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Vice President

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March 12, 1998

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
US Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555-0001

SUBJECT: Request for Approval of Alternative to ASME Code Requirements

Pursuant to 10 CFR 50.55a(a)(3), Consolidated Edison Company of New York, Inc. (Con Edison) hereby submits a request for approval of an alternative to the ASME Boiler and Pressure Vessel Code Section III requirements for inservice inspection. The proposed alternative, described in Attachment 1, would be applicable to the part length control rod mechanism modification and associated repairs that are being performed at the Indian Point Unit No. 2 facility during the current maintenance outage. In response to the general concerns raised by NRC staff regarding the discovery of a flaw in the wall of a part length control rod mechanism at Northern States Power Company's Prairie Island Unit No. 2, Con Edison has decided to remove the mechanisms and replace them with modified head adapter plugs. These part length control rod mechanisms are not used and are retired in place. The basis for this relief request and supporting documentation are provided in the attachments to this letter.

Should you or your staff have any concerns regarding this matter, please contact Mr. Charles W. Jackson, Manager, Nuclear Safety & Licensing.

Very truly yours,

A047

Attachments

cc: Mr. Hubert J. Miller
Regional Administrator-Region I
US Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. Jefferey F. Harold, Project Manager
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Mail Stop 14B-2
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Senior Resident Inspector
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Buchanan, NY 10511

ATTACHMENT 1

Relief Request for Alternative to ASME Code Requirements

Consolidated Edison Company of New York, Inc.
Indian Point Unit No. 2
Docket No. 50-247
March 1998

RELIEF REQUEST NUMBER 41

COMPONENT IDENTIFICATION

Code Class:	1
References:	ASME B&PV Code, 1989 Edition, Section III, NB-5270
Examination Category:	NA
Item Number:	NA
Description:	Seal Weld of Reactor Head Adapter to CRDM and Caps.

CODE REQUIREMENT

Per the ASME B&PV Code Section III; NB-5271 special weld joints, seals, require examination using magnetic particle examination or liquid penetrant method.

BASIS FOR RELIEF

Relief is requested pursuant to 10 CFR 50.55a(a)(3), which allows the use of proposed alternatives to ASME Code requirements when authorized by the Director of the Office of Nuclear Reactor Regulation. The applicant must demonstrate that:

1. The proposed alternatives would provide an acceptable level of quality and safety, or
2. Compliance with the specified requirements of this section would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

While the liquid penetrant examination required by NB-5270 would detect surface indications, the process used to perform the seal welds and the visual examination of the welds provide the best measures of seal weld acceptability due to the limited access and high radiation fields. The surface to be seal welded will be examined with a 6X (approximately) magnification camera during the surface preparation. The weld is deposited using a machine weld tungsten inert gas weld process. All welding parameters are controlled within the qualified range from a remote panel. The weld puddle/deposit is observed via a 6X camera during every phase of the welding. A final visual examination of the weld is performed using the same 6X camera. Much of the welding is observed at the control panel by a level II welding inspector. A low pressure visual examination will be performed upon completion of the welding. The post outage pressure test of the reactor coolant system will include the Technical Specification Section 4.3 pressure test, and a VT-2 inspection of the seal weld and control rod drive mechanism cap for leakage in accordance with IWA-5241.

The part length control rod drive mechanisms being replaced are located in a high radiation area, of approximately 2,000 mr/hr. Additionally, access to the area of the seal welds would be difficult due to the limited clearance between each of the adjacent control

rod housings. The separation clearance between the outer housings varies from 4 to 8 inches. This is inadequate to gain complete access to the inner rod housings to perform liquid penetrant examination of the seal welds. Final surface preparation, the liquid penetrant examination, and the subsequent cleanup would be difficult and time consuming due to the limited access, and personnel performing these operations would incur substantial radiation exposure.

PROPOSED ALTERNATE EXAMINATION

In accordance with the provisions of 10 CFR 50, Section 50.55a(a)(3), Con Edison is proposing the following alternatives to the liquid penetrant testing requirements of NB-5271 of the 1989 ASME B&PV Code for the weld repairs described above.

1. Use of a machine weld tungsten inert gas weld process.
2. Observation of the weld puddle/deposit via a 6X camera during the welding process.
3. A final visual examination, of the weld surface, using the 6X camera.
4. Performance of a system pressure test with remote Visual Examination of the seal weld and CRDM penetration cap for leakage.
5. Authorized Nuclear Inservice Inspector approval of the alternative testing and NIS-2 acceptance.
6. The Primary System leakage monitoring system is in continuous operation and is capable of detecting leakage of less than 1 GPM.

PERIOD FOR WHICH RELIEF IS REQUESTED

Relief is requested for the remainder of third inspection interval, ending June 30, 2004.

JUSTIFICATION FOR RELIEF

A liquid penetrant examination would provide a more qualitative verification of the final weld surface than visual examination and, therefore, an additional measure of the quality and safety of the completed seal weld. However, the liquid penetrant examination does not provide a substantial increase in quality and safety above what is provided by the measures (controlled process, observation of weld process using 6X camera, final 6X visual examination and visual examination during leak test) sought to be taken in lieu of the performance of liquid penetrant examinations.

A structural evaluation was performed by Westinghouse to determine the amount of weld material which would be necessary to ensure the integrity of the seal weld to be installed on the CRDM caps. The analysis demonstrated that under a variety of conservative assumptions, the critical flaw size predicted for the repair geometry exceeded 70 percent of the circumference of the weld. The analysis is summarized in Attachment 2.

Tests to qualify the remote visual inspection technique and to evaluate the capabilities of the camera system to be used in the performance of the weld repair were performed by Westinghouse. This testing concludes that the camera system would be able to resolve characteristics visually similar to those encountered during the visual examination. A summary of the tests performed and the results are included in Attachment 3.

ATTACHMENT 2

Evaluation of Limiting Flaws for Structural Adequacy
in CRDM Repair Adapter Plug Fillet Weld Evaluation

Consolidated Edison Company of New York, Inc.
Indian Point Unit No. 2
Docket No. 50-247
March 1998

Critical Flaw Size Calculation: Cap Seal Welds

A structural evaluation was conducted to determine the amount of weld material which is necessary to ensure the integrity of the seal weld applied to the caps installed on the part length CRDM housings. Although the majority of the axial forces from the operating pressure are taken by the threads, there are some stresses which result from differences in thermal expansion for the materials at steady state operation.

A detailed finite element analysis has been carried out to determine these stresses, and the results show that the maximum stress in the seal weld region is 10.02 ksi. This stress was applied to the weld in an evaluation of the critical flaw size , to determine how much weld would be required to take the stress. The evaluation was a ductile limit load calculation, and used the same approach used by the ASME Code Section XI.

The result showed that the critical flaw length exceeded 70 percent of the circumference of the weld. This means that 70 percent of the circumference of the weld could be completely missing, and it would still take the required loads. The stress at failure for the remaining cross section would still be 22 ksi, providing a factor of safety of more than two over the maximum stress of 10.02 ksi present there. This assessment has used all the applied stresses in the region of interest, regardless of whether they would actually contribute to a potential failure here. The thermal expansion stresses would be relieved as the flaw extended, and therefore would have no effect on the failure, so their inclusion adds further margin to the calculation.

Therefore there is no need for a surface examination of the seal weld, since only a very small part of it is needed to take the loads.

Warren Bamford
Structural Mechanics Technology
Westinghouse
7 March 1998

ATTACHMENT 3

Summary of Camera Testing

Consolidated Edison Company of New York, Inc.
Indian Point Unit No. 2
Docket No. 50-247
March 1998

Qualification Of Remote Visual Examination Technique

On the morning of 11 March 1998, the qualification of a remote visual inspection technique utilizing the PCI weld head, orbiter, and CCTV system was conducted.

The qualification was conducted to enable remote visual examination of welds and components during the Part Length Control Rod Drive Mechanism cutting and welding activities at Indian Point Unit 2, PCI Job Number 31039.

The following is a description of the qualification assembly, sensitivity and illumination indicators. Attached is a development (not to scale) of the placement of the indicators.

Qualification Assembly:

The qualification assembly consisted of the orbital weld head to which two (2) CCTV cameras are mounted. The cameras articulate on x, y, and z axes, as does the weld head which consists of a machine welding GTAW torch and wire feed apparatus. This equipment is mounted on a mast which contains drive assemblies to orbit the weld head and cameras around the area to be welded.

To emulate the configuration of the locale on the reactor head, the above assembly is mounted on the "mock-up" table, a small metal table with steel top containing two (2) vertical tube with spacing equal to or less than the spacing of interference's on the reactor head.

The tube to which the orbiting weld head is mounted also simulates the actual configuration of the field weld. An actual head adapter plug has been mounted (by threads) to represent one of the welded members, the other welded member similar in form, fit, and finish to that on the reactor vessel head.

The sensitivity and illumination indicators are temporarily attached to the surfaces of these members as indicated in the attached illustration. They are:

1. An 18% neutral gray card containing a 1/64" wide (as measured with a 7X hand loupe and comparator reticle) black line. The dimensions of the card are 2" x 2".
2. 1/32" and 1/64" scales mounted horizontally and vertically. These indicators are a 1" piece and full length Mitutoyo Model 182-201 machinists' scales.
3. A number 10 and 7 ASTM E142 penetrameters.
4. An ASTM Group A, #1 wire type penetrameter.

Qualification:

The qualification consisted of determining the resolution of the indicator's attributes on the CCTV monitor while moving the weld head and cameras on their axes and orbit. The qualification was also video taped. Additionally, the magnification of the system was determined by measuring the image size (as it appeared on the monitor from which weld inspections will be made) of a portion of the machinists scale.

Results:

The 1/64" black line on the 18% neutral gray card was clearly visible. Both on the remote monitor and the video tape play-back.

The most narrow of the ASTM wire penetrameter wires (0.0032") was visible on the remote monitor and the video tape play-back.

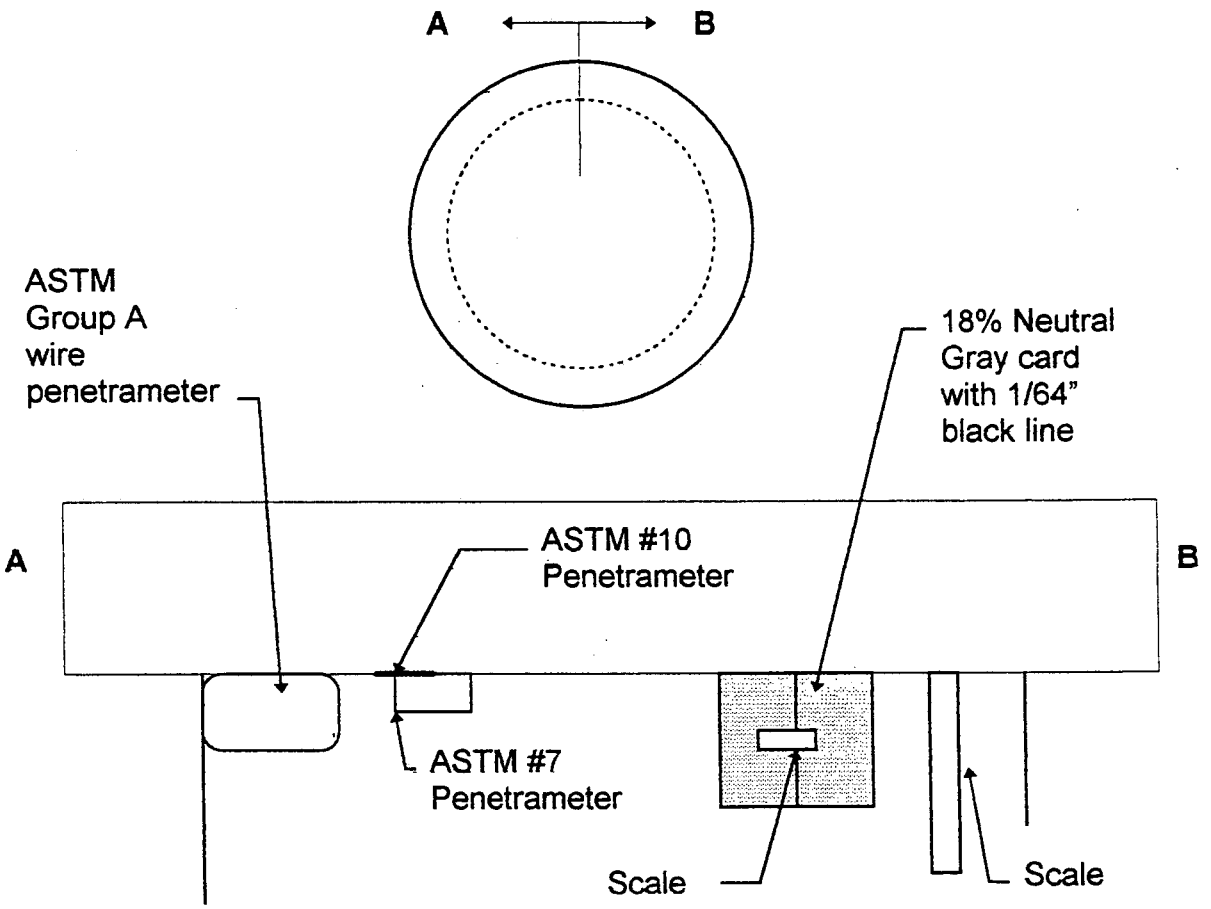
The 1t holes of both the #7 and #10 ASTM penetrameters was visible on the remote monitor and the video tape play-back.

The 1/64' scales, mounted vertically and horizontally, were clearly visible on the monitor and video play-back with no apparent distortion.

To measure the magnification, the tungsten electrode was placed on the division line representing 32/64" on the 1" long portion of machinist's scale and a measurement of the actual image size of a ¼" segment of this scale was made. A tape measure was used to measure the length of this image on the monitor. The results, 1-27/64" and 1-15/32" indicate a linear magnification of 5.62X and 5.89X. Lack of precision due in part to parallax from the monitor screen.

This qualification was found to be acceptable in demonstrating the systems ability to resolve characteristics visually similar to those encountered during visual examination.

Gary Marquardt 3/11/98
WSND QA /QC Date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