ILLINOIS POWER COMPANY

500 SOUTH 27TH STREET, DECATUR, ILLINOIS 62525

U-0209
L14-80(12-31)-L

December 31, 1980

Mr. James Keppler
Director, Region III
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Dear Mr. Keppler:

References: 1. Letter, L. J. Koch to James G. Keppler dated October 28, 1980, regarding an estimated date for the final report (10CFR50.55(e)) concerning a thin-walled elbow in RPV drain line; U-0194, L14-80(10-28)-9

2. Letter, L. J. Koch to James G. Keppler dated August 19, 1980, regarding an interim report (10CFR50.55(e)) concerning a thin-walled elbow in RPV drain line; U-0170, L14-80(09-10)-9

3. Letter, L. J. Koch to James G. Keppler dated July 14, 1980, "Interim Report" (10CFR50.55(e)), concerning a thin-walled elbow in RPV drain line; U-0156, L14-80(07-14)-9

Clinton Power Station Unit 1
Docket No. 50-461
Construction Permit No. CPPR-137

This letter is the final report concerning the thin-walled elbow discovered in the RPV drain line. Illinois Power considers that the presence of the thin-walled elbow is reportable per 10CFR50.55(e), because it represented a "significant deficiency" in construction. The description of the deficiency, its discovery, the ensuing investigation of the cause(s), and the corrective action to preclude recurrence are described in the following paragraphs:

Deficiency Description

The thin-walled condition in the second elbow of the drainline, downstream from the RPV, was an oval-shaped indentation approximately 1½ inches long, parallel to the elbow axis, one inch wide, 0.060 to 0.090 inch deep, radiused similarly to that of a thumb print impression. The indentation was located at the inside surface of the outer radius of the elbow.

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Discovery

The radiographs of the field weld joining a piping spool to the deficient elbow revealed the higher density oval-shaped image of the thinned region. The radiographic interpreter requested additional radiographs and an ultrasonic thickness measurement to better understand the condition. The radiographs also revealed the presence of foreign material in the elbow. Subsequently an NCR was written (Baldwin Associates NCR #3337) which described the wall thickness variations from 0.254 inch to over 0.600 inch for the two inch schedule 160 elbow, nominal wall thickness 0.344 inch. The minimum wall thickness allowed by the ASME Code is 0.301 inch. On June 20, 1980 NRC Region III was notified via telephone of a potentially reportable deficiency.

Investigation

Arrangements were made with General Electric Company for the removal of the defective elbow and the replacement with one meeting ASME Code requirements. Ultrasonic thickness measurements of the elbow nearer to the RPV penetration were also made; these revealed that this elbow was acceptable. General Electric was asked to investigate the causes of the thin-walled condition, the safety implications if the defective elbow had not been discovered and the corrective action that would be taken to preclude a similar, recurrent situation.

The elbow was removed on July 24, 1980 at which time the foreign material was identified as a water soluble dam used to assure the adequacy of the purge gas at the weld root during the welding. This dam would have dissolved with the first flushing of the system. Subsequently, an acceptable replacement elbow was installed.

The metallurgical evaluation of the thin-walled and normal thickness regions indicated a grain size and homogeneity typical of a carbon steel ferrite-lamellar pearlite microstructure. A microstructure analysis revealed that the indentation which caused the thin-walled condition was formed mechanically. The forming of the elbow was accomplished without the use of a mandrel. Hence, the defect was present in the manufactured pipe.

Since the discrepant elbow has been replaced with an acceptable elbow, the discrepancy will have no adverse effect on the safety of operations. Had the defective elbow not been detected, stresses higher than those reflected in the stress report could have occurred. However, failure in service would still be unlikely because of the localized nature of the defect and the hydrostatic testing requirements imposed on the drain line. In addition, failure of the line is bounded by the safety analysis and is within the capability of the emergency core cooling systems to allow the safe shutdown of the reactor and maintenance of adequate water inventory.

Corrective Action

The defective elbow was replaced with an elbow with acceptable wall thickness and material properties. The upstream elbow on the Clinton drain line was ultrasonically inspected for similar defects and found to be acceptable. General Electric has conducted an extensive investigation regarding this occurrence which resulted in the elbow manufacturer agreeing to initiate visual inspections of future elbows to detect defects in the inside surface of the elbows.

Further details regarding the investigation conducted in this matter are available for review. If you have any comments regarding this report, please notify me.

Very truly yours,

L. J. Koch
Vice-President

JBC/ph

cc: Director, Office of I&E, NRC, Washington, D.C.
H. H. Livermore, NRC Resident Inpsector
Director, Quality Assurance