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NOTES



Attention: L Ward
Integrated Leak Rate Testing (ILRT)

Date:
26 January 2016

Enquiries:
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Our Ref: DB2016-0002

Dear Mr Ward

**SYSTEM DESIGN ENGINEERING ACCEPTANCE OF THE UNIT 2 ILRT (OUTAGE 221)
STRUCTURAL INTEGRITY TESTS RESULTS**

This memorandum serves to confirm that SDE has reviewed the results for the Outage 221, Unit 2 ILRT structural integrity measurements documented in report reference H-44200971-2015-000338 and H-44200971-2015-000339 and our conclusion is attached as Appendix 1 and Appendix 2.

Based on the recommendations and conclusions of Appendix 1 & 2, the ILRT structural integrity tests results are accepted.

Should you require any further information, please do not hesitate to contact us.

Technically review by:  _____ Derek Lee

Yours sincerely



Siham Saban
SYSTEM DESIGN ENGINEERING – PLANT SUPPORT MANAGER (ACTING)

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Attachments: Appendix 1: JN411-NSE-ESKB-L-6426 Rev 0
Appendix 2: JN411-NSE-ESKB-L-6427 Rev 0



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For Attention: Vickeshree Munsamy

Project No.	Your Ref.	Our Ref.	Date
JN 411		JN411-NSE-ESK-L-6426 Rev 0	21 Jan 2016

Assessment of ILRT Reports on Outage 221 ILRT

Dear Vicky

I have reviewed the following reports for the ILRT on Unit 2 (Outage 221) as requested. My observations are as follows:

1. Review of NSE report No JN573-NSE-ESKB-L-6312 Rev2 – Topographic Measurements of Lower and Upper Rafts

This report has been reviewed previously and comments made. The comments have been addressed and the results are now in line with the topographical survey conducted on Unit 1 during the ILRT for Outage 121. The maximum downward settlements of the upper and lower rafts for Unit 2 are 1.1 mm and 0.7 mm, respectively. In comparison, the same measurements for Unit 1 are 1.5 mm and 0.3 mm, respectively.

2. EDF Survey of the equipment access hatch during ILRT 2015 Unit 2

2.1 Review of EDF report No KBG2_ILRT2015_1 – Monitoring survey of the equipment access hatch during ILRT 2015 Unit 2 Stage 1 bar.

The results show horizontal elongation and shifted to the right hand side when viewed from the outside. This is consistent with the SITES survey for the equipment hatch.

2.2 Review of EDF report No KBG2_ILRT2015_2 – Monitoring survey of the equipment access hatch during ILRT 2015 Unit 2 Stage 4 bar.

Profiles 2 and 3 (interface with hatch and inside concrete surface of the containment) shows horizontal elongation and outward movement. Profile 4 (outer concrete surface of the containment) shows horizontal and vertical elongation which differs to the SITES survey results

but it must be noted that the SITES survey provides the relative displacement between the concrete and the steel liner of the hatch.

2.3 Review of EDF report No KBG2_ILRT2015_3 – Monitoring survey of the equipment access hatch during ILRT 2015 Unit 2 Stage 0 bar after depressurisation.

The survey results indicate a slight over recovery of the surfaces surveyed but all surveyed points are concentric around the centre line through the equipment hatch indicating elastic recovery.

The EDF equipment hatch survey results are considered acceptable.

3. SITES report No R 15 LY 1630 Rev0, Outage 221, EAU system preparation for implementation of temporary automatic reading devices during ILRT.

This report indicates linear and reversible behaviour of the pendulums, invar wires and strain gauges although it must be noted that 8 strain gauges appeared to be defective. The measured deformations are also within the range of expected behaviour. It is noted that the vertical deformation of the containment structure is uniform on its circumference which again places doubt on the survey results presented by SITES on the dome displacements.

It is concluded BY EDF / DTG that the overall behaviour of the containment structure for the outage 221 ILRT is linear and the results are within the expected range. A comparison between 2015 and 2008 ILRT results for Unit 2 are presented in the EDF presentation (Mechanical behaviour during ILRT – Unit 2). The results for the strain gauges, pendulums and invar wires are very similar (Table 1) indicating that the structure is behaving in a similar fashion to that measured in 2008 despite the surface degradation.

Table 1: Comparison of average readings between 2015 and 2008

	2015	2008
Variation of diameter as measured by pendulum P1-P3 at mid height	11.4 mm	11.5 mm
Variation of diameter as measured by pendulum P2-P4 at mid height	11.5 mm	12.0 mm
Average variation in height on containment as measured by Invar wires	4.5 mm	4.9 mm

There is a statement in the report regarding guarantees on invar wires. This is a contractual issue which should be addressed elsewhere on specific evidence rather than speculation.

4. EDF Report No EAU H-44200971-2015-000338, ILRT Containment Test – Koeberg Unit 2, Mechanical Behaviour of the Structure – October 2015

Comments on the mechanical measurements have been made in the individual reports. The conclusions made in this report are acceptable.

5. EDF Report No EAU H-44200971-2015-000339, ILRT Containment Test – Koeberg Unit 2, Graphical Results – October 2015

In general, it can be observed from the plots of the instrumentation monitoring that the structural behaviour under pressurisation is linear and the amount of hysteresis is relatively low. The overall structural behaviour of the containment is therefore considered acceptable.

I trust that the above reviews are sufficiently clear. Please feel free to contact me should you require further explanation.

Yours Faithfully,



D E Lee (Pr Eng)
Koeberg Responsible Engineer (Civils)



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For Attention: Siham Saban

Project No.	Your Ref.	Our Ref.	Date
JN 411		JN411-NSE-ESKB-L-6427 Rev 1	25 Jan 2016

Re-assessment of EdF Report on Outage 221 ILRT

Dear Siham

I have reviewed the SITES and EDF results for the ILRT on Unit 2 (Outage 221). Comments have been made in correspondence JN411-NSE-ESKB-L-6386 and 6426. I have recommended that the increase in blistering of the steel liner in the Unit 2 containment be identified as a post ILRT Eskom action for investigation as there do not appear to be any acceptance criteria or EDF databases to assist in the evaluation of these results. Furthermore, I have recommended that the SITES survey of the dome be disregarded at this stage as they do not align with the results of the Invar Wire readings.

Based on the results of the EAU monitoring system, I conclude that the structural response of the containment has not changed since the previous ILRT in 2008 despite on-going delamination of the surface concrete and corrosion of the external layer of horizontal rebar in discrete zones. The structural integrity and functionality of the Unit 2 containment at the current time is therefore demonstrated through test and compliant with KBA 0028 NES MA ISI 02, Module E-L.

It is noted that there are no ungrouted tendons on the Unit 2 containment and hence, this aspect of Module E-L cannot be evaluated.

Yours Faithfully,

D E Lee (Pr Eng)
Koeberg Responsible Engineer (Civils)