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April 18, 1984

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Byron Generating Station Unit 1
Preservice Inspection Program Plan
NRC Docket No. 50-454

References (a): August 26, 1983 letter from T. R. Tramm to H. R. Denton

(b): December 6, 1983 letter from T. R. Tramm to H. R. Denton

Dear Mr. Denton:

This letter provides additional information in support of the requests contained in references (a) and (b) for relief from the requirement to examine certain cast stainless steel components during the Byron 1 preservice inspection program.

Attachment I to this letter summarizes attempts which have been made to examine by ultrasonic means typical cast stainless steel components at Byron 1. None of these efforts were successful.

Please address further questions regarding this matter to this office.

Very truly yours,

T. R. Tramm

T. R. Tramm
Nuclear Licensing Administrator

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Attachment

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ATTACHMENT I
Summary of Cast Stainless Steel
Examinations for Byron Unit 1

1. Welds of Pipe-To-Cast Stainless Steel Components and Elbows

Ultrasonic examinations were performed on these welds with a 45° shear wave transducer calibrated on a block made of the pipe material per ASME Section XI. Axial scans were made from the pipe side to examine the required inspection volume of the piping material and weld metal for reflectors parallel to the weld.

Longitudinal wave examinations were made on all welds to obtain thickness measurements and to detect any defects parallel to the surface. Since an additional 30 to 40 dB gain was needed to see the back reflection on the cast stainless steel side it was concluded that shear wave examinations on this side would be meaningless. Therefore, axial scans from the cast side were not performed. Relief Request NR-6 requests relief from Section XI requirements.

Additional examinations of these welds include circumeferential ultrasonic scans on the weld crown in both directions for transverse reflectors and ASME Section III radiographs.

2. Welds of Reactor Nozzle Safe Ends and Steam Generator Primary Nozzles-to-Cast Stainless Steel Elbows

The reactor nozzle safe end-to-cast stainless steel elbow weld originally were to be examined from the inner diameter by the automated reactor vessel examination tool. However, discovering that this could not be done and being aware that 45° shear wave examinations are meaningless on cast stainless steel an examination procedure utilyzing a 2.25 megahertz (MHZ) 45° refracted longitudinal wave transducer was developed. This procedure was developed and qualified on a mockup consisting of safe end material welded to cast stainless steel. The cast stainless steel material was obtained from the manufacturer of the cast stainless steel elbows at Byron Units 1 and 2 (and also at Braidwood Units 1 and 2). The mockup contained two holes in the cast stainless material. One hole was at the weld fusion line 1/4 T from the outer diameter (O.D.) of the cast stainless material. The other hole was in the corner of the required inspection volume, 1/3 T from the inner diameter and approximately 1/2 inch from the fusion line into the cast material.

Because the acoustic properties of cast stainless steel are unpredictable, a test of the attenuation characteristics of the mockup material and the cast elbows was performed. Using a 1 MHZ longitudinal wave transducer on the cast side of the mockup, 24 to 26 decibels (dB) gain was needed to obtain an 80 percent back wall reflection. With a 2.25 MHZ transducer 32 to 34 dB gain was needed to see the back reflection. Performing the same test on a Byron Unit 2 pipe-to-elbow weld 28 to 32 dB gain was needed for 1 MHZ and 40 dB gain was required for 2.25 MHZ. Thus, it was concluded that

the cast elbows installed in the plant are more attenuative than the cast material in the mockup. Similar results were obtained from the elbows at Braidwood Units 1 and 2. The Byron Unit 1 elbows can be expected to have the same attenuation properties since the same manufacturer provided elbows for all four units. This conclusion is substantiated by the fact that longitudinal examinations performed on the Byron Unit 1 welds for thickness measurements required 30 to 40 dB gain to obtain a back reflection.

The 45^{0} refracted longitudinal wave transducer was chosen to be used on the reactor safe end-to-elbow welds and the steam generator primary nozzle-to-elbow welds in an attempt to perform a meaningful exam on the cast material. However, during calibration the hole at the fusion line 1/4T from the O.D. could not be seen from the cast side. As a result of this and because the elbows have even higher attenuation properties than the mockup it was concluded that an axial scan from the cast side of the welds using refracted longitudinal wave would also be meaningless. Therefore, these scans were not performed. Relief Requests NR-4 and NR-8 request relief from Section XI requirements for these examinations.

Refracted longitudinal wave was used to examine these welds axially from the safe-end side. During calibration on the mockup both holes in the cast stainless material were seen with 1/2 V-path shooting across the weld. Therefore, it is estimated that during the scans from the safe-end side the heat-affected-zone (HAZ) on the cast stainless side was examined up to 1/2 inch beyond the fusion line.

Circumferential ultrasonic scans were also done in both directions and prior to the preservice inspections ASME Section III radiographs were made.

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