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September 14, 2012

U. S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555
ATTN: David B. Matthews, Director
Division of New Reactor Licensing

SUBJECT: COMANCHE PEAK NUCLEAR POWER PLANT, UNITS 3 AND 4
DOCKET NUMBERS 52-034 AND 52-035
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION NO. 6342
(SECTION 3.3.2)

Dear Sir:

Luminant Generation Company LLC (Luminant) submits herein the response to Request for Additional Information (RAI) No. 6342 (CP RAI #250) for the Combined License Application for Comanche Peak Nuclear Power Plant Units 3 and 4. The RAI addresses the design basis hurricane and hurricane missiles.

Should you have any questions regarding this response, please contact Don Woodlan (254-897-6887, Donald.Woodlan@luminant.com) or me.

There are no commitments in this letter.

I state under penalty of perjury that the foregoing is true and correct.

Executed on September 14, 2012.

Sincerely,

Luminant Generation Company LLC

RD Bird for

Rafael Flores

Attachment: Response to Request for Additional Information No. 6342 (CP RAI #250)

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NRO

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RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Comanche Peak, Units 3 and 4

Luminant Generation Company LLC

Docket Nos. 52-034 and 52-035

RAI NO.: 6342 (CP RAI #250)

SRP SECTION: 03.03.02 - Tornado Loads

QUESTIONS for Structural Engineering Branch 1 (AP1000/EPR Projects) (SEB1)

DATE OF RAI ISSUE: 3/13/2012

QUESTION NO.: 03.03.02-9

The NRC issued Regulatory Guide 1.221, "Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants" (October 2011), and the staff issued an RAI (US-APWR DCD RAI 3.3.2.-06) requesting MHI to provide information that addresses design-basis hurricane and hurricane missiles for US-APWR DC in consideration of the guidance provided in RG 1.221. The staff requests the COL applicant to provide information that addresses the design-basis hurricane and hurricane missiles for the Comanche Peak Nuclear Power Plant, Units 3 and 4 site and their impact on the safety of the site-specific Category I SSCs.

ANSWER:

The COLA has been revised to incorporate RG 1.221 Revision 0 guidance to consider the effects of design-basis hurricane winds and hurricane-generated missiles on the analysis and design of Comanche Peak Unit 3 and 4 site-specific seismic Category I SSCs.

Impact on R-COLA

See attached marked-up FSAR and COLA Part 10 Revision 3 pages:

1.8-15	2.3-37	3.8-4	8.2-4	19.1-87
1.8-17	3.3-1	3.8-6	9.2-13	
1.8-21	3.3-2	3.8-7	9.2-17	Part 10 page 11
1.8-32	3.3-3	3.8-11	9.4-7	Part 10 page 18
1.9-15	3.3-4	3.8-12	11.4-3	Part 10 page 32
1.9-25	3.5-3	3.8-21	19.1-6	Part 10 page 33
2.0-2	3.5-4	3.12-1	19.1-62	
2.0-3	3.5-6	3.12-2	19.1-66	
2.3-13	3.7-11	3LL-1	19.1-74	

Impact on S-COLA

None; this response is site-specific.

Impact on DCD

None.

CP COL 1.8(2)

Table 1.8-201 (Sheet 4 of 71)

Resolution of Combined License Items for Chapters 1 - 19

COL Item No.	COL Item	FSAR Location	Resolution Category
COL 3.3(1)	The COL Applicant is responsible for verifying the site-specific basic wind speed is enveloped by the determinations in this section.	3.3.1.1	3a
COL 3.3(2)	These requirements also apply to seismic category I structures provided by the COL Applicant. Similarly, it is the responsibility of the COL Applicant to establish the methods for qualification of tornado or hurricane effects to preclude damage to safety-related SSCs.	3.3.2.1 3.3.2.2.1 3.3.2.2.4	3a
COL 3.3(3)	It is the responsibility of the COL Applicant to assure that site-specific structures and components not designed for tornado and hurricane loads will not impact either the function or integrity of adjacent safety-related SSCs, or generate missiles having more severe effects than those discussed in Subsection 3.5.1.4.	3.3.2.3	3a
COL 3.3(4)	The COL Applicant is to provide the wind load design method and importance factor for site-specific category I and category II buildings and structures. The COL Applicant shall also verify that the site location does not have features promoting channeling effects or buffeting in the wake of upwind obstructions that invalidate the standard plant wind load design methods described above.	3.3.1.2	3a
COL 3.3(5)	The COL Applicant is to note the vented and unvented requirements of this subsection to the site-specific category I buildings and structures.	3.3.2.2.2	3a
COL 3.3(6)	The COL Applicant is responsible for verifying that the site-specific design-basis hurricane basic wind speed, exposure category and resulting wind forces are enveloped by the determinations in this section.	3.3.2.1	3a
COL 3.4(1)	The COL Applicant is to address the site-specific design of plant grading and drainage.	3.4.1.2	3a

RCOL2_03.03.02-9

RCOL2_03.03.02-9

RCOL2_03.03.02-9

CP COL 1.8(2)

Table 1.8-201 (Sheet 6 of 71)

Resolution of Combined License Items for Chapters 1 - 19

COL Item No.	COL Item	FSAR Location	Resolution Category
COL 3.5(1)	The COL Applicant is to have plant procedures in place prior to fuel load that specify unsecured equipment, including portable pressurized gas cylinders, located inside or outside containment and required for maintenance or undergoing maintenance is to be removed from containment prior to operation, moved to a location where it is not a potential hazard to SSCs important to safety, or seismically restrained to prevent it from becoming a missile.	3.5.1.1.4	2
COL 3.5(2)	The COL Applicant is to commit to actions to maintain P1 within this acceptable limit as outlined in RG 1.115, "Protection Against Low-Trajectory Turbine Missiles" (Reference 3.5-6) and SRP Section 3.5.1.3, "Turbine Missiles" (Reference 3.5-7).	3.5.1.3.2	2
COL 3.5(3)	As described in DCD, Section 2.2, the COL Applicant is to establish the presence of potential hazards, except aircraft, which is reviewed in Subsection 3.5.1.6, and the effects of potential accidents in the vicinity of the site.	3.5.1.5	3a
COL 3.5(4)	It is the responsibility of the COL Applicant to verify the site interface parameters with respect to aircraft crashes and air transportation accidents as described in Section 2.2.	3.5.1.6	3a
COL 3.5(5)	The COL Applicant is responsible to evaluate site-specific hazards for external events that may produce missiles more energetic than tornado missiles and hurricane missiles for the standard plant presented in Subsection 3.5.1.4, and assure that the design of seismic category I and II structures meet these loads.	3.5.1.4 3.5.2	3a
COL 3.5(6)	The COL Applicant is responsible to assess the orientation of the T/G of this and other unit(s) at multi-unit site for the probability of missile generation using the evaluation of Subsection 3.5.1.3.2.	3.5.1.3.1	3a

RCOL2_03.03.02-9

RCOL2_03.03.02-9

CP COL 1.8(2)

Table 1.8-201 (Sheet 10 of 71)

Resolution of Combined License Items for Chapters 1 - 19

COL Item No.	COL Item	FSAR Location	Resolution Category
COL 3.7(7)	The COL Applicant is to determine the allowable static and dynamic bearing capacities based on site conditions, including the properties of fill concrete placed to provide a level surface for the bottom of foundation elevations, and to evaluate the bearing loads to these capacities.	3.7.1.3 Table 3.7-203 Table 3.8-202	3a
COL 3.7(8)	The COL Applicant is to evaluate the strain-dependent variation of the material dynamic properties for site materials.	3.7.2.4.1	3a
COL 3.7(9)	The COL Applicant is to assure that the design or location of any site-specific safety-related SSCs, for example pipe tunnels or duct banks, will not expose those SSCs to possible impact due to the failure or collapse of non-seismic category I structures, or with any other SSCs that could potentially impact, such as heavy haul route loads, transmission towers, non safety-related storage tanks, etc.	3.7.2.8	3a
COL 3.7(10)	It is the responsibility of the COL Applicant to further address structure-to-structure interaction if the specific site conditions can be important for the seismic response of particular US-APWR seismic category I structures, or may result in exceedance of assumed pressure distributions used for the US-APWR standard plant design.	3.7.2.8	3a
COL 3.7(11)	It is the responsibility of the COL Applicant to confirm the masses and frequencies of the PCCV polar crane and fuel handling crane and to determine if coupled site-specific analyses are required.	3.7.2.3.4	
COL 3.7(12)	It is the responsibility of the COL Applicant to design seismic category I below- or above-ground liquid-retaining metal tanks such that they are enclosed by a tornado/hurricane missile protecting concrete vault or wall, in order to confine the emergency gas turbine fuel supply.	3.7.3.9 Appendix 3MM	3a

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3.03.02-9

CP COL 1.8(2)

Table 1.8-201 (Sheet 21 of 71)

Resolution of Combined License Items for Chapters 1 - 19

COL Item No.	COL Item	FSAR Location	Resolution Category
COL 3.11(6)	The COL Applicant is to qualify site-specific electrical and mechanical equipment (including instrumentation and control, and certain accident monitoring equipment) using qualification process that is equivalent to that delineated for the US-APWR Standard Plant, as described in Technical Report MUAP-08015.	3.11.4	3a
COL 3.11(7)	The COL Applicant is to identify chemical and radiation environmental requirements for site-specific qualification of electrical and mechanical equipment (including instrumentation and control, and certain accident monitoring equipment).	3.11.5	3a
COL 3.11(8)	The COL Applicant is to provide the site-specific mechanical equipment requirements.	3.11.6 Table 3D-201	3a
COL 3.11(9)	Optionally, the COL Applicant may revise the parameters based on site-specific considerations.	3.11.1.2	3a
COL 3.12(1)	Deleted from the DCD.		
COL 3.12(2)	If any piping is routed in tunnels or trenches in the yard, the COL Applicant is to generate site-specific seismic response spectra, which may be used for the design of these piping systems.	3.12.5.1	3a
COL 3.12(3)	If the COL Applicant finds it necessary to lay ASME Code, Section III (Reference 3.12-2), Class 2 or 3 piping exposed to wind, ~~or~~ tornado, or hurricane loads, then such piping must be designed to the plant design basis loads.	3.12.5.3.6	3a
COL 3.12(4)	The COL Applicant is to screen piping systems that are sensitive to high frequency modes for further evaluation.	3.12.5.6	3a
COL 3.12(5)	The COL holder for the first plant is to perform the pressurizer surge line monitoring subsequent to the COL item 14.2(11).	3.12.5.10	3a

RCOL2_03.03.02-9

Table 1.9-201 (Sheet 12 of 12)
Comanche Peak Nuclear Power Plant Units 3 & 4 Conformance with Division 1 Regulatory Guides

RG Number	RG Title	Revision/Date	COLA FSAR Status	Corresponding Chapter/ Section
1.197	Demonstrating Control Room Envelope Integrity at Nuclear Power Reactors	Revision 0 May 2003	Conformance	COLA Part 4
1.198	Procedures and Criteria for Assessing Seismic Soil Liquefaction at Nuclear Power Plant Sites	Revision 0 November 2003	Conformance	2.5.4
1.202	Standard Format and Content of Decommissioning Cost Estimates for Nuclear Power Reactors	Revision 0 February 2005	Not applicable (Application for CPNPP Units 3 and 4 is for new units. RG applies to activities that occur during decommissioning.)	N/A
1.205	Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants	Revision 0 May 2006	Not applicable (Risk informed performance based fire protection is not used.)	N/A
1.206	Combined License Applications for Nuclear Power Plants (LWR Edition)	Revision 0 June 2007	Conformance with exceptions (The guidance for referencing an early site permit and passive advanced light-water reactor [ALWR] plant is not applicable.)	All chapters and appendices
1.208	A Performance-Based Approach to Define the Site-Specific Earthquake Ground Motion	Revision 0 March 2007	Conformance	2.5.2 3.7
1.221	Design-Basis Hurricane and Hurricane Missiles for Nuclear Power Plants	Revision 0 October 2011	Conformance	2.0 2.3.1.2.2, 3.3.2 3.5.1.4

RCOL2_03.03.02-9

CP COL 1.9(1)

Table 1.9-206 (Sheet 1 of 2)

Comanche Peak Nuclear Power Plant Units 3 & 4 Conformance with Standard Review Plan
Chapter 3 Design of Structures, Systems, Components & Equipment

SRP Section	SRP Title	Revision/Date	COLA FSAR Status	Appears in FSAR Chapter/Section	
3.2.1	Seismic Classification	Revision 2 March 2007	Conformance	3.2.2 3.7-3.12	
3.3.1	Wind Loading	Revision 3 March 2007	Conformance	3.3.1	
3.3.2	Tornado Loads	Revision 3 March 2007	Conformance	3.3.2	
3.4.2	Analysis Procedures	Revision 3 March 2007	Conformance	3.4.2	
3.5.1.3	Turbine Missiles	Revision 3 March 2007	Conformance	3.5.1.3.1 3.5.1.3.2	
3.5.1.4	Missiles Generated by Tornadoes and Extreme Winds	Revision 3 March 2007	Conformance	3.5.1.4 3.5.2	RCOL2_03.0 3.02-9
3.5.1.5	Site Proximity Missiles (Except Aircraft)	Revision 4 March 2007	Conformance	3.5.1.5	
3.5.1.6	Aircraft Hazards	Revision 3 March 2007	Conformance	3.5.1.6	
3.5.2	SSCs to Be Protected From Externally-Generated Missiles	Revision 3 March 2007	Conformance	3.5.2	
3.7.1	Seismic Design Parameters	Revision 3 March 2007	Conformance	3.7.1 3.8	
3.7.2	Seismic System Analysis	Revision 3 March 2007	Conformance	3.7.2 3.8	
3.7.3	Seismic Subsystem Analysis	Revision 3 March 2007	Conformance	3.7.3 3.9 3.12	

Table 2.0-1R (Sheet 1 of 13)
Key Site Parameters

CP COL 2.3(1)

Meteorology		
Parameter Description	Parameter Value	
	DCD	CPNPP 3 and 4
Normal winter precipitation roof load(11)	50 lb/ft^2	11.7 lb/ft^2
Extreme winter precipitation roof load(12)	75 lb/ft^2	37.8 lb/ft^2
48-hr probable maximum winter precipitation (PMWP)	36 in	31 in
Tornado maximum wind speed	230 mph	230 mph
	184 mph maximum rotational	184 mph maximum rotational
	46 mph maximum translational	46 mph maximum translational
Radius of maximum rotational speed	150 ft	150 ft
Rate of Pressure drop	0.5 psi/s	0.5 psi/s
Tornado maximum pressure drop	1.2 psi	1.2 psi
Tornado-generated missile spectrum and associated velocities	15 ft long schedule 40 steel pipe moving horizontally at 135 ft/s(1)	15 ft long schedule 40 steel pipe moving horizontally at 135 ft/s(1)
	4000 lb automobile moving horizontally at 135 ft/s(1)	4000 lb automobile moving horizontally at 135 ft/s(1)
	1 in diameter steel sphere moving horizontally at 26 ft/s(1)	1 in diameter steel sphere moving horizontally at 26 ft/s(1)
Extreme wind speed (other than in tornado and hurricane)	155 mph for 3-second gusts at 33 ft aboveground level based on 100-year return period, with importance factor of 1.15 for seismic category I and II structures	96 mph for-3-second gust wind speed at 33-ft aboveground based on 100-year return period

RCOL2_03.03.02-9

Table 2.0-1R (Sheet 2 of 13)
Key Site Parameters

Design-Basis Hurricane Wind	160 mph for 3-second gusts at 33 ft. above ground level which corresponds to the exceedance frequency of 10^{-7} per year	145 mph for 3-second gusts at 33 ft. above ground level which corresponds to the exceedance frequency of 10^{-7} per year	RCOL2_03.03.02-9
Hurricane-generated missile spectrum and associated velocities	15 ft. long Schedule 40 pipe moving horizontally at 102 ft/s or vertically at 85 ft/s	15 ft. long Schedule 40 pipe moving horizontally at 85 ft/s or vertically at 85 ft/s	RCOL2_03.03.02-9
	4000 lb automobile moving horizontally at 135 ft/s or vertically at 85 ft/s	4000 lb automobile moving horizontally at 114 ft/s or vertically at 85 ft/s	RCOL2_03.03.02-9
	1 in. diameter steel sphere moving horizontally at 89 ft/s or vertically at 85 ft/s	1 in. diameter steel sphere moving horizontally at 73 ft/s or vertically at 85 ft/s	RCOL2_03.03.02-9
Ambient design air temperature	1% annual exceedance maximum: 100°F dry bulb, 77°F coincident wet bulb, 81°F non-coincident wet bulb	1% annual exceedance maximum: 99°F dry bulb, 75°F coincident wet bulb, 78°F non-coincident wet bulb	
	0% exceedance maximum: 115°F dry bulb, 80°F coincident wet bulb, 86°F non-coincident wet bulb, historical limit excluding peaks <2 hr	0% exceedance maximum: 112°F dry bulb, 78°F coincident wet bulb, 83°F non-coincident wet bulb, historical limit excluding peaks <2 hr 100-year return period maximum: 115°F dry bulb, 78°F coincident wet bulb 86°F non-coincident wet bulb	

CP COL 2.3(1)

In a paper by Kaplan and Demaria, the decay of tropical cyclone winds after landfall was evaluated. The wind speed after landfall is given by the following inland wind decay model:

$$V(t) = V_b + (RV_o - V_b)e^{-\alpha t} - C$$

Where:
V(t) is the wind speed as a function of time,
V_b is 26.7 kt,
R is 0.9,
α is 0.095 hr^{-1},
t is the time after landfall, and
C is a correction factor to account for the inland distance. Where:

$$C = m\left[ln\left(\frac{D}{D_o}\right)\right] + b$$

Where:
D in the inland distance in kilometers,
D_o is 1 km,
$m = c_1{}^*t(t_0 - t)$,
$b = d_1{}^*t(t_0 - t)$,
$c_1 = 0.0109$ kt/hr^2,
$d_1 = -0.0503$ kt/hr^2, and
$t_o = 50$ hr.

Assuming a maximum landfall wind speed or 208 kt (~240 mph), a translational velocity of 16 kt (18.4 mph), and a distance of 400 miles from the CPNPP site to Galveston, gives a maximum possible wind speed of 61 mph at the CPNPP site. This should be considered as the upper bound of possible hurricane wind speed at the CPNPP site.

The Probable Maximum Hurricane (PMH) is discussed in CPNPP UFSAR Subsection 2.3.1.2.2. For the CPNPP site, the PMH sustained (10-minute average) wind speed at 30 ft aboveground is 81 mph (Reference 2.3-205).

The design-basis hurricane parameters used in the design and operation of CPNPP are based on Rev. 0 of RG 1.221. Figure 1 of RG 1.221 indicates that a design-basis hurricane wind speed of 145 mph applies to the CPNPP site. This value is a nominal 3-second gust at 33 ft. above ground over open terrain and has an exceedance probability of 10^{-7} per year (10 million year return period). RCOL2_03.03.02-9

2.3.1.2.3 Tornadoes

During the period January 1, 1950 through July 31, 2006, 158 tornadoes (mean annual frequency of 2.8/yr) occurred within Somervell County and the surrounding counties (Bosque, Erath, Hood, and Johnson) (Reference 2.3-225). It should be

2.3.2.3 Local Meteorological Conditions for Design and Operating Bases

Local meteorological data have not been used for design and operating basis considerations other than those conditions referred to in Subsections 2.3.4 and 2.3.5. Design wind loadings, tornado loadings, hurricane loadings, and snow loadings are referred to under Regional Meteorology, Subsection 2.3.1. Comparison of DCD site parameters with the CPNPP site characteristics is given in Table 2.0-1R. RCOL2_03.03.02-9

2.3.3 On-site Meteorological Measurements Program

CP COL 2.3(1) Replace the content of DCD Subsection 2.3.3 with the following.

The meteorological monitoring program for CPNPP Units 3 and 4 is a continuation of the on-site meteorological monitoring program in place at CPNPP Units 1 and 2. The on-site program follows the program requirements defined in the CPNPP Off-site Dose Calculation Manual (ODCM) (Reference 2.3-223). The current meteorological monitoring program is in effect throughout the CPNPP Units 3 and 4 construction, pre-operational, and operational phases of the project.

The CPNPP meteorological monitoring program completed the pre-operational phase (May 15, 1972 – May 14, 1976) and was reestablished as an operational system prior to CPNPP Unit 1 fuel load (Reference 2.3-205). The program is maintained in accordance with all applicable requirements, was improved on several occasions, and maintains a high level of reliably to perform all required functions.

The pre-operational meteorological program measured the parameters needed to evaluate the dispersive characteristics of the site for both routine operational and hypothetical accidental releases of radionuclides to the atmosphere.

2.3.3.1 Meteorological Measurement System

The CPNPP Units 1 and 2 Reactor Complex is located approximately 450m west-northwest of the meteorological tower. The top of the dome is 69 meters above the level of the base of the meteorological tower. Prior to construction of CPNPP Units 1 and 2, wind was recorded from the west-northwest sector approximately 2.1 percent of all recordings; thus, any effect of the CPNPP Units 1 and 2 Reactor Complex on the overall meteorological measurements program is minimal. Current data (2001 – 2006) show that the wind is from the northwest approximately 2.4 percent of the time at the upper instrument level (60m) and approximately 1.4 percent of the time at the lower (10m) instrument level. In addition, no other structures are in such proximity to the tower that will cause a significant alteration of the meteorological data.

The meteorological measurements system consists of a primary meteorological tower, a backup tower, and a computer system with condition and limit code

3.3 WIND ~~AND~~, TORNADO AND HURRICANE LOADINGS

RCOL2_03.03.02-9

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3.3.1.1 Design Wind Velocity and Recurrence Interval

CP COL 3.3(1) Replace the last sentence of the second paragraph in DCD Subsection 3.3.1.1 with the following.

The site-specific basic wind speed of 96 mph corresponds to a 3-second gust at 33 ft. above ground for exposure category C, with the same recurrence interval as described above, and is therefore enveloped by the basic wind speed used for the design of the standard plant. Site-specific structures, systems, and components (SSCs) are designed using the site-specific basic wind speed of 96 mph, or higher.

3.3.1.2 Determination of Applied Forces

CP COL 3.3(4) Replace the last paragraph in DCD Subsection 3.3.1.2 with the following.

Specific descriptions of wind load design method and importance factor for US-APWR site-specific plant structures are as follows:

- The UHSRS (seismic category I) are analyzed using method 2 of American Society of Civil Engineers (ASCE)/Structural Engineering Institute (SEI) 7-05 (Reference 3.3-1) and an importance factor of 1.15. FSAR Figures 2.5.1-215 and 2.5.5-204 show that the site does possess natural features such as escarpments or hills near the UHSRS that may promote channeling effects or the creation of wakes, but not to the extent that special consideration is warranted. Method 2 of ASCE/SEI 7-05 provides a topographic factor, K_{zt}, in Section 6.5.7 "Topographic Effects," to address this issue when calculating the design wind loading. Also, the other buildings on the site are not of the height, plan dimension, or location relative to the UHSRS such that channeling effects or the creation of wakes or other non-standard wind effects are produced that extend beyond the provisions of the ASCE/SEI 7-05 method 2 procedure. FSAR Table 3KK-2 states that the minimum natural frequency of the UHSRS is 7.1 Hz for the east-west direction, which is the lowest fundamental frequency in any orthogonal direction for any of the soil conditions considered. This means that the UHSRS are rigid with respect to wind loading. As shown in FSAR Figures 3.8-206 through 3.8-211, the UHSRS complex is comprised of relatively low-rise, nearly rectangular structures that do not include any unusual or irregular geometric shapes and are constructed of reinforced concrete walls, floors, and roofs. Therefore, based on the configuration and properties of the UHSRS complex, method 2 of ASCE/SEI 7-05 is an appropriate method of wind load design.

- The exposed portions of the ESWPT (seismic category I) and power source fuel storage vaults (PSFSVs) (seismic category I) are analyzed using method 1 of ASCE/SEI 7-05 (Reference 3.3-1) and an importance factor of 1.15.

CPNPP Units 3 and 4 do not have site-specific seismic category II buildings and structures. FSAR Figures 2.5.1-215 and 2.5.5-204 show that the site location does not have features promoting channeling effects or buffeting in the wake of upwind obstructions that warrant special design consideration. Therefore the wind design methods used for standard plant buildings are valid for the site.

3.3.2.1 Applicable Design Parameter

RCOL2_03.03.02-9

CP COL 3.3(2)
CP COL 3.3(6)

Add the following after the last paragraph in DCD Subsection 3.3.2.1.

The design-basis hurricane wind speed for site-specific seismic category I structures is 145 mph, which corresponds to a 3-second gust at 33 ft. above ground for exposure category C, with the same recurrence interval as described above, and is therefore enveloped by the basic wind speed used for the design of the standard plant. Site-specific SSCs are designed using the site-specific design basis wind speed of 145 mph, or higher.

3.3.2.2.1 Tornado and Hurricane Velocity Forces

CP COL 3.3(2)

Add the following after the third paragraph in DCD Subsection 3.3.2.2.1.

Hurricane velocity pressures for site-specific seismic category I structures are determined by converting hurricane wind speeds into effective velocity pressures in accordance with procedures accepted by SRP 3.3.2 (Reference 3.3-5). Design hurricane loads for seismic category I structures are determined for enclosed and partially enclosed buildings using the analytical procedure method 1 or method 2 provided in Subsection 3.3.1.2, where:

V is the maximum hurricane windspeed = 145 mph

For the design basis hurricane, wind pressure varies with respect to height; therefore, adjustment for wind speed variation with respect to height applies. RCOL2_03.03.02-9

3.3.2.2.2 Tornado Atmospheric Forces

CP COL 3.3(5) Replace the last paragraph in DCD Subsection 3.3.2.2.2 with the following.

Site-specific seismic category I structures are the UHSRS, ESWPT, and the PSFSVs.

The UHSRS, including the pump houses and transfer pump rooms, are configured with large openings and/or vents. The UHS basins and cooling tower enclosures are designed as vented with respect to tornado atmospheric differential pressure loading. Venting of the pump houses and transfer pump rooms is anticipated during a tornado event, however, for the purpose of structural design, the external walls, internal walls, and slabs of the pump houses and transfer pumps rooms are conservatively designed as unvented and the full tornado atmospheric differential pressure loading is applied. Since the full pressure differential for the structural elements is considered, a depressurization model is not used for the structural design.

The ESWPT and PSFSV structures are designed as unvented because they do not have openings that permit depressurization during a tornado.

3.3.2.2.4 Combined Tornado or Hurricane Effects RCOL2_03.03.02-9

CP COL 3.3(2) Replace the first and second sentences of the last paragraph in DCD Subsection 3.3.2.2.4 with the following.

Site-specific seismic category I structures, i.e., the UHSRS and exposed portions of the ESWPT and PSFSVs, are designed for the same tornado or hurricane loadings and combined tornado or hurricane effects using the same methods for qualification described for standard plant SSCs. RCOL2_03.03.02-9

3.3.2.3 Effect of Failure of Structures or Components Not Designed for Tornado and Hurricane Loads RCOL2_03.03.02-9

STD COL 3.3(3) Replace the last paragraph of DCD Subsection 3.3.2.3 with the following.

Other miscellaneous NS buildings and structures in the plant yard are located and/or anchored such that their failure will neither jeopardize safety-related SSCs nor generate missiles not bounded by those discussed in Subsection 3.5.1.4. Further, any site-specific or field routed safety-related SSCs in the plant yard are evaluated prior to their installation to determine if structural reinforcement and/or missile barriers are required to ensure their function and integrity.

3.3.3 Combined License Information

Replace the content of DCD Subsection 3.3.3 with the following.

CP COL 3.3(1) ***3.3(1)*** *Wind speed requirements*

This COL item is addressed in Subsection 3.3.1.1.

CP COL 3.3(2) ***3.3(2)*** *Tornado or hurricane loadings and ~~combined~~ tornado or hurricane effects* RCOL2_03.03.02-9

This COL item is addressed in Subsections 3.3.2.1, 3.3.2.2.1 and 3.3.2.2.4.

STD COL 3.3(3) ***3.3(3)*** *Structures not designed for tornado and hurricane loads*

This COL item is addressed in Subsection 3.3.2.3.

CP COL 3.3(4) ***3.3(4)*** *Wind load design methods and importance factors*

This COL item is addressed in Subsection 3.3.1.2.

CP COL 3.3(5) ***3.3(5)*** *Vented and unvented requirements for site-specific buildings and structures*

This COL item is addressed in Subsection 3.3.2.2.2.

CP COL 3.3(6) ***3.3(6)*** *Hurricane speed requirements* RCOL2_03.03.02-9

This COL item is addressed in Subsection 3.3.2.1.

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probability of turbine failure resulting in the ejection of turbine rotor (or internal structure) fragments through the turbine casing, P_1, as less than 10^{-5} per year. The acceptable risk rate $P_4 = P_1 \times P_2 \times P_3$ is therefore maintained as less than 10^{-7} per year.

RCOL2_03.0
3.02-9

3.5.1.4 Missiles Generated by Tornadoes, Hurricanes and Extreme Winds

CP COL 3.5(5) Add the following after the last paragraph of DCD Subsection 3.5.1.4.

The design basis spectrum of hurricane missiles for site-specific seismic category I structures conforms to the spectrum of missiles in Table 1 and Table 2 of RG 1.221 (Reference 3.5-21) and NUREG/CR-7004 (Reference 3.5-22) with a hurricane wind speed of 145 mph. The spectrum of missiles is: (1) a massive high-kinetic-energy missile that deforms on impact, (2) a rigid missile that tests penetration resistance, and (3) a small rigid missile of a size sufficient to pass through any opening in protective barriers.

Therefore, the spectrum of hurricane missiles is:

- A 4,000 pound automobile, 16.4 ft by 6.6 ft by 4.3 ft, impacting the structure at normal incidence with a horizontal velocity of 114 ft/s or a vertical velocity of 85 ft/s.
- A 6.625 inch diameter by 15 ft long schedule 40 pipe, weighing 287 pounds, impacting the structure end-on at normal incidence with a horizontal velocity of 85 ft/s or a vertical velocity of 85 ft/s.
- A 1 inch diameter solid steel sphere assumed to impinge upon barrier openings in the most damaging direction with a horizontal velocity of 73 ft/s or a vertical velocity of 85 ft/s.

Due to the robustness of the exterior wall design, CPNPP Units 3 and 4 site-specific seismic category I structures exposed to hurricane missiles are capable of withstanding the impact of each identified hurricane missile at any elevation, including the potential impact of a 4,000 pound automobile more than 30 feet above grade.

3.5.1.5 Site Proximity Missiles (Except Aircraft)

CP COL 3.5(3) Replace the paragraph of DCD Subsection 3.5.1.5 with the following.

Externally initiated missiles considered for design are based on tornado missiles and hurricane missiles as described in DCD Subsection 3.5.1.4. As described in Section 2.2, no potential site-proximity missile hazards including turbine missiles from CPNPP Units 1 and 2 are identified except aircraft, which are evaluated in Subsection 3.5.1.6. Subsection 3.5.1.3.1 provides further discussion on the assessment of a turbine missile from CPNPP Units 1 and 2. RCOL2_03.03.02-9

3.5.1.6 Aircraft Hazards

CP COL 3.5(4) Replace the paragraph of DCD Subsection 3.5.1.6 with the following.

The probability of aircraft-related accidents for CPNPP Units 3 and 4 is less than an order of magnitude of 10^{-7} per year for aircraft, airway, and airport information reflected in Subsection 2.2.2.7 and expanded as follows.

- Allowing for an 8 nautical mile wide airway, the plant is at least 2 statute miles beyond the edge of the nearest federal airways.
- The reported average operations of 73 per day (26,645 per year) at Granbury Municipal airport are well below the conservative threshold of 500 D^2 operations per year, where D is the plant-to-airport distance of 10 statute miles.
- Allowing for a 10 nautical mile wide airway, the plant is 2 statute miles beyond the edge of the nearest military flight path.

Since the plant is within 5 statute miles from the nearest edge of military training route VR-158, the probability of an aircraft crashing into the plant (P_{FA}) is estimated in the following manner:

$$P_{FA} = C \times N \times A/w$$

where

C = In-flight crash rate per mile for aircraft using the airway

w = Width of airway, plus twice the distance from the airway edge to the site, conservatively provided in statute miles, equals 10 statute miles + (2 x 2 statute miles)

N = Estimated annual number of aircraft operations

A = Effective area of plant in square miles

As determined in FSAR Section 2.2, Subsection 3.5.1.5 and Subsection 3.5.1.6, no site-specific hazards for external events produce missiles more energetic than tornado missiles and hurricane missiles identified for the US-APWR standard plant design. The design basis for externally generated missiles is therefore bounded by the standard plant design criteria for tornado-generated missiles and hurricane-generated missiles in ~~DCD~~ Subsection 3.5.1.4. RCOL2_03.03.02-9 RCOL2_03.03.02-9

3.5.4 Combined License Information

Replace the content of DCD Subsection 3.5.4 with the following.

STD COL 3.5(1) ***3.5(1)*** *Prevent unsecured equipment from becoming potential hazard*

This COL item is addressed in Subsections 3.5.1.1.2 and 3.5.1.1.4.

CP COL 3.5(2) ***3.5(2)*** *Maintain* P_1 *within acceptable limit*

This COL item is addressed in Subsection 3.5.1.3.2.

CP COL 3.5(3) ***3.5(3)*** *Presence of potential hazards and effects in vicinity of site, except aircraft*

This COL item is addressed in Subsection 3.5.1.5.

CP COL 3.5(4) ***3.5(4)*** *Site interface parameters for aircraft crashes and air transportation accidents*

This COL item is addressed in Subsection 3.5.1.6.

CP COL 3.5(5) ***3.5(5)*** *Other potential site-specific missiles*

This COL item is addressed in Subsections 3.5.1.4 and 3.5.2. RCOL2_03.03.02-9

CP COL 3.5(6) ***3.5(6)*** *Orientation of T/G of other unit(s)*

This COL item is addressed in Subsection 3.5.1.3.1.

3.5.5 References

Add the following reference after the last reference in DCD Subsection 3.5.5.

3.5-201 *The Annual Probability of an Aircraft Crash on the U.S. Department of Energy Reservation in Oak Ridge, Tennessee*, ORNL/ENG/TM-36, Oak Ridge National Laboratory, Oak Ridge, TN, November 1992.

Structure-to-structure interactions, which could potentially influence the measured seismic response levels, will not occur because the R/B and PS/B are both founded on the same very stiff limestone layer and are separated by expansion joints which prevent seismic interaction.

Site-specific conditions at CPNPP Units 3 and 4 do not result in exceedance of the assumed pressure distributions used for the US-APWR standard plant design.

STD COL 3.7(9) Replace the seventh paragraph in DCD Subsection 3.7.2.8 with the following.

The site-specific Category I SSCs are the UHSRS, the ESWPT, and the PSFSV. The layout design of the site-specific safety-related SSCs ensures that there are no adjacent non-seismic Category I structures which may adversely affect these structures, to protect them from structural failure of non-seismic Category I structures.

3.7.2.13 Methods for Seismic Analysis of Dams

CP COL 3.7(27) Replace the paragraph in DCD Subsection 3.7.2.13 with the following.

Neither the US-APWR standard plant design nor the CPNPP Units 3 and 4 plant design include the use of dams.

3.7.3.8 Methods for Seismic Analysis of Category I Concrete Dams

CP COL 3.7(27) Replace the paragraph in DCD Subsection 3.7.3.8 with the following.

Neither the US-APWR standard plant design nor the CPNPP Units 3 and 4 plant design include the use of dams.

3.7.3.9 Methods for Seismic Analysis of Aboveground Tanks

CP COL 3.7(12) Replace the first paragraph in DCD Subsection 3.7.3.9 with the following.

The seismic category I fuel oil storage tanks are metal tanks which are enclosed by tornado/hurricane missile protecting concrete vaults (that is, the seismic category I PSFSVs). Since the PSFSVs are below-grade structures, the fuel oil storage tanks are not above-ground tanks. However, the tanks and their mountings are seismically analyzed consistent with the discussion of hydrodynamic loads for above-ground tanks given further below. The tanks' seismic analysis is based on the ISRS which are derived from site-specific SSI analysis of the PSFSVs as documented in Appendix 3MM, using the corresponding site-specific FIRS. Flexibility of the tank shell and tank shell RCOL2_03.03.02-9

The following structures are supported by the ESWPT as an integral part of the tunnel:

- Fuel/Pipe access tunnels, providing access from the PS/B to the PSFSVs are shown in Figures 3.8-204 and 3.8-212.
- Reinforced concrete air intake enclosures projecting above the ground for ESWS piping from the ESWS pump houses.

For details see Figures 3.8-202 through 3.8-205.

The modeling and analysis of the ESWPT is described in Appendix 3LL.

The ESWPT is divided into three segments separated by expansion joints. A key plan showing the locations of the three segments is included in Figure 3.8-201. The segments are defined as follows:

- Tunnel Segment 1, as shown in Section G in FSAR Figure 3.8-203, is representative of the typical tunnel segments to the east and west of the R/B.
- Tunnel Segment 2, as shown in Section F and F' in FSAR Figure 3.8-202, is representative of segments adjacent to the Ultimate Heat Sink (UHS) structures. A tornado/hurricane missile shield extends from the top of this segment to protect openings in the UHS. RCOL2_03.03.02-9
- Tunnel Segment 3, as shown in Section H and H' in FSAR Figure 3.8-204 is representative of segments with fuel pipe access tunnels extending from the top. These are located adjacent to the PSFSVs.

Each segment has a somewhat different geometry and is designed separately. Segments 1 and 3 have roof slab and mat slab thicknesses of 2'-0" while Segment 2 has a roof slab and mat slab thickness of 2'-6".

All segments are designed for the same basic load conditions, but due to differing geometry the values of some of the loads (seismic, soil pressure, live loads, etc.) varied. The resulting moments and shears also varied. Thus, Segment 2 requires a thicker roof slab because this segment includes the tornado/hurricane missile shield structure. This requires a thicker roof to resist additional reactions not present in the roof slabs of the other segments. RCOL2_03.03.02-9

Similarly, a thicker mat slab is required in Segment 2 to resist additional moments and shears at the two large shear keys and to resist additional bearing pressures. The keys are required to resist soil dynamic and active pressures because over most of the length of this segment backfill is placed only on one side of the structure. In this segment there are unbalanced soil pressures, thus requiring shear keys to resist the lateral forces. Higher bearing pressures are placed on the trajectory of postulated direct or deflected design basis tornado missiles and hurricane missiles. RCOL2_03.03.02-9

The operating floor of the pump house is a reinforced concrete slab spanning east-west and supported by UHS basin exterior and interior walls. The operating floor supports the ESWS pump, UHS transfer pump, and motors. The roof of the pump house is a reinforced concrete slab spanning north-south and supported by reinforced concrete beams. To allow access to the ESWS pump/motor, a removable reinforced concrete cover is provided in an opening in the roof of the pump house.

Tornado/hurricane missile shields are provided to protect the air intake and air outlets of the ESWS pump house HVAC system from tornado missiles and hurricane missiles. The structural design considers tornado differential pressure loads as discussed in Subsection 3.3.2.2.2. RCOL2_03.03.02-9

UHS cooling tower enclosures - Each UHS basin has one cooling tower with two cells. Each cell is enclosed by reinforced concrete structures that house the equipment required to cool the water for ESWS. The reinforced concrete wall running north-south separates the two cell enclosures. The enclosures are an integral part of the UHS basin supported by the basin interior and exterior walls on the basemat foundation. A reinforced concrete wall, running east-west, separates the cell enclosure portion of the basin from the rest of the UHS basin. An east-west wall is provided with openings at the basemat to maintain the continuity of the UHS basin. Air intakes are located at the north and south faces of the cooling tower enclosure. The missile shields at the air intakes are configured to protect the safety-related substructures and components housed within the UHS structure from tornado missiles and hurricane missiles. FSAR Table 3.2-201 lists the site-specific equipment and components located in the UHSRS that are protected from tornado missiles and hurricane missiles. The north side air intake is an integral part of the cooling tower enclosure, whereas the south side air intake is an integral part of the ESWPT, and is supported by reinforced concrete piers which are supported by the ESWPT walls and basemat. RCOL2_03.03.02-9 RCOL2_03.03.02-9

Each cooling tower cell enclosure is equipped with a fan and associated equipment to cool the water. Equipment includes header pipe, spray nozzles, and drift eliminators with associated reinforced concrete beams supported by the exterior walls of the enclosure. The fan and motor are supported by reinforced concrete deck above the drift eliminators. A circular opening is provided in the deck for the fan, and the deck is supported by enclosure walls and a deep upside circular concrete beam around the fan opening. The fan is supported by a north-south concrete beam at the center of enclosure. For air circulation and to protect the fan and motor from tornado missiles and hurricane missiles, a circular opening is provided at the roof of the enclosure (centered on the fan) with a reinforced concrete slab and heavy steel grating between the roof and the deck. The fans, motors and associated equipment are designed ~~with consideration given to~~to withstand the effects of design basis tornado differential pressure. RCOL2_03.03.02-9 RCOL2_14.03.07-38

All exposed parts of cooling tower enclosure, the UHS ESWS pump house and the UHS basin that could be impacted by a tornado or hurricane missile are RCOL2_03.03.02-9 designed to prevent full penetration or structural failure by the spectrum of tornado missiles and hurricane missiles identified in Subsection 3.5.1.4. RCOL2_03.03.02-9

For details see Figures 3.8-207 through 3.8-211 for the UHS basin, UHS ESW pump house and cooling tower enclosures. Details of the UHSRS seismic analysis are provided in Appendix 3KK.

3.8.4.1.3.3 PSFSVs

The PSFSVs are underground reinforced concrete structures required to house the safety-related and non safety-related fuel oil tanks. There is one vault for each PS/B. The vault contains two safety-related and one non safety-related oil tanks. Each tank is contained in a separate compartment. Compartments are separated by reinforced concrete walls. A common mat supports the tanks and the rest of the vault. The PSFSV roof slab is sloped to facilitate drainage. The highest point of the roof slab is slightly above grade. Bollards and a concrete curb are provided to prevent vehicular traffic on the roof.

Access to each vault is provided by a reinforced concrete tunnel from the applicable PS/B. Each tank compartment has a separate pipe/access tunnel, which is an integral part of the ESWPT.

For vault details see Figures 3.8-212 through 3.8-214. Details of the PSFSV seismic analysis are provided in Appendix 3MM.

3.8.4.1.3.4 Other Site-Specific Structures

There are no additional site-specific seismic category I structures other than ESWPT, UHSRS and PSFSVs.

3.8.4.3 Loads and Load Combinations

CP COL 3.8(20) Replace the second paragraph in DCD Subsection 3.8.4.3 with the following.

Externally generated loads from the following postulated site-specific sources are evaluated in the following subsections:

- Subsection 2.4.2.3 concludes no loads induced by floods are applicable.
- Subsection 3.5.1.6 concludes no loads from non-terrorism related aircraft crashes are applicable.
- Subsection 2.2.3.1.1 concludes no explosive hazards in proximity to the site are applicable, and

layers above elevation 393 ft. Since the support below the structure will not exhibit long-term settlement effects, the subgrade stiffness calculated from ASCE-4 Section 3.3.4.2 is used for analysis of both static and seismic loads.

The equivalent shear modulus for the ASCE spring calculations is based on the equivalent shear wave velocity which is determined using the equivalent shear wave travel time method described in Appendix 3NN. The equivalent Poisson's ratio and density are based on the weighted average with respect to layer thickness. The springs are included in the model using three individual, uncoupled uni-directional spring elements that are attached to each node of the base mat. The same stiffness is applied to all springs and the sum of all nodal springs in each of the three orthogonal directions are equal to the corresponding generalized structure-foundation stiffness in the same direction calculated from ASCE 4-98 (Reference 3.8-34). In the vertical direction, the smaller of the spring stiffness that matches the ASCE 4-98 vertical or rocking stiffness is used. Matching of the torsional stiffness is not considered since significant torsional response is not expected (or observed) in any of the structures.

Each UHS cooling tower, air intake enclosures, and ESWS pump house are designed for tornado and hurricane wind and tornado/hurricane~~-~~generated missiles and in-plane and out-of-plane seismic forces. The walls are shear/bearing walls carrying the loads from the superstructure and transferring to the basemat. The UHS basin exterior walls are also designed for static and dynamic soil pressure, and hydrostatic and hydrodynamic fluid pressures. The static soil pressures are calculated using at-rest pressures with K_o = 0.47. This is the same as the at-rest pressure coefficient given in Figure 2.5.4-243. The design also considers the load from soil compaction pressure. The dynamic soil pressures are determined in accordance with ASCE 4-98 (Reference 3.8-34) and the hydrodynamic fluid pressures are determined using ACI 350.3-06 (Reference 3KK-5) and modeling procedures of ASCE 4-98 as described in Appendix 3KK. Below-grade walls loaded laterally by soil pressure on the outside, or hydrostatic pressure on the inside, act as two-way slabs, spanning horizontally to perpendicular shear walls, and cantilevering vertically from the mat slab (at the pump room, the walls span vertically between the mat slab and the pump room floor). For seismic loads, the shear walls are designed to resist 100% of the applied lateral load through in-plane shear. The shear walls transmit load to the mat slab. The shear in the mat slab is transferred to the fill concrete via friction, and direct bearing at the pump house sump. The shear in the fill concrete is transferred to the bedrock via friction and bearing at the pump hose sump. The coefficients of friction considered at the fill concrete/bedrock interface and the foundation concrete/fill concrete interface are no higher than 0.6, which is consistent with the values for coefficient of friction discussed in Subsection 2.5.4.10.5. RCOL2_03.03.02-9

Above grade walls loaded laterally by seismic forces as described in Appendix 3KK, or by wind, ~~or~~ tornado wind or hurricane wind, atmospheric and missile loads, act as two-way slabs, spanning horizontally to perpendicular shear walls and vertically to floor and roof slabs. These slabs act as horizontal diaphragms, RCOL2_03.03.02-9 and span horizontally to the perpendicular shear walls. The shear in the shear walls is transferred to bedrock as described above.

Vertical loads in the floor and roof slabs are due to dead load, live load, and wind, ~~or~~ tornado, or hurricane missile loads. The floor and roof slabs act as two-way slabs, spanning to the walls or beams below in both directions. The vertical loads are transmitted to the mat slab, then into the fill concrete, and then into bedrock. RCOL2_03.03.02-9

3.8.4.4.3.3 PSFSVs

The PSFSVs are designed to withstand the loads specified in Subsection 3.8.4.3. The structural design of the PSFSV is performed using the computer program ANSYS (Reference 3.8-14). Details of the seismic analysis and the computer programs used for the seismic analysis are addressed in Appendix 3MM.

The ANSYS analyses are performed on the model placed on soil springs at the bottom of the concrete fill / top of limestone level representing the stiffness provided by the rock subgrade. The stiffness of the subgrade springs is calculated using the methodology in ASCE-4 Section 3.3.4.2 (Reference 3.8-34) for vibration of a rectangular foundation resting on an elastic half space. The springs are included to provide localized flexibility at the base of the structure to calculate base slab demands. The soil adjacent to the PSFSVs is not included in the design model in order to transfer the total seismic load through the structure down to the base slab. Embedment effects are included in the SSI model from which the seismic lateral soil pressures and inertia loads are based. The evaluation of subgrade stiffness considers the best estimate properties of the layers above elevation 215 ft. Since the support below the structure will not exhibit long-term settlement effects, the subgrade stiffness calculated from ASCE-4 Section 3.3.4.2 is used for analysis of both static and seismic loads.

The equivalent shear modulus for the ASCE spring calculations is based on the equivalent shear wave velocity, which is determined using the equivalent shear wave travel time method described in Appendix 3NN. The equivalent Poisson's ratio and density are based on the weighted average with respect to layer thickness. The springs are included in the model using three individual, uncoupled uni-directional spring elements that are attached to each node of the base mat. The same stiffness is applied to all springs and the sum of all nodal springs in each of the three orthogonal directions are equal to the corresponding generalized structure-foundation stiffness in the same direction calculated from ASCE 4-98 (Reference 3.8-34). In the vertical direction, the smaller of the spring stiffness that matches the ASCE 4-98 vertical or rocking stiffness is used. Matching of the torsional stiffness is not considered since significant torsional response is not expected (or observed) in any of the structures.

Vertical loads present on the roof of the PSFSVs are carried by the perimeter and interior walls. The roof acts as a two-way slab based on its aspect ratio with a single span in the north-south direction and a 3-span continuous slab with two-way action in the east-west direction. The vertical wall loads are transmitted

Table 3.8-203

Load Combinations and Factor of Safety for Buildings and Structures

Building/Structure	Load Combination (per SRP 3.8.5)	Overturning (FS_{ot})	Sliding (FS_{sl})	Flotation (FS_{fl})
PFSVs	D + H + W	5.51	1.85(2)	N/A
	D + H + E_s	3.29	1.28(2)	N/A
	D + H + W_t	5.51	1.85(2)	N/A
	D + F_b	N/A	N/A	1.71
UHSRS	D + H + W	>6	1.77	N/A
	D + H + E_s	>3	1.10	N/A
	D + H + W_t	>>1.1(4)	>>1.1(4)	N/A
	D + F_b	N/A	N/A	1.13(1)
ESWPT	D + H + W	3.56(5)	1.61(3)(5)	N/A
	D + H + E_s	1.57(5)	1.18(3)(5)	N/A
	D + H + W_t	3.56(5)	1.61(3)(5)	N/A
	D + F_b	N/A	N/A	2.0

Notes

1. The value shown is based on the assumption that a UHS basin is completely emptied of water (such as for maintenance) concurrent with a local intense precipitation event that causes saturation of the adjacent backfill up to elevation 821 ft. This is conservative because, as stated in Subsection 2.4.2.3, the UHSRS are adjacent to downward slopes leading into the Squaw Creek Reservoir which allow drainage to pass freely without accumulating.

2. Shear keys are used to prevent sliding and the FS is based on the shear key capacities.

3. Adjacent to the UHSRS, a shear key is used at both the tunnel base slab-to-concrete fill interface and the concrete fill-to-limestone interface, and the FS is based on shear key capacity.

4. Global stability is governed by wind and seismic load combinations for the UHSRS and is not explicitly calculated for the tornado or hurricane load combination. In terms of total base shear force, the seismic demand is more than 10 times the tornado demand. RCOL2_03.03.02-9

5. The factors of safety shown are for the ESWPT segment adjacent to the UHSRS, which governs the design with respect to these safety factors due to the mass and exposure of the UHS air intake missile shields that are integrally attached to the tunnel at this location.

3.12 PIPING DESIGN REVIEW

This section of the referenced DCD is incorporated by reference with the following departures and/or supplements.

3.12.5.1 Seismic Input Envelope vs. Site-Specific Spectra

STD COL 3.12(2) Replace the second paragraph in DCD Subsection 3.12.5.1 with the following.

For piping located in the yard that is not part of the US-APWR standard design, site specific response spectra described in Subsection 3.7.1 are used for piping analysis.

3.12.5.3.6 Wind/Tornado or Hurricane Loads

RCOL2_03.03.02-9

CP COL 3.12(3) Replace the paragraph in DCD Subsection 3.12.5.3.6 with the following.

There is no ASME Code, Section III (Reference 3.12-2) Class 2 or 3 piping exposed to wind, ~~or~~ tornado or hurricane loading. Non-ASME piping, such as B31.1 (Reference 3.12-1) exposed to wind, ~~or~~ tornado or hurricane loading, is evaluated to the wind and tornado or hurricane loading identified in Section 3.3, in conjunction with the applicable piping code load combinations.

RCOL2_03.03.02-9

3.12.5.6 High-Frequency Modes

CP COL 3.12(4) Replace the second sentence of the second paragraph in DCD Subsection 3.12.5.6 with the following.

For the site-specific ground motion response spectra, there are no high frequency exceedances of the CSDRS. Therefore, high frequency screening of the piping system for high frequency sensitivity is not required.

3.12.5.10 Thermal Stratification

CP COL 3.12(5) Replace the last sentence of the last paragraph in DCD Subsection 3.12.5.10 with the following.

The monitoring of the first cycle operation is performed when the CPNPP Unit 3 or 4 will be the first US-APWR Plant.

3.12.7 Combined License Information

Replace the content of DCD Subsection 3.12.7 with the following.

3.12(1) *Deleted from the DCD.*

STD COL 3.12(2) ***3.12(2)*** *Site-specific seismic response spectra for design of piping*

This COL item is addressed in Subsection 3.12.5.1.

CP COL 3.12(3) ***3.12(3)*** *Site-specific ASME Code, Section III, Class 2 or 3 piping, exposed to wind, ~~or~~ tornado or hurricane loads* RCOL2_03.03.02-9

This COL item is addressed in Subsection 3.12.5.3.6.

CP COL 3.12(4) ***3.12(4)*** *Piping systems evaluation for sensitivity to high frequency modes*

This COL item is addressed in Subsection 3.12.5.6.

CP COL 3.12(5) ***3.12(5)*** *The monitoring of thermal stratification at pressurizer surge line*

This COL item is addressed in Subsection 3.12.5.10.

3LL MODEL PROPERTIES AND SEISMIC ANALYSIS RESULTS FOR ESWPT

3LL.1 Introduction

This Appendix discusses the seismic analysis of the essential service water pipe tunnel (ESWPT). The computer program SASSI (Reference 3LL-1) serves as the platform for the soil-structure interaction (SSI) analyses. The three-dimensional (3D) finite element (FE) models used in SASSI are condensed from FE models with finer mesh patterns initially developed using the ANSYS computer program (Reference 3LL-2). The dynamic analysis of the SASSI 3D FE model in the frequency domain provides results for the ESWPT seismic response that include SSI effects. The SASSI model results for maximum accelerations, seismic soil pressures and base response spectra are used as input to the ANSYS models for performing the detailed structural design, including loads and load combinations in accordance with the requirements of Section 3.8. Table 3LL-14 summarizes the analyses performed for calculating seismic demands. The SASSI analysis and results presented in this Appendix include site-specific SSI effects such as the layering of the subgrade, flexibility, and embedment of the ESWPT structure, and scattering of the input control design motion. Due to the low seismic response at the Comanche Peak Nuclear Power Plant site and the lack of high-frequency exceedances, the SASSI capability to consider incoherence of the input control motion is not implemented in the analysis of the ESWPT. Wave passage effects are considered small and do not impact the seismic design because the tunnel foundation is supported by a stiff limestone layer, which will experience low strains under the fairly low seismic motion at the site.

3LL.2 Model Description and Analysis Approach

The ESWPT is modeled with three separate models, each model representing a physical portion of the ESWPT, which are separated by expansion joints (see Subsection 3.8.1.6) that prevent any significant interaction of segments at the interface. Tunnel Segment 1 represents a typical straight north-south tunnel segment buried in backfill soil. Tunnel Segment 2 represents east-west segments adjacent to the ultimate heat sink related structures (UHSRS). Two tornado/hurricane missile shields extend from the top of this segment to protect the essential service water (ESW) piping and openings into the ultimate heat sink (UHS). The FE model for Segment 3 represents east-west segments adjacent to the power source fuel storage vault (PSFSV) and includes elements representing the fuel pipe access tunnels that extend across the top of the ESWPT. The SSI analyses for all tunnel segments considered soil on all sides in which soil is in contact including the top and bottom of the tunnel. RCOL2_03.03.02-9

The SSI models for each of the three ESWPT segments are shown in Figures 3LL-1 through 3LL-6 as overall and cutaway views. Tables 3LL-1, 3LL-2, and 3LL-3 present the properties assigned to the structural components of the SASSI FE models for Segments 1, 2, and 3, respectively. Detailed descriptions and cables are physically separated which minimizes the chance of simultaneous failure. The underground duct bank for these circuits is sealed to prevent degradation in wetted or submerged condition.

8.2.1.2.1 Switchyard

CP COL 8.2(3) Replace the content of DCD Subsection 8.2.1.2.1 with the following.

8.2.1.2.1.1 Plant Switching Station

The plant switching station is located approximately half a mile south-west from the plant-site, within the CPNPP property. From the plant switching station, there are four outgoing transmission lines going to remote switching stations, and four transmission tie lines going to the four unit switchyards. There are two control houses in the plant switching station. The control and protection equipment associated with the DeCordova and Johnson transmission lines and the two normal PPS transmission tie lines are located in control house #1. The control and protection equipment associated with the Parker and Whitney transmission lines and the two alternate PPS transmission tie lines are located in control house #2. The control and protection circuit cables that are routed in the yard and associates with two different control houses are physically separated to avoid a common cause failure of the two control houses and the availability of the associated offsite power circuits. The four outgoing transmission lines to remote switching stations and the four transmission tie lines to the unit switchyards are installed on separate sets of transmission towers and do not cross each other. Any credible failure of one PPS circuit, including catastrophic failure of transmission towers, is not cause the failed circuit or tower to fall into PPS circuit for the same unit. The plant switching station, including the transmission lines, towers, protection relay systems, control houses, etc. are not specifically designed for earthquake, tornado, hurricane or flooding; however, they are designed to the applicable industry standards and regulations to assure a safe and highly reliable offsite power system. Each power circuit of the normal and alternate PPS, originating from the ERCOT transmission grid and terminating at the line-side of the medium-voltage bus incoming circuit breakers, is designed to withstand the effects of natural phenomena (excluding earthquake, tornado, hurricane or flooding) and protected from dynamic effects, and has sufficient capacity and capability to assure satisfactory operation of all safety loads and non safety loads, under normal, abnormal and postulated accident conditions. Lightning protection system is also provided as discussed in Subsection 8.3.1.1.11.

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RCOL2_03.03.02-9

The breakers in the plant switching station are arranged in a breaker-and-a-half scheme having six bays. Of the six bays, two bays are provided with three circuit breakers and the remaining four bays are provided with two circuit breakers. Provision is made for adding the third circuit breaker in the two-circuit breaker bays to accommodate future growth. All 345 kV circuit breakers have dual trip coils. The switching station main buses are constructed of six-inch aluminum

A detailed description and drawing of the UHS are provided in Subsection 9.2.5.2.1, Figure 9.2.5-1R, and Table 9.2.5-3R.

The source of makeup water to the UHS inventory and blowdown discharge location are discussed below. Subsection 10.4.5.2.2.11 describes treatment of blowdown in order to meet wastewater discharge limits.

The source of cooling water and location of the UHS are discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

The location and design of the ESW intake structure is discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

The location and design of the ESW discharge structure is discussed in Subsections 9.2.5.2.1 and 9.2.5.2.2.

9.2.5.2.1 General Description

CP COL 9.2(1)
CP COL 9.2(3)
CP COL 9.2(4)
CP COL 9.2(5)
CP COL 9.2(18)
CP COL 9.2(19)
CP COL 9.2(20)
CP COL 9.2(21)

Replace DCD Subsection 9.2.5.2.1 with the following.

Each unit is provided with its own independent UHS, with no sharing between the two units. The UHS for each unit consists of four 50 percent capacity mechanical draft cooling towers, one for each ESWS train, and four 33 one-third percent capacity basins to satisfy the thirty day cooling water supply criteria of RG 1.27.

Each cooling tower consists of two cells with fans and motors, drift eliminators, film fills, risers, and water distribution system all enclosed and supported by a seismic category I reinforced concrete structure. Cooling tower components are designed per equipment Class 3 and quality group C requirements. Each basin includes an ESWP intake structure that contains one 50 percent capacity ESWP and one 100 percent capacity UHS transfer pump, and associated piping and components. The UHS system is classified as a moderate-energy system. The UHS piping material, including the UHS transfer piping, is carbon steel with an internal polyethylene lining. The piping is not buried; therefore, cathodic protection is not utilized. The cooling tower spray nozzles are sized to prevent blockage by debris. Tornado/hurricane missile protection for the cooling tower components, ESWPs and piping is provided by the UHS safety-related seismic category I structures and ESW pipe tunnel as discussed in Subsection 3.8.4. The UHS structural design, including pertinent dimensions, is also discussed in Subsection 3.8.4.

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RCOL2_09.02.05-19
RCOL2_14.03.07-38
RCOL2_03.03.02-9

Each cooling tower consists of two cells, each with a motor driven fan driven with a right-angle gear reducer. The fans operate at a single speed and in a single direction. The fan motors are powered from the Class 1E normal ac power system. On loss of offsite power (LOOP), the motors are automatically powered from their respective division emergency power source.

RCOL2_14.02-21

vents minimize system drain down in the idle trains or upon loss of offsite power and subsequent pump trip.

The following features preclude or minimize water hammer forces:

- On loss of off-site power (LOOP), the discharge MOV of the operating train is closed by DC power. This, together with the discharge check valve, prevents draindown to the basin.

- The ESW pump start logic interlocks the discharge MOV operation with the pump operation. The re-start of the tripped pump or start of the stand-by pump, opens the discharge valve slowly after a pre-determined time delay, sweeping out voids from the discharge piping and CT riser and distribution piping.

- The system valve lineup and periodic inservice testing of the idle trains, including testing of the high point vents, help minimize potential voids and water hammer forces.

- ~~Level switches are installed in the vertical piping of the cooling tower spray header to annunciate if system inventory reduction occurs and operator action is required to supply water to the vertical piping.~~ RCOL2_14.02-21 RCOL2_14.03.07-38 S01 RCOL2_14.02-21 S01

Four 100% capacity UHS transfer pumps, one located in each UHS ESW pump house, are provided to transfer cooling water from a non-operating UHS basin to the operating UHS basins when required during accident conditions.

All transfer pumps discharge into a common header which in turn discharges to individual UHS basins. All discharge piping is located in missile protected and tornado/hurricane protected areas. The common discharge header and other UHS system piping are designed to seismic Category I requirements. The piping is located in seismic Category I structures. There is no non-seismic piping in the vicinity of this header, and there are no seismically induced failures. Pipes are protected from tornado missiles and hurricane missiles. The UHS transfer pump(s) operate during accident conditions, during IST in accordance with plant Technical Specifications, during maintenance, and for brief periods during cold weather conditions for recirculation. As the header is normally not in service, deterioration due to flow-accelerated corrosion is insignificant. Transfer of water inventory is required assuming one train/basin of ESW/UHS is out of service (e.g., for maintenance), and a second train is lost due to a single failure. When a transfer pump is in operation, fluid velocity in the header is approximately 5.1 ft/sec. Operating conditions are approximately 20 psig and 95° F. Therefore, header failures are not considered credible. RCOL2_03.03.02-9 RCOL2_03.03.02-9

The UHS transfer pump is designed to supply 800 gpm flow at a total dynamic head (TDH) of 40 feet. Transfer pump capacity is more than adequate to replenish the maximum water inventory losses from two operating ESWS trains. Minimum available net positive suction head (NPSHA) is approximately 40 feet. This is

- The wall separating the ESW pump room from the transfer pump room is a solid wall with all penetrations sealed with an approved 3-hour fire rated seal and a water tight seal. RCOL2_09.04.05-23 S01
- As shown in Table 9.4-203, failure of a single active component in one of the UHS ESW pump house ventilation system does not result in a loss of the system's safety function.
- The UHS ESW pump house ventilation system components are protected from tornado/hurricane generated missiles by their location inside a seismic category I structure. RCOL2_03.03.02-9
- Backdraft dampers are capable of withstanding the affects of tornado wind and atmospheric differential pressure loading or hurricane wind effects. RCOL2_03.03.02-9
- The UHS ESW pump house air intakes and air outlets are protected from tornado missiles and hurricane missiles as described in Subsection 3.8.4.1.3.2. RCOL2_03.03.02-9

STD COL 9.4(6) Add the following new subsection after DCD Subsection 9.4.5.4.5.

9.4.5.4.6 UHS ESW Pump House Ventilation System

In addition to the general requirements in Subsection 9.4.5.4, the backdraft dampers are factory tested to demonstrate their capability to withstand the tornado and hurricane wind effects and atmospheric differential pressure loading. RCOL2_03.03.02-9

The general requirements in Subsection 9.4.5.4 apply.

STD COL 9.4(6) Add the following new subsection after DCD Subsection 9.4.5.5.5.

9.4.5.5.6 UHS ESW Pump House Ventilation System

The following instrumentation serving the UHS ESW pump houses includes:

- Alarm on low airflow for ESW pump room or UHS transfer pump room.
- Indication of the status of the exhaust fans.
- Alarm on high room temperature in ESW pump room or UHS transfer pump room.
- Alarm on low room temperature in ESW pump room or UHS transfer pump room.
- Temperature switches for control of ESW pump room and UHS transfer pump room exhaust fans and heaters.

CP COL 11.4(1) Replace the last sentence of the fourth paragraph in DCD Subsection 11.4.2.3 with the following.

A common radwaste interim storage facility is provided between Units 3 and 4 and is designed to store classes A, B, and C wastes from all four CPNPP units for up to 10 years. The common radwaste facility is designed to maintain onsite and offsite radiological doses within the limits in 10 CFR Part 20 and to maintain occupational exposures ALARA. This common radwaste interim storage facility reflects the site-specific waste volume reduction requirements and the current waste disposal strategy of the State of Texas. As design proceeds, the interim storage facility design may be revised to meet future waste acceptance and disposal criteria.

The common radwaste interim storage facility also includes a separate storage area for mixed waste and temporary staging of large equipment items for maintenance.

The radioactive mixed waste storage area is designed and constructed in accordance with permit application for its operation received from the State of Texas Commission on Environmental Quality.

The interim storage facility is designed to meet the guidance of NUREG-0800 Appendix 11.4-A. The facility design and operation ensure that radiological consequences of design basis events (such as fire, tornado, hurricane, seismic occurrence, and flood) do not exceed a small fraction of 10 CFR 100 dose limits. RCOL2_03.03.02-9 The facility also meets the guidance provided in Generic Letters 80-09, 81-38, and 81-39, and in SECYs 94-198 and 93-323. The facility is located within the plant's protected area and meets the dose limits set in 40 CFR 190 as implemented under 10 CFR 20.1301 (e) and 10 CFR 20.1302. Onsite dose limits from the radwaste interim storage facility meet the requirements of 10 CFR 20, including the ALARA principle of 10 CFR 20.1101.

In accordance with 10 CFR 20.1406, the facility includes design features that would minimize contamination of the waste facility and environment to the extent practicable; facilitate eventual decommissioning; and minimize the generation of extraneous radioactive waste. All potential radionuclide release pathways are monitored in accordance with 10 CFR 50, Appendix A.

The containers selected for use in the facility are chosen based on their ability to maintain integrity over their storage life, and compatibility with the types of waste stored. Additionally the containers are inspected periodically to ensure container integrity is maintained. The facility is also equipped with provisions for collecting liquid drainage and sampling of collected liquids. The design of the facility also uses shielded vaults for Class B and C waste; includes separate control and equipment room ventilation systems and airborne radiation monitor; and a remote bridge crane with closed circuit television cameras.

the criteria provided in the 1975 Standard Review Plan can be used as an acceptable basis for the screening criteria of external events. The criteria are:

i. the contribution to core damage frequency (CDF) is less than 10^{-6}/year, or

ii. the design-basis event at annual frequencies of occurrence is between 10^{-7} and 10^{-6}.

For Comanche Peak Units 3 and 4, a value of 10^{-7} for the annual frequency of occurrence is used as a more conservative quantitative screening criterion. If an event frequency is greater than 10^{-7}/year, perform bounding analysis or PRA to confirm that the risk is sufficient lower for advanced light water reactors such as less than 1% of total CDF. The remaining external events which do not meet the above screening criteria are assessed using a bounding analysis.

The qualitative and quantitative screenings are performed using the analysis reported in the FSAR Sections 2.2, 2.3 and 2.4, and Section 3.5. The summary of the screenings is described in Table 19.1-205. Only tornado events are not screened because the probability of expected maximum tornado wind speed on the site is close to 10^{-7}/year.

High Winds, ~~and~~ Tornado~~es~~ Winds, and Hurricane Winds RCOL2_03.03.02-9

For high winds, ~~and~~ tornado~~es~~ winds and hurricane winds, tornadoes are evaluated using level 1 PRA as a bounding analysis from the discussion in Subsection 2.3.1.2.3.

The following sections show the results of the tornado PRA elements (1) tornado hazards, (2) plant vulnerabilities, (3) accident scenario, and (4) quantification.

- Tornado hazard

  A tornado wind speed hazard curve for CPNPP Units 3 and 4 was developed following NUREG/CR-4461 which also forms the basis for NRC Regulatory Guide 1.76. The tornado hazard methodology developed in NUREG/CR-4461 fully meets the requirements of ASME/ANS RA-Sa-2009.

  The CPNPP Units 3 and 4 are near Glen Rose, Texas and are located at 32° 17' latitude and 97° 47' longitude. The tornado hazard curve has been developed based on data reported in NUREG/CR-4461 for the 2° box surrounding the site, which recorded 655 tornado occurrences from 1950 through 2003. The hazard curve produced for the CPNPP Units 3 and 4 is shown in Figure 19.1-201. Strike and exceedance frequencies for tornadoes categorized in enhanced F-scale intensity are shown in Table 19.1-201.

CP COL 19.3(4)

Table 19.1-205 (Sheet 12 of 35)
Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability			
				Criteria(1)	Freq. (/yr)	Site Appl.	
			The annual number of aircraft operations on military training route VR-158 are less than 19,300 operations per year. Thus the probability of aircraft-related hazards for CPNPP Units 3 and 4 is less than 10^{-7} per year (criterion 6).				
	Site Proximity Missle	3.5.1.5	Externally initiated missiles considered for design are based on tornado ~~missiles~~and hurricane missiles as described in DCD Subsection 3.5.1.4. As described in Section 2.2, no potential site-proximity missile hazards are identified except aircraft, which are evaluated in Subsection 3.5.1.6. Thus, no site proximity missile hazard is identified (criterion ~~3~~1).	~~3~~1	None	No	RCOL2_03.3.02-9 RCOL2_03.3.02-9
	Turbine Missile	3.5.1.3.1 3.5.1.3.2	The CPNPP site plan shows the location of CPNPP Units 3 and 4 is such that no postulated low trajectory turbine missiles from CPNPP Units 1 and 2 can affect CPNPP Units 3 and 4. The probability of of turbine missile accidents for CPNPP Units 3 and 4 is less than 10^{-7} per year is analyzed in FSAR Subsection 3.5.1.3.2. Mathematically, $P4 = P1 \times P2 \times P3$, where RG 1.115 considers an acceptable risk rate for $P4$ as less than 10^{-7} per year. For unfavorably oriented T/Gs determined in Subsection 3.5.1.3, the product of $P2$ and $P3$ is estimated as 10^{-2} per year, which is a more conservative estimate than for a favorably oriented single unit. The probability of turbine failure resulting in the ejection of turbine rotor (or internal structure) fragments through the turbine casing, $P1$, as less than 10^{-5} per year. CPNPP Units 3 and 4 procedures will require inspection intervals and a turbine valve test frequency to maintain $P1$ within acceptable limits. The acceptance risk rate $P4 = P1 \times P2 \times P3$ is therefore maintained as less than the frequency of Tornado Missiles, 10^{-7} per year (criterion 6).	6	$<10^{-7}$	No	

CP COL 19.3(4)

Table 19.1-205 (Sheet 16 of 35)
Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability		
				Criteria(1)	Freq. (/yr)	Site Appl.
			Assuming a maximum landfall wind speed or 208 kt (~240 mph), a translational velocity of 16 kt (18.4 mph), and a distance of 400 miles from the CPNPP site to Galveston, gives a maximum possible wind speed of 61 mph at the CPNPP site. This should be considered as the upper bound of possible hurricane wind speed at the CPNPP site. The design-basis hurricane parameters used in the design and operation of CPNPP are based on Rev. 0 of RG 1.221. Figure 1 of RG 1.221 indicates that a design-basis hurricane wind speed of 145 mph applies to the CPNPP site. This value is a nominal 3-second gust at 33 ft. above ground over open terrain and has an exceedance probability of 10^{-7} per year (10 million year return period). Only one hurricane, in 1900, passed within 50 mi of the site during the period 1851 – 2006. This gives a frequency of 1/156 yr = 6.4×10^{-3} per yr of a hurricane striking the CPNPP site. As shown above, the probability of a major hurricane striking the Texas coast is small (8×10^{-2} per year) and the probability of a major hurricane passing within 50 miles of the CPNPP site is also small (6.4×10^{-3} per yr). The probability of design-basis hurricane is 10^{-7} per year. Even if a major hurricane is assumed to strike the CPNPP site, the maximum wind speed would be ~~61 mph based on the maximum possible hurricane landfall wind speed~~145 mph based on Rev. 0 of RG 1.221. Therefore, hurricane winds can be screened out as not risk significant because the frequency of hurricanes reaching the CPNPP site with a wind speed above ~~90~~the tornado design wind speed of 230 mph is exceedingly small and thus bounded by the ~~potential damage from the Tornado Missiles spectrum that the US-APWR is designed to withstand~~tornado design criteria (criterion 1).			

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RCOL2_03.3.02-9

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CP COL 19.3(4)

Table 19.1-205 (Sheet 24 of 35)
Comanche Peak, Units 3 and 4 External Events Screening and Site Applicability

Category	Event	FSAR Section Disposition	Description	Screening and Applicability		
				Criteria[1]	Freq. (/yr)	Site Appl.
	Ultimate Heat Sink	2.3.1.2.10 2.3.2.1.3	The performance of the ultimate heat sink is discussed in Subsection 9.2.5. The wet bulb design temperature for the ultimate heat sink was selected to be 80°F based on 30 yr (1977 -2006) of climatological data obtained from National Climatic Data Center/National Oceanic and Atmospheric Administrator for Dallas/Fort Worth International Airport Station in accordance with RG 1.27. The worst 30 day period was selected from the above climatological data between June 1, 1998 and June 30, 1998, with an average wet bulb temperature of 78.0°F. A 2°F margin was added to the maximum average wet bulb temperature for conservatism. These are not significant impact to ultimate heat sink.	1	None	No
	Extreme Winds	2.3.1.2.11 3.3.1.1	Estimated extreme winds (fastest mile) for the general area based on the Frechet distribution are: Return Period (year) — Wind Speed (mi per hr) 2 — 51 10 — 61 50 — 71 100 — 76 Fastest mile winds are sustained winds, normalized to 30 ft above ground and include all meteorological phenomena except tornadoes and hurricanes.	~~1, 4~~Not screened (bounding analysis conducted)	None	No

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RCOL2_03.3.02-9

CP COL 19.3(4)
CP COL 19.3(5)

Table 19.1-206 (Sheet 2 of 2)

Site-specific Key Assumptions

Key Insights and Assumptions	Disposition
The elevation of pumping equipment and cooling fans are higher than the elevation of the basin wall and the ground elevation, and are enclosed by a concrete wall. The pumping equipment and cooling fans are protected from flooding due to the failure of the non-seismic intake piping to the UHS.	FSAR 3.8.4.1.3.2
NFPA 1144 minimum setback distance in the Owner Controlled Area will be procedurally maintained. Also, the Owner Controlled Area adjacent to the isolation zone will be cleared of any concentration of vegetation for security reasons.	FSAR 9.5 NFPA 1144 minimum setback distance will be procedurally maintained
Administrative control will be in place to ensure that the truck bay entrance of the reactor building is closed when a tornado or hurricane is nearby or source of high wind is forecast for the immediate area.	FSAR 13.5 RCOL2_03.03.02-9
Adequate sloped site grading and drainage prevents flooding caused by probable maximum precipitation (PMP) or postulated failure of non safety-related, non seismic storage tanks located on site.	FSAR 3.4.1.2
All seismic Category 1 buildings and structures below-grade are protected against the effects of flooding, including ground water.	FSAR 3.4.1.2

Appendix A.1

18. The UHSS is capable of performing its safety functions under design basis event conditions and coincident single failure with or without offsite power available.

19. The UHS cooling tower fans, identified in Table A.1-2, can withstand design basis tornado and hurricane effects, including differential pressure effects and overspeed, without loss of safety function. RCOL2_14.03.07-38 RCOL2_03.03.02-9

20. The UHS cooling tower spray nozzles and orifices are sized to prevent clogging due to debris.

21. The ASME Code Section IIII, Class 3 piping systems and components, for the UHSS and ESWS (portions outside the certified design), identified in FSAR Table 3.2-201 are designed to retain their pressure integrity and functional capability under internal design and operating pressures and design basis loads. RCOL2_14.03.03-1 S01

A.1.2 Inspections, Tests, Analysis, and Acceptance Criteria

Table A.1-1 describes ITAAC for the UHSS and ESWS portions outside the scope of the certified design.

Appendix A.1

Table A.1-1 (Sheet 7 of 7)

Ultimate Heat Sink System and Essential Service Water System (Portions Outside the Scope of the Certified Design) Inspections, Tests, Analyses, and Acceptance Criteria

Design Commitment	Inspections, Tests, Analyses	Acceptance Criteria	
17. The sum of the ESW pump shutoff head and static head is such that the ESWS design pressure is not exceeded.	17. Inspection, test and analysis of the as-built ESWS will be performed.	17. A report exists and concludes that the sum of the as-built ESW pump shutoff head and static head is such that the ESWS design pressure is not exceeded.	
18. The UHSS is capable of performing its safety functions under design basis event conditions and coincident single failure with or without offsite power available.	18. Inspection and analysis of the as-built UHSS will be performed.	18. A report exists and concludes that the as-built UHSS is capable of performing its safety functions under design basis event conditions and coincident single failure with or without offsite power available.	
19. The UHS cooling tower fans, identified in Table A.1-2, can withstand design basis tornado and hurricane effects, including differential pressure effects and overspeed, without loss of safety function.	19.i Type tests, analyses, or a combination of type tests and analyses will be performed to demonstrate that the UHS cooling tower fans, identified in Table A.1-2, can withstand the design basis tornado and hurricane effects, including differential pressure effects and overspeed, without loss of safety function.	19.i A report exists and concludes that the UHS cooling tower fans, identified in Table A.1-2, can withstand the design basis tornado and hurricane effects, including differential pressure effects and overspeed, without loss of safety function.	RCOL2_14 .03.07-38 RCOL2_03 .03.02-9
	19.ii Inspections and analyses will be performed to verify that the as-built UHS cooling tower fans identified in Table A.1-2 are bounded by the tested or analyzed conditions.	19.ii A report exists and concludes that the as-built UHS cooling tower fans identified in Table A.1-2 are bounded by the tested or analyzed conditions.	
20. The UHS cooling tower spray nozzles and orifices are sized to prevent clogging due to debris.	20. Inspections of the as-built UHS cooling tower spray nozzles and orifices will be performed.	20. Each as-built UHS cooling tower spray nozzles and orifices have an orifice size greater than 3mm.	
21. The ASME Code Section IIII, Class 3 piping systems and components, for the UHSS and ESWS (portions outside the certified design), identified in FSAR Table 3.2-201 are designed to retain their pressure integrity and functional capability under internal design and operating pressures and design basis loads.	21. An inspection of the stress report(s) for the ASME Code Section III, Class 3 piping systems and components, for the UHSS and ESWS (portions outside the certified design) will be performed.	21. The stress report(s) exist and conclude that the design of the ASME Code Section III, Class 3 piping systems and components, for the UHSS and ESWS (portions outside the certified design), identified in FSAR Table 3.2-201 comply with the requirements of ASME Code Section III.	RCOL2_14 .03.03-1 S01

PART 10 - APPENDIX A.3

PLANT-SPECIFIC STRUCTURES

A.3.1 Design Description

The site-specific structures are comprised of the UHS related structures (UHSRS), ESW pipe tunnel (ESWPT) and power source fuel storage vault (PSFSV), which are seismic Category I structures. The seismic Category I structures are designed and constructed to withstand design-basis loads without loss of structural integrity. Design basis loads are:

- Normal plant operation (including dead loads, live loads, lateral earth pressure loads, equipment loads, hydrodynamic loads temperature and equipment vibration)
- External events (including rain, snow, flood, tornado, hurricane, tornado generated missiles, hurricane generated missiles and safe shutdown earthquake) RCOL2_03.03.02-9
- Internal events (including flood, pipe rupture, equipment failure, and equipment failure generated missiles).

Seismic category I buildings and structures, including the R/B-PCCV-containment internal structure on a common mat, the PS/Bs, UHSRS, ESWPT, PSFSVs are founded directly on solid limestone or on fill concrete. Fill concrete is used as 'dental' fill in any areas where additional removal of materials below the nominal top of limestone is required in order to reach competent limestone.

A.3.1.1 UHSRS

The UHSRS consists of an UHS cooling tower enclosure, UHS ESW pump houses, and an UHS basin. These structures are described below.

UHS cooling tower enclosures - Each UHS basin has one cooling tower with two cells. Each cell is enclosed by reinforced concrete structures that house the equipment required to cool the water used by the ESWS. The reinforced concrete wall separates the two cell enclosures. A reinforced concrete wall, running eastwest, separates the cell enclosure portion of the basin from the rest of the UHS basin. Air intakes serving the cooling towers are configured to protect the safety-related substructures and components from tornado missiles and hurricane missiles. RCOL2_03.03.02-9

UHS ESW pump house - The pump house is an integral part of the UHS basin supported by UHS basin exterior and interior walls. Each pump house contains one ESW pump and one UHS transfer pump with associated auxiliaries. The pump bay (lowest portion of the pump house required for the pump suction) is deeper than the rest of the UHS basin. A reinforced concrete wall divides the pump house basin from the rest of the UHS basin and is configured to prevent postulated direct or deflected design basis tornado missiles and hurricane missiles from impacting safety related components located within the structure. There is a fire barrier between the UHS transfer pump and the UHS ESW pump of each UHS ESW pump house. RCOL2_03.03.02-9

UHS Basin - There are four basins for each unit and each basin has one cooling tower with two cells. Each basin is constructed of reinforced concrete and serves as a reservoir for the ESWS. Two basins share a common foundation mat and a reinforced concrete wall divides them.

A.3.1.2 ESWPT

The ESWPT is a reinforced concrete structure that runs from beneath the T/B to the UHSRS. The ESWPT is divided into two sections by a concrete wall. Each section contains both ESWS supply and return lines. The ESWPT structure is isolated from other structures to prevent seismic structural interaction.

A.3.1.3 PSFSV

The PSFSVs are reinforced concrete structures, which house the safety-related and non safety-related fuel oil tanks for the emergency power generators. There is one vault for each PS/B founded on separate reinforced concrete basemats. The vault contains three oil tanks, two safety-related and one non safety-related. Each tank is contained in a separate compartment separated by reinforced concrete walls. The top of the roof slab is at the finished plant grade elevation, with a concrete curb. The curb is provided to prevent vehicular traffic on the roof.

1. The structural configurations of the UHSRS, ESWPT and PSFSV are as described in the Design Description of Section A.3, in Table A.3-2, and as shown in FSAR Figures 3.8-201 through 3.8-214.

2.a Divisional flood barriers are provided in the UHSRS, ESWPT and PSFSV to protect against internal flooding.

2.b Deleted

3. Deleted

4. For the UHSRS, ESWPT and PSFSV, external walls below flood level are as indicated in Table A.3-2 to protect against water seepage.

5.a Deleted