3.5 Missile Protection

The information in this section of the reference ABWR DCD, including all subsections, tables, and figures, is incorporated by reference with following departure and supplements.

STP DEP 3.5-1 (Table 3.5-1 and Figure 3.5-2)

STP DEP 3.5-2

3.5.1.1.1.3 Main Steam Turbine

STP DEP 3.5-1

~~*Acceptance Criteria 1 of SRP Section 3.5.1.3 considers a plant with a favorable turbine generator placement and orientation and adhering to the guidelines of Regulatory Guide 1.115 adequately protected against turbine missile hazards. Further, this criterion specifies that exclusions of safetyrelated structures, systems or components from low trajectory turbine missile strike zones constitutes adequate protection against low trajectory turbine missiles. The turbine generator placement and orientation of the ABWR Standard Plant meets the guidelines of Regulatory Guide 1.115 as illustrated in Figure 3.5 2.*~~

The STP 3 & 4 turbine generator placement and orientation in relation to essential systems of the adjoining unit are illustrated on Figure 3.5-2. Per Regulatory Guide 1.115, the STP 3 & 4 turbine generator placement and orientation is considered unfavorable. Per Acceptance Criteria 1 of Standard Review Plan Section 3.5.1.3 for unfavorable turbine generators, a value of 10^{-2} per year per plant was chosen as a conservative value for the product of strike probability (P_2) and damage probability (P_3). The criteria for unfavorable turbine generator orientation given in Standard Review Plan Table 3.5.1.3-1 and provided in Table 3.5-1 was assumed for the missile generation probability (P_1). The resulting probability of unacceptable damage from a main steam turbine missile (P_4), which is $P_1 \times P_2 \times P_3$, is less than 10^{-7} per year per plant.

Therefore STP 3 & 4 main steam turbine generator placement and orientation meets the acceptance criteria of Standard Review Plan 3.5.1.3 and the guidelines of Regulatory Guide 1.115.

3.5.1.4 Missiles Generated by Natural Phenomena

STP DEP 3.5-2

Tornado/hurricane*-generated missiles have been determined to be the limiting natural phenomena hazard in the design of all structures required for safe shutdown of the nuclear power plant. Since tornado*/hurricane *missiles are used in the design basis, it is not necessary to consider missiles generated from other natural phenomena. The design basis tornado for the ABWR Standard Plant is the maximum tornado windspeed corresponding to a probability of l0E-7 per year (483 km/h). The other characteristics*

of this tornado are summarized in Subsection 3.3.2.1. The design basis tornado missiles are per SRP 3.5.1.4, Spectrum I.

Using the design basis tornado and missile spectrum as defined above with the design of the Seismic Category I buildings, compliance with all of the positions of Regulatory Guide 1.117, "Tornado Design Classification," Positions C.1 and C.2 is assured.

The SGTS charcoal absorber beds are housed in the tornado resistant reactor building and, therefore, are protected from the design basis tornado missiles. The offgas system charcoal absorber beds are located deep within the Turbine Building and it is considered very unlikely that these beds could be ruptured as a result of a design basis tornado missile. These features assure compliance with Position C.3 of Regulatory Guide 1.117.

Design requirements for STP 3 & 4 due to hurricane winds and hurricane generated missiles are described in Section 3H.11.

See Subsections 3.5.4.2 and 3.5.4.4 for COL license information requirements.

3.5.4 COL License Information

3.5.4.1 Protection of Ultimate Heat Sink

The following site-specific supplement addresses COL License Information Item 3.9.

Compliance with Regulatory Guide 1.27 as related to the UHS and connecting conduits being capable of withstanding the effects of externally generated missiles, is demonstrated in Subsection 3H.6.

3.5.4.2 Missiles Generated by Other Natural Phenomena

The following site-specific supplement addresses COL License Information Item 3.10.

The only missiles generated by natural phenomena that have been identified, are those generated by tornados and hurricanes. Tornado generated missiles are described in Section 3.5.1.4. Hurricane missiles are described in Section 3H.11.

3.5.4.3 Site Proximity Missiles and Aircraft Hazards

The following site-specific supplement addresses COL License Information Item 3.11.

No site proximity missiles or aircraft hazards were identified for this site. For details see Subsection 2.2S.2.7.2.

3.5.4.4 Impact of Failure of Out of ABWR Standard Plant Scope Non-Safety-Related Structures, Systems, and Components due to a Design Basis Tornado

The following site-specific supplement addresses COL License Information Item 3.12.

In general, safety-related SSCs are protected from tornado missiles by being either underground or housed in a tornado missile proof structure. The design criteria for systems and components (not housed in tornado structures) are as follows: Such plant

SSCs are analyzed for the design basis tornado missile to ensure that their failure will not affect the ability of safety-related SSCs from performing their intended safety functions.

3.5.4.5 Turbine System Maintenance Program

The following site-specific supplement addresses COL License Information Item 3.13.

A turbine system maintenance program will be submitted within three years following receipt of a COL that includes a probability calculation of turbine missile generation and shows that the turbine meets the minimum requirements as given in Table 3.5-1. This probability calculation shall evaluate each turbine control and protection system (for example, the condition that the primary overspeed trip system may be out of service during turbine operation) and all component failure modes to calculate the probability of turbine missile generation in order to determine the appropriate required licensee action in Table 3.5-1 under those circumstances. (COM 3.5-1)

3.5.4.6 Maintenance Equipment Missile Prevention Inside Containment

The following site-specific supplement addresses COL License Information Item 3.14.

Procedures ensure that maintenance equipment inside containment, such as hoists, will either be removed prior to operation, moved to a location where they are not a potential hazard to safety-related equipment, or seismically restrained to prevent them from becoming a missile.

3.5.4.7 Failure of Structures, Systems, and Components Outside ABWR Standard Plant Scope

The following site-specific supplement addresses COL License Information Item 3.15.

Non-tornado resistant structures are constructed from materials such as reinforced concrete block, and/or structural steel with metal siding and roof deck. Potential missiles or debris from these materials, resulting from failure of structure or from items blown off, when subjected to winds of tornado intensity, would not generate missiles more severe than the design basis tornado missiles defined in Subsection 3.5.1.4 (Reference 3.5-10).

3.5.5 References

The following site-specific supplement addresses COL License Information Item 3.15.

3.5-10 “Rationale for Wind-borne Missile Criteria for DOE Facilities,” J.R. McDonald, Sept. 1999

Table 3.5-1 Requirement for the Probability of Missile Generation

Criterion	Probability/Yr	Required Licensee Action
(A)	$P_1 < \sout{10^{-4}}\ 10^{-5}$	Criterion (A) is the general, minimum reliability requirement for loading the turbine and bringing the system on line.
(B)	$\sout{10^{-4}} 10^{-5} < P_1 < \sout{10^{-3}}\ 10^{-4}$	If Criterion (B) is reached during operation, the turbine may be kept in service until the next scheduled outage, at which time the COL applicant is to take action to reduce P1 to meet Criterion (A) before returning the turbine to service.
(C)	$\sout{10^{-3}}\ 10^{-4} < P_1 < \sout{10^{-2}}\ 10^{-3}$	If Criterion (C) is reached during operation, the turbine is to be isolated from the steam supply within 60 days, at which time the COL applicant is to take action to reduce P1 to meet Criterion (A) before returning the turbine to service.
(D)	$\sout{10^{-2}}\ 10^{-3} < P_1$	If Criterion (D) is reached at any time during the operation, the turbine is to be isolated from the steam supply within 6 days, at which time the COL applicant is to meet Criterion (A) before returning the turbine to service.

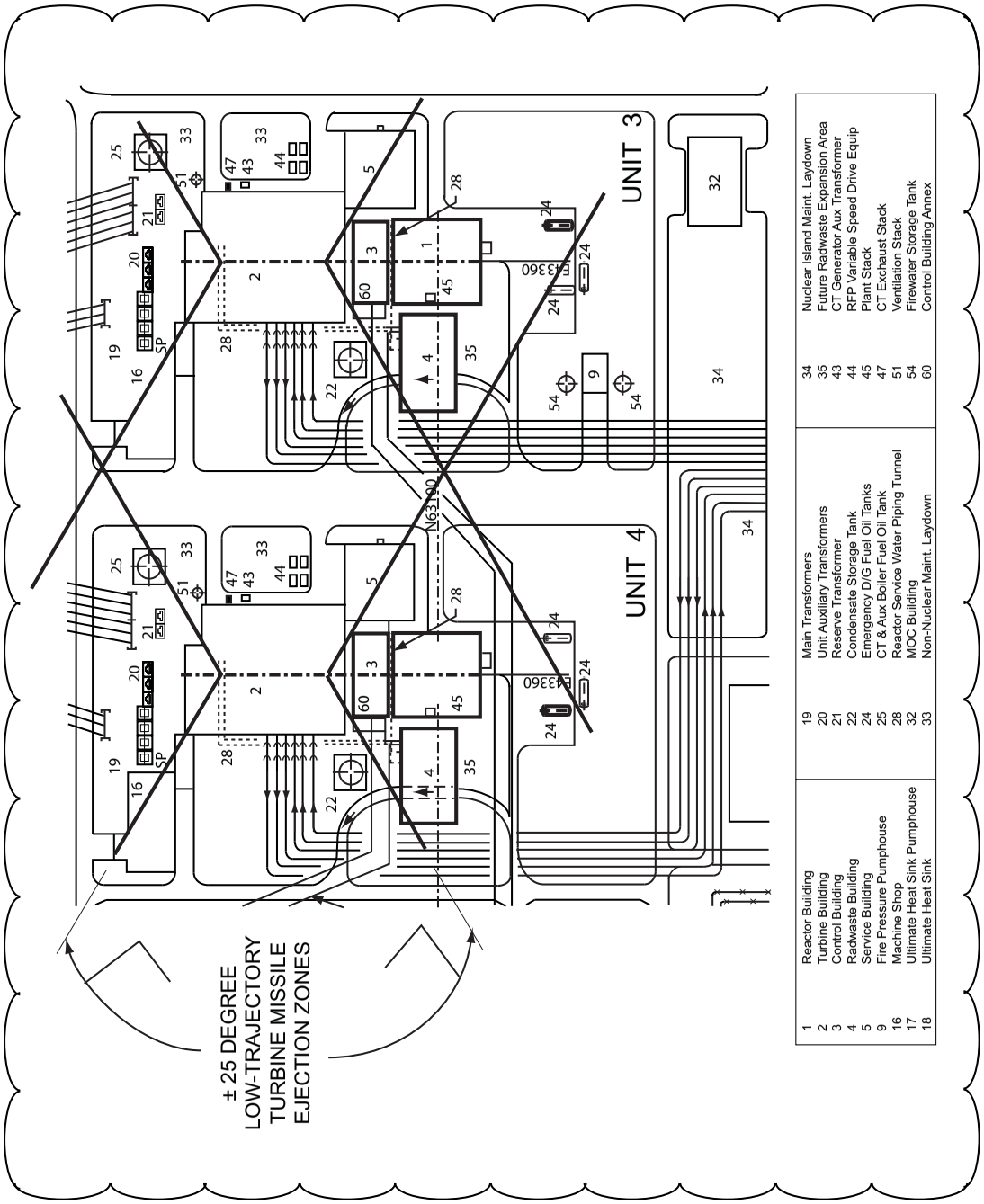

Figure 3.5-2 Low-Trajectory Turbine Missile Ejection Zone