

AUDIT WORKSHEET
GALL REPORT AMP

PLANT: _____

LRA AMP: _____

GALL AMP: **XI.M9, BWR Vessel Internals**

REVIEWER: _____

DATE: _____

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
Program Description	A. The program includes (a) inspection and flaw evaluation in conformance with the guidelines of applicable and staff-approved boiling water reactor vessel and internals project (BWRVIP) documents, and	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
“	B. (b) monitoring and control of reactor coolant water chemistry in accordance with the guidelines of BWRVIP-29 (Electric Power Research Institute [EPRI] TR-103515) to ensure the long-term integrity and safe operation of boiling water reactor (BWR) vessel internal components.	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 program is focused on managing the effects of cracking due to stress corrosion cracking (SCC), intergranular stress corrosion cracking (IGSCC), or irradiation assisted stress corrosion cracking (IASCC). The program contains preventive measures to mitigate SCC, IGSCC, or IASCC, inservice inspection (ISI) to monitor the effects of cracking on the intended function of the components, and repair and/or replacement as needed to maintain the ability to perform the intended function of BWR vessel internals.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
“	B. The BWRVIP documents provide generic guidelines intended to present the applicable inspection recommendations to assure safety function integrity of the subject safety-related reactor	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
	<p>pressure vessel internal components. The guidelines include information on component description and function; evaluate susceptible locations and safety consequences of failure; provide recommendations for methods, extent, and frequency of inspection; discuss acceptable methods for evaluating the structural integrity significance of flaws detected during these examinations; and recommend repair and replacement procedures. The various applicable BWRVIP guidelines are as follows.</p> <p>See the GALL Report, AMP XI.M9, BWR Vessel Internals, for more information.</p>	<p>Comment:</p>
<p>2. Preventive Actions</p>	<p>A. Maintaining high water purity reduces susceptibility to cracking due to SCC or IGSCC. Reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in BWRVIP-29 (EPRI TR-103515). The program description and the evaluation and technical basis of monitoring and maintaining reactor water chemistry are presented in Chapter XI.M2, "Water Chemistry."</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>
<p>3. Parameters Monitored/ Inspected</p>	<p>A. The program monitors the effects of cracking on the intended function of the component by detection and sizing of cracks by inspection in accordance with the guidelines of applicable and approved BWRVIP documents and the requirements of the American Society of Mechanical Engineers (ASME) Code, Section XI, Table IWB 2500-1 (2001 edition including the 2002 and 2003 Addenda). An applicant may use the guidelines of BWRVIP-62 for inspection relief for vessel internal components with hydrogen water chemistry provided such relief is submitted under the provisions of 10 CFR 50.55a and approved by the staff.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
4. Detection of Aging Effects	<p>A. The extent and schedule of the inspection and test techniques prescribed by the applicable and approved BWRVIP guidelines are designed to maintain structural integrity and ensure that aging effects will be discovered and repaired before the loss of intended function of BWR vessel internals. Inspection can reveal cracking. Vessel internal components are inspected in accordance with the requirements of ASME Section XI, Subsection IWB, examination category B-N-2. The ASME Section XI inspection specifies visual VT-1 examination to detect discontinuities and imperfections, such as cracks, corrosion, wear, or erosion, on the surfaces of components. This inspection also specifies visual VT-3 examination to determine the general mechanical and structural condition of the component supports by (a) verifying parameters, such as clearances, settings, and physical displacements, and (b) detecting discontinuities and imperfections, such as loss of integrity at bolted or welded connections, loose or missing parts, debris, corrosion, wear, or erosion.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>
“	<p>B. The applicable and approved BWRVIP guidelines recommend more stringent inspections, such as enhanced visual VT-1 examinations or ultrasonic methods of volumetric inspection, for certain selected components and locations. The nondestructive examination (NDE) techniques appropriate for inspection of BWR vessel internals including the uncertainties inherent in delivering and executing NDE techniques in a BWR, are included in BWRVIP-03.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>
5. Monitoring and Trending	<p>A. Inspections scheduled in accordance with the applicable and approved BWRVIP guidelines provide timely detection of cracks. The scope of examination and reinspection must be expanded beyond the baseline inspection if flaws are detected.</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p> <p>Comment:</p>
6. Acceptance Criteria	<p>A. Any indication detected is evaluated in accordance with ASME Section XI or the applicable staff-approved BWRVIP</p>	<p>Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:</p>

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
	guidelines. Approved BWRVIP-14, BWRVIP-59, and BWRVIP-60 documents provide guidelines for evaluation of crack growth in stainless steels (SSs), nickel alloys, and low-alloy steels, respectively.	Comment:
7. Corrective Actions	A. Repair and replacement procedures are equivalent to those requirements in ASME Section XI. Repair and replacement is performed in conformance with the applicable and approved BWRVIP guidelines listed above. As discussed in the appendix to this report, the staff finds that licensee implementation of the guidelines in the staff-approved BWRVIP reports will provide an acceptable level of quality for inspection and flaw evaluation of the safety-related components addressed in accordance with 10 CFR Part 50, Appendix B, corrective actions.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
8. Confirmation Process	A. Site quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. As discussed in the appendix to this report, the staff finds that licensee implementation of the guidelines in the staff-approved BWRVIP reports will provide an acceptable level of quality for inspection and flaw evaluation of the safety-related components addressed in accordance with the 10 CFR Part 50, Appendix B, confirmation process and administrative controls.	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 8, above.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
10. Operating Experience	A. Extensive cracking has been observed in core shrouds at both horizontal (Nuclear Regulatory Commission [NRC] Generic Letter [GL] 94-03) and vertical (NRC Information Notice [IN] 97-17) welds. It has affected shrouds fabricated from Type 304 and Type 304L SS, which is generally considered to be more resistant to SCC. Weld regions are most susceptible to SCC,	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
	although it is not clear whether this is due to sensitization and/or impurities associated with the welds or the high residual stresses in the weld regions. This experience is reviewed in NRC GL 94-03 and NUREG-1544; some experiences with visual inspections are discussed in NRC IN 94-42.	
“	B. Both circumferential (NRC IN 88-03) and radial cracking (NRC IN 92-57) has been observed in the shroud support access hole cover made from Alloy 600. Instances of cracking in core spray spargers have been reviewed in NRC Bulletin 80-13.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
“	C. Cracking of the core plate has not been reported, but the creviced regions beneath the plate are difficult to inspect. NRC IN 95-17 discusses cracking in top guides of United States and overseas BWRs. Related experience in other components is reviewed in NRC GL 94-03 and NUREG-1544. Cracking has also been observed in the top guide of a Swedish BWR.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
“	D. Instances of cracking have occurred in the jet pump assembly (NRC Bulletin 80-07), hold-down beam (NRC IN 93-101), and jet pump riser pipe elbows (NRC IN 97-02).	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
“	E. Cracking of dry tubes has been observed at 14 or more BWRs. The cracking is intergranular and has been observed in dry tubes without apparent sensitization, suggesting that IASCC may also play a role in the cracking.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria: Comment:
“	F. The program guidelines outlined in applicable and approved BWRVIP documents are based on an evaluation of available information, including BWR inspection data and information on the elements that cause SCC, IGSCC, or IASCC, to determine which components may be susceptible to cracking.	Consistent with GALL AMP: <input type="checkbox"/> Yes <input type="checkbox"/> No Document(s) used to confirm Criteria:

Program Element	Auditable GALL Criteria	Documentation of Audit Finding
	Implementation of the program provides reasonable assurance that cracking will be adequately managed so the intended functions of the vessel internal components will be maintained consistent with the current licensing basis (CLB) for the period of extended operation.	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.			
....			