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Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Maintenance of Indian Point Unit 2 Service Water System Piping

In recent telephone conversations, (July 30, 1987) with personnel from NRC Headquarters and Region I, it was requested that Con Edison submit detailed information regarding the Service Water System including aspects of its design, design codes, recent examination history and maintenance. This letter is in response to that request.

The Indian Point 2 Service Water System piping consists of ASTM A53 seamless Grade B cement lined carbon steel piping ranging in size from 3" to 24". Portions of the piping are routed underground. Piping spools are typically joined by either a flange or weld. In order to protect the cement lining from the thermal effects of welding, the weld joint design, as described in the original specification, utilizes a partial penetration butt weld type joint in lieu of a full penetration butt joint. Therefore, typically at each weld joint, a slight crevice exists between adjacent cement lining segments as well as between the adjacent carbon steel end pieces.

The original examinations performed on these weld joints during fabrication and installation were a visual examination of the fitup and a magnetic particle or liquid penetrant examination of the final weld pass. The "built-in" crevice in these joints effectively precludes meaningful radiography for weld acceptance purposes.

During the 1980-1981 refueling outage an examination was performed of service water piping welds inside Containment using radiographic techniques supplemented by ultrasonic testing, to ascertain the extent of corrosion at these weld points. The radiographic examinations were for the purpose of determining wall thicknesses at the weld and adjacent base metal by comparing film density readings at these locations with nearby pipe wall thicknesses. This special technique was specifically developed and qualified on an insulated cement lined 10" pipe mockup of various wall thicknesses.

Direct correlation between density variations and wall thickness variations was established. Where radiographic examinations indicated potentially significant corrosion, local ultrasonic examination readings were taken to

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determine wall thickness. All 10" pipe welds were examined and determined to be acceptable for continued use, replaced or repaired. As a result of this effort, 157 joints were acceptable as is, 40 were repaired and 67 were replaced with new joints for a total of 264 joints. All of these weld joints will be reinspected over a 10-year period.

This examination program continued during the subsequent refueling outages of 1982, 1984 and 1986. For example, 63 weld joints were re-examined in 1982. The re-examination proved the welds to be acceptable for continued service. The 1984 examination inside Containment program also included radiographic examination of 38 welds and visual examination of 5 welds via the previously installed inspection and maintenance ports. All of these weld joints proved to be acceptable. In 1984, the examination program was expanded to monitor the service water piping outside of Containment as well as inside the Containment Building. Initially, the inspection program outside of Containment encompassed 25 welds from 4" to 18". A total of six weld joints exhibited unacceptable corrosion or seepage. Of these six joints, four 4" pipes were repaired using a weld overlay technique. A 10" pipe weld was repaired by the addition of a 6" inspection/maintenance port and a 10" pipe weld was repaired via access to the pipe inside circumference. A weld overlay technique was used to repair four 4" pipe welds located in the Diesel Generator Building. The details of this procedure are discussed elsewhere. Concurrently, 20 more weld joints were radiographed and were found acceptable for continued service.

Separate from these examinations, in 1985, seepage of water was observed in the transformer yard. The area was excavated and two localized leaks were repaired on 3" service water lines. These repairs are also discussed in more detail in a later paragraph. As a result of these initial examinations it was determined that piping welds outside of Containment should continue to be monitored via the inspection program.

During the 1986 Refueling Outage, 29 welds outside Containment were examined including one of the welds previously repaired by weld overlay. All of these welds were accepted. Additionally, 23 welds were inspected inside of Containment. All were found acceptable for continued service.

It is planned to inspect approximately 25 welds outside of Containment including the four welds previously repaired in 1984 via the weld overlay process. Approximately 30 welds inside of Containment are also planned to be inspected.

As stated earlier, inspection of the Service Water System piping external to Containment was initiated in 1984. The piping inside of the Diesel Generator Building was examined at that time. Three 4" pipe welds showed evidence of weepage; these welds and adjacent welds were subjected to radiographic examination. The radiographs indicated the three welds exhibited corrosion at several locations and wall thinning with a single through the weld small leak in each. In each case either the point of weepage was wet to the touch or dry. Additionally, one other weld contained a linear indication - possible as a result of original weld fabrication - as well as the general corrosion and wall thinning. There was no leakage observable in this joint. This section of service water pipe is 4 inches schedule 40 with average wall thickness of 0.237 inches.

Since the contributing cause of the weepage was corrosion as opposed to cracking, repairs to the leaking welds were effected by adding additional layers of weld material to the weld area. The weld material was deposited completely along the entire weld in a bead approximately 1" wide by 1/8" minimum thickness. The minimum wall required per U.S.A.S. B.31.1 in this case is 0.087 inches for pressure and seismic stresses; therefore the weld buildup by itself exceeds minimum wall requirements. A standard SMAW weld procedure and E 7018 filler metal was used.

The same welding process was used for the weld which exhibited corrosion and a linear indication. In this latter case, removal and rewelding of the linear indication could have affected the cement lining. Since the weld and base metal are ductile, the weld deposit technique was judged the most acceptable repair procedure. This weld was radiographed in 1986 and no evidence of indication propagation was detected which we believe validates the technical decision of repair method.

All four repairs were performed as "temporary" repairs which requires their replacement in the 1987 refueling outage. Since these repairs were accomplished primarily to compensate for wall thinning due to corrosion and not to repair weld defects, and since the repair process was developed to comply with the minimum wall requirement of U.S.A.S. B31.1, the work performed complies with the original design objectives of U.S.A.S. B.31.1.

As stated earlier, in 1985, repairs were made to two buried 3" service water pipes in the Transformer Yard area. Both pipes serve the Instrument Air System. After weepage was observed below ground, the area was excavated. Two leaks were identified, one at an elbow weld and the other at a weld joint in a horizontal pipe. Repairs were effected in one case by use of a fitting specifically designed for the application and in the other case by use of a standard compression clamp type fitting commonly used in similar applications.

In the case of the repair to the elbow leak the specially designed fitting is a split, bolted elbow that fits completely over and encompasses the elbow. This fitting serves as an extended pressure boundary. The split fitting is designed and fabricated in accordance with ASME Code Section VIII Division I Rules and allowable material stresses. This fitting meets the requirements of U.S.A.S. B.31.1 because the design is based on similarly shaped proportioned and sized components which have been proven satisfactory by successful performance under comparable service conditions. The fitting manufacturer has provided certification to that effect. The use of such a fitting is covered in U.S.A.S. B.31.1, paragraph 104.7.

The line is continuously supported by compacted subgrade underlain by bedrock and the mass of the added fitting is only 40 lbs. Calculations involving anticipated seismic bedrock displacement, the added mass, pressure and deadweight indicate that resulting stresses are well within U.S.A.S. B 31.1 allowable.

In summary, the use of such a fitting is consistent with U.S.A.S. B.31.1, the resulting conservatively calculated stresses are within U.S.A.S. B 31.1 allowable stresses and therefore the repair is consistent with applicable Code requirements.

The straight piping run was repaired utilizing a full circle clamp manufactured by Rockwell. This type of clamp has been used successfully within the industry. It is our opinion that this repair restored the system design integrity as required by U.S.A.S. B 31.1.

At the time that these repairs were made, radiographs were taken of adjacent welds (11) in this area. Corrosion at the weld joints was noted but no leaks were present. Specific wall thickness determinations could not be made because seepage from ground water and concerns about potential displacement of surrounding equipment due to the excavation precluded subsequent wall thickness checks.

The repairs discussed above were done in accordance with temporary repair procedures which limit the repair service life. All of the above repairs are to be converted into permanent repairs during the 1987 Refueling Outage which is scheduled to commence on October 5, 1987.

Very truly yours,

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