ACCELERATED DOCUMENT DISTRIBUTION SYSTEM

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:9304260140 DOC.DATE: 93/04/19 NOTARIZED: NO DOCKET #
FACIL:50-387 Susquehanna Steam Electric Station, Unit 1, Pennsylva 05000387
AUTH.NAME AUTHOR AFFILIATION
BYRAM,R.G. Pennsylvania Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
MILLER,C.L. Project Directorate I-2

SUBJECT: Forwards draft alternative rules for repair of erosion/ corrosion degradation in classes 1 & 2 ferritic steel piping re feedwater connection X-175.

DISTRIBUTION CODE: A001D COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 9
TITLE: OR Submittal: General Distribution

NOTES:

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD1-2 LA	1	1	PD1-2 PD	1	1
	CLARK,R	2	2			
INTERNAL:	ACRS	6	6	NRR/DE/EELB	1	1
	NRR/DORS/OTSB	1	1	NRR/DRCH/HICB	1	1
	NRR/DSSA/SCSB	1	0	NRR/DSSA/SPLB	1	1
	NRR/DSSA/SRXB	1	1	NUDOCS-ABSTRACT	1	1
	OC/LFMB	1	0	OGC/HDS2	1	0
	REG FILE 01	1	1			
EXTERNAL:	NRC PDR	1	1	NSIC	1	1

NOTE TO ALL "RIDS" RECIPIENTS:

PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK, ROOM P1-37 (EXT. 504-2065) TO ELIMINATE YOUR NAME FROM DISTRIBUTION LISTS FOR DOCUMENTS YOU DON'T NEED!

TOTAL NUMBER OF COPIES REQUIRED: LTTR 22 ENCL 19

MAY

RIDS/ADDS

PP&L Pennsylvania Power & Light Company
Two North Ninth Street • Allentown, PA 18101-1179 • 215/774-5151

Robert G. Byram
Senior Vice President-Nuclear
215/774-7502

APR 19 1993

Director of Nuclear Reactor Regulation
Attention: Mr. C. L. Miller, Project Director
Project Directorate I-2
Division of Reactor Projects
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUSQUEHANNA STEAM ELECTRIC STATION
FEEDWATER SYSTEM EROSION/CORROSION REPAIR
PLA-3941 **FILE R41-2** **Docket #50-387**

References: *NRC letter from Mr. J.J. Raleigh to Mr. H.W. Keiser, "Summary of Meeting With Pennsylvania Power & Light Company (PP&L) on the Feedwater 'Tee' Weld Overlay Thinning" dated June 12, 1992.*

PLA-3796 from Mr. H.W. Keiser to Mr. C.L. Miller, "Technical Safety Assessment of Feedwater System With As-Found Pipe Wall Thinning" dated June 17, 1992.

NRC Letter from Mr. M.W. Hodges to Mr. H.W. Keiser, "Clarification of PP&L Commitments to NRC on the Feedwater Piping X-175" dated July 30, 1992.

NRC letter from Mr. J.J. Raleigh to Mr. H.W. Keiser, "Safety Evaluation of the Pennsylvania Power & Light Technical Safety Assessment of Feedwater Location X-175, Susquehanna Steam Electric Station, Unit 1" dated October 15, 1992.

Dear Mr. Miller:

The purpose of this letter is to forward PP&L's proposal addressing options relative to repair or continued use of the feedwater tee connection X-175. It is also our desire to obtain NRC agreement with the following proposal prior to commencement of the Unit 1 - 7th Refueling and Inspection Outage (U1-7RIO) currently scheduled to begin on September 11, 1993.

260023

A001

Background

As a result of PP&L's Erosion/Corrosion (E/C) Inspection Program, a localized area of apparent excessive E/C was ultrasonically detected on a ASME Class 1 portion of the Susquehanna Unit 1 feedwater piping during the U1-6RIO in April 1992. The wall thinning occurred in a counterbore region just downstream of a welded joint located between a 20 inch tee and a 12 inch riser pipe leading to one of the reactor pressure vessel (RPV) feedwater nozzles. (Ref. NRC Information Notice 92-35). The thinning did not infringe upon the design minimum wall-thickness, however, based upon previous ultrasonic inspection data, it was conservatively estimated that the rate of thinning was such that minimum design wall would be violated sometime during the next cycle of operation for Unit 1. Examinations of other similar areas in the feedwater system indicated that E/C (or 'flow-accelerated' corrosion) was occurring at various locations throughout the Class 1 portion, but at much lower rates, indicating that corrective actions for other portions of the system would not be necessary until approximately the U1-9RIO currently scheduled for September 1996.

PP&L decided to restore the wall thickness at the area of erosion through application of a 360 degree engineered built-up weld-metal reinforcement on the external surface of the piping. The design of the build-up was in accordance with the requirements of ASME Section III, and the installation was performed under the provisions of ASME Section XI. After notifications were made to NRC-Region I and NRC-NRR personnel, design and reconciliation of the modification by Bechtel, the original N-Stamp holder, commenced. The physical work was subsequently completed by General Electric on April 16, 1992.

Prior to restart of Unit 1, NRC requested a meeting on May 28, 1992 with PP&L to discuss concerns raised regarding the ASME code acceptability of the modification. As a result of the meeting, NRC advised that it was their belief that the modification did not satisfy the repair/replacement rules of ASME Section XI. Subsequently, PP&L provided, at NRR request, a technical safety assessment confirming that the existing E/C in addition to the E/C predicted to occur in the pipe during the next cycle of operation (up to U1-7RIO) would prove to be acceptable under the provisions of ASME Code Case N-480. A major constraint imposed by NRR on the technical safety assessment was that no credit could be taken in the assessment for the increased wall thickness provided by the weld build-up. NRC issued a safety evaluation dated October 15, 1992 finding that PP&L had provided reasonable assurance that component X-175 would maintain its structural integrity until at least the U1-7RIO.

In addition to the technical safety assessment that provided PP&L's justification for continued operation (JCO), PP&L committed to evaluate, as follows, the service condition of the affected area of the feedwater piping during the U1-7RIO. If the evaluation:

1) indicates the pipe wall is, or is predicted over the next cycle to be, outside Code allowable, to repair the pipe in a manner that meets the interests of both NRC and PP&L; or

2) if the evaluation indicates a repair is not warranted, to submit the results and obtain NRC agreement with our course of action for continued operation.

Proposed Code Case for Alternative Rules for Repair of
Erosion/Corrosion Degradation in Classes 1 & 2 Ferritic Steel Piping

In recognition of NRC's position that the ASME Code currently requires repair of the degraded portion of the piping interior, PP&L has initiated a proposed Code Case which, if approved, would confirm the technical suitability and Code acceptability of accomplishing an engineered full circumferential exterior built-up weld-metal reinforcement for restoration of wall thickness, without the need for removal of internal E/C degradation.

The ASME Section XI Working Group - Welded Repairs and Special Repair Processes has established a Task Group to address this issue. The result of this Group's efforts has been reviewed, modified and accepted by Working Group - Welding, and Subgroup - Nondestructive Examination (SG-NDE), and has been submitted for review by Subgroup - Repairs, Replacements and Modifications (SG-RRM). It is anticipated that the code case will progress further during the Code Meetings in May, 1993. However, since the next subsequent ASME Main Committee (final Code approval authority) meetings are not scheduled until September, 1993 it is unlikely that final Code approval will be obtained prior to our U1-7RIO. We believe, however, that the technical acceptability of the concept will be well established before then.

Replacement of Degraded Piping

Concurrent with the processing of the Code Case, PP&L is preparing a design change to accomplish removal of the existing weld build-up and replacement of the eroded portion of piping during the Unit 1-7RIO. However, due to the fact that each of the three RPV feedwater nozzle thermal sleeve assemblies on this non-isolable loop of piping is designed to permit approximately 40 gpm back flow into the feedwater piping when the system is not pressurized, it will be necessary to drain the RPV to a level beneath the elevation of the assemblies in order to accomplish the replacement. After the core is fully unloaded this will require installation of the fuel pool gates, defeat of the RPV level signal interlocks, and drainage of the reactor cavity and vessel to the required elevation prior to breaching the pipe. A reversal of these activities would be required after final NDE and acceptance of the installation welds.

Proposed Course of Action

During the U1-7RIO, an ultrasonic examination and evaluation will be performed of the area of concern, including adjacent upstream and downstream locations, to determine the existent internal eroded surface condition and remaining wall thickness of the piping. This data will be evaluated relative to previously obtained ultrasonic data in order to determine any change in internal configuration and to calculate the current and predicted maximum rates of wall thinning. Predicted rates will be based upon the worst case conditions observed during the current U1-7RIO fuel cycle. Subsequent action will depend on the results of this evaluation, as follows:

I. *Evaluation of the pipe wall shows that no appreciable wear has occurred between U1-6RIO and U1-7RIO. For this condition, the piping will be considered suitable for use for an additional fuel cycle of operation.*

II. *Evaluation of the pipe wall shows that some appreciable wear has occurred, however, the remaining pipe wall thickness excluding the weld build-up is still above minimum wall thickness (as provided for in Code Case N-480) and the predicted wear rate indicates minimum wall thickness will not be breached during the forthcoming cycle of operation (U1-7RIO through U1-8RIO). For this condition, the piping will be considered suitable for use for an additional fuel cycle of operation. Although the above criteria are met, PP&L may choose to replace the affected section of piping if other conditions warrant this action.*

III. *Evaluation of the pipe wall shows some appreciable wear has occurred, however the remaining pipe wall thickness <u>including</u> partial credit for the existing weld build-up is still above the sum of the <u>design</u> minimum wall thickness (0.438") plus the predicted erosion for the forthcoming cycle (U1-7RIO through U1-8RIO). For this condition, the requirements of the proposed Code Case N-ZZZ (attached) will apply, with the conservative exceptions that (1) the provisions of Code Case N-480 will not be applied in determining minimum acceptable wall thickness, and (2) credit will be taken for only 50% of the added weld reinforcement. In addition, the volume of the piping within the circumference of the build-up, including the original base metal, original welded joint, and built-up weld deposit (except for tapered transitions) will be volumetrically examined and verified to meet the acceptance criteria of IWB-3514 and 3650. Should this situation occur, PP&L will not restart Unit 1 without the review and concurrence of the NRC.*

IV. *Evaluation of the pipe wall, including credit for 50% of the added weld reinforcement shows that wear has occurred to the extent that the minimum design wall thickness is - or over the next cycle will be - infringed upon; or the volumetric examination does not meet the requirements of III, above. For this condition the affected section of piping will be replaced with new material in accordance with the requirements and provisions of ASME Section III and XI, and applicable Code Cases approved by the NRC.*

Should Condition I, II or III exist, allowing continued operation for at least another cycle, the issue will be revisited with the NRC prior to the next subsequent U1-8RIO. Conservative application of some of the <u>provisions</u> of in-process Code Case N-ZZZ will be considered as Regulatory-approved relief for this specific situation, and will not signify NRC endorsement or approval of that Code Case.

<u>Conclusion</u>

The above proposed course of action reflects a safe, conservative, and technically sound approach to resolution of this condition of isolated erosion. It will permit additional time for the data collection and analysis necessary to totally define the extent of the problem and to develop the optimum final replacement solution.

PP&L requests that NRC review and approve the above proposed course of action before the upcoming U1-7RIO scheduled to begin September 11, 1993.

If you have any questions, contact Mr. J.B. Wesner at 215-774-7911.

Very truly yours,

for R. G. Byram

Attachment: Draft Code Case N-ZZZ

cc: NRC Document Control Desk (original))
NRC Region I
Mr. G. S. Barber, NRC Sr. Resident Inspector
Mr. R. J. Clark, NRC Sr. Project Manager

RRM 89-11
1-20-93 Handout

DRAFT Code Case N - ZZZ

Alternative Rules for Repair of Erosion/Corrosion Degradation in Classes 1 and 2 Ferritic Steel Piping

Prepared by: WGW Task Group on Alternate Rules for Repair of Erosion/Corrosion of Ferritic Steel Piping, as modified at Working Group - Welding and Special Repair Processes January, 1993

Code Applicability - All Editions of ASME Section XI from 1977 up to and including the 1992 Edition.

Inquiry: When non-through-wall erosion/corrosion wall thinning is detected in local areas of Class 1 or 2 ferritic (carbon or low alloy) steel piping systems, and the thinning does - or is predicted during the next refuel cycle to - infringe upon design minimum wall thickness, is it permissible under the rules of IWA - 4000/7000 (and IWB - 4000/7000 or IWC - 4000/7000, as applicable) in Editions up to and including the 1992 Edition, to restore the wall thickness at the affected areas through the deposition of 360 degree circumferential welded reinforcement on the outside surface of the piping and without removal of the internal erosion/corrosion degradation?

weld deposited

Reply: It is the opinion of the Committee that local areas of non-through-wall erosion/corrosion wall thinning on Class 1 and 2 ferritic steel piping systems which do - or are predicted during the next refuel cycle to - infringe upon design minimum wall thickness, may under the rules of IWA - 4000/7000 (and IWB - 4000/7000 or IWC - 4000/7000, as applicable) of Editions up to and including the 1992 Edition, have the wall thickness restored through the deposition of 360 degree circumferential welded reinforcement on the outside surface of the piping without removal of the internal erosion/corrosion degradation provided that the following conditions and requirements are met.

weld deposited

1. General Requirements

(a) The repair shall be performed in accordance with a Repair Program[1] satisfying the requirements of IWA - 4130 in the Edition and Addenda of ASME Section XI applicable to the plant ISI Program or later Edition and Addenda.

(b) Except as stated herein, the repair/replacement shall meet all other requirements of IWA - 4000/7000 (and IWB - 4000/7000 or IWC - 4000/7000, as applicable).

2. Initial Thickness Evaluation. The volume of the piping beneath the surface area to which the welded reinforcement is to be applied shall be evaluated to establish the actual wall thickness and the extent of erosion/corrosion degradation.

---

[1]When applying this code case to Editions and Addenda later than the 1989 Edition, reference to a Repair Program in accordance with IWA - 4130 shall mean a Repair Plan in accordance with IWA - 4140.

3. Design Requirements

(a) The application of the reinforcement, including the shrinkage effects of such application on the piping system, the existent piping internal eroded/corroded surface configuration, the effects of different coefficients of thermal expansion between the reinforcement filler metal and the base metal, and the predicted maximum erosion/corrosion degradation over the next operating cycle, shall be reconciled with the original design requirements and, as applicable, the Design Specification and Design Report, for the piping system. Reinforcement filler metal shall be restricted to ferritic materials.

(b) The reinforcement shall be 360 degree circumferential and shall be designed in accordance with the requirements of the Construction Code and applicable analytical evaluation criteria approved by this Section (e.g. Code Case N-480 or IWH - 3000, as issued). Alternative analytical evaluation methods may be used.

(c) The full thickness of reinforcement shall extend a minimum distance at least equal to L_{min} beyond any existing area predicted, over the next operating cycle, to infringe upon design minimum thickness, where

$L_{min} = 3/4 \sqrt{R\, t_{nom}}$,

R = outer radius of the component, and

t_{nom} = nominal wall thickness of the component.

Edges of the reinforcement shall then taper to the existing piping surface at a maximum slope of 1:3. Final configuration of the reinforcement shall provide for the examinations and evaluations required herein.

4. Initial Non-destructive Examinations

The entire surface area to which the reinforcement is to be applied shall be examined by the liquid penetrant or magnetic particle method, and shall satisfy the surface examination acceptance criteria of Section XI.

5. Performance of Repair

(a) Reinforcement weld metal shall be deposited, and if required stress - relieved, in accordance with a groove - welding procedure qualified in accordance with ASME Section IX and the Construction Code or IWA - 4500.

(b) The reinforcement shall, as a minimum, restore the thickness of the piping to the reconciled design minimum wall thickness plus the maximum predicted erosion/corrosion for the subsequent operating cycle.

(c) The surface of the weld reinforcement shall be prepared by machining or grinding, as necessary, to permit performance of the surface, volumetric and internal surface profile examinations/evaluations required by paragraph 6, below.

6. Non-destructive Examination/Evaluation

(a) The completed reinforcement shall be examined by the liquid penetrant or magnetic particle method and shall satisfy the surface examination acceptance criteria of Section XI.

(b) The completed reinforcement, including the volume upon which it is applied, shall be examined to verify acceptable wall thickness and configuration.

(c) For reinforcements requiring volumetric examination by the Construction Code, the finished reinforcement, excluding the tapered edges, shall be volumetrically examined. This examination shall satisfy the volumetric acceptance criteria of IWA - 3000 and IWB - 3514 or IWC - 3514, as applicable.

7. Testing Requirements

Pressure testing requirements shall be in accordance with IWA-4700.

8. Documentation. Use of this Code Case shall be documented on an NIS - 2 Form.

JEOas30119a.doc
01/19/93