

2.1.5 Essential Service Water Building

1.0 Description

Each of the four Essential Service Water Buildings (ESWB) is an independent, safety related, Seismic Category I, reinforced concrete structure. Each ESWB houses an Essential Service Water Cooling Tower structure (ESWCT) and an Essential Service Water Pump Building (ESWPB). The ESWCT houses two cooling towers and a water storage basin. The ESWPB houses pumps and electrical equipment. A total of four ESWBs are located in pairs on each side of the Nuclear Island (NI) complex. The pairs of buildings are separated to protect them from being simultaneously affected by external events such as aircraft hazards and explosion pressure waves. As shown on Figure 2.1.5-1, one pair is located adjacent to the Turbine Building and the other pair is located adjacent to the Fuel Building (FB). Information in tables and figures in this section are for information only with the exception of the specific features listed in the ITAAC for verification.

Each ESWB is embedded 21 feet below grade and is approximately 164 feet by 108 feet wide by 118 feet high (i.e., from the bottom of the basemat to the top of the building at elevation 96 feet, 0 inches). The ESWBs are Seismic Category I structures, which are capable of performing their safety function during and following a safe shutdown earthquake (SSE). The buildings are designed for external hazards including rain and snow, flooding, wind loads, tornado loads, missile impact loads, SSE loads, and site proximity hazards. The buildings are also designed for structure and component dead loads, live loads, pipe reactions, and thermal effects.

The function of the ESWBs is to house equipment and cooling water associated with the Essential Service Water System.

2.0 Arrangement

2.1 The basic configuration of the four ESWBs is as shown on Figure 2.1.5-1.

3.0 Key Design Features

3.1 Physical separation of the two pairs of ESWBs by the NI complex is as shown on Figure 2.1.5-1.

3.2 The ESWBs have five tornado-generated missile protection shields provided for the safety-related fans and pumps is as shown on Figure 2.1.5-2, Figure 2.1.5-3, Figure 2.1.5-4 and Figure 2.1.5-5.

3.3 The ESWBs site grade level is located within +/- 3 inches of the building +0 ft elevation.

3.4 The basic configuration of the ESWB structures contain an internal hazards separation barrier so that the impact of internal hazards, including fire, flood, high energy line break and missile impact, is contained within the ESWB of hazard origination. Figure 2.1.5-6 identifies the internal hazards separation barrier.

- 3.5 The ESWB structures are Seismic Category I and are designed and constructed to withstand design basis loads, as specified below, without loss of structural integrity and safety-related functions.
- Normal plant operation (including dead loads, live loads, lateral earth pressure loads, hydrostatic loads, hydrodynamic loads, and temperature loads).
 - Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reaction, and pipe break loads—including reaction loads, jet impingement loads, and missile impact loads).
 - External events (including rain, snow, flood, tornado, tornado-generated missiles, and earthquake).
- 3.6 ESWB structural walls or floors having exterior penetrations located below grade elevation are protected against external flooding by watertight seals.
- 3.7 The ESWB structures have key dimensions that are confirmed after construction.

4.0 Interface Requirements

There are no interface requirements for the ESWB structures.

5.0 Inspections, Tests, Analyses, and Acceptance Criteria

Table 2.1.5-3 lists ESWB ITAAC.

Table 2.1.5-1—Key Dimensions of Essential Service Water Building Structure

Label	Wall of Section Descriptions	Region	Floor Elevation or Elevation Range	Key Dimensions ⁽¹⁾
F5	Foundation Basemat.	Refer to Figure 2.1.5-4 and Figure 2.1.5-5.	Nominal elevation -16 ft.	6 ft – 0 in.
W12	Shear Wall at Column Line 4 Below Elevation +63 ft.	Refer to Figure 2.1.5-4.	From nominal elevations -16 ft to +63 ft.	3 ft – 0 in.
W13	Shear Wall at Column Line 4 Above Elevation +63 ft.	Refer to Figure 2.1.5-4.	From nominal elevations +63 ft to +96 ft.	2 ft – 0 in.
S11	Fan Deck Slab.	Refer to Figure 2.1.5-3.	Nominal elevation +63 ft.	2 ft – 6 in.

Notes:

- 1) Concrete forming and placement tolerances for construction shall conform to the requirements of ACI 349 and ACI 117.

Table 2.1.5-2—Key Dimensions of Essential Service Water Building Foundation Footprint

Label	Section Descriptions	Region	Key Dimension	Tolerance (inches)
D14	Distance from North to South edge of ESWB foundation base slab.	Refer to Figure 2.1.5-1.	164 ft ⁽²⁾	+/- 12 in.
D15	Distance from East to West edge of ESWB foundation base slab.	Refer to Figure 2.1.5-1.	107 ft – 11 ¼ in. ⁽²⁾	+/- 12 in.
D16	Distance from +0 ft elevation to ESWB roof elevation.	Refer to Figure 2.1.5-4.	96 ft	+/- 12 in. ⁽¹⁾
D17	Distance from +0 ft elevation to top of ESWB foundation base slab.	Refer to Figure 2.1.5-4.	16 ft	

Notes:

- 1) Tolerance specified is for the total dimension from top of foundation to top of roof elevation. The key dimensions individually are permitted to utilize up to the total tolerance specified provided the combined total tolerance for the two key dimensions does not exceed the tolerance specified.
- 2) Key dimension does not include basemat extensions.

**Table 2.1.5-3—Essential Service Water Building ITAAC
(3 Sheets)**

Commitment Wording		Inspections, Tests, Analyses	Acceptance Criteria
2.1	The basic configuration of the four ESWBs is as shown on Figure 2.1.5-1.	An inspection of the ESWBs will be performed.	The as-built configuration of the ESWBs is that there are four separate ESWBs as shown on Figure 2.1.5-1.
3.1	Physical separation of the two pairs of ESWBs by the NI complex is as shown on Figure 2.1.5-1.	An inspection of the ESWBs will be performed.	The as-built configuration of the ESWBs is that the two pairs of ESWBs are separated by the NI complex as shown on Figure 2.1.5-1.
3.2	The ESWBs have tornado-generated missile protection shields provided for the safety-related fans and pumps as shown on Figure 2.1.5-2, Figure 2.1.5-3, Figure 2.1.5-4, and Figure 2.1.5-5.	<p>a. An analysis of the tornado-generated missile protection shields in the ESWB structures for the design basis loads will be performed.</p> <p>b. An inspection of the as-built tornado-generated missile protection shield structures versus final construction drawings will be performed.</p>	<p>a. The ESWBs have tornado-generated missile protection shields provided for the safety-related fans and pumps as shown on Figure 2.1.5-2, Figure 2.1.5-3, Figure 2.1.5-4, and Figure 2.1.5-5.</p> <p>b. The as-built missile protection shields conform to the construction drawings.</p>
3.3	The ESWBs site grade level is located within +/- 3 inches of the building +0 ft elevation.	An inspection of the ESWBs site grade level will be performed.	The as-built ESWB site grade level is located within +/- 3 inches of the building +0 ft elevation.

**Table 2.1.5-3—Essential Service Water Building ITAAC
(3 Sheets)**

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
3.4	<p>The basic configuration of the ESWB structures contain an internal hazards separation barrier so that the impact of internal hazards, including fire, high energy line break and missile impact, is contained within the ESWB of hazard origination. Figure 2.1.5-6 identifies the internal hazards separation barrier.</p>	<p>a. An inspection of the ESWBs will be performed.</p> <p>b. A fire protection analysis will be performed.</p> <p>c. Inspection of as-built conditions of barriers, doors, dampers, and penetrations through the barriers identified in Figure 2.1.5-6, versus construction drawings of barriers, doors, dampers, and penetrations as determined in the part (b) analysis, will be performed.</p>	<p>a. The as-built configuration of the ESWBs provides internal hazards barriers as shown on Figure 2.1.5-6.</p> <p>b. Completion of analysis that indicates that barriers, doors, dampers and penetrations providing separation have a minimum 3-hour fire rating and mitigate propagation of smoke to the extent that safe shutdown is not adversely affected.</p> <p>c. The as-built configuration of walls, doors, dampers and penetrations through the barriers listed in Figure 2.1.5-6 agrees with the construction drawings.</p>
3.5	<p>The ESWB structures are Seismic Category I and are designed and constructed to withstand design basis loads, as specified below, without loss of structural integrity and safety related functions.</p> <ul style="list-style-type: none"> • Normal plant operation (including dead loads, live loads, lateral earth pressure loads, hydrostatic loads, hydrodynamic loads, and temperature loads). 	<p>An analysis of the ESWB structures for the design basis loads will be performed. During construction, deviations from the approved design will be analyzed for design basis loads.</p>	<p>A report exists which reconciles deviations during construction and concludes that the as-built ESWB structures conform to the approved design and will withstand the design basis loads specified without loss of structural integrity or safety- related functions.</p>

**Table 2.1.5-3—Essential Service Water Building ITAAC
(3 Sheets)**

	Commitment Wording	Inspections, Tests, Analyses	Acceptance Criteria
	<ul style="list-style-type: none"> • Internal events (including internal flood loads, accident pressure loads, accident thermal loads, accident pipe reaction, and pipe break loads – including reaction loads, jet impingement loads, cubicle pressurization loads, and missile impact loads). • External events (including rain, snow, flood, tornado, tornado-generated missiles, and earthquake). 		
3.6	ESWB structural walls or floors having exterior penetrations located below grade elevation are protected against external flooding by watertight seals.	An inspection of ESWB exterior structural walls and floors located below grade will be performed.	Watertight seals exist for exterior penetrations of ESWB structural walls and floors located below grade elevation.
3.7	The ESWB structures have key dimensions that are confirmed after construction.	An inspection of key dimensions of the as-built ESWB structures will be performed. During construction, deviations from the approved design will be analyzed for design basis loads.	Deviations from the key dimensions and tolerances specified in Tables 2.1.5-1 and 2.1.5-2 are reconciled and the as-built ESWB structures will withstand the design basis loads without loss of structural integrity and safety related functions.

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