

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

June 16, 1980

Docket Nos. 50-327/328

MEMORANDUM FOR: S. S. Pawlicki Chief
Materials Engineering Branch
Division of Engineering

FROM: J. Halapatz
Materials Engineering Branch

SUBJECT: EXPRESSION OF DIFFERING PROFESSIONAL OPINION IN THE MATTER
OF THE ADEQUACY OF SEQUOYAH UNIT ONE WELD DRAWBEAD REPAIR OF
PRESSURIZER RELIEF PIPE

The author of this memorandum, hereinafter referred to as the minority, herewith expresses his minority opinion in the matter of the adequacy of the weld drawbead repair of the Sequoyah Unit One pressurizer relief pipe. The minority expresses its differing professional opinion in accordance with Section II.A.3.J of the memorandum, Samuel J. Chalk to William J. Dircks, dated May 1, 1980, subject, "FY 1982-86 Policy Planning and Program Guidance (PPPG)."

Non Conformance Report NCR SWP-79-S-8 disclosed, that during the hot functional testing of Sequoyah Unit One, 1-RCH-93 pipe support for the pressurizer relief piping failed to slide in the vertical direction as the pressurizer expanded during heatup of the reactor coolant system. As a result the 6-inch, schedule 160 (nom. .718 wall), Type 316 stainless steel pressurizer relief pipe was bent. The related safety implication was that failure of this piping could lead to an uncontrolled blowdown of the reactor coolant system.

As corrective actions, TVA had two options. The first option was to cut out the damaged pipe and replace it. This option, however, would require a system pressure test in accordance with ('77) ASME Code Section XI IWA-4400(a), which requires that after repairs by welding on the pressure retaining boundary that a system pressure test be performed. The second option was to straighten the pipe by a repair procedure which would be exempted from system hydrostatic testing. TVA, to avoid cutting out the damaged pipe, sought this exemption through IWA-4400(b)(3), which exempts from hydrostatic testing repairs by welding on the pressure retaining boundary provided that the repairs did not penetrate through the pressure boundary.

The corrective action used by TVA to straighten the pipe was the weld drawbead technique. Two 270° grooves were ground in the pipe opposite to and straddling the kink. The grooves were filled with weld metal, reground to remove that weld metal, then filled a second time with weld metal. Weld metal shrinkage provided the stressing to plastically straighten the pipe.

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The repair was accepted by the Materials Engineering Branch via the memorandum, Pawlicki to Rubenstein, dated December 4, 1979, subject, "Tennessee Valley Authority, Sequoyah Nuclear Unit No. 1." TVA justified the exemption from hydrostatic testing of the system after the repair on the basis of TWA-4400(b)(3), claiming that the process of welding to realign the pipe did not result in penetration of the reactor coolant boundary. The minority challenged acceptance of the repair on the basis that more information was needed.

The memorandum, Gustafson to Pawlicki, dated January 25, 1980, subject, "Trip Report of Visit to Tennessee Valley Authority Sequoyah Nuclear Plant, Unit-1," which reported on a visit to the Sequoyah site, found the repair acceptable. The minority, after review of this memorandum and documentation related thereto, recommended in the memorandum, Halapatz to Pawlicki, dated February 27, 1980, subject, "Sequoyah Unit One Weld Drawbead Realignment of 6" Pressurizer Relief Pipe," that the Materials Engineering Branch defer acceptance of the repair pending the development and review of additional information. The minority was then advised by his assistant director that he was to personally examine the weld mockup used to qualify the repair which had been made. The memorandum, Pawlicki to Rubenstein, dated February 28, 1980, subject, "Tennessee Valley Authority, Sequoyah Nuclear Plant, Unit No. 1, Realignment of Pressurizer Relief Pipe," then reiterated acceptance of the repair and recommended that the minority meet with TVA personnel and examine metallographic samples. On March 5 and 6, 1980, the minority visited TVA at Knoxville and performed a metallurgical examination of the mockup used for the qualification of the weld drawbead realignment of the Sequoyah Unit One pressurizer relief pipe. Metallographic evidence was documented which showed that the mockup weld was fully penetrated. Full penetration of the mockup weld, which was supposed to represent the weld repair of the damaged pressurizer relief pipe, obviously did not demonstrate compliance with Section XI IWA-4400(b)(3). This finding, in itself, provided cause for denial of exemption from hydrostatic testing of TVA's weld drawbead repair of the pressurizer relief pipe which had been made. Other inconsistencies were noted between the mockup and the actual relief pipe. For example, a different material was used in the mockup. Further, while the mockup had only one weld groove, the actual relief pipe repair used two weld grooves. In addition, metallographic evidence was documented which showed through-wall sensitization to a significant degree, indicating that a potential through-wall crack propagation path existed. Since the propagation of cracks through the pipe wall is the essential concern with respect to the integrity of the reactor coolant boundary, it is the minority opinion that intergranular corrosion tests which would expose to the test environment specimens which represent the through-wall microstructure should be performed. However, only tests of ID specimen surfaces were performed.

Given that the mockup weld was fully penetrated, the minority concluded that TVA had not qualified its exemption to system hydrostatic testing.

Disclosure of the above information led to a meeting of TVA and NRC on March 13, 1980. It was agreed that TVA would perform in situ metallography to evaluate sensitization in the actual relief pipe repair and re-radiograph the repair to determine whether or not the pressure boundary had been fully

penetrated. The examination, reported in the memorandum Mills to O'Reilly, dated April 11, 1980, subject, "Sequoyah Nuclear Plant Unit 1 - Pressurizer Relief Piping Support - NCR SWP 79-S-8 - Supplemental Information" found the weld heat affected zone to be unsensitized and therefore, that sensitized base metal underlying the weld did not encroach on the pipe ID. In addition, on the basis of radiographic examination of the repair, it was concluded that the weld did not encroach on the pipe ID, i.e., did not fully penetrate the reactor coolant pressure boundary. These results were concurred in by OIE-RII in the memorandum, Murphy to Thornburg, dated April 22, 1980, subject, "RII Report No 50-327/80-12 Concerning Inspection Performed to Evaluate Repair of Sequoyah Unit 1 Pressurizer Relief Line."

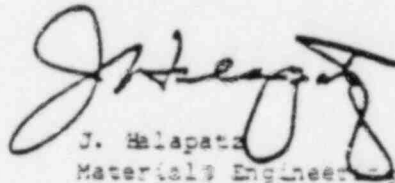
The minority considers that meaningful metallurgical conclusions cannot and should not be made from Xerox reproductions of the in situ metallography, which have been made available. Given the carbon content (.052/.059%) of the pressurizer relief pipe, the minority finds it anomalous that the weld heat affected zones did not show some sensitization, since then it is inferred that the base metal at any distance from the molten weld metal essentially did not experience some time in the 800°F to 1500°F sensitization range during post weld cooling.

The matter of the sensitization of austenitic stainless steels is enveloped in controversy. Arguments are made that the weld drawbead repair welds are no different than adjoining full penetrated installation welds. In the absence of identical metallurgical histories, however, this argument is tenuous. The minority notes the safety implication involved, viz., that failure of the repaired piping cannot be isolated, which as a consequence, could lead to an uncontrolled blowdown of the reactor coolant system. The minority is of the opinion that this matter be examined to a much more definitive and conclusive end. It should also be kept in mind that the environment, which will be experienced in service by the repair, will be a calculated 0.2 ppm maximum oxygen bearing steam rather than reactor coolant water containing a residual oxygen concentration during power operation of 0.005 ppm. BWR pipe crack experience and the lack of corrosion data on the performance of sensitized austenitic stainless steel weldments in 0.2 ppm oxygen bearing steam would suggest caution in acceptance of the Sequoyah weld drawbead repair of the pressurizer relief pipe. The argument that PWR service experience has not identified a problem with pressurizer relief pipes is tenuous, because it is unknown how many, if any, operating plants include pressurizer relief pipes which have been repaired as has Sequoyah's. Given this uncertainty, which the minority feels is related to the in situ metallography performed, the more definitive laboratory examination and corrosion testing of boat samples parted from the weld drawbead repaired Sequoyah pressurizer relief pipe is proposed for consideration.

With respect to the finding that the weld repair did not full penetrate the reactor coolant boundary, it is the minority opinion that it has not been demonstrated that the radiographic technique used has the capability to develop this conclusion. While evidence that the 2T hole in an ASTM No. 12 penetrometer was visible to TVA Level III film interpreters and OIE-RII personnel may demonstrate that defects are not present, these criteria may not necessarily demonstrate the capability of the technique to discriminate in a

radiograph between sound weld metal and sound wrought base metal underlying the weld metal. The technique must be able to provide for this distinction in order to confirm whether or not the weld has fully penetrated the reactor coolant boundary. The capability of the technique could be confirmed or denied by radiographing a known fully penetrated weld and a known partially penetrated weld in the same material and observing if a distinction can be made in film density differences in the weld root area between weld metal and wrought base metal.

Given the controversy which sometimes attends the interpretation of examination results, inspection by third party is desirable. Attention is called to an NRC position stated in the memorandum, Rubenstein to Farris, dated September 12, 1979, subject, "Qualification of Inspectors, Inspection Specialists, and Inspection Agencies for Sequoyah." The Rubenstein memorandum states the NRC position that TVA institute third part inspection for the Sequoyah nuclear plant. The Rubenstein memorandum is provided as an attachment to this memorandum. The minority opinion concludes that third party inspection is required and should be implemented in the matter of the acceptance of the weld drawbead repair of the Sequoyah Unit One pressurizer relief pipe.



J. Halapata
Materials Engineering Branch
Division of Engineering
Office of Nuclear Reactor Regulation

Enclosure:
As stated

cc: V. S. Noonan
R. L. Tedesco
A. Schwencer
C. E. Murphy, OIE-RII
A. R. Herdt, OIE-RII
R. M. Gamble
C. Stahle
P. K. Van Doorn, OIE-RII
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C. D. Sellers M. L. Boyle

Docket Nos.: 50-327/328

Mr. H. G. Parris
Manager of Power
Tennessee Valley Authority
500A Chestnut Street Tower II
Chattanooga, Tennessee 37401

Dear Mr. Parris:

SUBJECT: QUALIFICATION OF INSPECTORS, INSPECTION SPECIALISTS, AND
INSPECTION AGENCIES FOR SEQUOYAH

In Amendment No. 61 to the Sequoyah FSAR, you stated that you will provide your own independent review of the Section XI program of the ASME Boiler and Pressure Vessel Code through the TVA central office staff in Chattanooga, Tennessee. It is TVA's policy to provide its own inspection services on the basis that TVA is a Federal agency and it is not subject to State or other non-Federal inspectors.

It is our position that TVA is not exempt from any of the requirements of 10 CFR Part 50, Section 50.55a(g)(4). Therefore, we require that TVA institute the third party inspection system of the Sequoyah nuclear power plant.

A letter of compliance is requested.

Sincerely,

Original signed by:

L. S. Rubenstein, Acting Chief
Light Water Reactors Branch No. 4
Division of Project Management

cc: See next page

*Record Note: Spoke to Dick Clark
9/2/79
Dick, who was
informed of this approach
to ensure
Christine*

DPM: *[Signature]*-4
MService
9/1/79

DSS: *[Signature]*
SP: *[Signature]* cki
9/19/79

OFFICE	DPM: <i>[Signature]</i> -4	DELD <i>[Signature]</i>	<i>[Signature]</i>		
REMARKS	CStahle/jl	CWoodhead	LRubenstein		
DATE	9/1/79	9/11/79	9/20/79		



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L. S. Rubenstein
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Light Water Reactors Branch No. 4
Division of Project Management

cc: See next page

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