F-6.1-2 Rev 2

DOCUMENT COVER SHEET

DOCUMENT NO.	REVISION	PAGE	OPEN ITEMS
VS2-GW-GEI-101	0	1 of 1447	N

DOCUMENT STATUS: **CFC** | AP1000 SAFETY CLASS: **NA**

LICENSING REVIEW STATUS: Not Required

PLANT APPLICABILITY:

☐ All AP1000 Plants except: N/A

☒ Only the following plants: VS2

Westinghouse Acceptance of AP1000 Design Partner Document by:

N/A

(Print Full Name) N/A

(Signature/Date)

ALTERNATE DOCUMENT NUMBER: N/A

ORIGINATING ORGANIZATION: Westinghouse Electric Company

TITLE: AP1000 Preservice Inspection Program Plan for V.C. Summer Unit 2

DCP/DCA/SUPPLEMENTS/EDCR # INCORPORATED IN THIS DOCUMENT REVISION:

N/A

ATTACHMENTS:

Appendix A (Attachment 1, Attachment 2, Attachment 2, Attachment 3, Attachment 4, Attachment 5), P&IDs (Appendix B), Component Isometrics (Appendix G), Piping Isometrics (Appendix H)

PARENT DOCUMENT: N/A

LEGAL REVIEW J. C. Spadacene	SIGNATURE / DATE **(If processing electronic approval select option)** **Electronically Approved*** **
PATENT REVIEW D. E. Ekeroth	SIGNATURE / DATE **Electronically Approved*** **

ORIGINATOR(S) WEC 6.1.pdf Augi A. Cardillo	SIGNATURE / DATE **(If processing electronic approval select option)** **Electronically Approved*** **	
REVIEWER(S) WEC 6.1.pdf Rick D. Rishel	SIGNATURE / DATE **Electronically Approved*** **	
	SIGNATURE / DATE	
VERIFIER(S) WEC 6.1.pdf Paul V. Gionta	SIGNATURE / DATE **Electronically Approved*** **	Verification Method: **Independent Review**
APPLICABILITY REVIEWER WEC 6.1.pdf N/A	SIGNATURE / DATE	
RESPONSIBLE MANAGER* WEC 6.1.pdf Mark A. Urso	SIGNATURE / DATE **Electronically Approved*** **	

** Approval of the responsible manager signifies that the document and all required reviews are complete, the appropriate proprietary class has been assigned, electronic file has been provided to the EDMS, and the document is released for use.*

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VS2-GW-GEI-101
Revision 0

September 2015

AP1000®

AP1000 Preservice Inspection Program Plan for V.C. Summer Unit 2

VS2-GW-GEI-101
Revision 0

AP1000 Preservice Inspection Program Plan for V.C. Summer Unit 2

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September 2015

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REVISION HISTORY

RECORD OF CHANGES

Revision No.	Revision/Change Date	Pages/Sections/Paragraphs Changed	Brief Description/Change Authorization
0	See EDMS	Original Issue – All pages	

PREFACE TO PSI PROGRAM DOCUMENTS

Revision 0 of the PSI Program Plan, WINISI Database, component and piping system isometrics, and color-coded ***AP1000***® P&IDs, have been developed based on controlled drawings that had been issued as of May 2014, and color-coded ***AP1000***® P&IDs Issued in October 2011. This was deemed the most efficient way of developing the initial PSI Program knowing that as the **AP1000** design and field fabrication/erection progresses, changes will be required to these documents to reflect design changes and as-built conditions.

As such, the PSI Plan and associated documents are considered "Living Documents" that will be revised and updated as needed and before individual component or piping weld exams are performed. It is anticipated that Field Change Notices will be developed to reflect as-built conditions and that several revisions to the preceding documents may be required through PSI completion and plant operation.

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1 INTRODUCTION

This document provides the basis and plans for the Westinghouse Electric Company LLC, **AP1000** V.C. Summer Nuclear Power Plant, Unit 2, Preservice Inspection (PSI) Plan for American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code Class 1, 2, and 3 components (including supports).

The V.C. Summer Nuclear Power Plant Unit 2 PSI Plan for systems and components (including their supports) is developed giving due consideration to the requirements of the applicable Edition and Addenda of the ASME Code Section XI subject to limitations and modifications specified in 10 CFR 50.55a (b) (2) as well as other applicable regulatory guidance and/or commitments.

- Issuance of Combined Operating License (NPF-93) March 30, 2012
- Preservice Inspections TBD
- Commercial Operation Date TBD

1.1 NUCLEAR STEAM SUPPLY SYSTEM (NSSS)

The Westinghouse **AP1000** Nuclear Steam Supply System (NSSS) consists of a reactor pressure vessel (RPV) and closed reactor coolant loops connected in parallel to the reactor vessel. Each loop contains two reactor coolant pumps and a steam generator. The NSSS also contains an electrically heated pressurizer, two core make-up tanks, a passive residual heat removal heat exchanger, and certain auxiliary systems. The **AP1000** Advanced Pressurized Water Reactor (PWR) includes the following:

- Reactor pressure vessel (RPV)
- Reactor pressure vessel head (RPVH)
- Reactor vessel internals and flow skirt (RVI and RVFS)
- Reactor coolant pumps; (4) (RCPs)
- Steam generators; (2) (SGs)
- Pressurizer (PZR)
- Passive residual heat removal heat exchanger (PRHR HX)
- Passive core cooling system (PXS)
- Main reactor coolant loop piping (RCS)
- Pressurizer surge line (PSL) piping
- Core make-up tank; (2) (CMT)
- Accumulators; (2)

1.2 REFERENCE DOCUMENTS

1.2.1 Code of Federal Regulations

- 10 CFR 50.55a, “Codes and Standards” (as of December 11, 2014)
- 10 CFR 52, Licenses, Certifications, and Approvals for Nuclear Power Plants
- 10 CFR 50.2, Domestic Licensing of Production & Utilization Facilities (Definitions)

1.2.2 ASME Code Editions and Addenda

- ASME Boiler & Pressure Vessel Code, Section III, 1998 Edition through 2000 Addenda.
- ASME B&PV Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," 2007 Edition through the 2008 Addenda.

1.2.3 U.S. Nuclear Regulatory Commission (NRC) Regulatory Guides, NUREGs, and Other Applicable NRC Documents

- NRC Regulatory Guide 1.26, "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," Rev. 4, dated March 2007.
- NRC Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," Latest Approved Revision.
- NUREG-1793, "Final Safety Evaluation Related to Certification of the AP1000 Standard Design," dated September 2004.
- NRC Regulatory Issue Summary (RIS) 2015-01, "Qualification Requirements for Bolt and Stud Non-Destructive Examinations," dated January 29, 2015.

1.2.4 Site-Specific Documents

- NUREG-2124, "Final Safety Evaluation Report Related to the Combined License for V.C. Summer Electric Generating Plant, Unit 2," dated September 2012.
- SCE&G – Nuclear Development Quality Assurance Manual (Latest Approved Revision)

1.2.5 Westinghouse Electric AP1000 Component Inservice Inspection (ISI) Inspectability Assessment Documents

- APP-MV01-VMR-001, Revision 0, "AP1000 Component ISI Inspectability Assessment: Reactor Pressure Vessel & Reactor Pressure Vessel Head."
- APP-MI01-VMR-001, Revision 0, "AP1000 Component ISI Inspectability Assessment: Reactor Vessel Internals and Flow Skirt."
- APP-MB01-VMR-001, Revision 0, "AP1000 Component ISI Inspectability Assessment: Steam Generator."
- APP-MV20-VMR-001, Revision 0, "AP1000 Component ISI Inspectability Assessment: Pressurizer."
- APP-ME02-VMR-001, Revision 1, "AP1000 Component ISI Inspectability Assessment: Passive Residual Heat Removal Heat Exchanger (PRHR HX)."

- APP-PL01-VMR-001, Revision 0, "AP1000 Component ISI Inspectability Assessment: Main Loop and Surge Piping."
- APP-MP01-VMR–001, Revision 0, "AP1000 Component ISI Inspectability Assessment: Reactor Coolant Pump."
- APP-MT01-VMR-001, Revision 1, "AP1000 Component ISI Inspectability Assessment: Core Make-Up Tank (CMT)."

1.2.6 Westinghouse Electric AP1000 Procedures and Documents

- APP-GW-GL-700, Revision 19, "AP1000 Design Control Document."
- APP-GW-PLX-001, Revision 4, "AP1000 Plant System Piping Line List."
- APP-GW-P0C-007, Revision 1, "AP1000 High Energy Pipe Break Hazard Evaluation."
- APP-GW-VW-001, Revision 1, "AP1000® Design for Inspectability Program: ISI Requirements and Design Guidance for Class 1 Components."
- APP-GW-VW-002, Revision 0, "AP1000 Design for Inspectability Program: ISI Requirements for Class 2 and 3 Components and Core Internals Structures."
- WCAP-12308 (Latest Approved Revision), "WCAP ASME Quality Assurance Program."
- WesDyne Quality Policies and Procedures Manual (Latest Approved Revision).
- APP-GW-P0C-040, Revision 2, "Identification of High Energy Lines, Lines to be Evaluated for Leak-Before-Break, and Break Exclusion Zones within the AP1000 Nuclear Island."
- APP-GW-GBH-301, Rev. 0 "AP1000 Preservice Inspection Program Project Plan"
- WEC- E&DCR # APP-SGS -GEF-344,Rev. 0 "Éxtended ASME Boundaries Clarification in SGS SSD"

1.3 APPLICABLE CODE EDITION AND ADDENDA

1.3.1 Preservice Inspection

For a nuclear power facility whose construction permit under Part 50, or design certification, design approval, combined license, or manufacturing license under Part 52 for which components (including supports) which are classified as ASME Code Class 1, 2, or 3 must be designed and be provided with access to enable the performance of inservice examination of these components and must meet the preservice examination requirements set forth in the Editions and Addenda of Section XI of the ASME B&PV Code incorporated by reference in paragraph (b) of section 55a (or the optional ASME Code Cases

listed in NRC Regulatory Guide 1.147, Revision 16) that are incorporated by reference in Paragraph (b) of Section 55a applied to the construction of the particular component.

The preservice examination requirements defined in this preservice inspection plan are based on the rules set forth in the 2007 Edition through the 2008 Addenda of ASME Section XI.

1.4 ASME CODE CLASSIFICATIONS

Structures, systems, and components (SSCs) are classified to meet the requirements of 10 CFR 50.55a and NRC Regulatory Guide 1.26. Based on the classification, components are constructed and certified to meet the requirements of the appropriate code class of ASME Section III.

1.4.1 ASME Code Class 1

ASME Code Class 1 boundaries are developed based on the requirements of 10 CFR 50.55a(c) and apply to the reactor coolant pressure boundary (RCPB) components as defined in 10 CFR 50.2, excluding those items meeting the provisions of 10 CFR 50.55a(c)(2).

1.4.2 ASME Code Class 2

ASME Code Class 2 boundaries are developed based on the requirements of 10 CFR 50.55a(d) and Section C.1 of NRC Regulatory Guide 1.26 and include those items of the reactor coolant pressure boundary as defined in 10 CFR 50.2, but excluded from the requirements of 10 CFR 50.55a(c) pursuant to paragraph (2) of that section and not classified as ASME Code Class 1.

1.4.3 ASME Code Class 3

ASME Code Class 3 boundaries are developed based on the requirements of 10 CFR 50.55a(e) and Section C.2 of NRC Regulatory Guide 1.26 and include those safety-related items that are not part of the reactor coolant pressure boundary or classified as ASME Code Class 2.

1.4.4 Application

Application of the rules of ASME Section XI are governed by the group classification criteria as defined in Section 1.4 above and applied as follows:

- The rules of Subsection IWB are applied to those systems (or portion of systems) whose components are classified as ASME Code Class 1.
- The rules of Subsection IWC are applied to those systems (or portion of systems) whose components are classified as ASME Code Class 2.
- The rules of Subsection IWD are applied to those systems (or portion of systems) whose components are classified as ASME Code Class 3.
- The rules of Subsection IWF are applied to supports classified as ASME Code Class 1, 2, or 3.

1.4.5 Optional Construction of a Component

Optional construction of a component within a system boundary to a classification higher than the minimum class established in the component Design Specification (either upgrading from Class 2 to Class 1 or from Class 3 to Class 2) shall not affect the overall system classification by which the applicable rules of ASME Section XI are determined.

1.4.6 Classification Diagrams

The ASME Code Class 1, 2, and 3 classification interfaces between components of different classes applicable to the **AP1000** APWR plant are designated on various ASME Section XI Code Boundary Diagrams. These designations identify the system class breaks. Appendix B provides a list of the applicable ASME Section XI Code Boundary Diagrams.

The rules of ASME Section XI Subsections IWB, IWC, and IWD are applied to these classification diagrams to determine those components/systems subject to examination/testing. Components subject to surface, volumetric, and visual examination are listed in the ASME Section XI Preservice Examination Schedule.

1.5 PRESERVICE EXAMINATIONS

All preservice examinations shall be completed prior to initial fuel load with the clarification that examination of supports for systems that operate at temperatures greater than 200°F (95°C) during normal operation shall be performed during or after initial system heatup and cooldown.

1.6 REPAIR/REPLACEMENT ACTIVITIES

All repair/replacement activities for preservice examinations of ASME Code Class 1, 2, and 3 components shall be performed in accordance with ASME Section III requirements.

1.7 DEVELOPMENT OF PRESERVICE INSPECTION PLAN

Sections 2 through 6 provide a narrative description of the Westinghouse **AP1000** Preservice Inspection Plan basis for ASME Code Class components and/or systems (including their supports) subject to examination (including augmented/additional examinations, such as Leak Before Break [LBB] and the Break Exclusion Zone [BEZ] lines not included in the ASME Section XI scope but required by the **AP1000** DCD).

1.8 ADDITIONAL PROGRAMS

The following Programs are not included in this PSI Program Plan document but are separate documents that are required to complete preservice examination and testing requirements:

- Steam Generator Tubing Examination Program
- Class 1 Heat Exchanger Tubing Examination Program
- Metal Containment (ASME Section XI – IWE) Program

- Snubber Program Examination and Testing

2 ASME CODE CLASS 1 SYSTEMS AND COMPONENTS

The ASME Code Class 1 system boundaries subject to examination are developed based upon the requirements of 10 CFR 50.55a(c) and apply to the reactor coolant pressure boundary components as defined in 10 CFR 50.2, excluding those items meeting the provisions of 10 CFR 50.55a(c)(2). Class 1 Systems are listed in Table 2-1.

Table 2-1. ASME Code Class 1 Systems

System Description	System Identification
Chemical and Volume Control System	CVS
Passive Core Cooling System	PXS
Reactor Coolant System	RCS
Normal Residual Heat Removal System	RNS

2.1 CLASS 1 SAFETY SYSTEM DESCRIPTIONS

2.1.1 CVS

Class 1 CVS lines have a design pressure and temperature consistent with the RCPB (2,485 psig and 650°F).

2.1.1.1 Safety-Related Functions

The **AP1000** plant employs passive safety systems to mitigate the consequences of design basis events (DBEs). The passive safety systems provide the means to bring the plant to stable and safe conditions. The safety-related functions of the CVS, in conjunction with the operation of the safety systems, achieve safe shutdown and mitigate the consequences of design basis accidents (DBAs).

The CVS performs and supports the safety-related functions of containment isolation of CVS lines penetrating the containment boundary, termination of inadvertent RCS boron dilution, isolation of excessive make-up, and preservation of the RCPB, including isolation of normal CVS letdown to radwaste systems from the RCS.

2.1.1.1.1 Containment Isolation

The CVS supports the Containment System (CNS) by isolating the CVS lines that penetrate the containment structure during accident operations. Five CVS lines that penetrate the containment boundary are isolated: the discharge header from the make-up pumps, the letdown line to the Liquid Radwaste System (WLS), the spent resin sluice line to the Solid Radwaste System (WSS), the zinc injection line, and the hydrogen injection line.

2.1.1.1.2 Termination of Inadvertent RCS Boron Dilution

The CVS provides a safety-related method of stopping an inadvertent boron dilution by isolating sources of borated water to the RCS during all modes of operation. Specifically, isolation valves on the demineralized water supply line and on the make-up discharge header will close upon actuation of safety-related signals.

2.1.1.1.3 Preservation of Reactor Coolant Pressure Boundary

The CVS is connected to the RCS; therefore, it protects the RCPB during all modes of operation. For each CVS flow path that is directly connected to the RCS, there are three safety-related isolation valves in series that are connected to safety-related piping.

2.1.1.1.4 Isolation of Excessive Make-Up

The CVS provides a safety-related method of automatically isolating make-up upon receiving a high pressurizer level signal to prevent pressurizer overfill during power operation. Remotely operated valves on the make-up discharge header close upon receiving a safety-related, high-level signal.

2.1.1.1.5 Isolation of Letdown to Radwaste Systems

The CVS provides a safety-related method of automatically isolating the letdown line to the radwaste systems to maintain mid-loop RCS inventory during shutdown maintenance operation. Remotely operated valves in the letdown line close upon receiving a safety-related, low hot leg level signal.

2.1.1.2 Other Licensing-Related Functions of the CVS

2.1.1.2.1 Make-Up for Leaks

The CVS provides make-up for leaks or breaks from up to a 3/8 in. diameter line within the RCPB. Typical examples of small line breaks include a severed instrument process line or tubing or an SG tube leak. This function allows the plant to be taken to cold shutdown conditions without the use of safety-related make-up systems.

2.1.1.3 Other Non-Safety-Related Functions of the CVS

Other non-safety-related functions are those specified to perform or support electrical power production by the plant and normal operation of the CVS.

The CVS performs non-safety-related power generation functions of controlling RCS chemistry, purity, and inventory for the continued operation of the plant. It also provides the means for oxygen control, chemical addition, and reactor coolant degasification. The CVS can also provide auxiliary spray during plant cooldown, borated water to auxiliary equipment, and a means for filling and pressure testing the RCS.

2.1.1.3.1 Reactor Coolant Purification

The CVS maintains the RCS fluid purity and activity level within acceptable limits for all modes of operation. The CVS removes fission and activation products in ionic form or as particulates from the RCS to ensure that operating activity levels are consistent with the plant Technical Specifications and industry guidance. The CVS also removes other ionic impurities and corrosion products to maintain the reactor coolant chemistry consistently with industry guidance and the **AP1000** Chemistry Manual.

2.1.1.3.2 Reactor Coolant Inventory Control and Make-Up

The CVS maintains the required coolant inventory in the RCS within the allowable pressurizer level range during all normal modes of operation, including plant heatup from cold shutdown, reactor startup, full-power operation, and plant cooldown. It also maintains hot leg mid-loop levels in the RCS during maintenance operations during cold shutdown.

2.1.2 PXS

Class 1 PXS lines have a design pressure and temperature consistent with the RCPB (2,485 psig and 650°F.)

2.1.2.1 Safety-Related Functions

Safety-related functions provide for the integrity of the RCPB, the capability to shut down the reactor and maintain it in a safe shutdown condition, or the capability to prevent or mitigate the consequences of accidents that could result in potential offsite exposures comparable to the guidelines of 10 CFR 50.34.

The PXS is designed to perform the following major safety-related functions:

- Emergency RCS Make-Up and Boration
- Safety Injection
- Emergency Core Decay Heat Removal
- Post-Accident Containment pH Control
- Nitrogen Supply Line Containment Isolation

These functions are available during all normal modes of RCS operation including hot/cold shutdowns and refueling.

2.1.2.2 Emergency RCS Make-Up and Boration Function

The PXS provides RCS make-up during transients or accidents in which the normal RCS make-up supply from the chemical and volume control system (CVS) is unavailable or is insufficient. This make-up allows for transfer of heat from the core. This make-up is sufficient to accommodate significant RCS leakage and RCS cooldown without Automatic Depressurization System (ADS) actuation.

The PXS also adds negative reactivity during transients or accidents in which the normal RCS boron make-up supply from the CVS is unavailable or is insufficient. This negative reactivity provides or recovers core shutdown margin for events that result in cooldown of the RCS, such as steam line break accidents or safe shutdown cooldowns.

2.1.2.3 Safety Injection Function

The PXS provides safety injection to the RCS to ensure adequate core cooling for the complete range of loss-of-coolant accidents (LOCAs) up to and including the double-ended rupture of the largest RCS piping. In addition to mitigating the immediate effects of the LOCA, the safety injection (SI) function must provide core cooling to support long-term safe shutdown.

The ADS, which is part of the RCS, supports the PXS in performing the safety injection function by depressurizing the RCS to allow lower-pressure injection supplies to inject.

2.1.2.4 Emergency Core Decay Heat Removal Function

The PXS provides emergency core cooling during transients, accidents, or whenever the normal heat removal paths are unavailable. The emergency core cooling prevents overheating of the core. During a steam generator tube rupture (SGTR) accident, the emergency core cooling must remove sufficient heat to support automatic termination of the loss of reactor coolant. In the longer term following non-LOCAs, the emergency core cooling must be capable of cooling the RCS to safe shutdown conditions.

2.1.2.5 Other Non-Safety-Related Functions

2.1.2.5.1 RCS Cooldown Function

The PXS is able to cool the RCS to a temperature at which the Normal Residual Heat Removal System (RNS) can be put into operation. This capability allows for the transition from the safety-related systems to the non-safety-related systems in case SG Startup Feedwater (SFW) is unavailable, which allows the plant to be put into a cold shutdown faster.

This capability should allow problems to be repaired faster, which should, in turn, improve plant availability.

2.1.2.5.2 Automatic Depressurization

The ADS valves act in conjunction with the PXS to mitigate design basis accidents. Their function is to reduce the RCS pressure in a controlled fashion, to allow the required safety injection flow rates from the CMTs, accumulators, and in-containment refueling water storage tank (IRWST). Automatic depressurization is required primarily to mitigate small-break LOCAs.

2.1.3 RCS

Class 1 RCS lines have a design pressure and temperature consistent with the RCPB (2,485 psig and 650°F.)

2.1.3.1 Safety-Related Functions

The RCS performs and/or supports the following safety-related functions: maintaining the RCPB, core cooling and reactivity control, process monitoring, automatic depressurization, and reactor vessel head emergency letdown/venting. The RCS does not penetrate the containment building, so containment isolation is not an applicable safety function for the RCS.

2.1.3.1.1 Reactor Coolant Pressure Boundary (RCPB)

The RCS serves as a pressure boundary for containing the reactor coolant and/or emergency core cooling flow and for limiting radiation releases (by limiting coolant leakage) to the containment during all plant operating conditions except for those plant conditions that postulate a failure of the RCPB.

The RCS serves as a pressure boundary to preclude leakage (and radiation release) between the primary system and the non-radioactive secondary system (Steam Generator System) and between the primary system and the atmosphere during all plant operating conditions, except for those plant conditions that postulate a failure of the RCPB.

The RCS provides relief capability to prevent the RCPB from overpressure in accordance with Section III of the ASME B&PV Code during all plant operating conditions.

2.1.3.1.2 Core Cooling and Reactivity Control

The RCS (in conjunction with the RXS and the PXS) circulates the coolant [by natural circulation] to (1) remove RCS sensible heat and the decay heat produced in the reactor after it is shut down, (2) provide a uniform RCS temperature distribution, and (3) maintain the chemical homogeneity of the reactor coolant (e.g., soluble neutron poison concentration) when chemical adjustments occur during certain safe shutdown operations and accident operations.

The RCS provides the coolant circulation and decay heat removal required during the transition from forced circulation to natural circulation to ensure core departure from nucleate boiling (DNB) limits are not violated following the trip of all RCPs during plant operations when the RCPs are operating.

The RCS (in conjunction with the RXS and the PXS) contains the neutron poison, which supplements the negative reactivity inserted by the control rods to satisfy the reactor shutdown margin requirements during plant safe shutdown operations and accident operations.

2.1.3.1.3 Automatic Depressurization

A subsystem of the RCS is the automatic depressurization system (ADS). The ADS acts in conjunction with the PXS to mitigate the consequences of LOCAs. The safety-related ADS function is to

automatically depressurize the RCS so that the PXS can adequately cool the core during small-break LOCAs.

2.1.3.1.4 Emergency Letdown

The RCS provides an emergency letdown path to avoid long-term overfill of the pressurizer during accident events, which result in an increase in pressurizer water level. This is accomplished by the use of remotely operated reactor vessel head vent valves.

2.1.3.2 Non-Safety-Related Defense-in-Depth Functions

The RCS performs and/or supports the following defense-in-depth functions: core cooling, RCS pressure control, RCS venting, and process monitoring.

2.1.3.2.1 Core Cooling and Reactivity Control

The RCS transfers the heat generated in the RCS and RXS to the SGs for the production of steam used by the turbine-generator to produce electricity during plant power operations.

The RCS transfers the heat generated in the RCS and the RXS to the SGS for dissipation by the MSS to maintain the plant in Mode 3, to assist in the control of plant startup, and to satisfy plant cooldown requirements during the first phase of cooldown from Mode 3 to the temperature at which the RNS can be aligned.

The RCS circulates water through the RXS and steam generators to achieve the heat transfer requirements for the normal operating modes.

The RCS provides the coolant circulation, which ensures a uniform RCS temperature distribution during normal operating modes.

The RCS provides the coolant circulation, which maintains the chemical homogeneity of the reactor coolant (for example, soluble neutron poison concentration) when chemical adjustments occur during normal operating modes so that uncontrolled reactivity changes do not occur.

The RCS (coolant) promotes and sustains the neutron chain reaction in the RXS during plant power operations by containing the materials that serve as neutron moderator and neutron reflector.

The RCS (coolant) promotes a uniform power distribution (and fuel depletion) in the RXS and provides reactor shim control during power operations by containing the material that serves as neutron poison. (This function supplements the reactor control function of the control rods.)

The RCS (coolant) contains the neutron poison, which supplements the negative reactivity inserted by the control rods to satisfy reactor shutdown margin requirements during plant shutdown operations.

The RCS (in conjunction with the RNS) removes core decay heat during the second phase of plant cooldown, cold shutdown, refueling, and the early stages of startup.

2.1.3.2.2 RCS Pressure Control

The RCS, through the use of pressurizer spray, provides the capability to control system pressure during certain accident operations. This capability helps prevent the need to actuate passive safety systems, such as the pressurizer safety valves for overpressure events.

The RCS, through the use of pressurizer heaters, provides the capability to control system pressure to maintain natural circulation cooling using the steam generators. This capability helps prevent the need to actuate the PRHR heat exchanger.

2.1.3.2.3 RCS Venting

The RCS provides manual limited depressurization to support manual mitigation of an SGTR and RCS shutdown operations. This capability supports core cooling capability in multiple failure scenarios.

The RCS provides manual RCS depressurization as a backup to automatic depressurization to prevent high-pressure core melt sequences in multiple failure scenarios.

2.1.4 RNS

Class 1 RNS lines have a design pressure and temperature consistent with the RCPB (2,485 psig and 650°F.)

2.1.4.1 Safety-Related Functions

The RNS design provides the following safety-related functions:

2.1.4.1.1 Containment Isolation

The RNS design provides containment isolation for the RNS piping that penetrates the containment barrier. Containment isolation valves are active to transfer closed.

2.1.4.1.2 RCS Pressure Boundary Preservation

The RNS design provides an RCPB at the RNS suction and discharge interface with the RCS.

2.1.4.1.3 Containment Inventory Make-Up

The RNS provides a flow path for long-term (post-72-hour) containment inventory make-up in case of design basis leakage from containment after a LOCA. The check valves in this flow path are active to transfer open.

2.1.4.2 Other Licensing-Related Functions

2.1.4.2.1 Interfacing System Loss-of-Coolant Accident (ISLOCA)

The design of the portion of the RNS that is outside containment minimizes the probability of containment bypass: The RNS piping and components are designed to have an ultimate rupture strength that is not less than that of the RCS operating pressure (2,235 psig or 15.4 MPa). A design pressure of 900 psig (6.2 MPa) satisfies this commitment.

2.1.4.2.2 Low-Temperature Overpressure Protection (LTOP)

The RNS provides LTOP for the RCS during refueling (when the reactor vessel head is on), startup, and shutdown operations.

2.1.4.2.3 In-Containment Refueling Water Storage Tank (IRWST) Gravity Injection to RCS Hot Leg Through RNS Suction

The RNS provides an alternate gravity injection path through RNS-V023 to make-up to the RCS hot leg during cold shutdown and refueling conditions. The capability of this function is a Probabilistic Risk Assessment (PRA) insight. This function can be used to prevent unnecessary IRWST squib valve actuation on a low RCS hot leg level.

2.1.4.2.4 RCS Cooldown Following a Main Steam Line Break (MSLB)

Following an MSLB, the RNS can be used to reduce the RCS temperature below 212°F (100°C, boiling conditions) within 72 hours after reactor shutdown to prevent continued secondary coolant steaming. Any release of airborne radionuclides ceases once the temperature of primary/secondary coolant is below boiling. The safety analysis for a steam system piping failure assumes that the RNS may be used in this instance if it is available. If the RNS is not available, the passive safety systems will mitigate the accident.

2.1.4.3 Non-Safety-Related Defense-in-Depth Functions

2.1.4.3.1 Shutdown or Post-Accident Heat Removal

The RNS can provide closed-loop heat removal from the core and the RCS during shutdown operations to achieve plant recovery following successful mitigation of an accident by the PXS.

2.1.4.3.2 Shutdown Cooling During Mid-Loop Operation

The RNS provides shutdown decay heat removal from the core during refueling operations, including those in which reduced inventory RCS conditions are established. In this condition, the water level in the RCS is reduced to near the centerline of the main coolant piping (“mid-loop”).

This function is considered as Regulatory Treatment of Non-Safety Systems- (RTNSS-) important because it reduces the probability of an initiating event due to loss of RNS cooling and because it

provides margin in the PRA sensitivity performed, assuming no credit for non-safety-related SSCs to mitigate at-power and shutdown events. Additional regulatory oversight is imposed on this function.

2.1.4.3.3 Low-Pressure RCS Injection

The RNS provides non-safety-related low-head injection from either the cask loading pit (CLP) or the IRWST following actuation of ADS Stages 1-3 as described in the "Systems/Event Matrix" (Reference 12.2.1.31) in the DCD. This function is considered RTNSS-important because it provides margin in the PRA sensitivity performed, assuming no credit for non-safety-related SSCs to mitigate at-power and shutdown events. Additional regulatory oversight is imposed on this function.

2.1.4.4 Other Non-Safety-Related Functions

2.1.4.4.1 Normal Cooldown

The RNS removes heat from the core and the RCS during normal plant cooldown.

2.1.4.4.2 Refueling Draindown

The RNS facilitates draining the RCS through the CVS to a level near the centerline of the main coolant hot leg piping during refueling operations.

2.1.4.4.3 Spent Fuel Pool (SFP) Cooling

If normal SFP cooling capacity is lost, the RNS can be aligned to supplement or replace Spent Fuel Pool Cooling System (SFS) cooling. The RNS is also used in conjunction with the SFS to cool the SFP following a full core offload during normal refueling operations.

2.1.4.4.4 In-Containment Refueling Water Storage Tank Cooling

The RNS cools the IRWST during operation of the passive residual heat removal (PRHR) heat exchanger or during normal plant operations when required. This minimizes vapor production from the IRWST and subsequent condensation of water elsewhere in containment.

2.1.4.4.5 Preventing ADS Stage 4 Actuation with Low-Pressure RCS Injection

The RNS provides an additional non-safety-related function that is related to the defense-in-depth function for low-pressure RCS injection. By providing low-pressure make-up to the RCS (with two RNS pumps operating) following ADS actuation after a small-break LOCA (or non-LOCA event), it is possible to prevent actuation of the ADS Stage 4 valves.

2.1.4.4.6 IRWST Gravity Injection to RCS Hot Leg Through RNS Suction

The RNS provides an alternate gravity injection path through RNS-V023 to provide make-up to the RCS hot leg. The valve RNS-V023 can be jog-positioned to provide rough control of the make-up flow and restore hot leg level to prevent automatic IRWST injection squib valve actuation.

2.1.4.4.7 RCS Cooldown Following a Main Steam Line Break (MSLB)

The RNS shall provide the capability to cool the RCS temperature below 212°F (100°C) within 72 hours after reactor shutdown following a break in the main steam line. The offsite dose safety analysis for a steam system piping failure assumes that the RNS may be used in this instance if it is available. If the RNS is not available, the passive safety systems will mitigate the accident.

2.2 ASME CODE EXEMPTIONS

In accordance with IWB-1220, the following components[1] or portions of components are exempted from the volumetric and surface examination requirements of IWB-2500:

- Components that are connected to the RCS and are part of the RCPB, and that are of such a size and shape that, upon postulated rupture, the resulting flow of coolant from the RCS under normal plant operating conditions is within the capacity of make-up systems that are operable from on-site emergency power. The emergency core cooling systems are excluded from the calculation of make-up capacity.

  – Components and piping segments NPS 1 (DN25) and smaller, except for steam generator tubing

  – Components and piping segments that have one inlet and one outlet, both of which are NPS 1 (DN25) and smaller

  – Components[2] and piping segments that have multiple inlets or multiple outlets whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the outside diameter (OD) of NPS 1 (DN 25) pipe

- Reactor vessel head connections and associated piping, NPS 2 (DN50) and smaller, made inaccessible by control rod drive penetrations.

-

- **Note**: For clarification, exemption of (b)(1) also is applied to branch connections 1" NPS and smaller.

1. The exemption from examination in IWC-1220 may be applied to those components permitted to be Class 2 in lieu of Class 1 by the regulatory authority having jurisdiction at the plant site.
2. For heat exchangers, the shell side and tube side may be considered separate components.

2.3 PRESERVICE EXAMINATIONS

- Examinations required by this inspection plan (with the exception of Examination Category B-P, and the visual VT-3 examination of the internal surfaces of Categories B-L-2 and B-M-2) shall be completed prior to initial plant startup. In addition, these preservice examinations shall be extended to include essentially 100% of the pressure-retaining welds in all Class 1 components, except in those components exempted from examination by IWB-1220(a), (b), or (c). However, in the case of Examination Category B-O, the examination shall be extended to include essentially 100% of the welds in the installed peripheral control rod drive housings only.

- Shop and field examinations may serve in lieu of the on-site preservice examinations provided:

  – In the case of vessels only, the examination is performed after the hydrostatic test required by Section III has been completed.

  – Such examinations are conducted under conditions and with equipment and techniques equivalent to those that are expected to be employed for subsequent inservice examinations.

  – The shop and field examination records are, or can be, documented and identified in a form consistent with those required in IWA-6000.

- SG tube examination shall be governed by the plant Technical Specifications. SG tubing baseline examinations (PSI) shall be performed as described in Plant Technical Specifications (Sections 3.4.18.1 and 5.5.4).

2.4 REPAIR/REPLACEMENT ACTIVITIES

All repair/replacement activities for preservice examinations of ASME Code Class 1 components shall be performed in accordance with ASME Section III requirements.

2.5 COMPONENT/PIPING EXAMINATION DEVELOPMENT

Class 1 components subject to preservice examination are described in this section. See Appendix A for details of items subject to PSI.

2.5.1 Category B-A – Pressure-Retaining Welds in Reactor Vessel

Item No. B1.11 – Circumferential Shell Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the transition ring / lower head to lower shell circumferential weld and lower shell to upper shell circumferential weld length.

Item Number	Number of Items	Number Required	Number Selected	Comments

B1.11	2	2	2	

Item No. B1.12 – Longitudinal Shell Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of all longitudinal shell weld lengths.

Note

Not applicable as no longitudinal welds exist due to the RPV shell being a one-piece forging.

Item Number	Number of Items	Number Required	Number Selected	Comments
B1.12	N/A	N/A	N/A	Each shell course is forged.

Item No. B1.21 – Circumferential Head Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the transition ring-to-lower head dome circumferential weld length.

Item Number	Number of Items	Number Required	Number Selected	Comments
B1.21	1	1	1	

Item No. B1.22 – Meridional Head Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of all meridional head welds.

Note

Not applicable as no meridional welds exist due to heads being one-piece forgings.

Item Number	Number of Items	Number Required	Number Selected	Comments
B1.22	N/A	N/A	N/A	One-piece forgings

Item No. B1.30 – Shell-to-Flange Weld

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the vessel shell to flange weld length.

Note

Not applicable as the flange to upper shell is a one-piece forging.

Item Number	Number of Items	Number Required	Number Selected	Comments
B1.30	N/A	N/A	N/A	Flange to upper shell is one forging.

Item No. B1.40 – Upper Head-to-Flange Weld

Scope of Examination – Volumetric (ultrasonic) and surface (magnetic particle or liquid penetrant) examination of essentially 100% of the vessel upper head-to-flange weld length.

Note

Not applicable as the closure head consists of a one-piece flange and dome forging.

Item Number	Number of Items	Number Required	Number Selected	Comments
B1.40	N/A	N/A	N/A	The **AP1000** closure head consists of a one-piece flange and dome forging.

Item No. B1.51 – Repairs Welds (Beltline Region)

Scope of Examination – Volumetric (ultrasonic) examination of any base metal repair welds where depth of repair exceeds 10% of nominal vessel wall thickness (if applicable).

Item Number	Number of Items	Number Required	Number Selected	Comments
B1.51	TBD	TBD	TBD	

2.5.2 Category B-B – Pressure-Retaining Welds in Vessels Other Than Reactor Vessels

2.5.2.1 Pressurizer

Pressurizer, Item No. B2.11 – Circumferential Shell-to-Head Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the upper-head-to-upper-shell and lower-shell-to-lower-head circumferential weld length.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.11	2	2	2	

Pressurizer, Item No. B2.12 – Longitudinal Shell-to-Head Welds

Scope of Examination – Volumetric (ultrasonic) examination of all welds intersecting the circumferential weld. Examination includes 1 foot of all welds.

Note

Not applicable as the heads and shells are one-piece forgings.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.12	N/A	N/A	N/A	Heads and shells are one-piece forgings.

Pressurizer, Item No. B2.21 – Head Circumferential Weld

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the head circumferential weld length.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.21	N/A	N/A	N/A	One-piece forged heads

Pressurizer, Item No. B2.22 – Head Meridional Weld

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of all meridional head welds.

Note

Not applicable since head is a one-piece forging.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.22	N/A	N/A	N/A	One-piece forged heads

2.5.2.2 Steam Generator (Primary Side)

Steam Generator (Primary Side), Item No. B2.31 – Circumferential Head Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of the SG channel head-to-channel head ring circumferential weld.

Note

V.C. Summer Unit 2 has a one-piece forged channel head with no additional circumferential weld.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.31	N/A	N/A	N/A	One-piece forged channel head

Steam Generator (Primary Side), Item No. B2.32 – Meridional Head Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of all SG meridional welds.

Note

Not applicable since no meridional welds exist on the lower head (one-piece forging).

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.32	N/A	N/A	N/A	One-piece forging

Steam Generator (Primary Side), Item No. B2.40 – Tubesheet-to-Head Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of the SG tubesheet-to-head circumferential weld. Examination is applicable to SGs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.40	1	1	1	SG-A
B2.40	1	1	1	SG-B
B2.40	2	2	2	

2.5.2.3 PRHR Heat Exchanger (Primary Side) – Head

Heat Exchanger (Primary Side), Item No. B2.51 – Head Circumferential Weld

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of the PRHR heat exchanger head circumferential weld.

Note

Not applicable since head is a one-piece forging.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.51	N/A	N/A	N/A	One-piece forging

Heat Exchanger (Primary Side), Item No. B2.52 – Head Meridional Weld

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of all PRHR heat exchanger head meridional welds.

Note

Not applicable since inlet and outlet heads are one-piece forgings.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.52	N/A	N/A	N/A	One-piece forgings

2.5.2.4 PRHR Heat Exchanger (Primary Side) – Shell

Heat Exchanger (Primary Side), Item No. B2.60 – Tubesheet-to-Head Weld

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of all PRHR heat exchanger inlet and outlet tubesheet-to-head welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.60	2	2	2	One inlet / one outlet

Heat Exchanger (Primary Side), Item No. B2.70 – Longitudinal Weld

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of all PRHR heat exchanger longitudinal welds. Examination includes 1 foot of all welds at each end of the shell.

Note

Not applicable; one-piece forging.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.70	N/A	N/A	N/A	One-piece forging

Heat Exchanger (Primary Side), Item No. B2.80 – Tubesheet-to-Shell Welds

There are no shell welds associated with the PRHR HX. Tubesheet is welded directly to the inlet and outlet heads.

2.5.2.5 Core Make-Up Tank

This is a new component included within the **AP1000** design. This component is not currently addressed within the applicable Edition and Addenda of the Code. A proposed Code Case has been submitted to ASME for consideration. Defined below are the recommended examination requirements (Item Numbers for the CMTs are note by "XX" since this has not yet been defined by the code).

Note
The PSI examinations are essentially the same as for the pressurizer.

Core Make-Up Tank, Item No. B2.XX – Circumferential Shell-to-Head Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of the upper shell barrel to upper head (petal section) circumferential weld and lower shell barrel to lower head (petal section) circumferential weld. Examinations are applicable to CMTs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.XX	2	2	2	CMT-A
B2.XX	2	2	2	CMT-B
B2.XX	4	4	4	

Subject to Proposed Code Case N-XXX, Alternative Examination Requirements for **AP1000**, NSSS Core Make-Up Tanks, Examination Categories B-B, B-D, and B-F, Section XI, Division 1. See Appendix C (Relief Requests/Alternatives) for details.

Core Make-Up Tank, Item No. B2.XX – Longitudinal Shell-to-Head Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 1 foot of all longitudinal welds per head. Examinations are applicable to CMTs A and B.

Note
One-piece forged shells, no long seams.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.XX	N/A	N/A	N/A	Single-piece forgings

Subject to Proposed Code Case N-XXX, Alternative Examination Requirements for **AP1000**, NSSS Core Make-Up Tanks, Examination Categories B-B, B-D, and B-F, Section XI, Division 1. See Appendix C (Relief Requests / Alternatives) for details.

Core Make-Up Tank, Item No. B2.XX – Head Circumferential Weld

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of all circumferential head welds. Examinations are applicable to CMTs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.XX	2	2	2	CMT-A: one upper & one lower
B2.XX	2	2	2	CMT-B: one upper & one lower
B2.XX	4	4	4	

Subject to Proposed Code Case N-XXX, Alternative Examination Requirements for **AP1000**, NSSS Core Make-Up Tanks, Examination Categories B-B, B-D, and B-F, Section XI, Division 1. See Appendix C (Relief Requests / Alternatives) for details.

Core Make-Up Tank, Item No. B2.XX – Head Meridional Weld

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of the length of all meridional head welds (if present). Examinations are applicable to Core Make-Up Tanks A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
B2.XX	8	8	8	CMT-A: four upper & four lower
B2.XX	8	8	8	CMT-B: four upper & four lower
B2.XX	16	16	16	

Subject to Proposed Code Case N-XXX, Alternative Examination Requirements for **AP1000**, NSSS Core Make-Up Tanks, Examination Categories B-B, B-D, and B-F, Section XI, Division 1. See Appendix C (Relief Requests / Alternatives) for details.

2.5.2.6 Reactor Coolant Pump Stator Casing Welds

The stator casing welds have been evaluated for determining if PSI and ISI examinations are required. It has been determined that PSI and ISI examinations are not required for the following reasons:

1. While the full-penetration circumferential weld of the stator lower shell to the shell is designed to ASME Section III Class 1 requirements, it is not in contact with water and is not pressure-retaining; therefore, it is not subject to examination under ASME Section XI, Subarticle IWB-2500. Neither preservice nor inservice examination is required for this weld.

2. Under Normal operating conditions, the stator shell welds are not wetted and are not subject to nominal operating pressure (NOP) except in the case of a catastrophic failure of the RCP.

2.5.3 Category B-D – Full-Penetration Welded Nozzles in Vessels

2.5.3.1 Reactor Pressure Vessel

Reactor Vessel, Item No. B3.90 – Nozzle-to-Vessel Welds

Scope of Examination – Volumetric (ultrasonic) examination of 100% of all (4) 22.0" N2 RPV Primary Inlet Nozzles, (2) 31.0" N1 Primary Outlet Nozzles, and (2) 7.25" N3 Direct Vessel Injection (DVI) nozzle-to-shell full-penetration welds, as listed in Table 2.5-1.

Table 2.5-1. Reactor Vessel Nozzle Locations

Reactor Vessel Nozzles				
Nozzle Number	**Size (in)**	**Nozzle Inside Diameter (ID)**	**Nozzle Type**	**Location (deg.)**
N1	31.0	N1A	Outlet	90
	31.0	N1B	Outlet	270
N2	22.0	N2A	Inlet	135
	22.0	N2B	Inlet	45
	22.0	N2C	Inlet	225
	22.0	N2D	Inlet	315
N3	7.25	DVIA	Inlet	0
	7.25	DVIB	Inlet	180
B3.90	8	8	8	

Reactor Vessel, Item No. B3.100 – Nozzle Inside Radius Section

Scope of Examination – Volumetric (ultrasonic) examination of 100% of the required volume for all (2) 31.0" N1 RPV Primary Outlet Nozzles, (4) 22.0" N2 Primary Inlet Nozzles, and (2) 7.25" N3 Direct Vessel Injection nozzle inside radius sections of full-penetration welded nozzles.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.100	8	8	8	

Note: Preservice examinations shall be performed as follows in accordance with Code Examination Alternative # 3 identified and detailed in Appendix D. Code Case N-648-2 shall be utilized. Supplemental pre-service examinations will consist of a surface examination (PT) of each nozzle inner radius region and a manual non-ASME Section XI, Appendix VIII UT examination (consistent with ASME Section XI, Appendix I, I-2400) from the nozzle ID surface after the Section III Pressure Test. In addition, a Visual Examination (VT-1) shall be performed in accordance with Code Case N-648-2 using the allowable flaw length criteria of Table IWB-3512-1 with limiting assumptions on the flaw aspect ratio.

2.5.3.2 Pressurizer

Pressurizer, Item No. B3.110 – Nozzle-to-Vessel Welds

Scope of Examination – Volumetric (ultrasonic) examination is not applicable to the pressurizer with integrally forged primary nozzles.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.110	N/A	N/A	N/A	Integrally forged with head

Pressurizer, Item No. B3.120 – Nozzle Inside Radius Section

Scope of Examination – Volumetric (ultrasonic) examination of 100% of the 18.0" pressurizer surge, 14.0" safety/relief A, and B and the pressurizer 4.0" spray nozzle inside radius sections.

Note

This item was removed from the 2007 Edition. As required by 10 CFR 50.55a(b)(2)(xxi)(A), Item B3.120 of the 1998 Edition of ASME Section XI shall be applied for Examination Category B-D when using the 1999 Addenda or later of ASME Section XI. A visual examination with magnification that has a resolution sensitivity to detect a 1-mil width wire or crack, utilizing the allowable flaw length criteria in Table IWB-3512-1, 1997 Addenda through the latest Edition and Addenda incorporated by reference in paragraph (b)(2) of Section 55a, with a limiting assumption on the flaw ratio (i.e., a/l = 0.5), may be performed instead of an ultrasonic examination. Access to the inner radius areas for an EVT-1 examination is unavailable; therefore, a manual UT examination from the head OD surfaces shall be performed for PSI.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.120	4	4	4	

2.5.3.3 Steam Generator (Primary Side)

Steam Generator (Primary Side), (2 Generators), Item No. B3.130 – Nozzle-to-Vessel Welds

Scope of Examination – Volumetric (ultrasonic) examination is not applicable to **AP1000** SGs with integrally forged primary nozzles.

Note

There are no full-penetration welded nozzles on the SGs. Inlet, outlet, and the PRHR nozzles are integrally forged with the heads. SG-A also has a CVS inlet nozzle that consists of an OD weld buildup and a CVS nozzle barrel welded to the weld buildup area. See Augmented Examination Requirements for the weld buildup examination requirements in Section 6, paragraph 6.3.6 of this document.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.130	N/A	N/A	N/A	N/A

Steam Generator (Primary Side), Item No. B3.140 – Nozzle Inside Radius Section

Scope of Examination – Volumetric (ultrasonic) examination of 100% of the required volume of all SG primary nozzle and PRHR nozzle inside radius sections. Examinations are applicable to SGs A and B. There is no inner radius section applicable to the CVS nozzle.

Note

This item was removed from the 2007 Edition. As required by 10 CFR 50.55a(b)(2)(xxi)(A), Item B3.140 of the 1998 Edition of ASME Section XI shall be applied for Examination Category B-D when using the 1999 Addenda or later of ASME Section XI. A visual examination with magnification that has a resolution sensitivity to detect a 1-mil width wire or crack, utilizing the allowable flaw length criteria in Table IWB-3512-1, 1997 Addenda through the latest Edition and Addenda incorporated by reference in paragraph (b)(2) of section 55a, with a limiting assumption on the flaw ratio (i.e., a/l = 0.5), may be performed instead of an ultrasonic examination.

For PSI, a manual UT examination shall be performed from the ID or OD surfaces and an EVT-1 examination shall be performed from the ID surface.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.140	4	4	4	SG-A: one inlet, two outlet & one PRHR nozzle
B3.140	3	3	3	SG-B: one inlet & two outlet nozzles
B3.140	7	7	7	

2.5.3.4 PRHR Heat Exchanger (Primary Side)

Heat Exchanger (Primary Side), Item No. B3.150 – Nozzle-to-Vessel Welds

Scope of Examination – Volumetric (ultrasonic) examination is not applicable to PRHR heat exchangers with integrally forged primary nozzles.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.150	N/A	N/A	N/A	One-piece forging

Heat Exchanger (Primary Side), Item No. B3.160 – Nozzle Inside Radius Section

Scope of Examination – Volumetric (ultrasonic) examination of 100% of the required volume of the PRHR heat exchanger primary inlet and outlet nozzle inside radius section.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.160	2	2	2	

2.5.3.5 Core Make-Up Tank

Core Make-Up Tank, Item No. B3.XXX – Nozzle-to-Vessel Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of all CMT nozzle-to-vessel welds. Examinations are applicable to CMTs A and B. There are no typical nozzle-to-shell welds.

Note

There are no full-penetration welded nozzles on the CMTs. The inlet and outlet nozzles consist of an OD weld buildup and an inlet and outlet nozzle barrel welded to the weld buildup area. See Augmented Examination Requirements for the weld buildup examination requirements in Section 6, Paragraph 6.3.6 of this document.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.XXX	N/A	N/A	N/A	CMT-A & B

Subject to Proposed Code Case N-XXX, Alternative Examination Requirements for **AP1000**, NSSS Core Make-Up Tanks, Examination Categories B-B, B-D, and B-F, Section XI, Division 1. See Appendix D for details.

Core Make-Up Tank, Item No. B3.XXX – Nozzle Inside Radius Sections

Scope of Examination – Volumetric (ultrasonic) of essentially 100% of all CMT inlet and outlet nozzle inside radius sections. Examinations are applicable to CMTs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.XXX	2	2	2	CMT-A: one inlet & one outlet
B3.XXX	2	2	2	CMT-B: one inlet & one outlet
B3.XXX	4	4	4	

Subject to Proposed Code Case N-XXX, Alternative Examination Requirements for **AP1000**, NSSS Core Make-Up Tanks, Examination Categories B-B, B-D, and B-F, Section XI, Division 1. See Appendix D for details.

Core Make-Up Tank, Item No. B3.XXX – Nozzle-to-Vessel Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of all CMT nozzle-to-vessel welds. Examinations are applicable to CMTs A and B. There are no typical nozzle-to-shell welds.

Note

There are no full-penetration welded nozzles on the CMTs. The inlet and outlet nozzles consist of an OD weld buildup and an inlet and outlet nozzle barrel welded to the weld buildup area. See Augmented Examination Requirements for the weld buildup examination requirements in Section 6, Paragraph 6.3.6 of this document.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.XXX	N/A	N/A	N/A	CMT-A & B

Subject to Proposed Code Case N-XXX, Alternative Examination Requirements for **AP1000**, NSSS Core Make-Up Tanks, Examination Categories B-B, B-D, and B-F, Section XI, Division 1. See Appendix D for details.

Core Make-Up Tank, Item No. B3.XXX – Nozzle Inside Radius Sections

Scope of Examination – Volumetric (ultrasonic) of essentially 100% of all CMT inlet and outlet nozzle inside radius sections. Examinations are applicable to CMTs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
B3.XXX	2	2	2	CMT-A: one inlet & one outlet
B3.XXX	2	2	2	CMT-B: one inlet & one outlet
B3.XXX	4	4	4	

Subject to Proposed Code Case N-XXX, Alternative Examination Requirements for **AP1000**, NSSS Core Make-Up Tanks, Examination Categories B-B, B-D, and B-F, Section XI, Division 1. See Appendix D for details.

2.5.4 Category B-F – Pressure-Retaining Dissimilar-Metal Welds in Vessel Nozzles

2.5.4.1 Reactor Pressure Vessel

Reactor Vessel, Item No. B5.10 – NPS 4 or Larger Nozzle-to-Safe-End Butt Welds

Scope of Examination – Volumetric (ultrasonic) and surface (liquid penetrant) examination of (2) N1 RPV Primary Outlet Nozzles, (4) N2 Primary Inlet Nozzles, and (2) N3 Direct Vessel Injection Nozzle dissimilar-metal nozzle-to-safe-end butt welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.10	8	8	8	

Reactor Vessel, Item No. B5.20 – Less than NPS 4 Nozzle-to-Safe-End Butt Welds

Scope of Examination – Surface (liquid penetrant) examination of all dissimilar-metal nozzle-to-safe-end butt welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.20	N/A	N/A	N/A	No nozzle to safe-ends <4"

Reactor Vessel, Item No. B5.30 – Nozzle-to-Safe-End Socket Welds

Scope of Examination – Surface (liquid penetrant) examination of all dissimilar-metal nozzle-to-safe-end socket welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.30	N/A	N/A	N/A	No socket-welded safe-ends

2.5.4.2 Pressurizer

Pressurizer, Item No. B5.40 – NPS 4 or Larger Nozzle-to-Safe-End Butt Welds

Scope of Examination – Volumetric (ultrasonic) and surface (liquid penetrant) examination of the pressurizer surge, spray, and safety relief A and B nozzle-to-safe-end butt welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.40	4	4	4	

Pressurizer, Item No. B5.50 – Less than NPS 4 Nozzle-to-Safe-End Butt Welds

Scope of Examination – Surface (liquid penetrant) examination of all nozzle-to-safe-end butt welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.50	N/A	N/A	N/A	No nozzle to safe-end <4"

Pressurizer, Item No. B5.60 – Nozzle-to-Safe-End Socket Welds

Scope of Examination – Surface (liquid penetrant) examination of all nozzle-to-safe-end socket welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.60	N/A	N/A	N/A	No socket-welded safe-ends

2.5.4.3 Steam Generator

Steam Generator, Item No. B5.70 – NPS 4 or Larger Nozzle-to-Safe-End Butt Welds

Scope of Examination – Volumetric (ultrasonic) and surface (liquid penetrant) examination of two primary inlet, one PRHR, and four SG to RCP nozzle-to-safe-end butt welds. Examinations are applicable to SGs A and B.

Note

The four RCP to SG safe-ends are examined per the requirements of Alternative # 1. See Appendix C (Relief Requests / Alternatives) for details.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.70	7	7	7	

Steam Generator, Item No. B5.80 – Less than NPS 4 Nozzle-to-Safe-End Butt Welds

Scope of Examination – Surface (liquid penetrant) examination of all nozzle-to-safe-end butt welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.80	N/A	N/A	N/A	No nozzle to safe-ends <4"

Steam Generator, Item No. B5.90 – Nozzle-to-Safe-End Socket Welds

Scope of Examination – Surface (liquid penetrant) examination of all nozzle-to-safe-end socket welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.90	N/A	N/A	N/A	No socket-welded safe-ends

2.5.4.4 PRHR Heat Exchanger

Heat Exchangers, Item No. B5.100 – NPS 4 or Larger Nozzle-to-Safe-End Butt Welds

Scope of Examination – Volumetric (ultrasonic) and surface (liquid penetrant) examination of two 14.0" PRHR heat exchanger nozzle-to-safe-end butt welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.100	2	2	2	One inlet / one outlet

Heat Exchangers, Item No. B5.110 – Less than NPS 4 Nozzle-to-Safe-End Butt Welds

Scope of Examination – Surface (liquid penetrant) examination of all PRHR heat exchanger nozzle-to-safe-end butt welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.110	N/A	N/A	N/A	No nozzle to safe-ends < 4"

Heat Exchangers, Item No. B5.120 – Nozzle-to-Safe-End Socket Welds

Scope of Examination – Surface (liquid penetrant) examination of all PRHR heat exchanger nozzle-to-safe-end socket welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.120	N/A	N/A	N/A	No socket-welded safe-ends

2.5.4.5 Core Make-Up Tank

Core Make-Up Tank, Item No. B5.XXX – NPS 4 or Larger Nozzle-to-Safe-End Butt Welds

Scope of Examination – Volumetric (ultrasonic) and surface (liquid penetrant) examination of all CMT nozzle-to-safe-end butt welds. Examinations are applicable to CMTs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.XXX	2	2	2	CMT-A: one inlet / one outlet
B5.XXX	2	2	2	CMT-B: one inlet / one outlet
B5.XXX	4	4	4	

Core Make-Up Tank, Item No. B5.XXX – Less than NPS 4 Nozzle-to-Safe-End Butt Welds

Scope of Examination – Surface (liquid penetrant) examination of all nozzle-to-safe-end butt welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.XXX	N/A	N/A	N/A	No nozzle to safe-ends < 4"

Core Make-Up Tank, Item No. B5.XXX – Nozzle-to-Safe-End Socket Welds

Scope of Examination – Surface (liquid penetrant) examination of all nozzle-to-safe-end socket welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B5.XXX	N/A	N/A	N/A	No socket-welded safe-ends

2.5.5 Category B-G-1 – Pressure-Retaining Bolting, Greater Than 2 Inches in Diameter

Bolting may be examined; (a) in place under tension, (b) when the connection is disassembled, (c) when the bolting is removed.

2.5.5.1 Reactor Pressure Vessel

Reactor Vessel, Item No. B6.10 – Closure Head Nuts

Scope of Examination – Visual (VT-1) examination of all (45) reactor pressure vessel closure head nuts.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.10	45	45	45	

Reactor Vessel, Item No. B6.20 – Closure Head Studs

Scope of Examination – Volumetric (ultrasonic) examination of all (45) reactor pressure vessel closure head studs.

Note

When bolts or studs are removed for examination, surface examination meeting the acceptance standards of IWB-3515 may be substituted for volumetric examination.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.20	45	45	45	

Reactor Vessel, Item No. B6.40 – Threads in Flange

Scope of Examination – Volumetric (ultrasonic) examination of threads in flange surface surrounding all (45) stud holes. The examination includes 1-inch annular surface of the flange surrounding each stud hole.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.40	45	45	45	

Reactor Vessel, Item No. B6.50 – Closure Washers, Bushings

Scope of Examination – Visual VT-1 examination of all (45) closure head washers and bushings.

Note

Bushings are required to be examined only when the bolting is removed. Bushings may be examined in place. There are no bushings installed on V.C. Summer Unit 2.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.50	45	45	45	Washers only

2.5.5.2 Pressurizer

Pressurizer, Item No. B6.60 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of all pressurizer bolting.

Note

This item is not applicable; no bolting > 2" diameter.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.60	N/A	N/A	N/A	One manway – no bolting > 2″ diameter

Pressurizer, Item No. B6.70 – Flange Surface, When Disassembled

Scope of Examination – Visual (VT-1) examinations of the flange surface when connection disassembled.

Note

This item is not applicable; no bolting > 2" diameter.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.70	N/A	N/A	N/A	

Pressurizer, Item No. B6.80 – Nuts, Bushings, and Washers

Scope of Examination – Visual (VT-1) examinations of nuts, bushings, and washers.

Note

This item is not applicable; no bolting > 2" diameter.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.80	N/A	N/A	N/A	

2.5.5.3 Steam Generator

Steam Generator, Item No. B6.90 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of all bolts and studs.

Note

This item is not applicable; no bolting > 2" diameter.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.90	N/A	N/A	N/A	

Steam Generator, Item No. B6.100 – Flange Surface, When Connection Is Disassembled

Scope of Examination – Visual (VT-1) examination of flange surface when connection is disassembled.

Note

This item is not applicable; no bolting > 2" diameter.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.100	N/A	N/A	N/A	

Steam Generator, Item No. B6.110 – Nuts, Bushings, and Washers

Scope of Examination – Visual (VT-1) examination of all nuts, bushings, and washers.

Note

This item is not applicable; no bolting > 2" diameter.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.110	N/A	N/A	N/A	

2.5.5.4 PRHR Heat Exchanger

Heat Exchanger, Item No. B6.120 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of all bolts and studs.

Note

This item is not applicable; no bolting > 2" diameter.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.120	N/A	N/A	N/A	

Heat Exchanger, Item No. B6.130 – Flange Surface, When Connection Is Disassembled

Scope of Examination – Visual (VT-1) examination of flange surface when connection is disassembled.

Note
This item is not applicable; no bolting > 2" diameter.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.130	N/A	N/A	N/A	

Heat Exchanger, Item No. B6.140 – Nuts, Bushings, and Washers

Scope of Examination – Visual (VT-1) examination of all nuts, bushings, and washers.

Note
This item is not applicable; no bolting > 2" diameter.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.140	N/A	N/A	N/A	

2.5.5.5 Piping

Piping, Item No. B6.150 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of all studs and bolting greater than 2.0".

System/ Isometric Number	Flange Size (in)	Number of Flanges	Number Required	Number Selected	Comments
RCS-030	14.0	2	2	2	V004B/D, valve to piping flange 2.75" dia. studs (12)
RCS-03A	14.0	1	1	1	V004A, valve to piping flange 2.75" dia. studs (12)
RCS-03B	14.0	1	1	1	V004C, valve to piping flange 2.75" dia. studs (12)
B6.150		4	4	4	

Piping, Item No. B6.160 – Flange Surface, When Connection Is Disassembled

Scope of Examination – Visual (VT-1) examination of flange surfaces when disassembled. Examination includes 1" annular surface of flanges surrounding each stud and includes both the valve and piping flanges.

System/ Isometric Number	Flange Size (in)	Number of Flanges	Number Required	Number Selected	Comments
RCS-030	14.0	2	2	2	Flange surfaces
RCS-03A	14.0	1	1	1	Flange surfaces
RCS-03B	14.0	1	1	1	Flange surfaces
B6.160		4	4	4	

Piping, Item No. B6.170 – Nuts, Bushings, and Washers

Scope of Examination – Visual (VT-1) examination of all nuts, bushings, and washers (when disassembled).

System/ Isometric Number	Flange Size (in)	Number of Flanges	Number Required	Number Selected	Comments
RCS-030	14.0	2	2	2	Flange
RCS-03A	14.0	1	1	1	Flange
RCS-03B	14.0	1	1	1	Flange
B6.170		4	4	4	

2.5.5.6 Reactor Coolant Pump (RCP)

Reactor Coolant Pump, Item No. B6.180 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of (24) RCP main flange studs and (20) end closure studs. Examinations are applicable to four RCPs: 1A, 2A, 1B, and 2B.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.180	4	4	4	Main flange 4.5" (24 per pump)
B6.180	4	4	4	End closure 2.750" (20 per pump)

Reactor Coolant Pump, Item No. B6.190 – Flange Surface

Scope of Examination – Visual (VT-1) examination of 1-inch annular surface of flange surrounding each of the (24) and (20) stud holes on each of the (4) RCPs (1A, 2A, 1B, and 2B), when disassembled.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.190	4	4	4	Main flange when disassembled (24 per pump)
B6.190	4	4	4	End closure when disassembled (20 per pump)

Reactor Coolant Pump, Item No. B6.200 – Nuts, Bushings, and Washers

Scope of Examination – Visual (VT-1) examination of all (24) nuts, bushings, and washers on each of the (4) RCPs (1A, 2A, 1B, and 2B), when disassembled.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.200	4	4	4	Main flange when disassembled (24 per pump)

2.5.5.7 Valves

Valves, Item No. B6.210 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of all bolts and studs.

Item Number	Number of Valves	Number Required	Number Selected	Comments
B6.210	18	18	18	

Valves, Item No. B6.220 – Flange Surface, When Connection Is Disassembled

Scope of Examination – Visual (VT-1) examination of 1-inch annular surface of flange surrounding each stud hole, when connection is disassembled.

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.220	18	18	18	

Valves, Item No. B6.230 – Nuts, Bushings, and Washers

Scope of Examination – Visual (VT-1) examination of all nuts, bushings, and washers (when disassembled).

Item Number	Number of Items	Number Required	Number Selected	Comments
B6.230	18	18	18	

2.5.6 Category B-G-2 – Pressure-Retaining Bolting, 2 Inches and Less in Diameter

Note: All PSI examinations identified for B-G-2 Bolting Categories below ONLY apply when the connections are disassembled.

2.5.6.1 Reactor Pressure Vessel

Reactor Vessel, Item No. B7.10 – Bolts, Studs, and Nuts

Scope of Examination – Visual (VT-1) examination of all bolts, studs, and nuts 2 in. diameter or less.

Item Number	Number of Items	Number Required	Number Selected	Comments
B7.10	N/A	N/A	N/A	No bolting 2" or less

2.5.6.2 Pressurizer

Pressurizer, Item No. B7.20 – Bolts, Studs and Nuts

Scope of Examination – Visual (VT-1) examination of (20) 1.625" diameter pressurizer manway studs.

Item Number	Number of Items	Number Required	Number Selected	Comments
B7.20	1	1	1	One manway – (20) bolts

2.5.6.3 Steam Generator

Steam Generator, Item No. B7.30 – Bolts, Studs and Nuts

Scope of Examination – Visual (VT-1) examination of (40) 1.875" diameter SG manway studs and nuts per generator. Examinations are applicable to (2) manways per generator.

Item Number	Number of Items	Number Required	Number Selected	Comments
B7.30	2	2	2	SG-A: (20) per manway
B7.30	2	2	2	SG-B: (20) per manway
B7.30	4	4	4	Total

2.5.6.4 Heat Exchangers

Heat Exchanger, Item No. B7.40 – Bolts, Studs, and Nuts

Scope of Examination – Visual (VT-1) examination of RCP heat exchanger end studs, RCP heat exchanger mounting studs and cap screws, and PRHR heat exchanger manways. For heat exchangers, piping, pumps, valves, and tanks, examinations are limited to components selected for examination under Examination Categories B-B, B-L-2, and B-M-2.

Item Number	Number of Items	Number Required	Number Selected	Comments
B7.40	2	2	2	PRHR HX: 20 per manway, 1.5" dia.
B7.40	4	4	4	Cap screws on 4 RCP HXs
B7.40	4	4	4	Mounting studs for 4 RCP HXs
B7.40	4	4	4	Channel studs on 4 RCP HXs
B7.40	14	14	14	Total

2.5.6.5 Piping

Piping, Item No. B7.50 – Bolts, Studs, and Nuts

Scope of Examination – Visual (VT-1) examination of all bolts, studs, and nuts 2 in. diameter or less (piping flange connections).

System/ Isometric Number	Pipe Size	Number of Bolted Connections	Number Required	Number Selected	Comments
B7.50	N/A	20	20	20	

2.5.6.6 RCPs

Pumps, Item No. B7.60 – Bolts, Studs, and Nuts

Scope of Examination – Visual (VT-1) examination of heat exchangers, piping, pumps, valves, and tanks. Examinations are limited to components selected for examination under Examination Categories B-B, B-J, B-L-2, and B-M-2.

Item Number	Number of Items	Number Required	Number Selected	Comments
B7.60	N/A	N/A	N/A	No bolting < 2"

2.5.6.7 Valves

Valves, Item No. B7.70 – Bolts, Studs, and Nuts

Scope of Examination – Visual (VT-1) examination of all bolts, studs, and nuts 2 in. diameter or less. For heat exchangers, piping, pumps, valves, and tanks, examinations are limited to components selected for examination under Examination Categories B-B, B-L-2, and B-M-2.

Item Number	Valve Size	No of Valves	Number Required	Number Selected	Comments
B7.70	Various	55	55	55	

2.5.6.8 Tanks

Core Make-Up Tank, Item No. B7.XX – Bolts, Studs, and Nuts

Scope of Examination – Visual (VT-1) examination of (20) 1.875" diameter CMT manway studs, nuts, and washers. Examinations are applicable to CMTs A and B. Note: Code Item number assignment awaiting Code Case approval to add CMT's to the Code.

Item Number	Number of Items	Number Required	Number Selected	Comments
B7.XX	1	1	1	CMT-A (20 per Manway)
B7.XX	1	1	1	CMT-B (20 per Manway)
B7.XX	2	2	2	Total

2.5.7 Category B-J – Pressure-Retaining Welds in Piping

Item No. B9.11 – Circumferential Welds in Piping NPS 4 or Larger

Scope of Examination – Volumetric (ultrasonic) and surface (liquid penetrant) examination of all circumferential welds in piping NPS 4 or larger, including all dissimilar-metal welds in vessels not examined under Category B-F.

Item Number	Number of Items	Number Required	Number Selected	Comments
B9.11	503	503	503	

Item No. B9.21 –Circumferential Welds in Piping Less Than NPS 4

Scope of Examination – Surface (liquid penetrant) examination of essentially 100% of circumferential weld length other than PWR high-pressure safety injection systems in piping less than NPS 4.

Note

For circumferential welds with intersecting longitudinal welds, surface examinations of the longitudinal piping welds are required for those portions of the welds within the examination boundaries of intersecting Examination B-F and B-J circumferential welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B9.21	171	171	171	

Item No. B9.22 – Circumferential Welds in Piping Less Than NPS 4

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of circumferential weld length of PWR high-pressure safety injection systems in piping less than NPS 4.

Note

There are no high-pressure welds in the Class 1 Systems; all are at NOP.

Item Number	Number of Items	Number Required	Number Selected	Comments
N/A	0	0	0	

Item No. B9.31 – Branch Piping Connection Welds NPS 4 or Larger

Scope of Examination – Volumetric (ultrasonic) and surface (liquid penetrant) examination of all branch piping welds NPS 4 or larger.

Item Number	Number of Items	Number Required	Number Selected	Comments
B9.31	10	10	10	

Item No. B9.32 – Branch Piping Connection Welds Less Than NPS 4

Scope of Examination – Surface (liquid penetrant) examination of all branch piping welds less than NPS 4.

Item Number	Number of Items	Number Required	Number Selected	Comments
B9.32	31	31	31	

Item No. B9.40 – Socket Welds

Scope of Examination – Surface (liquid penetrant) examination of all socket welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B9.40	N/A	N/A	N/A	

Item No. B9.50 – Non-Code Item Number Added for Tracking All Weld Buildup Examinations as Required by Subsections 6.3.6.1, 6.3.6.2, and 6.3.6.3 of This PSI Plan

Scope of Examination – 100% volumetric examination of all weld material.

Item Number	Number of Welds	Number Required	Number Selected	Comments
B9.50	8	8	8	RPV Quicklocs
B9.50	1	1	1	SG CVS nozzle
B9.50	2	2	2	CMT A
B9.50	2	2	2	CMT B
B9.50	13	13	13	Total

2.5.8 Category B-K – Welded Attachments for Vessels, Piping, Pumps, and Valves

2.5.8.1 Pressure Vessel

Item No. B10.10 – Welded Attachments

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of all welded attachments within the IWB boundary (a distance of 't' from the pressure boundary surface) where 't' is the thickness of the pressure-retaining component at the location of the attachment.

Item Number	Number of Items	Number Required	Number Selected	Comments
B10.10	52	52	52	

Examinations are applicable to the following:

- RPV head (9 total required) – (9) integrated head package (IHP) support lugs and (3) IHP support lugs with lifting lugs. However (3) are lifting lugs and NOT under load during operation and therefore NOT subject to Exam.

- PZR (20 total required) – (8) sets of welded attachment pairs associated with upper lateral/ADS module support structure. Four (4) lower support assembly attachments.

- PRHR HX (4 total required) – Current design has 4 supports (Note: The PRHR HX supports system is currently under Design Review for potential re-design. Any documented design changes will be added to the PSI Plan, database, and Isometrics in a subsequent Revision as appropriate.)

- CMT (16 total required) – (8) support columns, per CMT.

2.5.8.2 Piping

Item No. B10.20 – Welded Attachments

Scope of Examination – Surface (liquid penetrant) examination of all welded attachments within the IWB boundary (a distance of 't' from the pressure boundary surface) where 't' is the thickness of the pressure-retaining component at the location of the attachment).

Note: Totals to be finalized when support designs are completed. . Isometrics do not show locations of all Piping System Integral Attachments at this time. When design drawings are complete the ISI isometrics will be revised.

Item Number	Number of Items	Number Required	Number Selected	Comments
B10.20	4	4	4	

2.5.8.3 Pumps

Item No. B10.30 – Welded Attachments

Scope of Examination – Surface (liquid penetrant) examination of all welded attachments within the IWB boundary (a distance of 't' from the pressure boundary surface) where 't' is the thickness of the pressure-retaining component at the location of the attachment).

Item Number	Number of Items	Number Required	Number Selected	Comments
B10.30	N/A	N/A	N/A	

2.5.8.4 Valves

Item No. B10.40 – Welded Attachments

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of all welded attachments within the IWB boundary (a distance of 't' from the pressure boundary surface where 't' is the thickness of the pressure-retaining component at the location of the attachment). Note: Awaiting final As Built Drawings for review.

Item Number	Number of Items	Number Required	Number Selected	Comments
B10.40	TBD	TBD	TBD	

2.5.9 Category B-L-2 – Pump Casings

Item No. B12.20 – Pump Casing

Scope of Examination – Visual (VT-3) examination of the interior surface of the pump casing. Examination is required only when pump is disassembled for maintenance or repair. Examinations are applicable to RCPs 1A, 1B, 2A, and 2B.

Note

This examination category is exempt from the scope of the PSI Plan in accordance with IWB-2200(a).

Item Number	Number of Items	Number Required	Number Selected	Comments
B12.20	4	N/A	N/A	Exempt from PSI

2.5.10 Category B-M-2 – Valve Bodies

Item No. B12.50 – Valve Body Exceeding NPS 4

Scope of Examination – Visual (VT-3) examination of 100% of internal surfaces, limited to at least one valve within each group of valves that are the same size, constructural design (such as globe, gate, or check valves), and manufacturing method, and that perform similar functions in the system (such as containment isolation and system overpressure).

Note: These examinations are not required for PSI.

Item Number	Number of Items	Number Required	Number Selected	Comments
B12.50	51	0	0	Exempt from PSI

2.5.11 Category B-N-1 – Interior of Reactor Vessel

Item No. B13.10 – Reactor Vessel Interior

Scope of Examination – Visual (VT-3) examination of all accessible areas. Areas to be examined shall include the space above and below the reactor core that are made accessible for examination by removal of components during normal refueling outages.

Note

For PSI, this examination shall include the entire RPV interior surface.

Item Number	Number of Items	Number Required	Number Selected	Comments
B13.10	1	1	1	

2.5.12 Category B-N-2 – Welded Core Support Structures and Interior Attachments to Reactor Vessel

Item No. B13.50 – Interior Attachments Within Beltline Region

Scope of Examination – This visual (VT-1) examination category is NOT applicable to **AP1000**.

Item Number	Number of Items	Number Required	Number Selected	Comments
B13.50	N/A	N/A	N/A	

Item No. B13.60 – Interior Attachments Beyond Beltline Region

Scope of Examination – Visual (VT-3) examination of all accessible attachment welds to RPV interior core support and flow skirt supports outside the beltline region.

Item Number	Number of Items	Number Required	Number Selected	Comments
B13.60	12	12	12	

2.5.13 Category B-N-3 – Removable Core Support Structures

Item No. B13.70 – Core Support Structure

Scope of Examination – Visual (VT-3) examination of all accessible surfaces of upper and lower internals, with the structure removed from the RPV.

Item Number	Number of Items	Number Required	Number Selected	Comments
B13.70	1	1	1	(14 Separate areas identified in Exam Schedule)

2.5.14 Category B-O – Pressure-Retaining Welds in Control Rod Drive and Instrument Nozzle Housings

Item No. B14.20 – Reactor Vessel (PWR) Welds in Control Rod Drive (CRD) Housings

Scope of Examination – Volumetric (ultrasonic) or surface (liquid penetrant or eddy-current testing [ECT]) examination of 100% of the (24) peripheral control rod drive housing welds. The surface examination method shall be performed on the inside surface of the penetration nozzle housing welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
B14.20	69	24	24	Peripheral housing welds only

Subject to Code Case N-729-1 – Pressurized Water Reactor (PWR) Examination and Alternative Examination Requirements for Pressure Retaining Welds in Control Rod Drive and Instrument Nozzle Housings.

Preservice examinations for the closure head will include a baseline top-of-the-head visual examination; ultrasonic examinations of the inside diameter surface of each vessel head penetration; eddy current examinations of the surface of head penetration welds, the outside diameter surface of the vessel penetrations, and the inside diameter surface of the penetrations; and post-hydro liquid penetrant examinations of accessible surfaces that have undergone preservice inspection eddy current examinations.

Exam Requirement	Number of Items	Number Required	Number Selected	Comments
Code Case N-729-1	69 + 1 VENT LINE	69 + 1 VENT LINE	69 + 1 VENT LINE	Exams required on all partial-penetration RPV head welds

Item No. B14.21 – Reactor Vessel (PWR) Welds in In-Core Instrumentation Nozzle (ICI) Housings > NPS 2 (DN 50)

Scope of Examination – Volumetric (ultrasonic) or surface (liquid penetrant or ECT) examination of 100% of the (8) alloy 690 Quickloc instrumentation nozzles integral to the closure head with a dissimilar metal weld joining the Quickloc nozzle with a carbon steel weld buildup on the closure head. The surface examination method shall be performed on the inside surface of the penetration nozzle housing welds.

Note

The weld buildup areas will be examined as Augmented Examinations as detailed in Section 6, Paragraph 6.3.1 of this document and are listed in Item B9.50.

Item Number	Number of Items	Number Required	Number Selected	Comments
B14.21	8	8	8	

2.5.15 Category B-P – All Pressure-Retaining Components

Item No. B15.10 – Pressure-Retaining Components (IWB-5222(a))

Scope of Examination – System leakage test and the associated VT-2 examination each refueling outage. This test is not required for the preservice examinations in accordance with IWB-2200(a).

Item Number	Number of Items	Number Required	Number Selected	Comments
B15.10	N/A	N/A	N/A	Excluded from PSI examinations

Item No. B15.20 – Pressure-Retaining Components (IWB-5222 (b))

Scope of Examination – System leakage test and the associated VT-2 examinations at or near the interval. This test is not required for the preservice examinations in accordance with IWB-2200(a).

Item Number	Number of Items	Number Required	Number Selected	Comments
B15.20	N/A	N/A	N/A	Excluded from PSI examinations

2.5.16 Category B-Q – Steam Generator Tubing

Item No. B16.20 – Steam Generator Tubing in U-Tube Design

Scope of Examination – All 10,025 tubes in each SG shall be examined by a volumetric examination method on the hot leg side, U-bend portion, and optionally cold side. The extent and frequency of examination shall be governed by the plant Technical Specifications.

Item Number	Number of Items	Number Required	Number Selected	Comments
B16.20	20,050	20,050	20,050	Exam performed after site cold hydro of the entire Class 1 pressure boundary per Technical Specifications

3 ASME CODE CLASS 2 SYSTEMS/COMPONENTS

The ASME Code Class 2 system boundaries subject to examination are developed based upon the requirements of 10 CFR 50.55a(g)(3)(ii) and the Plant Final Safety Analysis Report (FSAR). The ASME Code Class 2 NSSS systems (or portions of systems containing Class 2 items) subject to examination are identified in Table 3-1 and described in detail below.

Table 3-1. ASME Code Class 2 Systems

System Description	System Identification
Fire Protection System (only at penetrations), exempt per IWC-1222(c)	FPS
Component Cooling Water System, exempt per IWC-1222(c)	CCS
Passive Core Cooling System	PXS
Reactor Coolant System	RCS
Normal Residual Heat Removal System	RNS
Steam Generator System	SGS
Main Steam System	MSS
Main and Startup Feedwater Systems	FWS
Steam Generator Blowdown System (exempt by IWC-1222(a)(1)). NPS 4" piping.	BDS
Spent Fuel System	SFS
Chemical and Volume Control System	CVS
Containment Air Filtration System (exempt – Air System)	VFS
Nonradioactive Vent System (exempt – Air System)	VBS
Central Chilled Water System (at penetration, exempt per (IWC-1222(c))	VWS

3.1 CLASS 2 SYSTEM DESCRIPTIONS

This section provides descriptions for those new **AP1000** Systems that are not described as the conventional Residual Heat Removal (RHR), Emergency Core Cooling (ECC), or Containment Heat Removal (CHR) Systems described in IWC-1221.

- The RNS and PXS (described in detail under Class 1 [Section 2.0] Systems) are the only two systems that fit the description as ECCS and RHR as identified below for Class 2 piping exemptions. These two systems support ECCS functions as described below and their respective piping systems are subject to examination per Paragraph 3.2.1 below.

  – The PXS is primarily a Class 1 System that has NPS 2" lines as part of Class 2. Large-bore lines do not have a Class 2 portion and go directly from the accumulator tanks and discharge valves (Class 3) to the Class 1 portion of the PXS.

  – The RNS is used as a flow path for residual heat removal for other than "Accident Conditions" and is not considered for mitigating accidents in the same sense as conventional (non-passive cooling) PWRs. Class 2 portions of this system are limited to piping from the Class 1 motor-operated valves (MOVs) to the containment penetration and the discharge from the RNS heat exchangers at the containment penetration. These portions of the RNS are included within the scope of Examination Category C-F-1.

  – There are no Class 2 CHR Systems – The only CHR System is the PCS, which is a Class 3 System used to remove containment heat as described under Class 3 System Descriptions.

- The remaining Class 2 Systems in Table 3-1 are subject to examination per Paragraphs IWC-1221, IWC-1222, and IWC-2200.

3.2 ASME CODE EXEMPTIONS

In accordance with IWC-1220, the following components or portions of components are exempted from the volumetric and surface examination requirements of IWC-2200.

3.2.1 Components Within RHR, ECC, and CHR Systems or Portions of Systems[1]

- For systems, except the high-pressure safety injection system in PWR plants:

  – Component and piping segments NPS 4 (DN 100) and smaller.

  – Components and piping segments that have one inlet and one outlet, both of which are NPS 4 (DN 100) and smaller.

1. RHR, ECC, and CHR systems are the Residual Heat Removal, Emergency Core Cooling, and Containment Heat Removal Systems, respectively.

- Components[2] and piping segments that have multiple inlet or multiple outlets, whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 4 (DN 100) pipe.

- For high-pressure safety injection systems in PWR plants:
  - Components and piping segments NPS 1-1/2 (DN40) and smaller
  - Components and piping segments that have one inlet and one outlet, both of which are NPS 1-1/2 (DN40) and smaller.
  - Components[2] and piping segments that have multiple inlet or multiple outlets, whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 1 1/2 (DN 40) pipe. Vessels, piping, pumps, valves, other components, and component connections of any size in statically pressurized, passive (i.e., no pumps) safety injection system[3] of PWR plants. Piping and other components of any size beyond the last shutoff valve in open-ended portions of systems that do not contain water during normal plant operating conditions.

3.2.2 Components Within Systems or Portions of Systems Other Than RHR, ECC, and CHR Systems

- For systems, except auxiliary feedwater systems in PWR plants.
  - Components and piping segments NPS 4 (DN 100) and smaller.
  - Components and piping segments that have one inlet and one outlet, both of which are NPS 4 (DN 100) and smaller.
  - Components[2] and piping segments that have multiple inlets or multiple outlets, whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 4 (DN 100) pipe.

- For auxiliary feedwater systems in PWR plants:
  - Components and piping segments NPS 1-½ (DN 40) and smaller.
  - Components and piping segments that have one inlet and one outlet, both of which are NPS 1-½ (DN 40) and smaller.

2. For heat exchangers, the shell side and tube side may be considered separate components.
3. Statically pressurized, passive safety injection systems of pressurized water reactor plants are typically called:
   (a) Accumulator tank and associated system
   (b) Safety injection tank and associated system
   (c) Core flooding tank and associated system

– Components and piping segments that have multiple inlets or multiple outlets, whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 1-½ (DN 40) pipe.

- Vessels, piping, pumps, valves, and other components and component connections of any size in systems, or portions of systems that operate (when the system function is required) at a pressure equal to or less than 275 psig (1,900 kPa) and at a temperature equal to or less than 200°F (93°C).

  – Piping and other components of any size beyond the last shutoff valve in open-ended portions of systems that do not contain water during normal plant operating conditions.

Note

Requirements for examination of welds in piping ≤ NPS 4 (DN 100) apply to PWR high-pressure safety injection and auxiliary feedwater systems in accordance with the exemption criteria of IWC-1220.

3.3 PRESERVICE EXAMINATIONS

All examinations required by this preservice inspection plan (with the exception of Examination Category C-H of Table IWC-2500-1) for those components initially selected for examination in accordance with the Inspection Program and not exempt from inservice examination by IWC-1220 shall be completed prior to initial plant startup.

Shop and field examinations may serve in lieu of the on-site preservice examinations provided:

- In the case of vessels only, the examination is performed after the hydrostatic test required by Section III has been completed.

- Such examinations are conducted under condition and with equipment and techniques equivalent to those that are expected to be employed for subsequent inservice examinations.

- The shop and field examination records are, or can be, documented and identified in a form consistent with those required in IWA-6000.

3.4 REPAIR/REPLACEMENT ACTIVITIES

All repair/replacement activities for preservice examinations of ASME Code Class 2 components shall be performed in accordance with ASME Section III requirements.

3.5 COMPONENT EXAMINATION DEVELOPMENT

A narrative discussion of Class 2 components subject to examination is provided in detail below. See Appendix A for details of items subject to PSI.

3.5.1 Category C-A – Pressure-Retaining Welds in Pressure Vessels

Note

For welds in vessels with nominal wall thickness of 0.2 in. (15 mm) or less, a surface examination may be applied in lieu of a volumetric examination.

Item No. C1.10 – Shell Circumferential Welds

Scope of Examination – Volumetric (ultrasonic) examination of essentially 100% of cylindrical-shell-to-conical-shell-junction welds and shell (or head)-to-flange welds. Applicable to SGs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
C1.10	2	2	2	SG-A conical shell to upper & lower cylindrical shell welds
C1.10	2	0	0	SG-B conical shell to upper & lower cylindrical shell welds
C1.10	4	2	2	SG-A selected for examination

Item No. C1.20 – Head Circumferential Welds

Scope of Examination – Volumetric (ultrasonic) examination of elliptical head knuckle-to-upper-shell and elliptical-head-to-elliptical-head knuckle weld on each SG for essentially 100% of the weld length. Applicable to SGs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
C1.20	2	2	2	SG-A
C1.20	2	0	0	SG-B
C1.20	4	2	2	2 on each generator, SG-A scheduled

Item No. C1.30 – Tubesheet-to-Shell Welds

Scope of Examination – Volumetric (ultrasonic) examination of the vessel tubesheet-to-lower-shell circumferential welds for essentially 100% of the weld length. Applicable to SGs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
C1.30	1	1	1	SG-A
C130	1	0	0	SG-B
C1.30	2	1	1	1 on each generator, SG-A scheduled

3.5.2 Category C-B – Pressure-Retaining Nozzle Welds in Vessels

Item No. C2.11 – Nozzle-to-Shell (Nozzle-to-Head or Nozzle-to-Nozzle) Weld in Vessels ≤ 1/2 in. Nominal Thickness

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of all nozzle-to-shell (nozzle-to-head or nozzle-to-nozzle) welds for nozzles at terminal ends[4] of piping runs[5].

Item Number	Number of Items	Number Required	Number Selected	Comments
C2.11	N/A	N/A	N/A	

Item No. C2.21 – Nozzle-to-Shell (Nozzle-to-Head or Nozzle-to-Nozzle) Weld for Nozzles Without Reinforcing Plates in Vessels > 1/2 in. Nominal Thickness

Scope of Examination – Volumetric (ultrasonic) and surface (magnetic particle or liquid penetrant) examination of nozzle-to-shell weld for nozzles at terminal ends[4] of piping runs[5]. Applicable to main feedwater nozzle-to-shell weld, and Startup feedwater nozzle-to-shell weld on SGs A and B.

Item Number	Number of Items	Number Required	Number Selected	Comments
C2.21	2	2	2	SG-A MFW & S/U FW nozzles
C2.21	2	0	0	SG-B MFW & S/U FW nozzles
C2.21	4	2	2	SG-A selected for examination

4. Includes nozzles welded to or integrally cast to vessels that connect to piping runs. (Manways and handholes are excluded.)
5. Includes only those piping runs requiring examination under Examination Category C-F.

Item No. C2.22 – Nozzle Inside Radius for Nozzles Without Reinforcing Plates in Vessels > 1/2 in. Nominal Thickness

Scope of Examination – Volumetric (ultrasonic) examination of all nozzles at terminal ends[4] of piping runs[5]. Applicable to startup feedwater nozzle, main feedwater nozzle, and steam outlet nozzle inside radius (IR) sections on SGs A and B.

Note

S/U FW nozzles are 6" dia. and exempt from IR exams. The main steam nozzles do not have an inner radius and are therefore exempt from the IR exam requirements. Reference Drawing APP-MB01-V2-155, Rev. 2. There are no IR exams on the blowdown lines as they are 4" and therefore exempt from examination.

Item Number	Number of Items	Number Required	Number Selected	Comments
SG-A	1	1	1	SG-A MFW nozzle
SG-B	1	0	0	SG-A MFW nozzle
C2.22	2	1	1	SG-A selected for exam

Item No. C2.31 – Reinforcing Plate Welds to Nozzle and Vessel for Nozzles with Reinforcing Plates in Vessels > 1/2 in. Nominal Thickness

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of all nozzle-to-shell (nozzle-to-head or nozzle-to-nozzle) welds for nozzles at terminal ends[4] of piping runs[5].

Item Number	Number of Items	Number Required	Number Selected	Comments
C2.31	N/A	N/A	N/A	

Item No. C2.32 – Nozzle-to-Shell (Nozzle-to-Head or Nozzle-to-Nozzle) Weld for Nozzles with Reinforcing Plates in Vessels > 1/2 in. Nominal Thickness When Inside of Vessel Is Accessible

Scope of Examination – Volumetric (ultrasonic) examination of all nozzle-to-shell (nozzle-to-head or nozzle-to-nozzle) welds for nozzles at terminal ends[4] of piping runs[5].

Item Number	Number of Items	Number Required	Number Selected	Comments
C2.32	N/A	N/A	N/A	

Item No. C2.33 – Nozzle-to-Shell (or Head) Welds When Inside of Vessel Is Inaccessible

Scope of Examination – Visual (VT-2) examination of all terminal ends[4] of piping runs[5].

Item Number	Number of Items	Number Required	Number Selected	Comments
C2.33	N/A	N/A	N/A	

3.5.3 Category C-C – Welded Attachments for Vessels, Piping, Pumps, and Valves

Examination of items in this category is limited to welded attachments meeting the following conditions:

- The attachment is on the outside surface of pressure-retaining component.
- The attachment provides a component support function as defined in NF-1110 of ASME Section III.
- The attachment weld joins the attachment either directly to the surface of the component or to an integrally cast or forged attachment to the component.
- The attachment weld is full penetration, fillet, or partial penetration, either continuous or intermittent.

Item No. C3.10 – Pressure Vessels, Welded Attachments

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of essentially 100% of the weld length for each welded intermediate trunnion support and upper lateral snubber support pad. Applicable to SGs A and B.

Note

For multiple vessels of similar design, function, and service, only one welded attachment of only one of the multiple vessels shall be selected for examination.

Item Number	Number of Items	Number Required	Number Selected	Comments
C3.10	4	1	1	SG-A
C3.10	4	0	0	SG-B
C3.10	8	1	1	SG-A Selected for Exam

3.5.3.1 Piping

Item No. C3.20 – Piping, Welded Attachments

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of essentially 100% of the weld length for each piping welded attachment.

Note: For piping, pumps, and valves, a sample of 10% of the welded attachments associated with the component supports selected for examination under IWF-2510 shall be examined. Isometrics do not show locations of all Piping System Integral Attachments at this time. When design drawings are complete the ISI isometrics will be revised.

Item Number	Number of Items	Number Required	Number Selected	Comments
C3.20	4	1	2	4 x 10% = 1

3.5.3.2 Pumps

Item No. C3.30 – Pumps, Welded Attachments

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of essentially 100% of the weld length for each pump welded attachment. There are no Class 2 pumps.

Item Number	Number of Items	Number Required	Number Selected	Comments
C3.30	N/A	N/A	N/A	There are no Class 2 pumps.

3.5.3.3 Valves

Item No. C3.40 – Valve, Welded Attachments

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of essentially 100% of the weld length for each valve welded attachment.

Note: For piping, pumps, and valves, a sample of 10% of the welded attachments associated with the component supports selected for examination under IWF-2510 shall be examined.
Note: Awaiting final As Built Drawings for review.

Item Number	Number of Items	Number Required	Number Selected	Comments
C3.40	TBD	TBD	TBD	

3.5.4 Category C-D – Pressure-Retaining Bolting Greater Than 2 Inches in Diameter

3.5.4.1 Pressure Vessels

Item No. C4.10 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of all studs/bolts greater than 2 in. diameter. For bolts/studs that are removed for examination, a surface (magnetic particle or liquid penetrant) examination may be performed in lieu of the volumetric (ultrasonic) examination.

Item Number	Number of Items	Number Required	Number Selected	Comments
C4.10	1	1	1	

3.5.4.2 Piping

Item No. C4.20 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of all studs/bolts greater than 2 in. diameter. For bolts/studs that are removed for examination, a surface (magnetic particle or liquid penetrant) examination may be performed in lieu of the volumetric (ultrasonic) examination.

Item Number	Number of Items	Number Required	Number Selected	Comments
C4.20	N/A	N/A	N/A	All less than 2.0"

3.5.4.3 Pumps

Item No. C4.30 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of all studs/bolts greater than 2 in. diameter. For bolts/studs that are removed for examination, a surface (magnetic particle or liquid penetrant) examination may be performed in lieu of the volumetric examination.

Item Number	Number of Items	Number Required	Number Selected	Comments
C4.30	N/A	N/A	N/A	No Class 2 pumps

3.5.4.4 Valves

Item No. C4.40 – Bolts and Studs

Scope of Examination – Volumetric (ultrasonic) examination of all studs/bolts greater than 2 in. diameter. For bolts/studs that are removed for examination, a surface (magnetic particle or liquid penetrant) examination may be performed in lieu of the volumetric (ultrasonic) examination.

Item Number	Number of Items	Number Required	Number Selected	Comments
C4.40	1	1	1	

3.5.5 Category C-F-1 – Pressure-Retaining Welds in Austenitic Stainless Steel or High-Alloy Piping

Summary Table						
System	**Item #**	**Size (in)**	**Exempt but Counted**	**Exempt per IWC-1221**	**Subject to Code Exam**	**BEZ Exams Required**
PXS	N/A	2	N/A	YES	0	0
CVS	C5.21	3	34	N/A	11 (> NOP)	11
CVS	N/A	2	0	YES	0	0
SFS	N/A	4	0	YES	0	0
SFS	C5.11	6	10	N/A	0	0
RNS	C5.11	8	10	N/A	13	0
RNS	C5.11	10	15	N/A	32	0
TOTALS			69		56	11

125 x 7.5 % = 10 welds vs. 28 Code Minimum required.

Selection Basis:

- 3" BEZ (C5.21 WELDS) – 20% of population, therefore select = 4
- 8" (C5.11 WELDS) – 30% of population, therefore select = 6
- 10" (C5.11 WELDS) – 50% of population, therefore select = 18

Item No. N/A – Piping Welds Excluded from Examination Under Examination Category C-F-1 Circumferential Welds (> 4" NPS and < .375" T)

Scope of Examination – Some welds not exempted by IWC-1220 are not required to be examined per Examination Category C-F-1. These welds, however, shall be included in the total weld count for which the 7.5% sample rate is applied.

Note

Item # C5.00 is not a Code Item Number but was created for use in the Examination Database to identify those welds exempt from examination but included in the weld counts.

Item Number	Number of Items	Number Required	Number Selected	Comments
C5.00	35	0	0	Excluded

Item No. C5.11 – Piping Welds ≥ 3/8 in. Nominal Wall Thickness for Piping > NPS 4 Circumferential Welds

Scope of Examination – Volumetric (ultrasonic) and surface (liquid penetrant) examination of 100% of each weld. Examination for welds in piping shall include 7.5%, but not less than 28 welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
C5.11	45	24	24	

Item No. C5.21 – Piping Welds > 1/5 in. Nominal Wall Thickness for Piping ≥ NPS 2 and ≤ NPS 4 Circumferential Welds

Scope of Examination – Volumetric (ultrasonic) and surface (liquid penetrant) examination of 100% of each weld. Examination for welds in piping shall include 7.5%, but not less than 28 welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
C5.21	39	4	4	

Item No. C5.30 – Socket Welds

Scope of Examination – Surface (liquid penetrant) examination of 100% of each weld.

Item Number	Number of Items	Number Required	Number Selected	Comments
C5.30	N/A	N/A	N/A	

Item No. C5.41 – Pipe Branch Connections of Branch Piping ≥ NPS 2 Circumferential Welds

Scope of Examination – Surface (liquid penetrant) examination of 100% of each weld.

Item Number	Number of Items	Number Required	Number Selected	Comments
C5.41	0	0	0	

3.5.6 Category C-F-2 – Pressure-Retaining Welds in Carbon or Low-Alloy Steel Piping

System	Item Number	Size (in)	Total Number	Number Selected
MSS A & B	C5.51	38	22	5
		12	6	2
		6	8	2
	C5.81	38 x 8	12	2
		38 x 6	2	1
		38 x 12	2	1
FWS A & B	C5.51	20	38	10
S/U/FWS A & B	C5.51	6	24	5
BDS A & B	Exempt (4")			
FPS Exempt (IWC-1222)	By pressure & Temp.			
VWS Exempt (IWC-1222)	By pressure & Temp.			
VFS Exempt (IWC-1222)	By pressure & Temp.			
VBS Exempt (IWC-1222)	By pressure & Temp.			
CCS Exempt (IWC-1222)	By pressure & Temp.			
Totals			114	28

114 x 7.5% = 8 welds vs. 28 Code Minimum required.

Selection Basis:

- MSS (36 – C5.51 and 16 – C5.81 WELDS) – 46% of population, therefore select = 13
- MFW (38 – C5.51 WELDS) – 33% of population, therefore select = 10
- S/U FW (24 – C5.81 WELDS) – 21% of population, therefore select = 5

Item No. N/A – Piping Welds Excluded from Examination Under Examination Category C-F-2 Circumferential Welds

Scope of Examination – Some welds not exempted by IWC-1220 are not required to be examined per Examination Category C-F-2. These welds, however, shall be included in the total weld count for which the 7.5% sample rate is applied.

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
N/A	0	0	0	Excluded

Item No. C5.51 – Piping Welds ≥ 3/8 in. Nominal Wall Thickness for Piping > NPS 4 Circumferential Welds

Scope of Examination – Volumetric (ultrasonic) and surface (magnetic particle or liquid penetrant) examination of 100% of each weld. Examination selection shall include 7.5%, but not less than 28 welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
C5.51	107	24	24	

Item No. C5.61 – Piping Welds > 1/5 in. Nominal Wall Thickness for Piping ≥ NPS 2 and ≤ NPS 4 Circumferential Welds

Scope of Examination – Volumetric (ultrasonic) and surface (magnetic particle or liquid penetrant) examination of 100% of each weld. Examination selection shall include 7.5%, but not less than 28 welds.

Item Number	Number of Items	Number Required	Number Selected	Comments
C5.61	N/A	N/A	N/A	

Item No. C5.70 – Socket Welds

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of 100% of each weld.

Item Number	Number of Items	Number Required	Number Selected	Comments
C5.70	0	N/A	N/A	

Item No. C5.81 – Pipe Branch Connection of Branch Piping ≥ NPS 2 Circumferential Welds

Scope of Examination – Surface (magnetic particle or liquid penetrant) examination of 100% of each weld.

Item Number	Number of Items	Number Required	Number Selected	Comments
C5.81	18	4	4	

Note
Requirements for examination of welds in piping ≤ NPS 4 (DN 100) apply to PWR high-pressure safety injection and auxiliary feedwater systems in accordance with the exemption criteria of IWC-1220.

3.5.7 Category C-H – All Pressure-Retaining Components

Item No. C7.10 – Pressure-Retaining Components

Scope of Examination – System Leakage Test (IWC-5220) and the associated VT-2 examinations are not required for the PSI Plan in accordance with IWB-2200(a).

Item Number	Number of Items	Number Required	Number Selected	Comments
C7.10	N/A	N/A	N/A	Excluded from PSI examinations

4 ASME CODE CLASS 3 SYSTEMS/COMPONENTS

The ASME Code Class 3 system boundaries subject to examination are developed based upon the requirements of 10 CFR 50.55a(g)(3)(ii) and the plant Final Safety Analysis Report (FSAR). The ASME Code Class 3 systems (or portions of systems containing Class 3 items) subject to examination are identified in Table 4-1 and described in detail below.

Table 4-1. ASME Code Class 3 Systems

System Description	System Identification
Reactor Coolant System	RCS
Passive Containment Cooling System	PCS
Normal Residual Heat Removal System	RNS
Passive Core Cooling System	PXS
Circulating Water System	CWS
Spent Fuel Pool Cooling System	SFS
Main Steam System	MSS
Main Feedwater System	FWS
Blowdown System	BDS
Startup Feedwater System	S/U FWS

4.1 CLASS 3 SYSTEM DESCRIPTIONS

This section provides descriptions for those new **AP1000** Systems that are not described as the conventional RHR, ECC, or CHR Systems in IWD-1210 Safety-Related System Descriptions.

Other systems identified in Table 4-1 perform functions consistent with conventional PWR Systems or have been previously described under Class 1 and 2 System descriptions in Sections 2.1 and 3.1 of this document.

4.1.1 PCS Safety-Related Functions

4.1.1.1 Spent Fuel Pool Inventory Make-up

The PCS provides a flow path for long-term water make-up from the PCWST to the spent fuel pool process monitoring.

The PCS monitors the containment conditions that provide indications of the need to initiate various safeguards functions, including actuation of the PCS or the VFS Vacuum Relief System.

The PCS monitors the process parameters within the PCS required by the operators to monitor status of the system operations and to perform manual operations if necessary during safe shutdown and accident operations.

4.1.1.2 Containment Vessel Heat Removal

The PCS supports limiting the release of fission products by transferring heat from the containment atmosphere to the environment. This is accomplished by providing a volume of water that covers the containment shell to facilitate the transfer of heat to the countercurrent airflow and subsequently to the environment. The removal of heat from within containment keeps the internal containment pressure within its design limits, thus ensuring containment integrity. The safety-related functions associated with heat removal are required to provide the necessary cooling to ensure containment integrity by preventing internal overpressurization.

The heat removal function is provided following either a safe shutdown event or a design basis accident (DBA).

During a safe shutdown event, the core decay heat is released to the in-containment refueling water storage tank (IRWST) through the PRHR heat exchanger (PRHR HX), both of which are contained within the Passive Core Cooling System (PXS). The heat is subsequently released to the containment atmosphere as the IRWST attains saturation conditions. If containment pressure is increased to above the PCS setpoint, the Protection and Safety Monitoring System (PMS) will automatically actuate the PCS to begin containment cooling.

During a DBA in which large amounts of energy are released immediately from the RCPB to containment, for example a Main Steam Line Break (MSLB), the PCS is required to facilitate the transfer of heat to the outside environment to ensure containment integrity is maintained.

During a safe shutdown or DBA scenario where energy is slowly released from within the RCPB, for example a small leak across the RCPB, the PXS provides for reactor coolant make-up using the core make-up tanks and removal of decay heat to the IRWST by the PRHR HX. The IRWST eventually attains saturation conditions and begins steaming to containment. The PCS is required to facilitate the transfer of heat to the outside environment to ensure containment integrity is maintained.

During a DBA involving the loss of RCS integrity, the PCS, in conjunction with the PXS, provides a continuous source of make-up to the RCS by condensing steam released to containment, which is directed back to the IRWST to provide passive injection to the RCS.

The initial inventory of PCS cooling water in the PCWST is sufficient for 72 hours of flow without replenishment or operator action. A safety-related flow path from a blind-flange connection to either the PCWST or directly to the distribution bucket allows for use of offsite water supplies and provides a post-72-hour source of containment cooling water.

4.1.1.3 Spent Fuel Pool Inventory Make-Up

The PCS provides a safety-related flow path from the PCWST to the spent fuel pool. In addition, a safety-related flow path from a blind-flange connection to the spent fuel pool is required for use with offsite water sources for spent fuel pool make-up. In the event spent fuel pool cooling is lost, the spent fuel pool will reach saturation conditions and continue to provide cooling to the spent fuel by boiling the water inventory within the pool. The cask washdown pit, cask loading pit, and/or the PCWST can provide the necessary make-up to the pool over time to ensure the spent fuel is not uncovered.

4.2 ASME CODE EXEMPTIONS

The following components or portions of components are exempted from the VT-1 visual examination requirements:

- Components and piping segments NPS 4 (DN 100) and smaller
- Components and piping segments that have one inlet and one outlet, both of which are NPS 4 (DN 100) and smaller
- Components[1] and piping segments that have multiple inlets or multiple outlets whose cumulative pipe cross-sectional area does not exceed the cross-sectional area defined by the OD of NPS 4 (DN 100) pipe
- Components that operate at a pressure of 275 psig (1,900 kPa) or less and at a temperature of 200°F (95°C) or less in systems (or portions of systems) whose function is not required in support of reactor residual heat removal, containment heat removal, and emergency core cooling
- Welds or portions of welds that are inaccessible due to being encased in concrete, buried underground, located inside a penetration, or encapsulated by guard pipe

1. For heat exchangers, the shell side and tube side may be considered separate components.

4.2.1 Exceptions

The following systems have an ASME Code Classification break (Class 3 to NSR) at an anchor at the Auxiliary Building/Turbine Building Wall interface that is not in conformance with Regulatory Guide 1.26, Revision 4, which requires a Class break at an isolation valve.

The systems involved are:

- Main Steam System (MSS)
- Feedwater System (FWS)
- Startup Feedwater System (S/U FWS)
- Blowdown System (BDS)

An E&DCR (APP-SGS-GEF-344,Rev. 0) has been issued to clarify in the SGS - SSD the portions of these three systems have been upgraded due to being part of the Break Exclusion Zone Piping and are therefore not subject to ASME Section XI, Class 3 rules for examination and the Class Break at the Aux. Building to Turbine Building wall is acceptable. No examinations into the Turbine Building are required.

Changes to the SGS- SSD are as follows:

3.3.2 Safety Class C Equipment

The portion of the SGS from the containment isolation valve out to the interface with the adjoining system has a function to support the Safety Class B containment isolation valves and therefore must be Seismic Category I. Due to the Siesmic Category I classifcation, this portion of the system is specified as Safety Class C. These sections of lines, out to the first support, are considered part of the break exclusion zone as defined in Reference 12.1.1.1. This section of the standard review plan requires that the piping to which the classification is being applied must be safety class piping.

The main steam safety valve relief piping downstream of the relief valves is designated as Safety Class C to assure the capability of the safety-related function of the main steam safety valves, which is to provide overpressure protection to the steam generator and steam lines. This is consistent with Reference 12.2.1.9. This designation ensures that the piping will be Seismic Category I and will be available following a seismic event.

4.3 PRESERVICE EXAMINATIONS

All examinations required (with the exception of Examination Category D-B) shall be performed completely, once as a preservice examination requirement prior to initial plant startup.

4.3.1 Class 3 Components

Pressure testing and the associated VT-2 examinations for Examination Category D-B are not required to be performed for PSI.

4.3.2 2 Component Supports

For ASME Class 3 welded attachments, all integrally welded attachments to vessels, piping, pumps, and valves shall be visually examined per the requirements of Table IWD-2500-1, Category D-A for PSI. Extent of PSI examinations shall be in accordance with Table IWD-2500-1, Category D-A, Note 3.

4.4 REPAIR/REPLACEMENT ACTIVITIES

All repair/replacement activities for preservice examinations of ASME Code Class 3 components shall be performed in accordance with ASME Section III requirements. See Appendix A for details of items subject to PSI.

4.5 COMPONENT/PIPING EXAMINATION DEVELOPMENT

4.5.1 Examination Category D-A, Welded Attachments for Vessels, Piping, Pumps, and Valves

Item No. D1.10 – Pressure Vessel Welded Attachments

Scope of Examination – Visual VT-1 examination of 100% of required areas of each welded attachment.

Item Number	Number of Items	Number Required	Number Selected	Comments
D1.10	1	1	1	

Item No. D1.20 – Piping Welded Attachments

Scope of Examination – Visual VT-1 examination of 100% of required areas of each welded attachment. A 10% sample is required by Table IWD-2500-1.

Item Number	Number of Items	Number Required	Number Selected	Comments
D1.20	30	3	4	30 x 10% = 3

Note
Isometrics do not show locations of all Piping System Integral Attachments at this time.
When design drawings are complete, the ISI isometrics will be revised.

Item No. D1.30 – Pump Welded Attachments

Scope of Examination – Visual VT-1 examination of 100% of required areas of each welded attachment.

Item Number	Number of Items	Number Required	Number Selected	Comments

D1.30	N/A	N/A	N/A	

Item No. D1.40 – Valve Welded Attachments

Scope of Examination – Visual VT-1 examination of 100% of required areas of each welded attachment.

Note: Awaiting final As Built Drawings for review.

Item Number	Number of Items	Number Required	Number Selected	Comments
D1.40	TBD	TBD	TBD	

4.5.2 Examination Category D-B, All Pressure-Retaining Components

Item No. D2.10 – Pressure-Retaining Components

Scope of Examination – System leakage test (IWD-5220) and associated visual (VT-2) examination of the pressure-retaining boundary.

Item Number	Number of Items	Number Required	Number Selected	Comments
D2.10	N/A	N/A	N/A	Excluded from PSI examinations

5 ASME CODE CLASS 1, 2, AND 3 COMPONENT SUPPORTS

This section provides the requirements for inspection of ASME Code Class 1, 2, 3, and MC component supports and shall apply to the following:

- Piping supports
- Supports other than piping supports

5.1 EXEMPTIONS

Supports exempt from the examination requirements are those connected to piping and other items exempted from volumetric, surface, or VT-1 or VT-3 visual examinations. In addition, portions of supports that are inaccessible by being encased in concrete, buried underground, or encapsulated by guard pipe are also exempt from the examination requirements.

5.2 PRESERVICE EXAMINATIONS

5.2.1 Class 1, 2, and 3 Component Supports

All examinations shall be performed completely, once as a preservice examination. These preservice examinations shall be extended to include 100% of all supports not exempted.

Examinations for systems that operate at a temperature greater than 200°F (93°C) during normal plant operation shall be performed during or following initial system heatup and cooldown. Other examinations may be performed prior to initial system heatup and cooldown.

5.3 REPAIR/REPLACEMENT ACTIVITIES

All repair/replacement activities for preservice examinations of ASME Code Class 1, 2, and 3 component supports shall be performed in accordance with ASME Section III requirements. See Appendix A for details of items subject to PSI.

5.4 COMPONENT/PIPING EXAMINATION DEVELOPMENT

5.4.1 Category F-A – Supports

Item No. F1.10 – Class 1 Piping Supports

Scope of Examination – Visual VT-3 examination of 100% of Class 1 supports.

Item No. F1.10A – Class 1 Piping Supports (supports such as one-directional rod hangers)

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
F1.10A	0	0	0	

Item No. F1.10B – Class 1 Piping Supports (supports such as multidirectional restraints)

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
F1.10B	129	129	129	

Item No. F1.10C – Class 1 Piping Supports (supports that allow thermal movement, such as springs)

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
F1.10C	42	42	42	

Item No. F1.20 – Class 2 Piping Supports

Scope of Examination – Visual VT-3 examination of 100% of Class 2 supports.

Item No. F1.20A – Class 2 Piping Supports (supports such as one-directional rod hangers)

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
F1.20A	0	0	0	

Item No. F1.20B – Class 2 Piping Supports (supports such as multidirectional restraints)

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
F1.20B	50	50	50	

Item No. F1.20C – Class 2 Piping Supports (supports that allow thermal movement, such as springs)

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
F1.20C	20	20	20	

Item No. F1.30 – Class 3 Piping Supports

Scope of Examination – Visual VT-3 examination of 100% of Class 3 supports.

Item No. F1.30A – Class 3 Piping Supports (supports such as one-directional rod hangers)

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
F1.30A	0	0	0	

Item No. F1.30B – Class 3 Piping Supports (supports such as multidirectional restraints)

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
F1.30B	140	140	140	

Item No. F1.30C – Class 3 Piping Supports (supports that allow thermal movement, such as springs)

System/Isometric Number	Number of Items	Number Required	Number Selected	Comments
F1.30C	7	7	7	

Item No. F1.40 – Supports Other Than Piping Supports

Scope of Examination – Visual (VT-3) examination of 100% of Class 1, 2, 3, and MC supports. Applicable to the RPV, SGs A and B, pressurizer, CMTs A and B, and PRHR heat exchanger.

Item Number	Number of Items	Number Required	Number Selected	Comments
F1.40	43	43	43	

5.4.1.1 Reactor Vessel Supports

The reactor vessel is supported by four supports located under the cold legs, which are spaced 90 degrees apart in the primary shield wall. The supports are designed to provide for radial thermal growth of the RCS, including the reactor vessel, but they prevent the vessel from lateral and torsional movement. The loads are carried by the reactor vessel supports to bolts and embedded steel structures.

5.4.1.2 Steam Generator Supports

The SG vertical support consists of a single vertical column extending from the SG compartment floor to the bottom of the SG channel head. The column is constructed of heavy plate sections and is pinned at both ends to permit unrestricted radial displacement of the SG during plant heatup and cooldown. The location of this column is such that it will allow full access to the SG for routine maintenance activities. It is located a sufficient distance away from the RCP motors to permit pump maintenance and inservice inspection.

The lower SG horizontal support is located at the top of the vertical column. It consists of a tension/compression strut oriented approximately perpendicular to the hot leg. The strut is pinned at both the wall bracket and the vertical column to permit movement of the generator during plant heatup and cooldown, and acts as a rigid strut under dynamic loads. The upper SG horizontal support in the direction of the hot leg is located on the upper shell just above the transition cone. It consists of two large hydraulic snubbers oriented parallel with the hot leg centerline. One snubber is mounted on each side of the generator on top of the SG compartment wall. The hydraulic snubbers are valved to permit SG movement for thermal transition conditions and to “lock-up.”

The upper SG horizontal support in the direction normal to the hot leg is located on the lower shell approximately mid-way between the transition cone and the tubesheet. It consists of two rigid tension/compression struts oriented perpendicular to the hot leg. The two rigid struts are mounted on the SG compartment wall at the elevation of the operating deck. The SG loads are transferred to the struts and snubbers through trunnions on the generator shell.

The SG supports are anchored using anchor bolts or steel weldments embedded in the concrete, designed in accordance with Appendix B of ACI 349. The lower portion of the column pedestal, embedded in the concrete, transfers the vertical load into the reinforced concrete basemat. The lower and intermediate horizontal supports are located so that the loads are transferred into the plane of the adjacent floor. The upper supports are located so that the loads are transferred into the plane of the SG compartment walls.

5.4.1.3 Reactor Coolant Pump Supports

Because the reactor coolant pumps are integrated into the SG channel head, they do not have individual supports. They are supported by the SGs.

5.4.1.4 Pressurizer Supports

The pressurizer is supported by four columns mounted from the pressurizer compartment floor. A lateral support is provided at the top of the columns. This lateral support consists of eight struts connecting it to the pressurizer compartment walls. A lateral support is also provided on the upper portion of the pressurizer. This lateral support consists of a ring girder around the pressurizer and eight struts connecting it to the pressurizer compartment walls.

5.4.1.5 PRHR Heat Exchanger

The passive heat removal heat exchanger includes support-plate-to-support-shell weld support, shell-to-mounting-ring weld, mounting ring welds, mounting-ring-to-IRWST-liner-shell weld, and support structure to include housing upper and lower supports and extended flange welded attachments.

(**Note**: The PRHRHX supports system is currently under Design Review for potential re-design, any documented design changes will be added to the PSI Plan, database and Isometrics in a subsequent Revision as appropriate).

5.4.1.6 Core Make-Up Tanks (Class 1 Pressure Vessel)

The core make-up tank consists of eight support columns including integral welded column base plates with each support column fillet welded to a support pad welded directly to the CMT lower head petal section.

5.4.1.7 Integrated Head Package (IHP) Supports

Details of the IHP Supports (isos & database entries) are under development and will be added at the next Revision of the VCS2 PSI Program. There is one set of Safety Related supports at the top of the CRDM Extension Tubes and are considered as ASME Section III – Category N-F.

6 AUGMENTED INSPECTIONS/EXAMINATIONS

Augmented inservice inspection requirements are those examinations that are specified by documents other than the ASME Code Section XI. Typically, these augmented examinations are at the request of the U.S. NRC through such mechanisms as Bulletins, Notices, and Regulatory Guides. The augmented examinations addressed in this PSI Plan include the following.

6.1 MATERIAL RELIABILITY PROGRAM REQUIREMENTS FOR PWRS

The following documents have been reviewed for applicability to the **AP1000** and the results are recorded below.

6.1.1 ASME Section XI Code Case N-770-1

"Alternative Examination Requirements and Acceptance Standards for Class 1 PWR Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UN W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities – Section XI, Division 1"

Note

Not applicable to the **AP1000** Design as none of the specified materials are utilized in the fabrication of the Class 1 Systems.

6.1.2 MRP-146

Management of Thermal Fatigue in Normally Stagnant Non-Isolable Reactor Coolant System Branch Lines. See Section 6.1.4 for applicability.

6.1.3 MRP-192

Materials Reliability Program Assessment of RHR Mixing Tee Thermal Fatigue in PWR Plants. See subsection 6.1.4 for applicability.

6.1.4 NRC Bulletin – 88-08

Thermal Stresses in Piping Connected to Reactor Coolant Systems

The Westinghouse **AP1000** DCD addresses thermal fatigue associated with documents referenced in 6.1.2, 6.1.3, and 6.1.4 as detailed below. Those piping systems (lines) subject to thermal fatigue are identified below.

6.1.4.1 Thermal Stratification, Cycling, and Striping

Thermal stratification, cycling, and striping (TASCS) are phenomena that have resulted in pipe cracking at nuclear power plants. As a result of these incidents, the U.S. NRC has issued several bulletins, which are discussed below.

Thermal stratification may occur in piping when flow rates are low and adequate mixing of hot and cold fluid layers does not occur. Thermal cycling due to stratification may occur because of leaking valves or plant operation. Thermal striping is a cyclic mechanism caused by instabilities in the hot-cold fluid interface in stratified fluid during relatively steady flow conditions. The design of piping and component nozzles in the **AP1000** includes provisions to minimize the potential for and the effects of thermal stratification and cycling. [*Piping and component supports are designed and evaluated for the thermal expansion of the piping resulting from potential stratification modes. The evaluation includes consideration of the information on thermal cycling and thermal stratification included in NRC Bulletins 79-13, 88-08, and 88-11, and other applicable design standards.*]

For adverse stresses from leakage to occur in unisolable piping, three conditions are necessary:

1. A component with the potential for leakage must exist. In most cases, this will be a valve.

2. A pressure differential capable of forcing leakage through the pressure-retaining component must exist. Leakage in unisolable piping sections may be directed toward the RCS ("inleakage") or from the RCS ("outleakage").

3. A temperature differential between the unisolable piping section and the leakage source sufficient to produce significant stresses in the event of leakage must exist. For cases involving inleakage, this could result from a cold leakage entering hot sections of unisolable piping. For cases involving outleakage, this could result from hot leakage from the RCS entering cold sections of unisolable piping.

The criteria used in the evaluation of the **AP1000** systems design for susceptibility to adverse stresses from valve leakage are summarized below:

- Single isolation valves can leak; they are susceptible regardless of design except for explosively actuated valves.

- It is generally assumed that two or more closed valves in series are sufficient to limit the amount of leakage to a magnitude that would have a negligible effect on piping integrity.

- Valves that have external operators may leak through the valve seat and packing. In the case of leaking through the packing, additional in-series closed valves may not be beneficial.

- A positive pressure difference should be considered as a possible leak source.

- Cross-leakage is possible between interconnected lines that are attached to different reactor coolant loop pipes and are isolated by single check valves.

- Sections of piping systems that have a slope of greater than 45 degrees from the horizontal plane are not subject to thermal stratification, cycling, and striping thermal loadings.

- Pipe lines, or sections of lines less than or equal to 1-inch nominal size, do not require a thermal stratification, cycling, and striping evaluation.

The unisolable portions of the following lines connected to the RCS have been reviewed (as part of the DCD **AP1000** certification) and are not susceptible to thermal stratification, cycling, or striping:

- Core make-up lines from the cold legs to the core make-up tanks
- Auxiliary pressurizer spray from the pressurizer spray line to the auxiliary spray check valve
- Chemical and volume control purification line from the PRHR line to the charging valve
- Pressurizer safety valve lines from the pressurizer to the safety valve
- Pressurizer spray lines from the cold legs to the pressurizer
- Automatic depressurization Stage 1, 2, and 3 lines from the pressurizer to the depressurization valves

The unisolable portions of the following lines connected to the RCS have been reviewed (as part of the DCD **AP1000** certification) and are determined to be susceptible to thermal stratification, cycling, or striping:

- PRHR line from the PRHR heat exchanger to the SG channel head
- Automatic depressurization Stage 4 lines from the hot legs to the Stage 4 depressurization valves
- PRHR lines from the hot leg to the PRHR heat exchanger
- Chemical and volume control purification line from the pressurizer spray line to the letdown valve
- Normal residual heat removal suction lines from the hot legs to the isolation valves

DVI lines from the reactor vessel nozzle up to the accumulator injection valves, core make-up injection valves, IRWST injection valves, and normal residual heat removal injection valves.

Analyses of these lines are performed to demonstrate that the applicable requirements of the ASME Code Section III are met. This analysis includes consideration of plant operation and thermal stratification using temperature distributions that are developed from finite element fluid flow and heat transfer analysis.

The final design reports for ASME components, including reconciliation of the as-built piping, are discussed in the **AP1000** DCD subsection 3.9.8. This reconciliation includes verification of the thermal cycling and stratification loadings considered in the stress analysis. Effect of analysis on added augmented scope for PSI examinations shall be determined when the Final Design Report is completed.

6.2 CODE OF FEDERAL REGULATIONS

Title 10, Code of Federal Regulations Section 50.55a, "Codes and Standards" was revised on September 10, 2008, with an effective date of October 10, 2008. Two Code Cases were required to be incorporated into the ISI programs of PWRs by December 31, 2008.

6.2.1 ASME Code Case N-722

Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated With Alloy 600/82/182 Materials.

Source: 10 CFR 50.55a (December 11, 2014), 10 CFR 50.55a(g)(6)(ii)(E)(1)

Note
Not applicable as there are no Alloy 600/82/182 materials associated with the fabrication of the **AP1000** pressure-retaining welds.

6.2.2 ASME Code Case N-729-1

Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds.

The visual and volumetric examination requirements of Code Case N-729-1, "Alternative Examination Requirements for PWR Reactor Vessel Upper Heads With Nozzles Having Pressure-Retaining Partial-Penetration Welds" and the additional requirements of 10 CFR 50.55a are mandatory.

Source: January 10, 2012, 10 CFR 50.55a(g)(6)(ii)(D)(1)

6.3 BREAK EXCLUSION ZONE

6.3.1 High-Energy Piping

Systems or portions of systems in which the maximum normal operating temperature exceeds 200°F or the maximum normal operating pressure exceeds 275 psig, except that lines that exceed 200°F or 275 psig for 2 percent or less of the time that the system is in operation or less than 1 percent of the plant operation time are considered moderate energy.

Table 6.3-1. High-Energy Piping Systems

Boundary Diagram Number	System Title	Rev.
APP-RCS-M6-001	Reactor Coolant System Piping and Instrument Diagram	13
APP-RCS-M6-002	Reactor Coolant System Piping and Instrument Diagram	13
APP-SGS-M6-001	Steam Generator System Piping and Instrument Diagram	13
APP-SGS-M6-002	Steam Generator System Piping and Instrument Diagram	13
APP-PXS-M6-001	Passive Core Cooling System Piping and Instrument Diagram	9
APP-PXS-M6-002	Passive Core Cooling System Piping and Instrument Diagram	9
APP-CVS-M6-001	Chemical and Volume Control System Piping and Instrument Diagram	11
APP-CVS-M6-002	Chemical and Volume Control System Piping and Instrument Diagram	11
APP-RNS-M6-001	Normal Residual Heat Removal System Piping and Instrument Diagram	9

6.3.2 Moderate-Energy Piping

Systems or portions of systems pressurized above atmospheric pressure during normal plant conditions that are not classified as high energy.

6.3.3 Inservice Inspections

Inservice inspections shall include examination of circumferential pipe welds within the Break Exclusion Zone (see below).

A 100% volumetric inservice examination shall be performed in accordance with IWA-2400, ASME XI. This includes ASME Class 2 and Class 3 piping equal to and greater than a 3 in. nominal diameter.

6.3.4 Augmented Piping Examination Requirements

6.3.4.1 Break Exclusion Zone Examination Requirements

DCD 6.6.8, Augmented In-service Inspection to Protect Against Postulated Piping Failures (BEZ)

An augmented inspection program is developed for high-energy fluid systems piping between containment isolation valves. Such a program is also developed where no isolation valve is used inside containment between the first rigid pipe connection to the containment penetration or the first pipe whip restraint inside containment and the outside isolation valve. This program provides for 100 percent volumetric examination of welds in the affected piping during each inspection interval, conducted according to the ASME Code Section XI. The program covers the break exclusion portion of high-energy fluid systems described in **AP1000** DCD subsections 3.6.1 and 3.6.2.

Note

There is no requirement for an augmented inspection of ASME Code Section III Class 1, 2, or 3 pipe to address erosion-corrosion-induced pipe wall thinning. Class 1, 2, and 3 pipe containing single-phase water or two-phase steam and water are fabricated of erosion-corrosion-resistant material.

Areas of system piping where no breaks, except as noted in DCD subsections 3.6.1.3 and 3.6.1.2.2, are postulated as follows:

- The main steam piping from the containment penetration flued head outboard weld to the upstream weld of the auxiliary building anchor downstream of the main steam isolation valves, including the main steam safety valves and the connecting branch piping
- The main feedwater piping from the containment penetration flued head outboard weld to the auxiliary building anchor upstream of the isolation valve
- The startup feedwater piping from the containment penetration to the auxiliary building anchor upstream of the isolation valve
- The SG blowdown piping from the containment to auxiliary building anchor downstream of the isolation valve
- The chemical and volume control system make-up piping from the containment to the outboard isolation valve
- The chemical and volume control system make-up piping from the containment to the inboard isolation valve

Note

Preservice and Inservice Inspection Programs shall include 100% volumetric examination of the welds identified above. See Table 6.3-3 for details of the piping welds to be examined for PSI to meet BEZ requirements.

6.3.4.2 Leak-Before-Break Examination Requirements

DCD Design Criteria for Leak-Before-Break

The methods and criteria to evaluate LBB in the **AP1000** are consistent with the guidance in NUREG-1061 and Draft Standard Review Plan 3.6.3. The application of the mechanistic pipe break in **AP1000** requires that the following design requirements are met:

- Preservice inspection of welds is required

- For ASME Code Class 1, Class 2, and Class 3 systems for which LBB is demonstrated, the ASME Code Section III and Section XI preservice and inservice inspection requirements will provide for the integrity of each system. The weld and welder qualification, and weld inspection requirements for ASME Code Section III, Class 3 LBB lines are equivalent to the requirements for Class 2. The inservice inspection requirement for each Class 3 LBB line includes a volumetric inspection equivalent to the requirements for Class 2 for the weld at or closest to the high-stress location

DCD Differences in Inspection Criteria for Class 1, 2, and 3 Systems

Class 1, 2, and 3 systems are subjected to inservice inspection requirements from ASME Code Section XI. For Class 1 piping, terminal ends and dissimilar-metal welds are volumetrically inspected, along with other locations, to total 25 percent of the welds. For Class 2 piping, the requirement is to volumetrically inspect the terminal ends and other locations to total 7.5 percent of the welds. For Class 3 systems (the only Class 3 piping is in the accumulator line, which is always at room temperature), the system receives periodic visual examinations in conjunction with pressure testing.

These requirements were developed from ASME Code Section XI consistent with the different safety classes of these systems.

The LBB evaluations are based on the ability to detect a potential leaking crack, not the ability to find cracks by inservice inspections. The criteria or methods of the LBB evaluations are the same for ASME Code Class 1, 2, and 3.

DCD 3.6.4.4, Primary System Inspection Program for Leak-Before-Break Piping

Combined License applicants referencing the **AP1000** certified design will develop an inspection program for piping systems qualified for leak-before-break. The inspection program will consider the operating experience of the materials used in the **AP1000** piping systems qualified for leak-before-break, and will include augmented inspection plans and evaluation criteria consistent with those measures imposed on or adopted by operating PWRs as part of the ongoing resolution of concerns regarding the potential for PWSCC in operating plants. The **AP1000** inspection program will be consistent with the inspection program adopted for operating PWRs that use Alloy 690, 52, and 152 in approved leak-before-break applications.

PSI/ISI Examination Requirements

Class 1 LBB welds, 100% shall be volumetrically examined per the requirements of IWB-2500, Category B-F and B-J for Preservice Examinations.

For Class 1 LBB piping, terminal ends and dissimilar-metal welds are volumetrically inspected, along with other locations, to total 25 percent of the welds for Inservice Applications.

For Class 2 LBB piping (Preservice and Inservice Examinations), the requirement is to volumetrically inspect the terminal ends and other locations to total 7.5 percent of the welds.

For Class 3 systems (the only Class 3 LBB piping is in the accumulator line, which is always at room temperature), the system receives periodic visual examinations in conjunction with pressure testing. However, the Preservice and Inservice inspection requirement for each Class 3 LBB line will include a volumetric inspection equivalent to the requirements for Class 2 for the weld at or closest to the high-stress location. See Table 6.3-2 below.

Table 6.3-2. Class 3 Leak-Before-Break Weld Counts and Examination Requirements

System ID /Isometric Number	Code Category	Code Item Number	Pipe Size (in)	Number of Items	Number Required	Number Selected	Exam	Comments
PXS-013	C-F-1	C5.11	8.0	5	1	1	Volumetric	LBB Lines (Class 3)
PXS-014	C-F-1	C5.11	8.0	8	1	1	Volumetric	LBB Lines (Class 3)
PXS-023	C-F-1	C5.11	8.0	7	1	1	Volumetric	LBB Lines (Class 3)
PXS-024	C-F-1	C5.11	8.0	4	1	1	Volumetric	LBB Lines (Class 3)
	C-F-1	C5.11		24	4	4		25 welds x 7.5% = 2 required, (4) selected

Table 6.3-3. Break Exclusion Zone Weld Counts

System ID /Isometric Number	Code Category	Code Item Number	Pipe Size (in)	Number of Items	Number Required	Number Selected	Exam	Comments
CVS-531	C-F-1	C5.21	3.0	7	7	7	Volumetric	BEZ requirements
CVS-532	C-F-1	C5.21	3.0	1	1	1	Volumetric	BEZ requirements
CVS-090	C-F-1	C5.21	3.0	4	4	4	Volumetric	BEZ Requirements
CVS-093	C-F-1	C5.21	3.0	2	2	2	Volumetric	BEZ Requirements
SGS-031	C-F-2	C5.51	38.0	1	1	1	Volumetric	BEZ requirements, MSS-A, Outside Containment

Table 6.3-3. Break Exclusion Zone Weld Counts (cont.)

System ID /Isometric Number	Code Category	Code Item Number	Pipe Size (in)	Number of Items	Number Required	Number Selected	Exam	Comments
SGS-032	C-F-2	C5.51	38.0 12.0	4 1	4 1	4 1	Volumetric	BEZ requirements, MSS-A, Outside Containment
SGS-039	C-F-2	C5.51	12.0	2	2	2	Volumetric	BEZ requirements, MSS-A, Outside Containment
SGS-040	C-F-2	C5.51	38	5	5	5	Volumetric	BEZ requirements, MSS-B, Outside Containment
SGS-040A	C-F-2	C5.51	38	3	3	3	Volumetric	BEZ requirements, MSS-B, Outside Containment
SGS-130	C-F-2 Class 3	C5.51	3.0 3.0	5 5	5 5	5 5	Volumetric	BEZ requirements, MSS-A, Outside Containment
SGS-131	C-F-2 Class 3	C5.51	12.0 6.0	3 4	3 4	3 4	Volumetric	BEZ requirements, MSS-A, Outside Containment
SGS-041	C-F-2	C5.51	38.0	1	1	1	Volumetric	BEZ requirements, MSS-B, Outside Containment
SGS-042	C-F-2	C5.51	38.0 12.0	4 1	4 1	4 1	Volumetric	BEZ requirements, MSS-B, Outside Containment
SGS-049	C-F-2	C5.51	12.0	2	2	2	Volumetric	BEZ requirements, MSS-B, Outside Containment
SGS-141	Class 3 C-F-2	C5.51	12.0 6.0	2 6	2 6	2 6	Volumetric	BEZ requirements, MSS-B, Outside Containment
SGS-140	C-F-2	C5.61	3.0	10	10	10	Volumetric	BEZ requirements, MSS-B
SGS-031	C-F-2	C5.81	38x 8	3	3	3	Volumetric	BEZ requirements, MSS-A

Table 6.3-3. Break Exclusion Zone Weld Counts (cont.)

System ID /Isometric Number	Code Category	Code Item Number	Pipe Size (in)	Number of Items	Number Required	Number Selected	Exam	Comments
SGS-032	C-F-2	C5.81	38 x 8	3	3	3	Volumetric	BEZ requirements, MSS-A
SGS-032	C-F-2	C5.81	38 x 6	1	1	1	Volumetric	BEZ requirements, MSS-A
SGS-032	C-F-2	C5.81	38 x 12	1	1	1	Volumetric	BEZ requirements, MSS-A
SGS-032	C-F-2	C5.81	38 X 3	2	2	2	Volumetric	BEZ requirements, MSS-A
SGS-041	C-F-2	C5.81	38 x 8	3	3	3	Volumetric	BEZ requirements, MSS-B
SGS-042	C-F-2	C5.81	38 x 8	3	3	3	Volumetric	BEZ requirements, MSS-B
SGS-042	C-F-2	C5.81	38 x 6	1	1	1	Volumetric	BEZ requirements, MSS-B
SGS-042	C-F-2	C5.81	38 x 12	1	1	1	Volumetric	BEZ requirements, MSS-B
SGS-042	C-F-2	C5.81	38 x 3	2	2	2	Volumetric	BEZ requirements, MSS-A
SGS-011	C-F-2 Class 3	C5.51	20.0 20.0	8 4	8 4	8 4	Volumetric	BEZ requirements, MFW-A, Outside Containment
SGS-021	Class 3		20.0	4	4	4		BEZ requirements, MFW-B, Outside Containment
SGS-024	C-F-2	C5.51	20.0	8	8	8	Volumetric	BEZ requirements, MFW-B, Outside Containment
SGS-115	C-F-2	C5.51	6.0	4	4	4	Volumetric	BEZ requirements, S/U-FW-A, Outside Containment
SGS – 110	Class 3		6.0	6	6	6	Volumetric	BEZ requirements, S/U-FW-A, Outside Containment
SGS-116	Class 3		6.0	1	1	1	V0lumetric	BEZ requirements, S/U-FW-A, Outside Containment

Table 6.3-3. Break Exclusion Zone Weld Counts (cont.)

System ID /Isometric Number	Code Category	Code Item Number	Pipe Size (in)	Number of Items	Number Required	Number Selected	Exam	Comments
SGS-125	C-F-2	C5.51	6.0	3	3	3	Volumetric	BEZ requirements, S/U-FW-B, Outside Containment
SGS -120	Class 3		6.0	6	6	6	Volumetric	BEZ requirements, S/U-FW-B, Outside Containment
SGS-090	C-F-2	C5.51	4.0	2	2	2	Volumetric	BEZ requirements, BD-B, Outside Containment
SGS-092	C-F-2	C5.51	4.0	4	4	4	Volumetric	BEZ requirements, BD-B, Outside Containment
SGS-093	Class 3		4.0	2	2	2	Volumetric	BEZ requirements, BD-B, Outside Containment
SGS–094	Class 3		4.0	1	1	1	Volumetric	BEZ requirements, BD-B, Outside Containment
SGS-100	C-F-2	C5.51	4.0	2	2	2	Volumetric	BEZ requirements, BD-B, Outside Containment
SGS-102	C-F-2	C5.51	4.0”	6	6	6	Volumetric	BEZ requirements, BD-A, Outside Containment
SGS-103	Class 3		4.0	1	1	1	Volumetric	BEZ requirements, BD-A, Outside Containment
SGS -104	Class 3		4.0	2	2	2	Volumetric	BEZ requirements, BD-A, Outside Containment
SGS-105	Class 3		4.0	1	1	1	Volumetric	BEZ requirements, BD-A, Outside Containment
	BER			158	158	158		100% Required

6.3.5 Reactor Coolant Pump Flywheel Integrity

Preservice inspection of the flywheel according to **AP1000** DCD, Revision 19, Subsection 5.4.1.3.6.3 includes surface examinations and volumetric inspections of the inner hub and retainer cylinder ring, and an overspeed spin test followed by a visual inspection and leak test of the final assembly in accordance with ASME Code, Section III.

The NRC Staff found that these inspections provide reasonable assurance of the integrity of the flywheel during fabrication and ensure that the basis for safe operation of the RCP will be maintained.

The Augmented requirements of Regulatory Guide 1.14 (Flywheel Integrity) are not applicable per the Westinghouse DCD, Subsection 5.4.1.4 and the NRC-SER (NUREG-1783).

6.3.6 Augmented Examination Requirements for Weld Buildup Configurations (CVS Nozzle, CMT Nozzles, and RPV Instrumentation Nozzles)

6.3.6.1 Preservice and Inservice Inspection of Reactor Vessel Head Weld Buildup

The Combined License holder will establish an inservice inspection program prior to fuel load. The inservice inspection program will include the performance of a 100-percent volumetric examination of the weld buildup on the reactor vessel head for the instrumentation penetrations (Quickloc) conducted for the Preservice examinations and once during each 120-month inspection interval in accordance with the ASME Code, Section XI. The weld buildup shall be examined per the requirements of Code Category B-J and shall meet the acceptance standards of ASME Code, Section XI, IWB-3514. Personnel performing examinations and the ultrasonic examination systems shall be qualified in accordance with ASME Code, Section XI, Appendix VIII, Supplement 3.

6.3.6.2 Preservice and Inservice Inspection of Steam Generator Primary Head CVS Nozzle Weld Buildup

Consistent with the DCD examination requirements for the weld buildup on the RPV head, the weld buildup area on SG A shall be examined as follows. The inservice inspection program will include the performance of a 100-percent volumetric examination of the weld buildup on SG A head for the CVS nozzle weld buildup to be conducted for the Preservice examinations and once during each 120-month inspection interval in accordance with the ASME Code, Section XI. The weld buildup shall be examined per the requirements of Code Category B-J and shall meet the acceptance standards of ASME Code, Section XI, IWB-3514. Personnel performing examinations and the ultrasonic examination systems shall be qualified in accordance with ASME Code, Section XI, Appendix VIII, Supplement 3.

6.3.6.3 Preservice and Inservice Inspection of the CMT Inlet and Outlet Nozzle Nozzle Weld Buildup

Consistent with the DCD examination requirements for the weld buildup on the RPV head Quickloc nozzles, the weld buildup areas on the CMTs shall be examined as follows. The inservice inspection program will include the performance of a 100-percent volumetric examination of the weld buildup on the CMT heads conducted for the Preservice examinations and once during each 120-month inspection interval in accordance with the ASME Code, Section XI. The weld buildup shall be examined per the requirements of Code Category B-J and shall meet the acceptance standards of ASME Code, Section XI, IWB-3514. Personnel performing examinations and the ultrasonic examination systems shall be qualified in accordance with ASME Code, Section XI, Appendix VIII, Supplement 3.

7 ACCEPTANCE STANDARDS

7.1 CLASS 1

7.1.1 Preservice Volumetric and Surface Examinations

The preservice volumetric and surface examinations shall be evaluated by comparing the examination results with the acceptance standards specified in Table 7.1-1, except where 7.1.1.1(b) is applicable.

Acceptance of components for service shall be in accordance with 7.1.1.1, 7.1.1.2, and 7.1.1.3.

7.1.1.1 Acceptance

a. A component whose volumetric or surface examination either confirms the absence of or detects flaws that do not exceed the standards of Table 7.1-1 shall be acceptable for service, provided the verified flaws are recorded in accordance with the requirements in terms of location, size, orientation, and distribution within the component.

b. A component whose volumetric or surface examination detects flaws that meet the nondestructive examination standards of NB-2500 and NB-5300 and are documented in Quality Assurance Records (NCA-4134.17) shall be acceptable.

c. A component whose volumetric or surface examination detects flaws, other than the flaws of (b) above, that exceed the standards of Table 7.1-1, is unacceptable for service, unless the component is corrected by repair/replacement activity to the extent necessary to meet the acceptance standards prior to placement of the components in service.

7.1.1.2 Repair/Replacement Activity and Reexamination

The repair/replacement shall be performed in accordance with the requirements of the Construction Code (ASME Section III).

7.1.1.3 Review by Authorities

The Repair/Replacement Program and the reexamination results shall be subject to review by the enforcement authorities having jurisdiction at the plant site.

Evaluation of examination results may be subject to review by the regulatory authority having jurisdiction at the plant site.

7.1.2 Preservice Visual Examination

The preservice visual examinations shall be evaluated by comparing the examination results with the acceptance standards specified in Table 7.1-1.

Acceptance of components for service shall be in accordance with 7.1.2.1, 7.1.2.2, and 7.1.2.3.

7.1.2.1 Acceptance

A component whose visual examination confirms the absence of the relevant conditions described in the standard of Table 7.1-1 shall be acceptable for service.

A component whose visual examination detects the relevant condition described in the standards of Table 7.1-1 shall be unacceptable for service, unless such component meets the requirements of 7.1.2.2 and 7.1.2.3 prior to placement of the component in service.

7.1.2.2 Acceptance by Supplemental Examination

A component containing relevant conditions shall be acceptable for service if the results of supplemental examinations meet the requirements of Table 7.1-1.

7.1.2.3 Acceptance by Corrective Measures or Repair/Replacement Activity

A component containing relevant conditions is acceptable for service if the relevant conditions are corrected by repair/replacement activity or by corrective measures to the extent necessary to meet the acceptance standards of Table 7.1-1.

Table 7.1-1. Class 1 Acceptance Standards

Examination Category	Component and Part Examined	Acceptance Standards
B-A, B-B	Vessel welds	IWB-3510
B-D	Full-penetration welded nozzles in vessels	IWB-3512
B-F, B-J	Dissimilar- and similar-metal welds in piping and vessel nozzles	IWB-3514
B-G-1	Bolting greater than 2 in. in diameter	IWB-3515 IWB-3517
B-G-2	Bolting 2 in. in diameter and less	IWB-3517
B-K	Welded attachments for vessels, piping, pumps, and valves	IWB-3516
B-L-2, B-M-2	Pump casing and valve bodies	IWB-3519
B-N-1, B-N-2, B-N-3	Interior surfaces and internal components of reactor vessels	IWB-3520
B-O	Control rod drive and instrument nozzle housing welds	IWB-3523
B-P	Pressure-retaining boundary	IWB-3522
B-Q	Steam generator tubing	IWB-3521

7.2 CLASS 2

7.2.1 Preservice Volumetric and Surface Examinations

The preservice examinations shall be evaluated by comparing the examination results with the acceptance standards specified in Table 7.2-1, except where 7.2.1.1(b) is applicable.

Acceptance of components for service shall be in accordance with 7.2.1.1, 7.2.1.2, and 7.2.1.3.

7.2.1.1 Acceptance

a. A component whose examination either confirms the absence of or detects flaws that do not exceed the standards of Table 7.2-1 shall be acceptable for service, provided the verified flaws are recorded in accordance with the requirements in terms of location, size, shape, orientation, and distribution within the component.

b. A component whose examination detects flaws that meet the nondestructive examination standards of NC-2500 and NC-5300 and are documented in Quality Assurance Records (NCA-4134.17) shall be acceptable.

c. A component whose examination detects flaws, other than the flaws of (b) above, that exceed the standards of Table 7.2-1, is unacceptable for service, unless the component is corrected by repair/replacement activity to the extent necessary to meet the acceptance standards prior to placement of the component in service.

7.2.1.2 Repair/Replacement Activity and Reexamination

The repair/replacement shall be performed in accordance with the requirements of the Construction Code (ASME Section III).

7.2.1.3 Review by Authorities

a. The Repair/Replacement Program and the reexamination results shall be subject to review by the enforcement authorities having jurisdiction at the plant site.

b. Evaluation of examination results may be subject to review by the regulatory authority having jurisdiction at the plant site.

Table 7.2-1. Class 2 Acceptance Standards

Examination Category	Component and Part Examined	Acceptance Standards
C-A	Welds in pressure vessels	IWC-3510
C-B	Vessel nozzle welds	IWC-3511
C-C	Welded attachments for vessels, piping, pumps, and valves	IWC-3512
C-D	Bolting	IWC-3513
C-F-1, C-F-2	Welds in piping	IWC-3514
C-H	Pressure-retaining components	IWC-3516

7.3 CLASS 3

The acceptance standards are in course of preparation; the rules of Paragraph 7.2 may be used.

7.4 CLASS 1, 2, AND 3 COMPONENT SUPPORTS

7.4.1 Preservice Examinations

The preservice examinations shall be evaluated by comparing the examination results with the acceptance standards specified in Paragraph 7.4.3.

7.4.2 Acceptance

7.4.2.1 Acceptance by Examination

Component supports whose examinations do not reveal conditions described in Paragraph 7.4.3.1(a) shall be acceptable for service.

7.4.2.2 Acceptance by Corrective Measures or Repair/Replacement Activity

A support whose examination detects conditions described in Paragraph 7.4.3.1(a) is unacceptable for service until such conditions are corrected by one or more of the following:

a. Adjustment and reexamination for conditions such as:

- Detached or loosened mechanical connections
- Improper hot and cold setting of spring supports and constant load supports
- Misalignment of supports
- Improper displacement settings of guides and stops

b. Repair/replacement activities in accordance with IWA-4000 and reexamination.

7.4.2.3 Acceptance by Evaluation or Test

As an alternate to the requirements of 7.4.2.2, a component support or a portion of a component support containing relevant conditions that do not meet the acceptance standards of Paragraph 7.4.3 shall be acceptable for service without corrective measures if an evaluation or test demonstrates that the component support is acceptable for service.

If a component support or a portion of a component support has been evaluated or tested and determined to be acceptable for service in accordance with 7.4.2.3(a), the owner may perform corrective measures to restore the component support to its original design condition; reexaminations are not applicable after corrective measures are performed.

Records and reports shall meet the requirements of IWA-6000.

7.4.3 Acceptance Standards

7.4.3.1 Acceptance Standards – Component Support Structural Integrity

a. Component support conditions that are unacceptable for continued service shall include the following:

- Deformations or structural degradations of fasteners, springs, clamps, or other support items
- Missing, detached, or loosened support items
- Arc strikes, weld spatter, paint, scoring, roughness, or general corrosion on close-tolerance machined or sliding surfaces
- Improper hot or cold settings of spring supports and constant load supports
- Misalignment of supports
- Improper clearances of guides and stops

b. Except as defined in 7.4.3.1(a), the following are examples of non-relevant conditions:

- Fabrication marks (e.g., from punching, layout, bending, rolling, and machining)
- Chipped or discolored paint
- Weld spatter on other than close-tolerance machined or sliding surfaces
- Scratches and surface abrasion marks
- Roughness or general corrosion that does not reduce the load-bearing capacity of the support
- General conditions acceptable by the Material, Design, and/or Construction Specifications

8 RECORDS AND REPORTS

This section provides the requirements for the preparation and submittal of Preservice Inspection records and reports as required by the applicable Edition and Addenda of the ASME B&PV Code. This section also addresses additional reporting requirements, when required.

8.1 GENERAL REQUIREMENTS

a. Plans and schedules for the preservice and inservice examinations and tests shall be prepared to meet the requirements of ASME Section XI, 2007 Edition and 2008 Addenda.

b. Examinations, tests, replacements, and repair records shall be prepared in accordance with the requirements of the ASME B&PV Code, Section XI.

c. Preservice inspection summary reports for Class 1 and 2 pressure-retaining components and their supports shall be prepared. A cover sheet shall be provided.

d. Owner's Report for Inservice Inspections, Form NIS-1, for preservice examination of Class 1 and 2 pressure-retaining components and their supports shall be prepared.

e. Owner's Report for Repair/Replacement Activities, Form NIS-2, shall be prepared.

8.2 PREPARATION OF ABSTRACT OF EXAMINATIONS REQUIRED BY FORM NIS-1

The abstract shall include a list or table of examinations and tests that contains the following:

a. Component examined or tested.

b. Code Class.

c. Code Examination Category and Item No.

d. Examination or test method.

e. Code Cases.

f. Number and percentage of examination or test completed.

g. References to the abstracts of the conditions noted and the corrective measures recommended and taken for flaws detected during examination or test performed.

8.3 SUMMARY REPORT PREPARATION

a. A preservice inspection summary report shall be prepared prior to commercial service.

b. Each summary report required shall contain the following:

- Interval, period, and refueling outage number (when applicable)
- Owner's Report for Inservice Inspections, Form NIS-1
- Owner's Report for Repair/Replacement Activities, Form NIS-2

c. Summary reports shall have a cover sheet that provides the following:

- Date of document completion
- Name and address of Owner
- Name and address of plant
- Name or number designation of the unit
- Commercial service date for the unit

As an alternate to the above requirements (IWA-6000), Owners may implement ASME Code Case N-532-4, "Repair/Replacement Activity Documentation Requirements and Inservice Summary Report Preparation and Submission, Section XI, Division 1."

8.4 OWNER'S ACTIVITY REPORT

An Owner's Activity Report, Form OAR-1 (Figure 8.8-1), shall be prepared and certified upon completion of the Preservice Examinations.

Each Form OAR-1 shall contain the following:

- A listing of item(s) with flaws or relevant conditions that exceeded the acceptance criteria of Section XI and that required evaluation to determine acceptability for continued service shall be provided with the information and format of Figure 8.8-2. The information is required whether or not the flaw or relevant condition was discovered during a scheduled examination or test.

- An abstract for repair/replacement activities that were required due to an item containing a flaw or relevant condition that exceeded Section XI acceptance criteria shall be provided with the information and format of Figure 8.8-3. This information is required even if the discovery of the flaw or relevant condition that necessitated the repair/replacement activity did not result from an examination or test required by Section XI. If no acceptance criteria for a particular item are specified in Section XI, the provisions of IWA-3100(b) shall be used to determine which repair/replacement activities are required to be included in the abstract.

- If no items met the criteria of 2(a) or (b), the term "None" should be recorded in the applicable table.

- If there are multiple inspection plans with different intervals, periods, Editions, or Addenda, they shall be identified on Form OAR-1.

- Form OAR-1 shall be certified by the Plant and presented to the Authorized Nuclear Inservice Inspector for the required signature.

8.5 COVER SHEET

Each Owner's Activity Report will have a cover sheet that provides the following information:

- Date of document completion
- Name and address of Owner
- Name and address of generating plant
- Name and number designation of the plant
- Commercial service date for the unit

8.6 OWNER'S ACTIVITY REPORT SUBMITTAL

The preservice inspection summary report or Owner's Activity Report shall be submitted prior to the date of placement of the unit into commercial service.

8.7 REPORTING REQUIREMENTS FOR AUGMENTED/ADDITIONAL EXAMINATIONS

If any flaws are identified that do not meet the acceptance criteria for initial plant operation, flaw evaluation is NOT allowed for PSI and repairs per ASME Section III shall be performed.

8.8 REPORTING REQUIREMENTS FOR CLASS MC (METAL CONTAINMENT)

Reporting requirements for ASME Code Class MC are incorporated in Plant's Containment Inspection Plan.

OWNER'S ACTIVITY REPORT

As required by the provisions of the ASME Code Case N-532-4 Page of

Report Number _____

Plant _____

(Name and Address of Plant)

Plant Unit _____ Commercial Service Date _____ Refueling Outage Number_____

Current Inspection Interval_____

(1st, 2nd, 3rd, 4th, Other)

Current Inspection Period _____

(1st, 2nd, 3rd)

Edition and Addenda of Section XI applicable to the Inspection Plans _____Edition _____Addenda_____

Date and Revision of Inspection Plans _____

Edition and Addenda of ASME Section XI applicable to Repairs and Replacements, if different than the Inspection Plan_____ (if applicable)

CERTIFICATE OF CONFORMANCE

I certify that the statements made in this report are correct: (b) the examinations and tests meet the Inspection Plan as required by the ASME Code, Section XI; and (c) the repair/replacement activities and evaluations supporting the completion of _____ conform to the requirements of Section XI.

(refueling outage number)

Signed _____ Date_____, 20_____

(Owners Representative)

CERTIFICATE OF INSERVICE INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and the State or Province of _____and employed by _____ of _____ have inspected the items described in this Owner's Activity Report and state that to the best of my knowledge and belief, the Owner has performed all activities represented by this report in accordance with the requirements of Section XI.

By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the repair/replacement activities and evaluation described in this report. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

_____Commissions _____

Inspector's Signature National Board, State, Province, and Endorsements

Date_____, 20_____

Figure 8.8-1. Owners Activity Report (OAR-1)

ITEMS WITH FLAWS OR RELEVANT CONDITIONS THAT REQUIRE EVALUATION FOR CONTINUED SERVICE

As required by the provisions of the ASME Code Case N-532-4

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EXAMINATION CATEGORY	ITEM NUMBER	ITEM DESCRIPTION	EVALUATION DESCRIPTION

Figure 8.8-2. ASME Code Case N-532-4 Examination Form

ABSTRACT OF REPAIR/REPLACEMENT ACTIVITIES REQUIRED FOR CONTINUED SERVICE

As required by the provisions of the ASME Code Case N-532-4

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CODE CLASS	ITEM DESCRIPTION	DESCRIPTION OFWORK	DATE COMPLETED	REPAIR/ REPLACEMENT PLAN NUMBER

Figure 8.8-3. ASME Code Case N-532-4 Abstract Form

REPAIR/REPLACEMENT CERTIFICATION RECORD

As required by the provisions of the ASME Code Case N-532-4

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OWNER'S CERTIFICATE OF COMPLIANCE

I certify that the _____ activities represented by Repair/Replacement Plan Number_____ conforms to the requirements of Section XI.

Edition and Addenda of Section XI used: _____

Code Case used:_____
(if applicable)

Signed_____Date_____, 20_____
Owner or Owner's designee, Title

CERTIFICATE OF INSERVICE INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and the State or Province of_____ and employed by _____ of _____ have inspected the items described in Repair/Replacement Plan No._____ , and state that to the best of my knowledge and belief, the Owner has performed all the activities described in the Repair/Replacement Plan in accordance with the requirements of Section XI.

By signing this certificate neither the Inspector nor his employer makes any warranty, expressed or implied, concerning the activities described in the Repair/Replacement Plan. Furthermore, neither the Inspector nor his employer shall be liable in any manner for any personal injury or property damage or loss of any kind arising from or connected with this inspection.

_____Commissions_____
Inspector's Signature National Board, State, Province, and Endorsements

Date_____, 20_____

Figure 8.8-4. Repair/Replacement Record (NIS-2A)