CE 1233806-02

Background

Despite repairs to the anchors of the internals stands, change fixture and guide tube, the unit 2 refueling cavity continued to leak in 2R26. Leakage into sump B occurred soon after pool flood on 4/29 and was initially measured at 0.8 gph (AR1230016). Leakage decreased significantly to about .02 gph by 5/3. Leakage at the mezzanine adjacent to the regen room was estimated at 1 drop/minute. There was no indication of leakage in the regen room. By 5/8 there was no observed leakage in either sump B or the mezzanine. It should be noted the refueling pool had been drained below the upper cavity between 5/6 and 5/8. Additional vacuum box testing of accessible flat seams, sand plug covers and NIS covers (WO 390456-21) showed minimal leakage of weld seams with more significant leakage of the sand plug covers.

Prompt leakage in sump B, the lack of leakage in the regen room, and the recent repairs to the lower cavity anchor penetrations suggest a source of leakage other than the repaired anchors. The leakage initially started at 0.8 gph and spontaneously reduced to 0.02 gph suggesting a change. It is unlikely there was a spontaneous change in any of the welded repairs for liner seams.

Potential sources of continued leakage include the following.

1. The repaired penetration welds of the lower cavity:

   It is believed the majority of previous leakage can be attributed to the lower cavity penetrations. This conclusion is based on the observation that leakage in both units has been reduced by over 90% by welded repair to these penetrations. It is unlikely these penetrations are the source of remaining leakage as the new welds received both visual and surface examination with no indications.

2. Leakage of the liner welds:

   Leakage of the liner seam welds or vent line support welds is supported by the fact that several small indications of leakage were found by vacuum box testing. It is also supported by some of the welds being of poor surface finish and showing signs of previous repair. In addition, there is industry OE of chloride stress corrosion cracking of stainless steel welds, even at ambient temperature. Seam leakage is disputed by the fact that recent vacuum box testing of approximately 50% of the flat seams found only very small indications. The indications were small to the extent that it was not obvious if the observed bubbles indicated actual leakage, or were just stagnant soap bubbles. Theses indications would not account for the initial 0.8 gph leak rate. In addition, leakage of the liner welds would not spontaneously decrease.

3. Leakage at the sand plug covers, NIS covers, or Rx to cavity segmented seal:

   Leakage at the sand plug covers is a common occurrence. Leakage in 2R26 was evidenced by the need to pump sump C and leakage observed through the A hot-leg penetration. It was previously thought that any leakage in the area of the reactor vessel would go only to sump C as there is no obvious path or driving force for leakage at the sand plug covers to manifest at sump B. However, if one assumes containment has a “water table” with stagnant

water at the interface between the containment vessel bottom head and the interior concrete, then any leakage that could make its way to the bottom head could drive leakage in sump B. Leakage into sump C that migrates through the concrete to the containment vessel would explain the prompt leakage in sump B with the lack of leakage in the regen room. This leak source is also supported by the observation that the sand plug covers showed significant leakage when vacuum box tested. This leakage scenario could also explain the spontaneous reduction in leakage. It's possible the hydrostatic pressure on the sand plug covers caused a leaking cover to spontaneously seat into the RTV with a corresponding reduction in leakage.

Actions:

The ISI engineer believes the source of remaining refueling cavity leakage is one or more sand plug covers. As such, work order 406944 has been initiated to install full-face gaskets under the sand plug covers at the next unit 1 refueling outage 1R27.

The CE included an action to "update the degradation assessment performed for Unit 2 in 2009". There is no need to revise the previous evaluation as it is inclusive of unit 2 leakage in 2R26. A copy of EC 15044 is attached in sharepoint of this action for reference.