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SUBJECT: Interim deficiency rept re inadequate concrete strength
 achieved w/pneumatically placed mortar repairs.Evaluation of
 all repairs will be completed 801201.Final rept will be
 submitted by 801215.

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NOTES:Standardized Plant.
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REPORT
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ARIZONA NUCLEAR POWER PROJECT
Post Office Box 21666 Phoenix, Arizona 85036



50-528
50-529

October 7, 1980
ANPP-16500-BSK/JAR

U. S. Nuclear Regulatory Commission
Region V
Walnut Creek Plaza - Suite 202
1990 North California Boulevard
Walnut Creek, California 94596

Attention: Mr. G. S. Spencer, Chief
Reactor Construction and
Engineering Support Branch

Subject: A 50.55(e) Reportable Deficiency Relating to Inadequate
Concrete Strength Achieved with Pneumatically Placed
Mortar Repairs
Interim Report
File: 80-019-026

Reference: Telephone Conversation between J. Eckhardt and J. E. Cook
on September 4, 1980 (DER 79-12)

Dear Sir:

The NRC was notified of a reportable deficiency in the referenced telephone conversation. At that time, it was estimated that a final report would be available within thirty (30) days.

Due to the extensive investigation and evaluation required, an interim report is attached. It is now expected that this information will be finalized by December 15, 1980, at which time a complete report will be submitted.

Very truly yours,

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

EEVBJr/BSK:skc

Attachment

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5/1

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U. S. Nuclear Regulatory Commission
Attention: Mr. G. S. Spencer, Chief

Page 2

cc: Victor Stello, Jr., Director
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U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

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INTERIM REPORT
REPORTABLE DEFICIENCY
ARIZONA PUBLIC SERVICE COMPANY (APS)
PVNGS UNITS #1 AND #2

I. Potential Problem

The pneumatically placed mortar method of concrete imperfection repair was introduced to the PVNGS jobsite about August, 1978.

The first indication of a problem with pneumatically placed mortar was identified in September of 1979 when NCR C-J-1542 was generated. The NCR identified a number of concrete imperfections in the Control Building of Unit #2. The disposition of the NCR made in October, 1979 was "Repair" in accordance with Section 16 of Specification 13-CM-365 (Installation Specification for Forming, Placing, Finishing and Curing of Concrete). During the repair of these imperfections, application problems were found in the use of pneumatically placed mortar. In-situ concrete testing indicated a need for more accurate analysis by core sampling. Core samples were obtained from repaired locations and tested. Results indicated that pneumatically placed mortar was insufficient in strength from all sample areas. These results indicate that there may be a generic concern in strength adequacy of previous applications of pneumatically placed mortar.

Initial evaluation of this problem was limited to pneumatically placed mortar and concerned mainly surface imperfections which did not appear to adversely affect the safety performance of the structures. However, further investigation described below, revealed a much more extensive problem that could present a safety hazard.

II. Approach To and Status Of Proposed Resolution

A plan titled "Evaluation and Disposition of Concrete Repairs for DER 79-12" (attached) was developed in April, 1980. This plan provides instructions for the ultimate resolution of this subject by providing a full-scale evaluation, consisting of in-situ testing and a walk-down of all accessible areas of all buildings in Units #1 and #2, to locate all areas of repaired concrete imperfections because the concrete pour records did not indicate the exact location of the surface repairs. Evaluation of each repair consists of visual examination and tapping on repaired areas, and core samples taken of the visually accepted patches to determine the quality of the concrete. During the evaluation, it became apparent that concrete imperfections that had been repaired by pneumatic placement could not be visually distinguished from those repaired by mortar replacement or drypacking. All concrete imperfection areas were, therefore, evaluated and it was determined that not only pneumatically placed repairs were suspect, but all other repair methods were suspect also. NCE's C-X-1897 and C-X-1925 were written so as to include all concrete imperfection repair areas.

To date, the results of this evaluation indicate that concrete repairs were unacceptable using pneumatic placement, mortar replacement, and drypacking methods. If left uncorrected, these unacceptable repairs could possibly cause excessive stress to develop during a seismic event in the various shear walls.

Use of pneumatically placed mortar as a method of repair has been discontinued as of November 9, 1979. Specification 13-CM-365, Section 16.0 (Concrete Repair) has been revised to better control both the methods and materials used in the repair of concrete imperfections. Methods and materials have been consolidated to avoid confusion and eliminate complicated repair systems.

Areas that were accessible for rework have been evaluated by engineering on NCR's C-X-1897 and C-X-1925 and the necessary rework has been essentially completed. A review of the documentation of concrete records revealed that there are also a limited number of concrete imperfections that were repaired and are no longer accessible. The inaccessible imperfections will be evaluated and dispositioned on NCR C-R-2040.

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

The evaluation of all repairs is forecast to be completed by December 1, 1980.

The final report will be submitted by December 15, 1980.

EVALUATION AND DISPOSITION
OF CONCRETE REPAIRS FOR
DER 79-12

PURPOSE:

1. To review the specification requirements and field procedures for clarity and supplement as needed to provide any additional criteria for control of the work..
2. To identify pneumatically placed repairs that do not meet specification requirements in all units and as reported in DER 79-12 and initiate corrective measures.

INVESTIGATION PROCEDURES:

1. The evaluation and disposition of concrete repairs for DER 79-12 is shown by the flow diagram on page 3. All previously made repairs will be located physically and documented by mapping and sketching. The documentation will be by unit, building, and area.
2. All suspected areas will be identified as acceptable or nonacceptable by tapping or visual examination/engineering judgement. The quality of existing repairs will be investigated using one of the techniques listed below. Those items that are determined to be defective will be dispositioned by category defined in Item 3. Those repairs classified as sound will be reviewed by the Resident Engineer and a sample selected for confirmation of soundness of repair.

Techniques:

- a. Tapping
 - b. Visual Examination/Engineering Judgement
 - c. Drilling
 - d. Coredrilling
3. Determine the acceptance of the need for rework of the existing concrete repairs (see acceptance criteria). If rework is required, assign the repairs to categories as follows:
 - a. Cosmetic (surficial only to 1 inch depth)
 - b. Minor (up to first layer of rebar). NOTE: If the first layer of rebar is significantly exposed, the repair will be categorized as major.
 - c. Major (first layer of rebar and beyond).
 4. Areas of existing repair (minor or major) near major equipment foundations will be reviewed on a case by case basis by Engineering. Areas of existing repairs noted in inaccessible areas will be reviewed on a case by case basis by Engineering.

CRITERIA-ACCEPTANCE/REWORK OR REPAIR:

1. The investigation techniques and procedures are defined as follows:
 - a. Tapping - This method is used to determine the density and bond of the repair. If the repair sounds solid, it will be given a classification "C". If an immediate indentation is noted upon tapping, it will be given a classification "B".
 - b. Physical Examination/Engineering Judgement - Used in conjunction with tapping to assure good bond and high density of repair material. Also, location of repair and size of repair is considered in classification noted in (a) above.
 - c. Drilling - Use change in speed of drill to determine soundness of concrete. Speed of drill should change dramatically when drilling through defective repair and striking sound concrete.
 - d. Coredrilling - Samples will be tested to assure desired strength has been reached.
2. If any of the random selection of 30 percent of classification "C" repairs fail, then an additional 20 percent of the repairs must be reviewed. If no more failures are found, the procedure may stop. If additional failures are found, then all classification "C" repairs must be reviewed.
3. Rework or repair will be accomplished using the latest specification requirements in field procedures.

DOCUMENTATION:

1. The existing repaired areas categorized as cosmetic, that are satisfactory will be noted on the mapping sketches and will become part of the final DER Evaluation Report. Cosmetic areas found needing rework shall be documented for rework by a Rework Tag (Ref. WPP/QCI No. 5.0).
2. The existing repaired areas categorized as minor, that are found to need rework, shall be documented for rework by a Rework Tag. (Ref. WPP/QCI No. 5.0).
3. The existing repair areas categorized as major, that are found to need rework, shall be documented on an NCR and repaired in accordance with Engineering disposition. (Ref. WPP/QCI No. 5.0).
4. A report of the investigation by Unit, shall be prepared by Civil Field Engineering. The category, action date initiated, date rework/repair completed, and any other information considered applicable will be recorded and will form the basis for the Final DER Evaluation Report.

EVALUATION AND DISPOSITION OF
CONCRETE REPAIRS FOR DER 79-12
FLOW DIAGRAM



