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Docket 50-206

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Docket No. 50-206

Mr. James H. Drake
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Dear Mr. Drake:

RE: TOPIC III-10.B - PUMP FLYWHEEL INTEGRITY
SAN ONOFRE NUCLEAR GENERATING STATION

Enclosed is a copy of our draft evaluation of Systematic Evaluation Program Topic III-10.B. You are requested to examine the facts upon which the staff has based its evaluation and respond either by confirming that the facts are correct, or by identifying any errors. If in error, please supply corrected information for the docket. We encourage you to supply for the docket any other material related to this topic that might affect the staff's evaluation.

Your response within 30 days of the date you receive this letter is requested. If no response is received within that time, we will assume that you have no comments or corrections.

Sincerely,

Original Signed by:
Dennis L. Ziemann

Dennis L. Ziemann, Chief
Operating Reactors Branch #2
Division of Operating Reactors

CB

Enclosure:
Topic III-10.B

cc w/enclosure:
See next page

MA

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priv. [Signature]

OFFICE >	DOR:ORB#2	DOR:ORB#2			
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DATE >	8/16/79	8/16/79			

Mr. James H. Drake

- 2 -

August 16, 1979

cc

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SYSTEMATIC EVALUATION PROGRAM
PLANT SYSTEMS/MATERIALS
SAN ONOFRE NUCLEAR GENERATING STATION UNIT NO. 1

TOPIC III-10.B PUMP FLYWHEEL INTEGRITY

The safety objective of this review is to assure that the integrity of the primary reactor coolant pump flywheel is maintained to prevent failure at speeds that might be reached under accident conditions and that preclude the generation of missiles.

Information for this assessment was obtained from Parts I and II of the Final Safety Analysis Report and the Technical Specifications for the San Onofre Unit No. 1 station, Westinghouse reports on Nondestructive Inservice Inspection of the San Onofre Unit No. 1 station, dated October, 1970, and January, 1972, and the Safety Evaluation prepared by the staff of the Materials Engineering Branch, DSS, dated June, 1975.

The basis for the review is to determine the degree of compliance with the recommendations of Regulatory Guide 1.14, "Reactor Coolant Pump Flywheel Integrity". This guide describes and recommends a method, acceptable to the NRC staff, of implementing General Design Criterion 4, "Environmental and Missile Design Bases", with regard to minimizing the potential for failure of the flywheels of the reactor coolant pump motor.

There are two parts to the recommendation of Regulatory Guide 1.14. The first part is related to the evaluation of materials of construction, design, fabrication, proof testing, and pre-service inspection of the pump flywheels for construction permit submittals docketed on or after January 1, 1976. The second part is concerned with the evaluation of procedures used for the inservice inspection of pump flywheels for all plants after January 1, 1976.

The pertinent regulatory position for the inservice inspection of the reactor pump flywheels for the San Onofre Nuclear Generating Station Unit No. 1 is that the inservice inspection of each flywheel should be performed in compliance with the recommendations of Section D.2 of Regulatory Guide 1.14 as follows:

- a. In-place volumetric examination of areas of higher stress concentration at approximately 3-year intervals;
- b. Surface examination of all exposed surfaces and a complete volumetric examination at approximately 10-year intervals;
- c. The examination procedures should comply with Subarticle IWA-2200 (ASME Section XI);
- d. Acceptance criteria should be that the lowest critical speed is calculated to be twice the normal operating speed; and

- e. Should the examination indicate an increase in flaw size greater than predicted for the service life, the results should be submitted to the regulatory staff for evaluation.

The integrity of the primary coolant pump flywheels was addressed by the licensee in the October, 1970, Nondestructive Inservice Inspection Report, the salient points of which are quoted below:

The primary coolant pump motor flywheels in Loops A, B, and C were ultrasonically examined for laminar-type indications. No significant indications were observed in flywheels "A" and "B".

Flywheel "C" had been previously examined ultrasonically by SWRI personnel in July of 1969, and a large lamination area was found at that time. This area was again evaluated during the 1970 examination with special emphasis to determine if there were any changes in the previously detected defect area. There were indications of a possible extension or growth of the laminar flaw area by about 12 percent. Shear wave tests during this examination indicated that the lamination did not have any significant components vertical to the plane of the flywheel.

The liquid penetrant examination of the bore of flywheel "C" indicated several large porosity holes and evidence of some cracks. The defects were of an obvious fabrication nature and had not been previously noted as the bore was not examined during the 1969 inspection. Grinding to a depth of 0.25 in. did not eliminate the cracks. The flywheel was replaced with a new one which was examined prior to installation using ultrasonics and liquid penetrants, and indicated no evidence of defects.

Information submitted by the licensee, including information on pump flywheel integrity and inservice inspection techniques, was reviewed and assessed by the Materials Engineering Branch, Division of Technical Review, in their Safety Evaluation dated June, 1975. The applicable portions of that Safety Evaluation are:

The original flywheels were made of ASTM 514, Grade B carbon steel. In 1970 inservice examinations indicated several flaws in one flywheel. This flywheel was subsequently replaced with a flywheel made of SA-533, Grade B, Class 1 material. We have reviewed the applicant's inservice inspection program to ensure flywheel integrity and conclude that it conforms with the recommendations of NRC Regulatory Guide 1.14, "Reactor Coolant Pump Integrity."

The probability of a loss of pump flywheel integrity has been minimized by the use of suitable material, adequate design, and inservice inspection.

The use of adequate design and inservice inspections for the flywheels of reactor coolant pump motors in accordance with the recommendations of Regulatory Guide 1.14 provides reasonable assurance (a) that the structural integrity of flywheels is adequate to withstand the forces

imposed in the event of pump design overspeed transient without loss of function, and (b) that their integrity will be verified periodically in service to assure that the required level of soundness of the flywheel material is adequate to preclude failure.

An addition to Table 4.7.1 of the Technical Specifications was proposed in the reply to NRC Item 9.6.1 Response to Specific Items of Interest, Volume VI of the Final Safety Analysis Report. The proposed addition was as follows:

1. Item G should be added to the "Specification" section as follows:

"G. The reactor coolant pumps shall be inspected in accordance with AEC Regulatory Guide 1.14 'Reactor Coolant Pump Flywheel Integrity.'"

2. Items 5, 6, and 7 should be added to the "Pump Pressure Boundary" section of Table 4.7.1, Outline of Inservice Inspection Program, San Onofre Nuclear Generating Station Unit 1, as follows:

<u>Examination Category</u>	<u>Components or Areas to be Examined</u>	<u>Examination</u>	<u>Scope and Frequency of Examination</u>
**	5. Pump Flywheel bore and key-way	Volumetric	Without removal of the flywheel, all accessible areas at approximately 3-year intervals
**	6. Pump Flywheel	Surface	Without removal of the flywheel, all accessible surface of the flywheel at approximately 10-year intervals
**	7. Pump Flywheel	Volumetric	Without removal of the flywheel, 100% of the flywheel during the inspection interval.

**Not required by Section XI of the Code, but specified by AEC Regulatory Guide 1.14."

3. A new section, "Reactor Coolant Pump Flywheel," should be added after the existing "Reactor Coolant to Primary Coolant System Piping Welds" section of Table 4.7.2, Inspection Schedule, as follows:

<u>Components or Areas to be Inspected</u>	<u>Planned Date of Inspection</u>
<u>"Reactor Coolant Pump Flywheel</u>	
Pump A	
Flywheel bore and keyway	1976
Flywheel bore and keyway	1978
Flywheel bore and keyway	1982
Pump flywheel	1982
Pump B	
Flywheel bore and keyway	1976
Flywheel bore and keyway	1980
Pump flywheel	1980
Flywheel bore and keyway	1984
Pump C	
Flywheel bore and keyway	1976
Flywheel bore and keyway	1980
Flywheel bore and keyway	1984
Pump flywheel	1984"

It is intended that these proposed additions be submitted to the AEC in accordance with 10CFR50.59 as a formal request to revise the San Onofre Unit 1 technical specifications.

The proposed addition has not yet been added to the Technical Specification, but is being considered for addition in a future license amendment.

We conclude from our review that the integrity of the flywheels to the primary coolant pumps will be adequately maintained by an inservice inspection program in compliance with the recommendations of Regulatory Guide 1.14. The reports of inservice inspection that have been performed on the San Onofre Nuclear Generating Station Unit No. 1 since October, 1970 show compliance with the guidelines set forth in the guide. However, it is recommended that additions be made to the Technical Specifications to reflect compliance with the recommendation of Regulatory Guide 1.14. These additions should follow those originally proposed by the licensee but not yet incorporated by the staff.