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October 24, 1978

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Director of Nuclear Reactor Regulation
Attention: Mr. D. L. Ziemann, Chief
Operating Reactors Branch #2
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Gentlemen:

Subject: Docket No. 50-206
Additional Information in Support of
Steam Generator Technical Specifications
San Onofre Nuclear Generating Station
Unit 1

By letter dated July 31, 1978 we submitted Proposed Change No. 75 to the Technical Specifications which proposed provisions for steam generator inservice inspections at San Onofre Unit 1. Your letter of October 10, 1978 and subsequent telephone discussions with members of the NRC staff requested additional information pertaining to inspections to monitor tube denting and imperfections at antivibration bar intersections. Your October 10, 1978 letter also identified specific staff positions with respect to certain provisions in our proposed Technical Specifications.

In response to your request, enclosed is a copy of the proposed Technical Specification which has been modified to provide the additional information you requested and to incorporate the specific comments in your October 10 letter. Changes from our submittal of July 31, 1978 are identified by vertical lines in the right-hand margin.

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If you have any questions regarding this information
please contact us.

Very truly yours,

KPBastin/M

Enclosure

4.16 INSERVICE INSPECTION OF STEAM GENERATOR TUBING

Applicability: Applies to the inservice inspection and sampling selection for steam generator tubing.

Objective: To monitor the integrity of the steam generator tube primary boundary and provide guidance for corrective action when imperfections are observed.

Specification: A. GENERAL STEAM GENERATOR TUBE SELECTION

The steam generators shall be inspected when shutdown by selecting steam generator tubes on the following basis:

1. Tubes for the inspection shall be selected on a random basis except where experience at San Onofre Unit 1 or experience in similar plants indicates critical areas to be inspected.
2. Each inspection shall include at least 3% of the total number of tubes in each steam generator to be inspected.
3. Inservice inspections may be limited to one steam generator on a rotating schedule encompassing 3% of the total tubes of steam generators in the plant if the results of previous inspections indicate that all steam generators are performing in a like manner.
4. Every inspection shall include all non-plugged tubes in the steam generators to be inspected that previously had detected imperfections greater than 20%, except as specified in Specification C.1.

B. SUPPLEMENTARY INSPECTIONS

If the inspections in Specification A indicate imperfections, additional inspections shall be required as follows:

1. If any of the tubes inspected pursuant to Specification A.3 have imperfections greater than 20% that were not detected during the previous inspections or have previously detected imperfections that have increased more than 10% wall penetration since their last inspection, inspect 3% of the tubes in one of the uninspected steam generators.
2. If more than 10% of the tubes inspected in a steam generator have imperfections greater than 20% that were not detected during the previous inspections or have previously detected imperfections that have increased more than 10% wall penetration since their last inspection, or one or more of the tubes inspected have an imperfection in excess of the plugging limit, inspect an additional 3% of the tubes in that steam generator, concentrating on tubes in those areas of the tube sheet array where tubes with imperfections were found and on that length of tube where the imperfections were found. In addition, the rest of the steam generators shall be inspected in accordance with Specification A.2.
3. If the additional inspection in Specification B.2 indicates that more than 10% of the additionally inspected tubes have imperfections greater than 20% that were not detected during the previous inspections or have previously detected imperfections that have increased more than 10% wall penetration since their last inspection, or one or more of the additionally inspected tubes have an imperfection in excess of the

plugging limit, inspect an additional 6% of the tubes in that steam generator in the area of the tube sheet array where tubes with imperfections were found and through that length of tube where the imperfections were found.

C. SPECIAL STEAM GENERATOR TUBE INSPECTIONS

In addition to the general steam generator tube inspections performed in Specifications A and B, every inspection shall include the following special inspections:

1. Every inspection shall include all non-plugged tubes in one of the steam generators that previously had been noted as having discretely quantifiable imperfections greater than 30% at antivibration bar (AVB) intersections, and all non-plugged tubes in that steam generator that previously had been noted as having imperfections at AVB intersections which were not discretely quantifiable but which were identified during previous inspections as being in the 30 to 50% range.
2. At each steam generator inspection, all previously identified restricted tubes in either steam generator A or C shall be gauged by using eddy current probes to determine restriction sizes.

D. INSPECTION FREQUENCY

The inspections in Specifications A and B above shall be performed at the following frequencies:

1. Inservice inspections shall be not less than 10 nor more than 24 calendar months after the previous inspection.

2. If two consecutive inspections indicate that less than 10% of the tubes inspected have either (a) new imperfections greater than 20% or (b) previous imperfections that have increased more than 10% since their last inspection, the inspections shall be not less than 10 nor more than 40 calendar months after the previous inspection.
3. Unscheduled inspections shall be conducted in accordance with Specification A in the event of primary-to-secondary leaks exceeding Specification 3.1.4.C, a seismic occurrence greater than an operating basis earthquake, a loss-of-coolant accident requiring actuation of engineered safeguards, or a major steam line or feedwater line break.

E. ACCEPTANCE CRITERIA

1. As used in this specification:
 - a. Imperfection means an exception to the dimensions, finish, or contour required by drawing or specification.
 - b. Defect means an imperfection of such severity that the tube is unacceptable for continued service.
 - c. Plugging limit means the imperfection depth at or beyond which plugging of the tube must be performed. The plugging limit is equal to or greater than 50% of the nominal tube wall thickness.
2. If, in the inspections performed under Specification A,
 - a. Less than 10% of the total tubes inspected have imperfections greater than 20% that were not detected during the previous

inspections or have previously detected imperfections that have increased more than 10% wall penetration, and

- b. No tube inspected exceeds the plugging limit,

plant operation may resume.

3. If, in the inspections performed under Specification B,

a. Less than 10% of the total tubes inspected have imperfections greater than 20% that were not detected during the previous inspections or have previously detected imperfections that have increased more than 10% wall penetration, and

- b. No more than 3 of the tubes inspected exceed the plugging limit,

plant operation may resume after performance of the corrective action in Specification F.

4. If, in the inspections performed under Specification B,

a. More than 10% of the tubes inspected have imperfections greater than 20% that were not detected during the previous inspections or have previously detected imperfections that have increased more than 10% wall penetration, or

- b. More than 3 of the tubes inspected exceed the plugging limit,

the situation shall be reported to the Commission in accordance with Technical Specification 6.9.2 for approval of the proposed remedial action.

5. If in the inspections performed under Specification C.1, wear rates are observed at AVB intersections which are inconsistent with the 50% plugging criterion, the situation shall be reported to the Commission in accordance with Technical Specification 6.9.2 for approval of the proposed remedial action.
6. If in the inspections performed under Specification C.2 progression of the denting process is observed to be recurring, the situation shall be reported to the Commission in accordance with Technical Specification 6.9.2 for approval of the proposed remedial action.

F. CORRECTIVE ACTION

All leaking tubes, defective tubes, and tubes with imperfections exceeding the plugging limit shall be repaired or plugged.

Basis:

The Surveillance Requirements for inspection of the steam generator tubes ensure that the structural integrity of this portion of the Reactor Coolant System will be maintained. The program for inservice inspection of steam generator tubes is based on Regulatory Guide 1.83, Revision 1. Inservice inspection of steam generator tubing is essential in order to maintain surveillance of the conditions of the tubes in the event that there is evidence of degradation due to design, manufacturing errors, or inservice conditions that lead to corrosion. Inservice inspection of steam generator tubing also provides a means of characterizing the nature and cause of any tube degradation so that corrective measures can be taken.

The plant is expected to be operated in a manner such that the secondary coolant will be maintained within those chemistry limits found to result in negligible corrosion of the steam generator tubes. If the secondary coolant chemistry is not maintained within these limits, localized corrosion may likely result in stress corrosion cracking. The extent of

cracking during plant operation would be limited by the limitation of steam generator tube leakage between the primary coolant system and the secondary coolant system (primary-to-secondary leakage = .3 gallons per minute per steam generator). Cracks having a primary-to-secondary leakage less than this limit during operation will have an adequate margin of safety to withstand the loads imposed during normal operation and by postulated accidents. Operating plants have demonstrated that primary-to-secondary leakage of .3 gpm per steam generator can readily be detected by radiation monitors of steam generator blowdown. Leakage in excess of this limit will require shutdown during which the leaking tubes will be located and plugged and additional inspections performed.

Wastage-type imperfections are unlikely with proper chemistry treatment of the secondary coolant. However, even if a defect should develop in service, it will be found during scheduled inservice steam generator tube examinations. Plugging will be required for all tubes with imperfections exceeding the plugging limit of 50% of the tube nominal wall thickness. A plugging limit of 50% ensures that tube defects will not occur between inspection intervals.

The results of tube ID gauging and dent detection conducted in San Onofre Unit 1 steam generators demonstrate that the denting process has been arrested. Continuing assurance of this condition can be provided by performing a program of limited tube ID gauging and dent detection in either steam generator A or C on a refueling outage frequency. Adequate surveillance of denting related tube restrictions can be maintained at refueling intervals by noting any new restrictions during the conduct of general surveillance and AVB inspections and by gauging tubes which have previously been noted as being restricted. Progression of denting can also be monitored in either steam generator A or C by evaluating third and fourth support plate denting data obtained from the general surveillance and AVB inspections as well as from the ID gauging program and comparing these results with those of previous inspections.

The results of AVB area inspections conducted in San Onofre Unit 1 steam generators demonstrate that AVB modifications installed during the Cycle VI refueling outage were successful in eliminating significant growth of tube wall penetration indications at AVB locations. Continuing assurance of this condition can be provided by performing U-bend inspections at refueling outage intervals of tubes having wall penetration indications in excess of 30% at AVB locations.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

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