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U. S. Nuclear Regulatory Commission
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Subject: Arkansas Nuclear One - Unit 2
Docket No. 50-368
License No. NPF-6
Request for Use of ASME Code Case N-593
Regarding ANO-2 Replacement Steam Generators

Gentlemen:

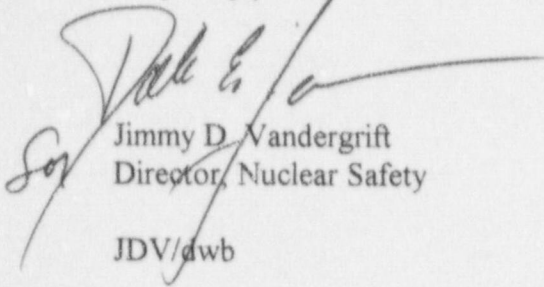
ASME Section XI, Table IWB-2500-1, Examination Category B-D of the 1986 ASME Boiler and Pressure Vessel Code requires volumetric examination of steam generator nozzle-to-vessel welds once each ten-year inspection interval. However, the examination figures applicable to Examination Category B-D currently do not address the design of steam generator nozzle-to-vessel welds found in the Arkansas Nuclear One, Unit 2 (ANO-2) replacement steam generators. The ANO-2 replacement steam generators are being fabricated with cylindrical section primary nozzles welded to integrally forged contours on the primary head. The contour of this head design precludes full examination coverage of the examination volume from two directions. In recognition of this type of concern, Code Case N-593, *Alternative Examination Requirements for Steam Generator Nozzle to Vessel Welds*, was developed and approved.

Therefore, Entergy requests the use of Code Case N-593 for application on the ANO-2 replacement steam generators. The basis for this request is contained in the attachment to this letter. Should you have any questions, please contact me.

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P PDR

A0471,

Very truly yours,



Jimmy D. Vandergrift
Director, Nuclear Safety

JDV/dwb

Attachment/enclosures

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Request Number: 98-001

Component Identification

Code Class: 1
Reference: 1986 ASME Code, Section XI (and future Editions)
IWB-2500, Table IWB-2500-1
Code Case N-593
Examination Category: B-D
Item Number: B3.130
Description: Alternate Examination Requirements for Steam Generator
Nozzle to Vessel Welds

Code Requirement

ASME Section XI, Table IWB-2500-1, Examination Category B-D requires volumetric examination of steam generator nozzle-to-vessel welds once each ten-year inspection interval. Multiple examination figures depicting different nozzle designs are provided which specify the required examination volume. A complete examination (i.e., 100% coverage) of the applicable volume is required. Alternatively, implementation of NRC approved Code Case N-460 allows a reduction in examination coverage of up to 10% due to interference by another component or part geometry.

Basis For Alternative

Pursuant to 10CFR50.55a(a)(3)(i), an alternative to the existing requirements is requested on the basis that the proposed alternative would provide an acceptable level of quality and safety as indicated below.

The examination figures applicable to Examination Category B-D currently do not address the design of steam generator nozzle-to-vessel welds found in the ANO-2 replacement steam generators. Replacement steam generators provided to Combustion Engineering plants, in particular, are fabricated with cylindrical section primary nozzles welded to integrally forged contours on the primary head. The contour of this head design precludes full examination coverage of the examination volume from two directions. In recognition of the above, a Code Case was initiated by the ASME Section XI Working Group on Inspection of Systems and Components to develop alternative examination requirements for steam generator nozzle-to-vessel welds.

Code Case N-593, *Alternative Examination Requirements for Steam Generator Nozzle to Vessel Welds*, was unanimously approved by the Board of Nuclear Codes and Standards on December 12, 1997. Previously, the Code Case had been unanimously approved by the ASME

Main Committee and the ASME Section XI Subcommittee on Nuclear Inservice Inspection (including NRC representation).

The following enclosures are provided for NRC review in assessing this request.

- Enclosure 1: Provides cross sectional views of projected UT45° and UT60° scan coverage for a typical replacement steam generator primary nozzle. These same coverage sketches were included as supporting information with Code Case N-593 during its approval by the ASME committee.
- Enclosure 2: Provides a summary of the ANO-2 primary nozzle design. The summary compares the existing channel head with the replacement channel head and identifies advantages to the new design.

In addition, the ultrasonic Performance Demonstration Initiative being conducted at the Electric Power Research Institute has demonstrated the capability of one-sided examinations to reliably detect flaws. This knowledge was a contributing factor in the unanimous approval of Code Case N-593 by the ASME Subgroup on Nondestructive Examination.

Entergy believes that Code Case N-593 will provide an acceptable level of quality and safety for primary nozzles which are welded to integrally forged contours on the primary head as an alternative to existing Code requirements. The existing Code requirements do not address examination designs for the ANO-2 replacement steam generators. The technical adequacy of the Code Case has been demonstrated by virtue of its ASME approval following a rigorous consensus review process. For the reasons discussed above, and in consideration of the National Technology Transfer and Advancement Act of 1995 (Public Law 104-113 which encourages federal regulatory agencies to consider adopting industry consensus standards as an alternative to the agency's development of standards affecting the industry), Entergy requests NRC approval for the use of Code Case N-593.

Proposed Alternate Examination

Entergy proposes to implement Code Case N-593 in lieu of existing Code requirements for the examination of the replacement steam generator primary nozzle welds.

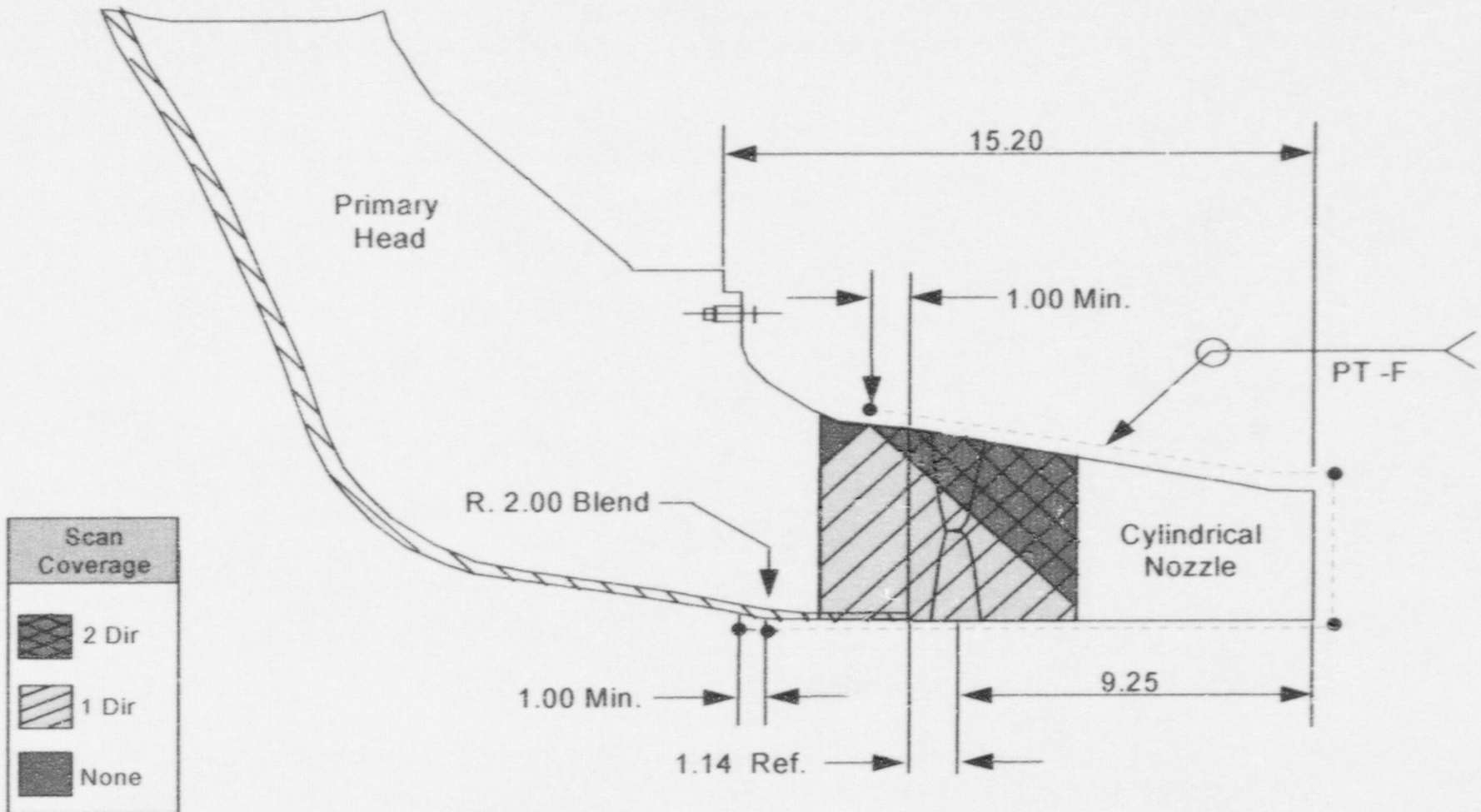
Applicable Time Period

Application of the alternative criteria is requested for the third ten-year interval of the Inservice Inspection Program for ANO-2 which is scheduled to begin on March 26, 2000. The ANO-2 steam generators will be replaced during the 2R14 refueling outage that is scheduled for the fall of 2000.

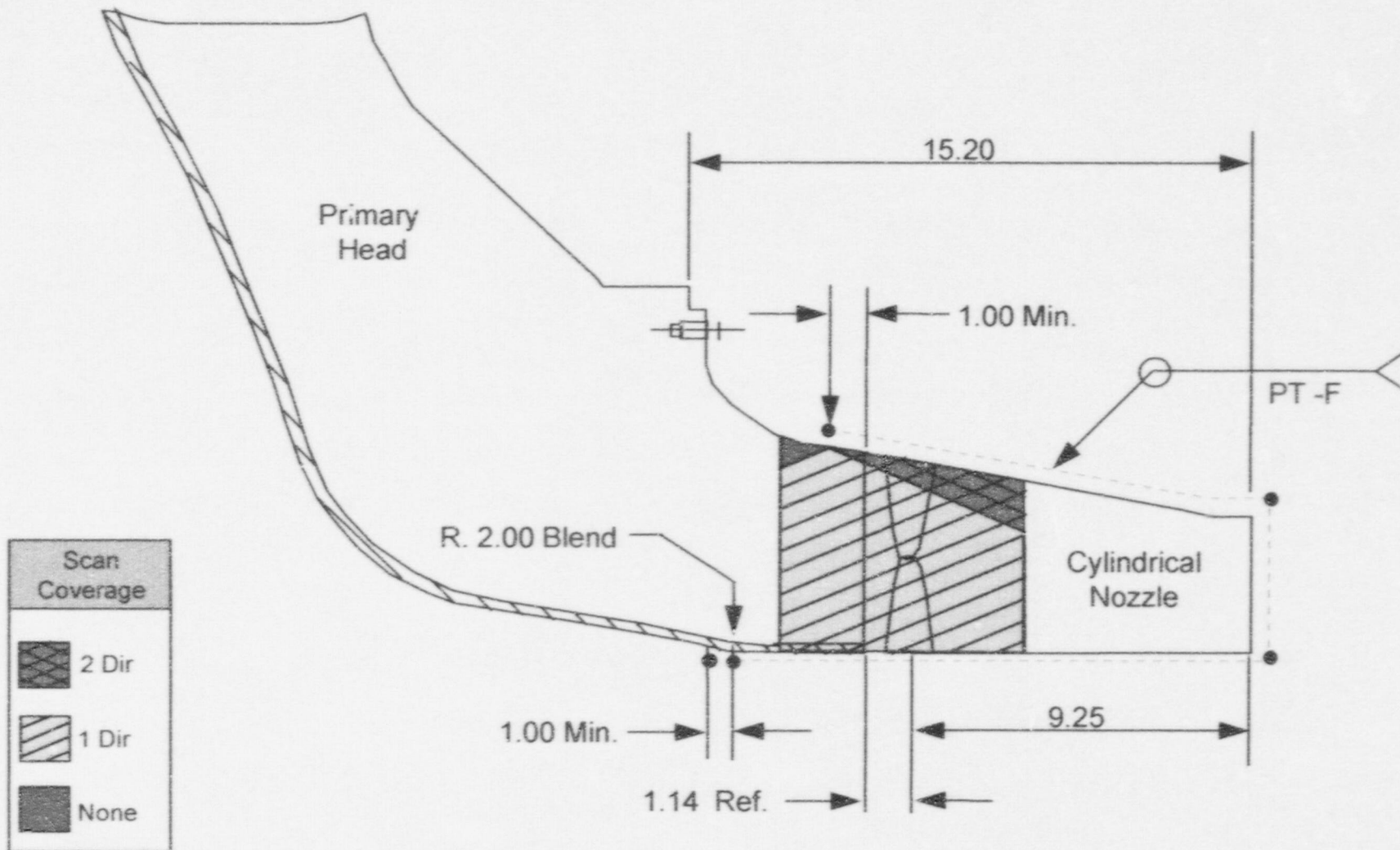
Enclosure 1

Coverage Sketches

UT45° Scan Coverage for a Typical Replacement Steam Generator Primary Nozzle



UT60° Scan Coverage for a Typical Replacement Steam Generator Primary Nozzle



Enclosure 2

**ANO-2 Primary Nozzle Design Summary
and Diagrams**

ANO-2 Primary Nozzle Design Summary

The original steam generators' (OSG) channel head assemblies at ANO-2 were fabricated from 15 separate pieces with 21 pressure boundary weld seams. The replacement steam generators' (RSG) channel head is a single piece forging with three nozzle transition pieces (four pieces total). The RSG has only four pressure boundary weldments with a total length that is ~30% that of the OSG. This reduction in the number of parts and welds simplifies the construction, enhances inspection, and provides superior access to regions requiring inspection.

The OSG centerpost has been removed; therefore, the welds between it and the tubesheet and channel head have been eliminated. Access to the centerpost welds was difficult and they were located in regions of high radiation exposure. The manway diameters have been increased from 16" to 18" and the orientations of the manways have been adjusted to enhance their use.

The ANO-2 RSG channel heads are a single piece forging. The channel head forging is being supplied with the longest possible primary nozzle extensions within the die limitations. The remaining portion of each primary nozzle (cylindrical sections) will be forgings of the same material (SA-508, Class 3a). The dimensions of the channel head and cylindrical nozzle sections must satisfy the ASME Section III structural criteria. Consistent with these criteria, the inlet and outlet nozzle contours have been shaped to best accommodate inspection. The design of the channel head has been chosen to minimize the number and length of welds. This design also maximizes the inspectability of the channel head cylindrical nozzle sections and the weld joints to the extent possible within the limitations of the forging process. Overall, even though examination coverage limitations exist on the primary head cylindrical nozzle section weld, it is concluded that there is a net improvement in the quality and inspectability of the channel head.

ANO-2 Replacement Steam Generator Channel Head Assembly

