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Arizona Public Service Company

October 15, 1984
ANPP-30852-TDS/TRB

U. S. Nuclear Regulatory Commission
Region V
Creekside Oaks Office Park
1450 Maria Lane - Suite 210
Walnut Creek, California 94596-5368

Attention: Mr. T. W. Bishop, Director
Division of Reactor Safety and Projects

Subject: Final Report - DER 83-53
A 50.55(e) Reportable Condition Relating To Unit 3 Embed Plates Do Not Meet Specification Of WPP/QCI Requirements.
File: 84-019-026; D.4.33.2

Reference: A) Telephone Conversation between P. Narbut and R. Tucker on August 1, 1983
B) ANPP-27597, dated August 26, 1983 (Interim Report)
C) ANPP-28323, dated November 30, 1983 (Interim Report)
D) ANPP-28799, dated February 6, 1984 (Interim Report)
E) ANPP-29532, dated May 17, 1984 (Time Extension)

Dear Sir:

Attached is our final written report of the Reportable Deficiency under 10CFR50.55(e), referenced above.

Very truly yours,

E. E. Van Brunt

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

EEVB/TRB/nj
Attachment

cc: See Page Two

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PDR ADOCK 05000528
S PDR

IE-27

cc: Richard DeYoung, Director
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U. S. Nuclear Regulatory Commission
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FINAL REPORT - DER 83-53
DEFICIENCY EVALUATION 50.55(e)
ARIZONA PUBLIC SERVICE COMPANY (APS)
PVNGS UNITS 1, 2, 3

I. Description of Deficiency

During the removal of a damaged beam in the Unit 3 Containment Building, as documented on Nonconformance Report (NCR) CC-4043, it was discovered that two type N wall embed plates were installed without any anchor bolts. This finding was documented on NCR CC-4201.

Evaluation

As a result of the findings in Unit 3, a field walkdown program was initiated to inspect all accessible wall embed plates for all Unit 3 buildings. The decision to inspect wall embed plates was based on the construction practice employed of inserting threaded anchor bolts in the plate after attachment of the plate to the form. This practice makes it more difficult to verify complete thread engagement of anchor bolts prior to concrete placement. Verification of thread engagement is accomplished after the concrete forms are removed. Embed plates placed in other areas, such as slabs, are generally placed with anchor bolts already inserted.

Approximately 20,000 plates with 190,000 bolts were inspected in Unit 3 and NCRs were issued to document missing bolts, bolts having thread engagement less than required by Specification 13-CM-308, and bolts covered by attachments on plates which did not have a post-concrete-placement inspection. The results of the Unit 3 inspection are summarized in Table I.

As a precautionary measure, approximately 10% of wall embed plates in Units 1 and 2 were randomly selected by Engineering at each level of each building for field inspection. During inspection, the walkdown personnel inspected an additional number of plates in areas adjacent to those plates selected in the original 10%. The number of additional plates inspected was approximately 30% in Unit 1 and 40% in Unit 2. Only those additional plates with nonconformities were reported. Furthermore, due to a finding in the Unit 2 Auxiliary Building of one plate with all 10 anchor bolts missing, all wall embed plates in the Unit 2 Auxiliary Building which support heavier loading were also inspected. The results of the Unit 1 and Unit 2 inspection are summarized in Tables II and III respectively.

TABLE I

INSPECTION RESULTS - UNIT 3
(100%* - APPRCXIMATELY 20,000 Plates)

BLDG.	NCR NO.	TOTAL NO. EMBED PLATES REPORTED	TOTAL NO. OF BOLTS	NO. OF EMBED PLATES WITH BOLTS COVERED BY ATTACH.	NO. OF BOLTS COVERED BY ATTACH.	NO. OF BOLTS REQUIRING PLUG WELD	NO. OF PLATES WITH MISSING BOLTS	NO. OF BOLTS MISSING
Diesel/Gen	CG-4259	78	774	8	9	181	1	2
Fuel	CF-4260	557	3442	441	976	194	0	0
Control	CJ-4261	180	1182	17	25	345		1
Containment	CC-4262	80	796	29	106	99	1	1
Containment	CC-4263	39	321	39	74	0	0	0
Tunnels	CY-4264	11	126	4	7	11	0	0
Containment	CC-4265	65	516	9	16	120	0	0
Containment	CC-4266	196	1898	42	146	347	0	0
Auiliary	CA-4267	168	1682	13	33	236	4	11
Turbine	CT-4286	88	715	85	249	9	1	10
Radwaste	CR-4310	1	1	0	0	0	1	1
Auxiliary	CA-4460	38	324	2	2	52	0	0
TOTALS		1,501	11,776	689	1,643	1,594	9	26

*100% of accessible wall embed plates

TABLE II

INSPECTION RESULTS - UNIT 1
(NCR CX-4563)

INITIAL 10% - APPROXIMATELY 2,000 PLATES

BLDG.	TOTAL NO. EMBED PLATES REPORTED	TOTAL NO. OF BOLTS	NO. OF EMBED PLATES WITH BOLTS COVERED BY ATTACH.	NO. OF BOLTS COVERED BY ATTACH.	NO. OF BOLTS REQUIRING PLUG WELD	NO. OF PLATES WITH MISSING BOLTS	NO. OF BOLTS MISSING
Fuel	4	32	1	1	5	0	0
Diesel/Gen	4	42	1	1	5	0	0
Control	7	63	0	0	10	0	0
MSSS	14	144	6	20	21	0	0
Tunnels	1	12	0	0	1	0	0
Containment	6	58	2	5	15	1	2
Auxiliary	28	270	5	6	32	1	1
Turbine	5	32	1	1	10	0	0
Radwaste	3	30	1	2	3	0	0
TOTALS	72	683	17	36	102	2	3

ADDITIONAL 30% - APPROXIMATELY 6,000 PLATES

Fuel	3	26	1	1	3	0	0
Diesel/Gen	5	50	1	2	8	0	0
Control	2	8	1	1	3	0	0
MSSS	12	113	4	19	35	0	0
Tunnels	7	70	2	3	9	0	0
Containment	8	67	2	2	9	2	3
Auxiliary	85	805	15	25	101	2	4
Turbine	3	18	1	2	6	0	0
Radwaste	5	50	0	0	7	0	0
TOTALS	130	1,207	27	55	181	4	7

TABLE III

INSPECTION RESULTS UNIT 2
(NCR CX-4564)

INITIAL 10% - APPROXIMATELY 2,000 PLATES

BLDG.	TOTAL NO. EMBED PLATES REPORTED	TOTAL NO. OF BOLTS	NO. OF EMBED PLATES WITH BOLTS COVERED BY ATTACH.	NO. OF BOLTS COVERED BY ATTACH.	NO. OF BOLTS REQUIRING PLUG WELD	NO. OF PLATES WITH MISSING BOLTS	NO. OF BOLTS MISSING
Fuel	6	54	1	1	10	0	0
Diesel/Gen	2	20	0	0	2	0	0
Control	13	94	0	0	13	1	1
MSSS	2	19	0	0	5	0	0
Tunnels	1	12	1	3	1	0	0
Containment	3	29	1	4	3	0	0
Auxiliary	36	329	6	10	40	1	1
Turbine	4	34	0	0	8	0	0
Radwaste	10	94	2	3	11	0	0
TOTALS	77	685	11	21	93	2	2

ADDITIONAL 40% - APPROXIMATELY 8,000 PLATES

Fuel	7	54	1	2	8	0	0
Diesel/Gen	3	24	0	0	2	1	1
Control	4	34	1	1	4	0	0
MSSS	7	64	2	4	12	1	2
Tunnels	1	10	0	0	2	0	0
Containment	5	20	0	0	10	0	0
Auxiliary	72	646	7	9	93	2	11*
Turbine	2	14	1	2	2	0	0
Radwaste	3	30	1	1	4	0	0
TOTALS	104	896	13	19	137	4	14

* Includes one plate with all 10 bolts missing.

ALL HEAVILY LOADED PLATES IN AUXILIARY BLDG.
(APPROXIMATELY 1,050 PLATES INSPECTED)

Auxiliary	25	262	13	18	29	2	2

The inspection revealed plates which had missing bolts, bolts having thread engagement less than required by Specification 13-CM-308, and bolts covered by attachment which did not have a post-concrete-placement inspection. With the exception of four plates found with all anchor bolts missing, all reported conditions have been evaluated to be acceptable for the actual loading conditions. Based on this evaluation, only plates found with all anchor bolts missing are considered to be defective and not able to perform the intended function.

The table below gives the estimated number of plates inspected in Units 1, 2, and 3 and the number of plates found to have all bolts missing. These plates are considered defective and the appropriate corrective action was taken as prescribed in the NCR disposition.

Unit No.	Number of Embed Plates Examined	Number of Defective Plates[a]
1	8,058 (est)	0
2	11,193 (est)	1
3	20,000 (est)	3
TOTALS	38,251	4

(a) All anchor bolts missing

The frequency of occurrence of defective plates, as illustrated by the above data, is such that these cases can be considered isolated and not indicative of any deficiency in the overall construction or quality verification programs. The root cause is attributed to the failure of craftsmen to install plates per design drawings plus the failure of QC to detect the craftsman's error. Nonconformances related to thread engagement of anchor bolts are believed to be a result of the technique used to inspect bolt recess from the face of the embed plate. Project Work Plan Procedure WPP/QCI 54-0, Revision 11, which was in effect at the time this work was done, lacked specific definition of how to perform the inspection utilizing the appropriate tools and only required visual inspection for proper anchor bolt thread engagement.

II. Analysis of Safety Implications

The lack of adequate anchorage for an embed plate could cause the plate to fail when subjected to its design load. Failure of the embed plate could damage safety-related systems and/or equipment. Therefore, the condition reported herein is considered safety significant and is evaluated as reportable under the requirements of 10CFR50.55(e). This condition is evaluated as not reportable under the requirements of 10CFR Part 21 since it does not involve a defect in a basic component.

III. Corrective Action

The following corrective actions have been implemented by Engineering:

A. Unit 3

1. The two defective Type N embed plates in the Unit 3 Containment Building, documented in NCR CC-4201, were replaced by new plates attached to the concrete with Maxi-bolts in accordance with Specification No. 13-CM-307.

2. The anchor bolts with visible thread engagement less than required by Specification 13-CM-308, documented in the tabulated NCRs, were plug welded in accordance with Section 7.4 of Specification No. 13-CM-308 (except in the elevator shaft of the Auxiliary Building-NCR CA-4460, where anchor bolts with recess greater than 3/16" were plug welded).

3. One embed plate on the Turbine Pedestal without any anchor bolts was removed and deleted from the Unit 3 Engineering design drawing (documented in NCR CT-4286), since it was not being utilized.

4. Embed plates with (a) bolts covered by attchments and (b) missing bolts (1 or 2 bolts missing) were evaluated based on the assumptions that the bolts covered by the attachments are existing but with 1/4" recess from the face of the plates. All embed plates were found to be structurally acceptable as the "as-built" embed plate design capabilities are higher than the applied loads. (Approximately 97% of evaluated plates are loaded to 25%, or less, of their calculated capacities.) However, DCNs have been issued for the few plates with heavier loading conditions to prevent additional attachments and loads without prior Engineering evaluation and approval.

   Bolts covered by attachments have been randomly selected by Engineering for field inspection to verify the existence of the bolts and the conditions of thread engagements. The number of the selected plates represents 32% of the embed plates with heavier loading conditions. Results of this inspection verified assumptions made relative to bolt existence and thread engagement.

5. Subsequent to completion of the inspection of accessible wall embed plates, it was determined that embed plates installed on the bottom of beams and slabs, i.e., soffit embed plates, may have been installed in the same manner as wall embed plates. Based on this, a 100% inspection of accessible soffit embed plates will be performed prior to fuel load in Unit 3. All nonconformances will be reported in accordance with project procedures and will be cross-referenced to this DER.

B. Units 1 and 2

1. One defective Type J embed plate in the Unit 2 Auxiliary Building documented in the NCR CA-4423, was corrected by adding Maxi-bolts to anchor the existing plate to the concrete in accordance with Specification No. 13-CM-307.

2. Embed plates with (a) bolts with visible thread engagement less than required by Specification 13-CM-308 (b) bolts covered by attachments and (c) missing bolts (1 or 2 missing bolts per plate) were evaluated based on the assumptions that the bolts covered by the attachment are existing, but with the same amount of thread engagement recess as those visible on the plate. Field inspections were made to verify Engineering assumptions relative to bolt existence and thread engagement. The evaluation revealed that approximately 94% of plates were loaded to 25%, or less, of their calculated capacities. Plates which have thread engagement less than required by Specification 13-CM-308 but which have been shown by Calculation 13-CC-ZS-015 to have no reduction in rated capacity will be accepted "as-is" with no plug welding required. Plates which require a reduction in capacity due to excessive bolt recess and/or missing bolts, but which have been shown by Calculation 13-CC-ZS-015 to be able to adequately support existing attachments, will be accepted "as-is" with no rework but will be identified on drawings to require prior Engineering approval for any future attachments. These plates will also be identified in the field by a permanent (engraved) marking to warn against making any further attachments without prior Engineering approval. Plates which cannot adequately support existing attachments due to excessive bolt recess and/or missing bolts will be reworked by plug welding and/or providing alternative anchorage.

3. Based on results of the partial (10%) inspection, a 100% inspection of accessible wall and soffit embed plates will be performed. Special CIP No. 553.0 was issued by Construction to provide procedures and documentation for this inspection. All work in Unit 1 was completed by September 1, 1984 and will be completed prior to fuel load in Unit 2.

C. Project Work Plan Procedure 54.0 has been revised to require inspection for anchor bolt thread engagement using a depth gauge.

D. Other work plan procedures have been reviewed and revised as applicable to provide adequate criteria and inspection requirements. This is documented in the project's response to the NRC CAT audit (ANPP-28749-EEVB/WEI, dated January 31, 1984).