350.0

C. Procedural requirements will be expanded to include in WPP/QCI 202.0 "Piping Systems Installation" that thread engagement will be verified upon acceptance of valve installation. WPP/QCI 207.0 "Disassembly and Reassembly of Quality Class "Q", "R", and "S" Valves will be revised to include verification of thread engagement upon reassembly of valves. These changes will be incorporated by January 1, 1985.

D. Training sessions were held in June and August 1984 to discuss with required AFE's and QC personnel about the acceptable thread engagement.