

AUDIT WORKSHEET
GALL REPORT AMP

PLANT: _____

LRA AMP: _____

REVIEWER: _____

GALL AMP: **XI.M37, Flux Thimble Tube Inspection**

DATE: _____

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
Program Description	A. The Flux Thimble Tube Inspection is an inspection program used to monitor for thinning of the flux thimble tube wall, which provides a path for the incore neutron flux monitoring system detectors and forms part of the RCS pressure boundary. Flux thimble tubes are subject to loss of material at certain locations in the reactor vessel where flow-induced fretting causes wear at discontinuities in the path from the reactor vessel instrument nozzle to the fuel assembly instrument guide tube. An NDE methodology, such as eddy current testing (ECT), or other applicant-justified and NRC-accepted inspection method is used to monitor for wear of the flux thimble tubes. This program implements the recommendations of NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," as described below.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
1. Scope of Program	A. The flux thimble tube Inspection encompasses all of the flux thimble tubes that form part of the reactor coolant system pressure boundary. The flux thimble guide tubes are not in the scope of this program. Within scope are the licensee responses to Bulletin 88-09, as accepted by the staff in its closure letters on the Bulletin, and any amendments to the licensee responses as approved by the staff.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment

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2. Preventive Actions	A. The program consists of inspection and evaluation and provides no guidance on preventive actions.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
3. Parameters Monitored/ Inspected	A. Flux thimble tube wall thickness will be monitored to detect loss of material from the flux thimble tubes during the period of extended operation.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
4. Detection of Aging Effects	A. An inspection methodology (such as ECT) that has been demonstrated to be capable of adequately detecting wear of the flux thimble tubes will be employed to detect loss of material during the period of extended operation. Justification for methods other than ECT should be provided unless use of the alternative method has been previously accepted by the Nuclear Regulatory Commission (NRC). The inspection results will be evaluated and compared with the acceptance criteria established as discussed in element 6 below.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
5. Monitoring and Trending	A. The wall thickness measurements will be trended and wear rates will be calculated. Examination frequency will be based upon wear predictions that have been technically justified as providing conservative estimates of flux thimble tube wear. The interval between inspections will be established such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection. The examination frequency may be adjusted based on plant-specific wear projections. Re-baselining of the examination frequency should be justified using plant-specific wear-rate data unless prior plant-specific NRC acceptance for the re-baselining was received. If design changes are made to use more wear-resistant thimble tube materials (e.g., chrome-plated stainless	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:

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	steel) sufficient inspections will be conducted at an adequate inspection frequency, as described above, for the new materials.	
6. Acceptance Criteria	A. Appropriate acceptance criteria such as percent through-wall wear will be established. The acceptance criteria will be technically justified to provide an adequate margin of safety to ensure that the integrity of the reactor coolant system pressure boundary is maintained. The acceptance criteria will include allowances for factors such as instrument uncertainty, uncertainties in wear scar geometry, and other potential inaccuracies, as applicable, to the inspection methodology chosen for use in the program. Acceptance criteria different from those previously documented in NRC acceptance letters for the applicant's response to Bulletin 88-09 and amendments thereto should be justified..	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
7. Corrective Actions	A. Flux thimble tube wall thickness which do not meet the established acceptance criteria must be isolated, capped, plugged, withdrawn, replaced, or otherwise removed from service in a manner that ensures the integrity of the reactor coolant system pressure boundary is maintained. Analyses may allow repositioning of flux thimble tubes that are approaching the acceptance criteria limit. Repositioning of a tube exposes a different portion of the tube to the discontinuity that is causing the wear. Flux thimble tubes that cannot be inspected over the tube length, that are subject to wear due to restriction or other defect, and that cannot be shown by analysis to be satisfactory for continued service, must be removed from service to ensure the integrity of the reactor coolant system pressure boundary. The site corrective actions program, quality assurance (QA) procedures, site review and approval process, and administrative controls are implemented in accordance with	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:

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	10 CFR Part 50, Appendix B. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the corrective actions, confirmation process, and administrative controls.	
8. Confirmation Process	A. See Item 7, above.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
9. Administrative Controls	A. See Item 7, above.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
10. Operating Experience	<p>A. In IE Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," the NRC requested that licensees implement a flux thimble tube inspection program due to several instances of leaks, and due to licensees identifying wear. Utilities established inspection programs in accordance with IE Bulletin 88-09 which have shown excellent results in identifying and managing wear of flux thimble tubes.</p> <p>As discussed in IE Bulletin 88-09, the amount of vibration the thimble tubes experience is determined by many plant-specific factors. Therefore, the only effective method for determining thimble tube integrity is through inspections which are adjusted to account for plant-specific wear patterns and history.</p>	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:

EXCEPTIONS

Item Number	Program Elements	LRA Exception Description	Basis for Accepting Exception	Documents Reviewed (Identifier, Para.# and/or Page #)
1.				
2.				
...				

ENHANCEMENTS

Item Number	Program Elements	LRA Enhancement Description	Basis for Accepting Enhancement	Documents Reviewed (Identifier, Para.# and/or Page #)
1.				
2.				
...				

DOCUMENT REVIEWED DURING AUDIT

Document Number	Identifier (number)	Title	Revision and/or Date
1.			
2.			
3.			
4.			
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