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Sandia National Laboratories
Albuquerque, New Mexico 87185

October 11, 1984

Mr. Louis Frank
USNRC
Materials Engineering Branch
Washington, DC 20555

Dear Mr. Frank:

Subject: Ultrasonic Evaluation Results of the Reported Indication in Indian Point Unit 2 .

A meeting was attended on October 3, 1984 at NRC Bethesda,Md. at which Consolidated Edison presented data from which they concluded the maximum size of the indication at Indian Point 2 at vessel location 245 degrees. They presented data taken from mockups which were constructed with various reflectors to demonstrate the pitch-catch and delta techniques and to determine if the ASME section XI ultrasonic sizing techniques exaggerated the vessel indication size. Their conclusion was that the indication was indeed exaggerated by section XI sizing and from their analysis the maximum size was 0.26 inches deep and 0.85 inches long. The initial size reported by Consolidated Edison for this indication by section XI sizing was 2.03 inches deep and 1.96 inches long. Since the 0.26" by 0.85" size is just below code allowable for which an augmented inspection of this indication is required in the near future, it was necessary to review the data and analysis to find out if their maximum size dimensions were justified.

After reviewing all the data presented by Consolidated Edison regarding the mockups and the vessel data, it is my conclusion that the maximum size of the indication could be larger than the 0.26" by 0.85" dimensions.

Depth Dimension: Consolidated Edison concluded that the maximum depth was 0.26" by considering the exaggeration factor of the machined slots of 0.3" and 0.5" deep in the mockup. The average depth exaggeration for these slots was 7.79 times with a standard deviation of 3.34 times. Dividing the section XI depth of 2.03" by 7.79 gives the 0.26" depth. However, if the standard deviation is considered in the analysis the maximum depth possible is given by dividing 2.03" by (7.79-3.34) which gives a 0.46 inch depth.

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Considering the data collected by the delta technique where the uncertainty in transit time was established to be +/- 2 microseconds the tip diffracted longitudinal wave transit time could be as low as 129.6 microseconds. This yields a depth determination of 0.26" but any uncertainty in the vessel wall thickness at the indication would be added to this value. There is reason to believe that the vessel wall thickness varies from 8.9" to 9.0" at this location. Therefore the maximum depth by the delta technigue could be 0.36". There is also a second smaller pulse at 30 microseconds later in time which is present in the delta technique data for the vessel . This signal is most likely due to the shear wave diffraction signal from the tip of the indication. Calculations yield a depth of 0.39" for the indication using the 30 microsecond delay between the longitudinal and shear wave tip diffracted signals.

Therefore, from consideration of all available data, the conclusion is that a conservative depth dimension would be near 0.5 inches.

Length Dimension: Consolidated Edison concluded that the maximum length was 0.85" by considering the length exaggeration factor of the flat bottom rectangular slots of 0.3,0.5,1.5,and 2.0 inch depth in the mockup. They obtained a length exaggeration of 1.109 inches for these slots. Therefore they concluded that the section XI length of 1.96 inches could be reduced by 1.109 inches to give 0.85 inches. First of all,the factor 1.109" is not a conservative value since one can subtract it from one of the determined lengths of the 0.3" deep slot in the mockup (1.789") and obtain a length of 0.68" which is smaller than the machined length of that slot of 1.0". Secondly, the square corner slots of the mockup present an ideal reflector of considerably more reflecting surface near the edges of the slot than is ever possible for a crack-like reflector with rounded edges. Therefore the exaggeration factor for length determined from the mockup is not appropriate as applied to the vessel indication. Since no other data is given to support a length reduction from that determined by section XI, it seems appropriate to assume that the length could be 1.96 inches long.

Sincerely,

John H. Gieske

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