

3.0 Site-Specific ITAAC

The reference ABWR DCD Tier 1, Chapter 4.0, "Interface Requirements," identifies significant design provisions for interface between systems within the scope of the ABWR standard design and other systems that are wholly or partially outside the scope of the ABWR standard design. The interface requirements define the attributes and performance characteristics that the out-of-scope (site-specific) portion of the plant must have in order to support the certified ABWR design.

The STP 3 & 4 site-specific systems and activities that require ITAAC, because they have a safety-related, safety-significant, or risk significant function, and/or have interface requirements stated in ABWR DCD (Tier 1), Section 4.0, are listed below:

- Ultimate Heat Sink (UHS)
- Offsite Power System
- Makeup Water Preparation (MWP) System
- Reactor Service Water (RSW) System
- Communication System (See Section 4.0 - Emergency Planning ITAAC)
- Site Security (See Section 5.0 - Physical Security ITAAC)
- Circulating Water (CW) System
- Backfill under Category 1 Structures
- Breathing Air (BA) System
- Waterproofing Membrane
- Design Reports for ASME Class 1, 2, and 3 Components
- Pipe Break Analysis Report for the As-designed Plant
- Diesel Generator Fuel Oil Storage Vaults

Table 3.0-1 Ultimate Heat Sink (UHS)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
1. The basic configuration of the UHS is as shown on Figure 3.0-1.	1. Inspections of the as-built system will be conducted.	1. The as-built UHS conforms with the basic configuration shown on Figure 3.0-1.
2. The UHS has sufficient cooling water to supply the RSW system for normal plant operation and to permit safe shutdown and cooldown of the plant and maintain the plant in a safe shutdown condition for for at least 30 days following a design-basis event without makeup water to the UHS. The water level at the end of the 30-day period must still be adequate to provide the required suction head to the RSW pumps when operating at their design flow rate.	<p>2.(a) An analysis will be performed which shows that the UHS has sufficient volume and surface area to meet the cooling requirements to permit cooldown and maintain the plant in a safe shutdown condition for at least 30 days following design basis accidents without any makeup water to the UHS. The analysis will also show that there is sufficient water level at the end of the 30 days to provide adequate suction head to the RSW pumps when operating at their design flow rate.</p> <p>2.(b) Inspections will be performed of the UHS configuration.</p>	<p>2.(a) A report exists which concludes that the UHS is capable of supplying the RSW system for normal plant operation and permit safe shutdown and cooldown of the plant and maintain the plant in safe shutdown condition without makeup for 30 days following a design basis accident.</p> <p>2.(b)(i) The minimum surface area and capacity of the UHS above the suction lines are 34,240 square feet and 2,165,500 cubic feet, respectively at the UHS basin low-low level.</p> <p>2.(b)(ii) The centerline elevation of the RSW pump suction lines are at a maximum Elev. 2.44 m MSL at the interface with the UHS basin wall.</p>
<p>3.(a) Active safety-related SSCs within the UHS shall have three divisions powered by their respective Class 1E divisions.</p> <p>3.(b) Each division shall be physically separated.</p>	<p>3.(a) Test will be performed on the UHS system by providing a test signal to only one Class 1E division at a time.</p> <p>3.(b) Inspections of the as-built UHS mechanical configuration shall be performed.</p>	<p>3.(a) The test signal exists in only the Class 1E division under test in the UHS system.</p> <p>3.(b) Each mechanical division of the UHS is physically separated from other mechanical divisions of the UHS system by structural and/or fire barriers.</p>
3.(c) Each division shall be electrically independent of the other divisions and independent of non-Class 1E.	3.(c) Inspections of the as-built UHS electrical system components shall be performed.	3.(c) Electrical isolation exists between Class 1E divisions, and between Class 1E divisions and non-Class 1E.

Table 3.0-1 Ultimate Heat Sink (UHS)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
4. Displays, alarms, and controls in the main control room and remote shutdown system (RSS) are provided for water level and temperature of the UHS system.	4. Inspections will be performed on the main control room and RSS displays, alarms, and controls for the UHS system.	4. Displays, alarms, and controls exist in the main control room and RSS for water level and temperature monitoring, with controls in the RSS for components required for UHS operation.
5. The UHS Basin, Reactor Service Water Pump House, and UHS Cooling Tower Enclosure are classified as Seismic Category I. These structures are designed and constructed to accommodate the dynamic and static loading conditions associated with the various loads and load combinations which form the structural design basis. The structural design basis loads are those associated with: (1) Natural phenomena—wind, floods, tornadoes (including tornado missiles), earthquakes, rain and snow. (2) Internal events—floods, pipe breaks and missiles. (3) Normal plant operation—live loads, dead loads and temperature effects.	5. A structural analysis will be performed that reconciles the as-built data with the structural design-basis.	5. A structural analysis report exists which concludes that the as-built UHS Basin, Reactor Service Water Pump House, and UHS Cooling Tower Enclosure are able to withstand the structural design-basis loads.

Table 3.0-2 Offsite Power System

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
1. There is redundancy and independence in the offsite power system.	<p>1.(a) Inspections of the as-built offsite power supply transmission system will be performed.</p> <p>1.(b) Tests of the as-built offsite power system will be conducted by providing a test signal in only one offsite power circuit/system at a time.</p>	<p>1.(a)(i) Two or more offsite transmission circuits exist.</p> <p>(ii) The offsite transmission circuits are separated by a minimum distance of 50 feet (15.24 meters).</p> <p>(iii) The offsite transmission lines do not have a common takeoff structure or use a common structure for support.</p> <p>1.(b) A test signal exists in only the circuit under test.</p>
2. Site loads are protected from offsite voltage variations during steady-state operation.	2. Analyses of the transmission network (TN) voltage variability and steady-state load requirements for as-built SSCs will be performed.	2. A report exists which concludes that voltage variations of the offsite TN during steady-state operation will not cause voltage variations at the loads of more than plus or minus 10% of the loads nominal ratings.
3. Site loads are protected from offsite frequency variations.	3. Analyses of as-built site loads on the TN and TN frequency variability during normal steady-state conditions and periods of instability will be performed.	3. A report exists which concludes that the normal steady-state frequency of the offsite TN will be within plus or minus 2 hertz of 60 hertz during recoverable periods of system instability.
4. The offsite power system is adequately sized to supply necessary load requirements, during all design operating modes.	4. Analyses of the as-built 1E divisions and non-Class 1E load groups will be performed to determine their load requirements during all design operating modes.	4. A report exists which concludes that the offsite transmission circuits from the TN through and including the main step-up power transformers and RATs are sized to supply their load requirements, during all design operating modes, of their respective Class 1E divisions and non-Class 1E load groups.
5. The impedance of the offsite power system shall be compatible with the interrupting capability of the plants circuit interrupting devices.	5. Analyses of the impedance of the as-built main step-up transformer and RATs will be performed.	5. A report exists which concludes that the impedance of the main step-up transformer and RATs are compatible with the interrupting capability of the plant's circuit interrupting devices.

Table 3.0-2 Offsite Power System

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
6. The offsite transmission power, instrumentation and control circuits for the preferred power are independent from the alternate power.	6. Tests of the as-built offsite power, instrumentation, and control system will be conducted by providing a test signal in only one offsite power circuit/system at a time.	6. A test signal exists in only the circuit under test.
7. Instrumentation and control system loads shall be compatible with the capacity and capability design requirements of the switchyard DC systems.	7. Analyses of offsite power control system and instrumentation loads shall be conducted.	7. A report exists which concludes that the offsite power control system and instrumentation loads are compatible with the capacity and capability of the switchyard DC systems.
8. Lightning protection and grounding features are provided for the offsite power system.	8. Inspections of the as-built offsite power system will be performed.	8. Lightning protection and grounding features exist for the offsite power system.
9. Measured ground resistance will be one ohm or less.	Perform tests of ground resistance measurements of the offsite power system (switchyard).	Ground resistance values are one ohm or less.

Table 3.0-3 Makeup Water Preparation (MWP) System

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
1. The MWP System supplies makeup water to the Makeup Water (Purified) (MUWP) System	1. Inspections of the as-built portion of the MWP system that supplies makeup water to the MUWP System will be performed.	1. The as-built MWP System has features to supply makeup water to the MUWP System.

Table 3.0-4 Potable and Sanitary Water System

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
No entry for this system.		

Table 3.0-5 Reactor Service Water System (RSW)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
1. The basic configuration of the site-specific RSW is as shown on Figure 3.0-1.	1. Inspections of the as-built system will be conducted.	1. The as-built RSW conforms with the basic configuration shown on Figure 3.0-1.
2. Each division is sized to prevent flooding greater than 5 meters above the floor level in each RCW heat exchanger room.	2.(a) Tests of the RSW water level switches will be performed using simulated signals. 2.(b) An analysis of the flooding of each RSW division will be performed.	2.(a) Upon receipt of the simulated signal, the level switches actuate which close the valves and stop the pumps. 2.(b) A report exists which concludes the internal flooding will not exceed 5 meters in each RCW heat exchanger room.

Table 3.0-5 Reactor Service Water System (RSW) (Continued)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
<p>3.(a) Active safety-related SSCs within the RSW shall have three divisions powered by their respective Class 1E divisions.</p> <p>3.(b) Each division shall be physically separated.</p> <p>3.(c) Each division shall be electrically independent of the other divisions.</p> <p>3.(d) Each division shall be capable of removing the design basis heat load of the RSW heat exchangers in that division.</p> <p>3.(e) Interdivisional flood control shall be provided to preclude flooding in more than one division.</p>	<p>3.(a) Test will be performed on the RSW system by providing a test signal to only one Class 1E division at a time.</p> <p>3.(b) Inspections of the as-built RSW mechanical configuration shall be performed.</p> <p>3.(c) Inspections of the as-built RSW electrical system components shall be performed.</p> <p>3.(d) An analysis will be performed of the heat removal capability of each RSW division.</p> <p>3.(e) An inspection will be performed of the structural features separating the RSW divisions.</p>	<p>3.(a) The test signal exists in only the Class 1E division under test in the RSW system.</p> <p>3.(b) Each mechanical division of the RSW system is physically separated from other mechanical divisions of the RSW system by a structural boundary with a three-hour fire rating.</p> <p>3.(c) Electrical isolation exists between Class 1E divisions.</p> <p>3.(d) A report exists which concludes that each RSW division can remove the design basis heat load as specified in Section 2.11.3 of Tier 1 of the reference ABWR DCD.</p> <p>3.(e) The RSW divisions are separated by walls and water-tight doors.</p>
<p>4. On a LOCA and/or LOPP signal, any closed valves for standby heat exchangers are automatically opened and the standby pumps automatically start.</p>	<p>4. Using simulated LOCA and/or LOPP signals, tests will be performed on standby heat exchanger inlet and outlet valves.</p>	<p>4. Upon receipt of simulated LOCA and/or LOPP signals, the standby heat exchanger inlet and outlet valves open. The standby pumps start.</p>

Table 3.0-5 Reactor Service Water System (RSW) (Continued)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
6. The RSW pumps have sufficient NPSH available at the pumps.	6. Inspections, tests and analyses will be performed upon the as-built system. NPSH tests of the pumps will be performed in a test facility. The analyses will consider the effects of: <ul style="list-style-type: none"> – Pressure losses for pump inlet piping and components. – Suction from the UHS basin with water level at the minimum value. – Maximum pressure drop through the perforated plate installed above the suction line intake. – Design basis fluid temperature (35°C). – UHS basin and corresponding return to the cooling towers at atmospheric pressure. 	6. The available NPSH exceeds the NPSH required by the pumps.
7. For each division of RSW the heat exchanger inlet and outlet valves close, the pumps trip, and the isolation valves close upon receipt of a signal indicating Control Building flooding in that division.	7. Using simulated signals, tests will be performed on the RSW System pumps and valves by providing a test signal in only one Class 1E division at a time.	7. The heat exchanger inlet and outlet valves close, the pumps trip, and the isolation valves close, and alarms are received in the MCR upon receipt of a signal indicating flooding in that division of has reached the appropriate level setpoint in the Control Building.

Table 3.0-5 Reactor Service Water System (RSW) (Continued)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
<p>8. The Reactor Service Water Piping Tunnels are classified as Seismic Category I. These tunnels are designed and constructed to accommodate the dynamic and static loading conditions associated with the various loads and load combinations which form the structural design basis. The structural design basis loads are those associated with:</p> <p>(1) Natural phenomena – wind, floods, tornadoes (including tornado missiles), earthquakes, rain and snow.</p> <p>(2) Internal events – floods, pipe breaks and missiles.</p> <p>(3) Normal plant operation – live loads, dead loads and temperature effects.</p>	<p>8.(a) A structural analysis will be performed to reconcile as-built data with the structural design basis.</p> <p>8.(b) An inspection of the Reactor Service Water Piping Tunnels will be performed.</p>	<p>8.(a) A structural analysis report exists which concludes that the as-built Reactor Service Water Piping Tunnels are able to withstand the design basis loads.</p> <p>8.(b) The Reactor Service Water Piping Tunnels have no openings that would permit external flooding from penetrating the tunnels.</p>
<p>9. The RSW Piping Tunnel and RSW Pump House are protected against external floods by having:</p> <p>a. External walls below design basis flood level that are equal to or greater than 0.6 m thick to prevent groundwater seepage.</p> <p>b. Tunnels below design basis flood level not penetrating exterior walls of the RSW Pump House and Control Building.</p> <p>c. Penetration seals with flood protection features.</p>	<p>9. Inspection of the as-built structure will be conducted.</p>	<p>9.</p> <p>a. External walls below design basis flood level are equal to or greater than 0.6 m thick to prevent groundwater seepage.</p> <p>b. Tunnels below design basis flood level do not penetrate exterior walls of the RSW Pump House and Control Building.</p> <p>c. The penetration seals are provided with flood protection features.</p>

Table 3.0-6 Turbine Service Water System (TSW)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
No entry for this system.		

Table 3.0-7 Communication System

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
See COLA Part 9, Section 4.0, Table 4.0-1, Emergency Planning ITAAC.		

Table 3.0-8 Site Security

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
See COLA Part 9, Section 5.0, Table 5.0-1, Physical Security ITAAC.		

Table 3.0-9 Circulating Water System (CW)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
1. The circulating water system pumps are tripped and the discharge valves are closed in the event of a system isolation signal from the condenser area level switches.	1. Testing of the as-built CW System will be performed using simulated flood level signals.	1. The circulating water system pumps are tripped and the discharge valves are closed in the event of a system isolation signal from the condenser area level switches.

Table 3.0-10 Heating, Ventilating and Air Conditioning System (HVAC)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
No entry for this system.		

Table 3.0-11 Backfill Under Category I Structures

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
1. Backfill under Category 1 structures is installed to meet a minimum of 95 percent of the Modified Proctor density.	1. Testing will be performed during placement of the backfill materials.	1. A report exists that concludes the installed backfill material under Seismic Category I structures meets a minimum of 95 percent of the Modified Proctor density.

Table 3.0-11 Backfill Under Category I Structures

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
2. The shear wave velocity of backfill under Seismic Category I structures meets the value used in the site-specific design analyses.	2. Field measurements and analyses of shear wave velocity in backfill will be performed when backfill placement is at approximately the elevations corresponding to: (1) half the backfill thickness to be placed below the foundation level, (2) the foundation depth (i.e., base of concrete fill), and (3) the finish grade around the structure.	2. An engineering report exists that concludes that the shear wave velocity within the backfill material placed under Seismic Category I structures at their foundation depth and below is greater than or equal to 600 feet/second for the RSW Tunnels and Diesel Generator Fuel Oil Storage Vaults and 470 feet/second for the Diesel Generator Fuel Oil Storage Vault Tunnels.

Table 3.0-11 Backfill Under Category I Structures

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
<p>3. The engineering properties of backfill to be used under Seismic Category I structures bound the values used in the site-specific design analyses.</p>	<p>3. Laboratory tests, field measurements and analyses of engineering properties of the backfill will be performed.</p> <p>These tests will include:</p> <p>Test: Grain Size Distribution Frequency: 1 per material type per borrow source</p> <p>Test: Specific Gravity Frequency: 1 per material type per borrow source</p> <p>Test: Modified Proctor Frequency: 1 per material type per borrow source</p> <p>Test: Drained Triaxial Shear Frequency: 1 per material type per borrow source</p> <p>Test: Consolidation Frequency: 1 per material type per borrow source</p> <p>Test: Resonant Column/Torsional Shear Frequency: 1 per material type per borrow source</p>	<p>3. An engineering report exists that concludes that the engineering properties of backfill to be used under Seismic Category I structures (unit weight, phi angle, shear strength, shear modulus, shear modulus degradation and damping ratio) meet the values used in the site-specific design analyses.</p>

Table 3.0-12 Breathing Air System (BA)

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
1. The basic configuration of the BAS is as shown on Figure 3.0-2.	1. Inspections of the as-built system will be conducted.	1. The as-built BAS conforms with the basic configuration shown on Figure 3.0-2.
2. The ASME Code components of the BA System retain their pressure boundary integrity under internal pressures that will be experienced during service.	2. A pressure test will be conducted on those Code components of the BA System required to be pressure tested by the ASME Code.	2. The results of the pressure test of the ASME Code components of the BA System conform with the requirements in ASME Code Section III.

Table 3.0-13 Waterproofing Membrane

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
The friction coefficient to resist sliding meets the required friction coefficient to prevent sliding	Type testing will be performed to determine the minimum coefficient of friction of the type of material used in the mudmat-waterproofing-mudmat interface beneath the basemats of the Category I structures	A report exists and documents that the waterproof system (mudmat-waterproofing-mudmat interface) has a coefficient of friction to support the analysis against sliding.

Table 3.0-14 Design Reports for ASME Class 1, 2, and 3 Components

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
1. ASME Class 1, 2 and 3 components are designed in accordance with ASME Section III requirements and seismic Category I requirements.	1. Inspections of ASME Code Design Reports (NCA-3350) and required documents will be conducted.	1. ASME Code Design Reports (NCA-3350) (certified when required by the ASME Code) exist and conclude that the design of each ASME Class 1, 2 and 3 component complies with the requirements of the ASME Code, Section III, including for those stresses and loads related to fatigue (including environmental effects on fatigue for Class 1 carbon steel piping), thermal expansion, seismic, and load combinations.

Table 3.0-15 Settlement

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria
Settlement of structures predicted to occur after fuel load will be accounted for in the analysis and design of safety-related SSCs.	Field measurements of actual settlement of Seismic Category I structures and other structures, the integrity of which could potentially impact Seismic Category I structures, will be made at prescribed times throughout the construction process, including at the conclusion of construction, prior to the loading of fuel. These field measurements will be compared to the settlements predicted by the construction sequence-based time rate of settlement analyses. The results of these comparisons will be used to predict future settlement that might occur over the operating life of Units 3 and 4. These predicted settlements will be compared to the allowable settlements associated with the safe operation of safety-related SSCs.	An engineering report exists that concludes that future settlements of structures after the loading of fuel and throughout the operational life of Units 3 and 4 will be no greater than those used for the analysis and design of safety-related SSCs.

Table 3.0-16 Pipe Break Analysis Report for the As-designed Plant

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
<p>1. Systems, structures, and components, that are required to be functional during and following an SSE, shall be protected against or qualified to withstand the dynamic and environmental effects associated with postulated failures in Seismic Category I and NNS piping systems. Each postulated piping failure shall be documented in the Pipe Break Analysis Report.</p>	<p>1. Inspections of the Pipe Break Analysis Report will be conducted. Pipe break events involving high-energy piping systems are analyzed for the effects of pipe whip, jet impingement, flooding, room pressurization, and other temperature effects. Pipe break events involving moderate-energy piping systems are analyzed for wetting from spray, flooding, and other environmental effects.</p>	<p>1. A Pipe Break Analysis Report exists for the as-designed plant and concludes that for each postulated piping failure, the reactor can be shut down safely and maintained in a safe, cold shutdown condition without offsite power. The report documents the analysis to determine where protection features are necessary to mitigate the consequences of a pipe break.</p>

Table 3.0-17 Diesel Generator Fuel Oil Storage Vaults

Design Requirement	Inspections, Tests, Analyses	Acceptance Criteria
<p>1. (a) The Diesel Generator Fuel Oil Storage Vaults are classified as Seismic Category I. These vaults are designed and constructed to accommodate the dynamic and static loading conditions associated with the various loads and load combinations which form the structural design basis. The loads are those associated with:</p> <ul style="list-style-type: none"> i. Natural phenomena-wind, floods, tornadoes (including tornado missiles), earthquakes, rain and snow. ii. Internal events-floods, pipe breaks and missiles. iii. Normal plant operation-live loads, dead loads and temperature effects. <p>1. (b) Any access opening in the vaults below the flood level will be protected from external flooding with flood protection features.</p>	<p>1. (a) A structural analysis will be performed to reconcile as built data with the structural design basis as defined in the Design Requirement.</p> <p>1. (b) An inspection of the vaults will be performed.</p>	<p>1. (a) A structural analysis report exists which concludes that the as-built Diesel Generator Fuel Oil Storage Vaults are able to withstand the design basis loads as defined in the Design Requirement.</p> <p>1. (b) The vaults have no unprotected openings that would permit external flooding to penetrate into the vaults.</p>

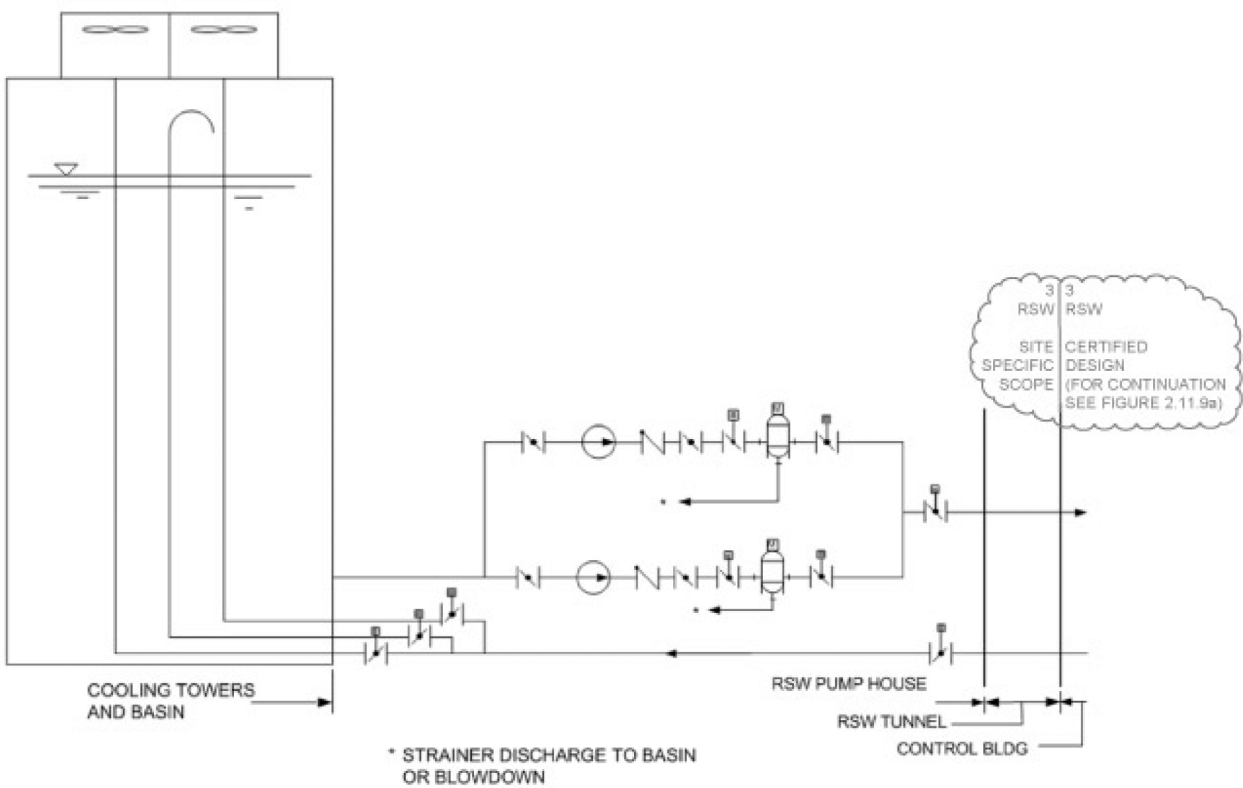
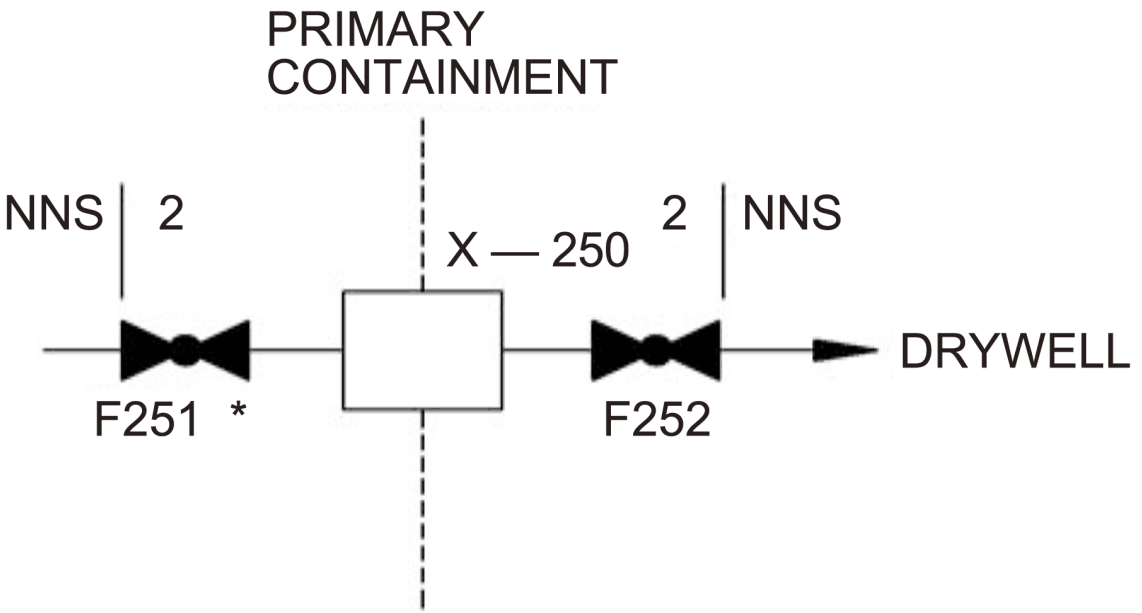


Figure 3.0-1 UHS and Reactor Service Water System



*VALVE F251 IS LOCATED IN SECONDARY CONTAINMENT.

Figure 3.0-2 Breathing Air System Containment Isolation Configuration

