0923-27-87

OAK RIDGE NATIONAL LABORATORY
OPERATED BY MARTIN MARIETTA ENERGY SYSTEMS, INC

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 3783·

November 4, 1987

Mr. M. R. Hum
Materials Engineering Branch
Mail Stop P-842
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission

Dear Mr. Hum:

Travel to Elmsford, New York, October 21-25, 1987, to Provide Technical Assistance to NRC for Evaluation of Flaw Indication in Indian Point Unit 2 Reactor Pressure Vessel

At your request via Work Task 87-1 (FIN A9478-3), I attended the subject evaluation at the reactor site (~25 miles north of New York City). The people most involved in this exercise, besides you and I, were Don Adamonis, Rick Rishell, and David Kurek of Westinghouse, Frank Dodd of NES/Dynacon, George Wasilenko of Consolidated Edison, John Gieske of Sandia, and Robert McBrearty of the NRC.

As requested, Gieske and I met with you and McBrearty the evening of October 21. This rather routine premeeting allows NRC to provide contractors with general guidance for the primary task.

Upon arrival at the reactor site (near Buchanan, New York), we were informed of the requirement for an orientation course prior to entering the protected area. This course consisted of an hour-long lecture on safety followed by a ten-question quiz covering the material presented.

After successfully completing the required course, we entered the protected area with McBrearty and walked to the conference room that served as a common meeting place for the next 2 days. McBrearty also escorted us to the NRC residence office where we met Peter Kelley and Larry Rossbach. Calls to Cy Cheng, Warren Hazelton, and Marylee Slosson were made from this office during the course of our stay.

No formal presentations were made by in-service inspection personnel during our visit. The most formal meeting was held Friday morning (October 23) when McBrearty held his exit meeting for inspection 87-31 (again in the conference room).

After meeting with Wasilenko and Spring in the conference room on the morning of October 22, our four-man NRC team walked to the Westinghouse in-service inspection trailer with Wasilenko. The Westinghouse personnel (Don Adamonis was the spokesperson) informed us that all the 10-year plate inspection data for the flaw indication zone had been collected as well as the SAFT data for PNL (Larry Reid). They were changing the plate on the Westinghouse-designed scanner to accommodate the Intercontrole-focused probes. Adamonis predicted a completion time as early as midnight, even though the planned schedule provided for an additional 12 h, if needed (it was not).

An ongoing review of the data by Kurek, Adamonis, Dodd, and others indicated that there was essentially no change from the 1984 results.

After lunch we returned to the Westinghouse trailer to participate in a preliminary review of the 10-year plate data with Dodd providing mostly modified B-scan color displays with the ultrasonic data recording and processing system (UDRPS). We observed the 0° data collected with the 2.25-MHz flat search unit; no indication of the flaw was observed. However, it was evident that the microstructure of the plate on one side of the weld would reduce the flaw detection sensitivity (due to scatter and/or attenuation) from this direction.

The UDRPS display provides a graphic display of this difference and thus signatures a location of the weldment. This discrete plate difference was not noted in the 1984 in-service inspection (UDRPS was not used) and therefore could have been a factor in the conclusion that the indication was oriented to favor detection from one direction.

We also observed pulse-echo data off the indication using the flat 45°shear wave search units. None of these displays showed the typical planar flaw response from notches (a large corner trap signal at the back surface and a smaller tip-diffracted signal at the top of the notch). Since the data had not been fully analyzed by the in-service inspection personnel at this time and since we were consistently asked what we wanted to see, Gieske collected an NRC request list. This handwritten draft requested the following items:

1. A table listing the manual DAC sizing with flat search units for both 1984 and 1987 in-service inspections.

2. UDRPS DAC sizing using flat search unit data collected at the 1987 in-service inspection.

3. UDRPS 6-dB drop sizing using focused search units (successive decibel drop sizing should be considered later).

4. Any delta data that would help to determine the size of the flaw indication.

5. Hard-copy color plots (modified B-scan and/or perspective) fro pulse-echo, delta, or other data that describe the interpretations c the in-service inspection personnel.

6. Results of a 0° inspection using a 5-MHz search unit as well as an other that might be available (focused, 2.25 MHz, flat, etc.).

On Friday morning, October 23, we returned to the conference room where w each received a copy of an examination summary (Attachment 1) as well a details of the examination sequence (not attached). This information wa provided at McBrearty's request.

Upon our arrival at the Westinghouse trailer on Friday, a hand-draft cop of the 1984 and 1987 data in tabular form was presented. This informatio indicated that no significant change in the indication had occurred, sinc the ultrasonic measurements were very similar. This apparen demonstration of an essentially unchanged condition for the indication wa the primary goal of the augmented in-service inspection task Westinghouse was to have the hand-draft data typed and copies availabl the following morning.

I asked Rick Rishell about the remaining data base that was promised ir his letter of September 22, 1987 [MT-NWE-296(87)]. He stated that he planned to provide us with this information on Saturday, October 24. He apparently did not complete the data analysis as planned; hence, we didn't receive this information.

As mentioned earlier, McBrearty conducted his exit meeting around 11:00 a.m. on October 23. The major points were that (1) no violations were identified, (2) preliminary results showed no change in the indication since 1984, and (3) more complete characterization information was expected on Saturday, October 24 (i.e., the six NRC requests).

On Friday afternoon we returned to the Westinghouse trailer and observed some delta and pulse-echo data displays by UDRPS. Specific plans were made to return on Saturday to obtain some expected hard-copy data addressing the six NRC requests. We agreed to meet at 11:00 a.m. because Westinghouse needed time to digest the data bank available for analysis.

On Saturday morning we arrived on schedule to discuss the second goal of the augmented in-service inspection. This goal was to establish better identification and measurement of the size of the indication with improved accuracy. Attachment 2 contains the only data that I received during the entire task (except for the verbal and visually observed data) and is a partial copy of Attachment 1 to which the raw data have been added by hand. (I deleted hand data that were not discussed.) Basically, using the data in the extreme left corner as an example, the position of the delta array plate is referenced by the first number (e.g., 241.1) when the 2.25-MHz flat search unit is detecting the flaw indication in a pulse-echo mode. The numbers 388-394 that follow are the minimum and maximum time readings (doubled) at the 241.1 location. Thus, the microsecond readings would be 194 and 197, or a difference of 3 μs (as written to the right of these two 45° shear pulse-echo data points). Attachment 3 documents the path lengths, etc., for the delta array plate. The theoretical shear wave pulse-echo metal path is twice the 12.18-in. path (shown in Attachment 3) divided by the velocity [2 (12.18 in.) divided by 0.127 in./μs] or 191.8 μs. Thus, the theoretical outer-diameter surface reading should be 383.6 (when doubled). Of course, some variation would be expected because of the cladding, surface roughness, etc.

The data just above the pulse-echo 45° shear wave data in Attachment 2 were taken in the delta mode. The 0° longitudinal search unit is the receiver and each of the 2.25-MHz flat 45° shear wave senders were used to transmit (first for the clockwise and then for the counterclockwise direction). Only two data points were collected in the clockwise direction; whereas the majority of the data (eight points) was collected with the transmitter emitting sound for the counterclockwise direction. As before, the time numbers are doubled. The reference signal was not always evident, but it occurs at about the 192 position (i.e., 96 μs). Thus, the difference between the reference signal position and the indication signal position varies from about 2 to 3.5 μs. The in-service inspection personnel suggested that this indicated the reflector was separated from the inside wall. They also showed us a position at about 240.1 (counterclockwise) where a 4-μs difference was observed between the reference 192 nominal position and the flaw indication. At this spot, a second signal from the flaw indication was observed. They suggested that this second signal did not have the appearance of a corner trap reflection, because it was smaller than the signal received earlier and it was not offset in the Dynacon display like those observed from planar reflectors. Thus, they concluded that the indication was separated from the outer surface at this position.

Since most of the data presented were not completely digested by the in-service inspection personnel and, by necessity, not well organized to present the type of evidence required to build a case for a buried flaw, I cannot make a valid judgement of the buried flaw conclusion. Hard-copy data and an explanation (based on a model where calculations can be checked) must be made available for study.

In summary, the in-service inspection appeared to go very smoothly and the personnel attempted to collect all the data we requested. Additional steps to supplement the inspection are not obvious. The focused probe data were disappointing because of the poor resolution for small flaws; however, because of this fact they add confidence that the discontinuity is smaller than measured by code. Theoretically, the focused probe data (not analyzed yet) should provide better sizing than the code method. The primary goal of the augmented inspection was to demonstrate an essentially unchanged condition for the indication. I feel that this goal was adequately achieved. A secondary goal of establishing better identification and measurement of the size of the indication with improved accuracy must await completion of analysis. In any event, I feel that hard-copy data presented in a logical sequence with adequate explanation will be required to formulate and document opinions on the second goal of the augmented in-service inspection.

I recommend that Westinghouse formulate a best-case opinion following a very thorough analysis of all the data (including the SAFT results). They should then submit those data which support their conclusions. A third-party review of this submission would be a second recommendation. This approach may adequately define the requirements of the second goal of the 1987 augmented in-service inspection.

Sincerely yours,

K. V. Cook

K. V. Cook
Nondestructive Testing Group
Metals and Ceramics Division

KVC:jlb

Attachments

cc/att: C. Y. Cheng, NRC
W. H. Hazelton, NRC
J. B. Henderson, NRC
A. P. Malinauskas
R. W. McClung
J. G. Pruett
G. M. Slaughter
K. V. Cook/File

ATTACHMENT 1

October 19, 1987

INDIAN POINT UNIT 2 RV INVESTIGATION
EXAMINATION SUMMARY

1. TEN-YEAR PLATE PLATE 1

   - Manual Data Collection (TR 27, 22, 24, 25, 20)
   - UDRPS Data Collection (TR 27, 22, 24, 25)
   - UDRPS Data Collection With TR 20 (IF INDICATION IS VISIBLE)
   - SAFT 45 deg. L With Beam Directed in CW Direction
   - SAFT 45 deg. L With Beam Directed in CCW Direction
   - SAFT 45 deg. S With Beam Directed in CCW Direction

2. FOCUSED ARRAY PLATE PLATE 2

   - 0 deg. L, 45 deg. L, 45 deg. S, 45S/0 Delta (G-Axis at 0 deg.)
   - 0 deg. L, 45 deg. L, 45 deg. S, 45S/0 Delta (G-Axis at 180 deg.)
   - 60 deg. S (G-Axis at 0 deg.)
   - 60 deg. S (G-Axis at 180 deg.)

3. DELTA ARRAY PLATE PLATE 3
   - TR 22/24, TR 24/20, TR 22/20, TR 22 (G-Axis at 0 deg.)
   - Acoustic Comparison at Gain Setting Used on IPP-2T at WMSC Using TR 24/22
   - 0 deg. L, 5.0 MHz Data Collection

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0° receiver — 45° shear Flat

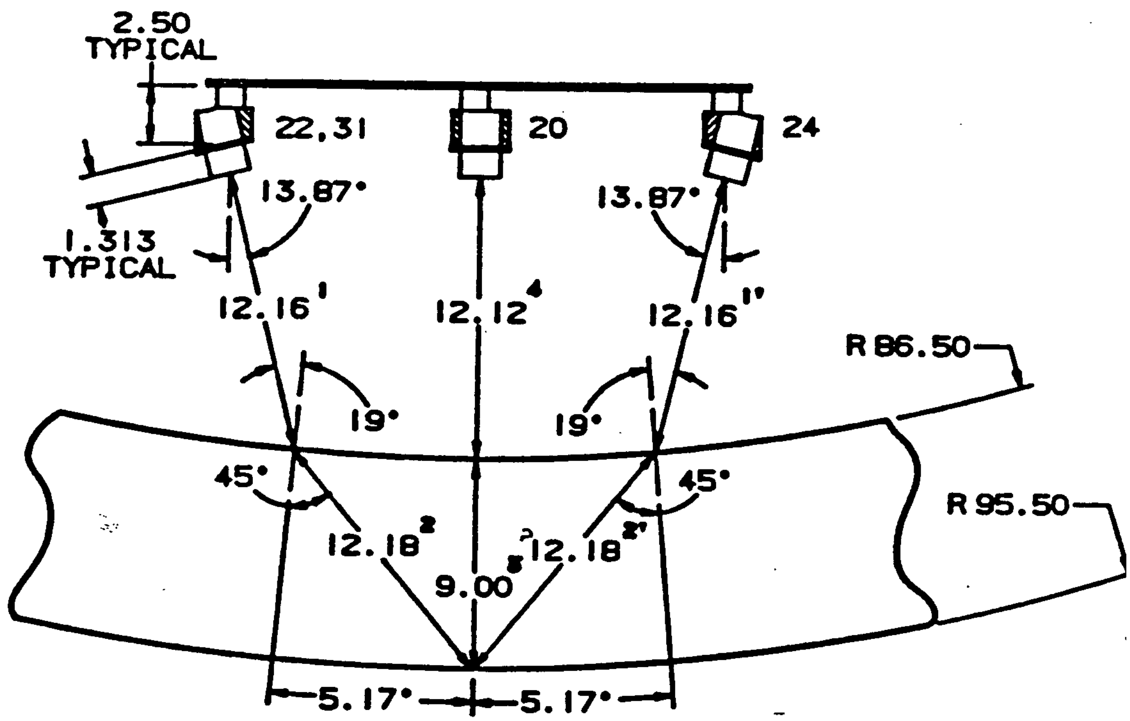
ccw 240.6	182	2nd	
+240.5	186	192	3 delta
+240.2	185	—	4 usec
+240.0	185		
+239.8	184	190	3
+239.6	187	192	2.5
+239.4	184	190	(2)
cw 239.7	188 - 191		1.5 usec
239.5	186 - 190		2 usec

F 45 shear sender

239.5	384 - 390	3 usec
241.1	388 - 394	

DEMONSTRATION PHASE OVERVIEW

SPECIAL EXAMINATIONS - DELTA AND PITCH-CATCH TECHNIQUES:



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KVC:jlb

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ATTACHMENT 2 (R[illegible] DATA)

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