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December 5, 1997
NG-97-2068

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Attn: Document Control Desk
Mail Station P1-37
Washington, DC 20555-0001

Subject: Duane Arnold Energy Center
Docket No: 50-331
Op. License No: DPR-49
Additional Justification for Inservice
Inspection Relief Request NDE-R004

Reference: Letter dated October 15, 1997, NG-97-1802,
from Kenneth E. Peveler (IES) to NRC, Third
10-Year Interval Inservice Inspection Relief
Request NDE-R004

File: A-100, A-286

The referenced letter submitted a revision to Duane Arnold Energy Center (DAEC) inservice inspection (ISI) relief request NDE-R004. The revision modifies the requirement for radiographic examinations of a non-Code repair on the outboard "D" main steam isolation valve (MSIV). The Staff has requested additional justification regarding the revision. Relief request NDE-R004 has been modified to include this justification and is attached.

As discussed in the attached relief request, the required radiographic examinations would require disassembly of outboard "D" MSIV, resulting in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, relief is requested in accordance with 10CFR 50.55a(a)(3)(ii).

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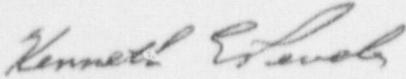
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NG-97-2068
December 5, 1997
Page 2

Should you have any questions regarding this matter, please contact this office.

Sincerely,



Kenneth E. Peveler
Manager, Regulatory Performance

Attachment

cc: C. Rushworth
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NRC Resident Office
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RELIEF REQUEST NUMBER: NDE-R004
(RR-002)

COMPONENT IDENTIFICATION

Code Class: 1

References: IWA-4000
IWB-4000, IWB-4120

Examination Category: B-M-2

Item Number: B12.50

Description: Valve bodies Exceeding NPS 4" Casting Repairs

Component Numbers: Main Steam Isolation Valve "D" Outboard, CV-4421

CODE REQUIREMENT

ASME Section XI IWA-4000, requires repair to be performed in accordance to the owner's design specification and constructor code. IWB-4120, requires the complete removal of the defect or flaw. IWB-4230, after final grinding, cavities prepared for welding, shall be examined by magnetic particle or liquid penetrant to ensure indications have been reduced to an acceptable limit in accordance with IWA-3000.

BASIS FOR RELIEF

The subject MSIV is an ASME Section XI Class 1 valve, the body is fabricated from ASTM/ASME SA-216, grade WCB, cast carbon steel, procured under GE Specification 21A9230 Rev. 2. The unacceptable defect was uncovered during a routine maintenance machining operation to correct unacceptable seat leakage. The indication was determined to be a subsurface casting shrinkage brought to the surface by the re-boring operation. An evaluation of the original construction radiographs confirmed the presence of the subsurface defects and that the flaws were acceptable to the radiography requirements.

A code repair to the MSIV would require a post-weld heat treatment (PWHT) of the valve body casting. Prior experience with PWHT has demonstrated that unacceptable distortion of the valve body may occur. Correction of the distortion may not be feasible. Application of imbedded flaw acceptance criteria after performing a weld overlay in the affected area should demonstrate acceptable structural integrity.

IES Utilities requested assistance from the EPRI Non-Destructive Examination (NDE) Center to develop an NDE technique for examination of the internal repair. EPRI reviewed the valve geometry and the details of the repair and determined that an ultrasonic examination of the valve from the outer diameter would not be reliable. Because of the wall thickness, the only feasible method of examining the MSIV repair area is with single-wall radiography, requiring the valve to be disassembled.

Disassembly of the "D" outboard MSIV solely for the purpose of performing a radiograph is undesirable for the following reasons:

- As discussed in the NRC safety evaluation transmitted by letter dated December 27, 1994 (Norrholm (NRC) to Liu (IES)), "Per the findings of NUREG-1169, excessive valve disassembly should be avoided if the leak tightness of valves such as MSIVs is to be optimum. Disassembly for no other reason than to perform a radiograph (necessary in this case due to overall valve size and thickness) is contrary to the guidance of the NUREG."
- The DAEC has learned from extensive experience that an MSIV can not just be taken apart and put back together. It requires extensive inspection, machining, grinding, and possible weld repair prior to reassembly to ensure the lowest practical leakage levels. This effort requires engineering personnel, mechanics, and machinists, unnecessarily diverting these resources from other outage projects.
- The disassembly and reassembly would result in the unnecessary expenditure of both resources and exposure. Simple disassembly and reassembly costs about \$20,000 and results in approximately 0.5 rem exposure. Refurbishment, including parts and labor, could increase the cost by approximately \$60,000.
- The MSIV is located in the Steam Tunnel, a contaminated and congested work area containing extensive safety-related equipment. During the performance of the RT all other work in the Steam Tunnel is deferred, delaying work activities on other equipment.

The radiography performed during RFO 12 indicated resolution of the 1T hole in a #40 penetrometer which represents a sensitivity of 1.26%. Since no indication is visible, a conservative estimate of the remaining flaw size may be obtained by assuming the flaw to be the size of the smallest hole in the penetrometer which was resolved. The size of the remaining flaw can therefore be conservatively estimated as 1.26% of wall thickness. Since the wall is about 3.175 inches thick, the flaw size is bounded by approximately 0.04 inches.

A flaw evaluation was performed in accordance with Appendix A of ASME Section XI 1980 with the Winter 81 Addenda. The evaluation was performed for several aspect ratios (1/6, 1/4, 1/3, 1/2). The size (0.04 inch), length (2 inches) and aspect ratio (1/100) of the predicted flaw detectable by the radiography technique is bounded by the flaw evaluation.

Since the predicted flaw is bounded by the evaluation, disassembly of the outboard "D" MSIV solely to perform a radiographic examination would result in undue hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, relief is requested in accordance with 10CFR 50.55a(a)(3)(i).

ALTERNATE EXAMINATION

The flaw was excavated to a depth not exceeding 20% of the wall thickness (0.6 inch in this case). A magnetic particle examination (MT) was performed to document the remaining flaw dimensions. Using a 200°F preheat, a low heat input, multi-pass weave was performed to fill the excavated cavity. Weld integrity was verified by performing a visual examination and hot MT of each layer of the weld metal. Shielded metal arc welding (SMAW) using small diameter electrodes was employed. The fluxing action of the SMAW electrodes (E7018 in this case) would aid in removal of any casting impurities that may have been present in the flawed area.

After machining of the weld was completed, an MT of the machined surface was performed. The repaired area was radiographed to verify that no defects existed in the weld deposit and that the casting around the repaired area met the original construction code. Structural integrity for the remaining embedded flaw was demonstrated by performing bounding analyses using the appropriate Section XI embedded flaw evaluation methods. The radiography used for the repair was capable of resolving a flaw size of 1.26% of the wall thickness. This size flaw is bounded by the flaw evaluation which determined that the flaw sizes were acceptable for 40 years of operation per the requirements of IWB-3600 of ASME Section XI 1980 Edition with the Winter 81 Addenda.

One more radiographic inspection of the non-code repair area on the "D" outboard MSIV will be performed when the valve is disassembled for other reasons. The inspection results will be compared with the previous results per IWB-3121.

APPLICABLE TIME PERIOD

This relief will be used during the third ten-year interval of the Inservice Inspection Program for the DAEC.