3E Design Details and Critical Sections for Safety-Related Category I Structures

This appendix provides details of structural design and analysis for the critical sections relevant to Seismic Category I structures. Critical sections are the subcomponents of individual Seismic Category I structures (i.e., shear walls, floor slabs and roofs, structure-to-structure connections) that are analytically representative of an essentially complete U.S. EPR design.

In general, critical section walls and slabs are reinforced concrete supported by a basemat foundation. Steel framing (beams and columns) is used to support some slabs within the RBIS. The reinforced concrete structural elements resist both vertical and lateral loads. The reinforced concrete structural elements in conjunction with the steel framing resist vertical loads. Loads are transferred from the walls and columns to the basemat and foundation soil.

A three-tier critical section selection methodology was used to identify critical sections, which are important for prevention or mitigation of consequences of postulated design basis accidents, are expected to experience the largest structural demands during design basis conditions, or are needed for safety evaluation of an essentially complete design. The critical section selection includes qualitative, quantitative, and supplementary methodologies to reasonably assure completeness and consistency for each structure.

Appendix 3E describes the critical section selection methodology for the Seismic Category I critical sections. For the nuclear island (NI), Emergency Power Generating Buildings (EPGB), and Essential Service Water Buildings (ESWB), Sections 3E.1, 3E.2 and 3E.3, respectively summarize the structural analysis and design that provides reasonable assurance of overall U.S. EPR structural design adequacy. For each critical section, the structural analysis and design summaries include:

- Description of the critical section.
- Description of the model
- Applicable load combinations loads
- Analysis and design methods
- Results of structural design.

A COL applicant that references the U.S. EPR design certification will address critical sections relevant to site-specific Seismic Category I structures.

Critical Section Selection Criteria

Qualitative Methodology

The qualitative methodology is applied to portions of the NI Common Basemat Structures that are credited in the risk mitigation of the nuclear power plant under design basis loading conditions to provide protection of public safety through the physical plant boundaries. Due to a safety-critical role, some of the NI Common Basemat Structures are required to achieve major performance requirements for functions whose failures could degrade system or equipment performance of the U.S. EPR design or pose a safety hazard to plant personnel or to the general public. In this regard, they are considered critical structures or critical sections. Unique engineered features in each of the structures can be further broken into subcomponents (e.g., cylindrical walls, liner plates, dome, and dome ring areas of the Reactor Containment Building (RCB)) that are defined as critical sections.

Critical sections identified by the qualitative methodology are:

- RCB liner plate.
- RCB cylinder wall and buttress.
- RCB dome and ring girder areas.
- RCB connection of containment wall to NI basemat.
- RCB equipment hatch area.
- Reactor Building Internal Structure (RBIS) primary shield wall/reactor vessel support area.
- NI basemat and RBIS baseslab.
- Fuel Building (FB) spent fuel pool walls and floor slab.
- RCB airlock and main steam and feedwater (MS/FW) penetrations.
- Fuel transfer tube area.

Quantitative Methodology

The quantitative methodology identifies critical sections by analysis of force and moment extracted from portions of the ANSYS NI static model not already defined as critical sections by the qualitative methodology. This model incorporates numerous finite element types to represent the NI geometry. Element forces and moments are extracted from the finite element model (FEM) and sorted for each force or moment type using a series of ANSYS macros to identify elements that have maximum and minimum force demand (minimum being the largest negative forces and moments).

Critical sections identified by the quantitative methodology are:

- RBIS operating floor slab area.
- RBIS Elevation +4 ft, 11 in heavy slab and support walls.
- RBIS steam generator (SG) cubicle area walls and slabs.
- Safeguard Building (SB) 2/3 hardened shell walls from top of NI basemat to grade.
- SB 2/3 internal structures exterior walls from top of NI basemat to Elevation +15 f, 5 in.
- SB 2/3 floor slab at Elevation 0 ft 0 in.
- SB 1 main steam and feedwater valve room walls and slabs.
- SBs 1 and 4 exterior walls from top of NI basemat to Elevation +15 ft, 5 in.
- FB hardened shell walls from top of NI basemat to grade.
- FB internal structures major walls from top of NI basemat to bottom of spent fuel pool slab.
- FB spent fuel pool walls and floor slab.
- FB internal structures spent fuel pool walls and floor slab.
- Reactor Shield Building (RSB) wall areas and connection between RSB wall and SB/FB roof slabs.
- RSB dome to wall transition areas.
- FB hardened shell material lock area roof slab for support walls.
- FB internal structures floor slab above spent fuel pool area and support walls.
- RSB lower wall areas.

Supplementary Methodology

Seismic Category I structures that perform safety-related functions are reviewed to determine which structural sections are not otherwise selected by either the quantitative or qualitative method. Once these sections are determined, engineering judgment is applied to assess whether the structural sections should be identified as critical sections. Critical sections selected using this method are supplementary critical sections.

Supplementary critical sections also include sections that constitute significant portions of the Seismic Category I structures in terms of their physical dimensions (i.e.,

wall and slab areas). Although these sections are not subject to the limiting structural demands of quantitatively-defined critical sections and can be considered less critical, they are necessary to represent an essentially complete design of each structure and provide reasonable assurance of U.S. EPR design adequacy.

Quantitatively-determined critical sections represent portions of a structure that experience high loads or stress and may not identify intervening structural elements that are not subject to high stress or loading but are needed for evaluating structural functionality.

Because potential supplementary critical sections exist throughout the U.S. EPR design, spatial distribution and significant structural discontinuities are also important factors in supplementary critical sections selection.

Critical sections identified by the supplementary methodology are:

- NI beams and columns.
- NI vent stack.
- EPGB basemat foundation at elevation 0 ft 0 in.
- EPGB shear wall on column line 11.
- EPGB reinforced concrete slab and composite beams at Elevation 51 ft 6 in.
- EPGB shear wall on column line C.
- EPGB shear wall on column line E.
- ESWB basemat foundation.
- ESWB shear wall on column line 4.
- ESWB fan deck slab at Elevation 63 ft 0 in.
- ESWB shear wall on column line D.

3E.1 Nuclear Island Structures

Description of Critical Sections in Nuclear Island Structures

The critical sections presented in this section are structures located within the RCB, RBIS, Fuel Building (FB), SBs 1, 2, 3, and 4, RSB, and NI Common Basemat. The list of NI critical sections is provided in Table 3E.1-1.

The scope of the NI critical sections include walls, slabs, beams, columns and Connection details are also included, where applicable. Stresses and loads adjacent to penetrations and discontinuities are considered in the design of the critical section.

In general, for each NI critical section subcomponent, e.g., individual walls, slabs to be designed are identified. Critical section walls and slabs are reinforced concrete supported by a basemat foundation. Steel framing (beams and columns) is used to support some slabs within the RBIS. The reinforced concrete structural elements resist both vertical and lateral loads. The reinforced concrete structural elements in conjunction with the steel framing resist vertical loads. Loads are transferred from the walls and columns to the basemat and foundation soil.

Loads and load combinations prescribed by applicable codes and standards are applied to the finite element ANSYS NI static model to analyze and evaluate the overall structural response of the Seismic Category I Structures. The ANSYS NI static model is described in Section 3.8.1.4.1.

Controlling load combinations i.e., those which produce forces and moments sufficiently large to challenge design code requirements or practical limitations are identified. Load and load combinations for Seismic Category I structures are described in Section 3.8. Loads included in the ANSYS NI static model are shown in Table 3E.1-2. Additional loads that were not considered in the ANSYS NI static model were identified, evaluated and accounted for in the local design, where applicable. These additional loads are shown in Table 3E.1-3 and the load combinations are shown in Table 3E.1-4.

The ANSYS NI static model is used to obtain the forces and moments at each node or element in the finite element model. Results extracted from the ANSYS NI static model are averaged to obtain the design loads. Forces and moments are obtained for each load combination, the material properties are checked and adjusted as needed, missing loads are added, and the required reinforcement is specified. For some locations, the capacity provided by the concrete materials and reinforcement may be exceeded. When this occurs, forces and moments are redistributed to adjacent areas in a design section to better reflect the behavior of reinforced concrete.

With the exception of the Vent Stack, the NI critical sections reinforced concrete and structural steel are design in accordance with ACI 359 (containment building), ACI 349 349 (other than containment building) and AISC-N690 (steel), respectively. The Vent Stack is designed in accordance with ASME STS-1 and AISC-N690.

For steel subcomponents, the process for determining the design of these critical sections is similar. Strains/stresses or forces/moments are obtained from the ANSYS NI static model and compared against code allowables.

Alternative methods used to design critical sections are described within the critical section design summary on a case-by-case basis.

For exterior walls above grade, the minimum wall thickness and reinforcing is greater than the minimum wall thickness required to prevent penetration from an aircraft and explosive pressure wave.

Connection details are included in the critical section design and/or instructions are provided in design drawings. Connection detail requirements for concrete designs are shown in Table 3E.1-7. Table 3E.1-7 includes concrete design requirements as specified in ACI 349-01 and ACI 359-04.

Materials

Concrete

Concrete is in accordance with the requirements specified in Sections 3.8.1.6.1, 3.8.3.6.1, 3.8.4.6.1, and 3.8.5.6.1 as summarized below:

	Compressive Strength f'_c (psi)	Modulus of Elasticity E_c (ksi)	Shear Modulus (ksi)	Poisson's Ratio
RCB	7000	4769	2038	0.17
Other NI Seismic Category I Structures (except NI Basemat)	6000	4415	1887	0.17
NI Basemat	4000	3605	1541	0.17

Reinforcing Steel

Deformed steel bars are in accordance with ASTM A615 Grade 60 and the requirements specified in Sections 3.8.1.6.2 and 3.8.3.6.2.

Structural Steel

Structural steel is in accordance with the requirements specified in Section 3.8.1.6.4, Section 3.8.3.6.3, and Table 3.8-8. Liner plate material conforms to SA-516, Grades 55 to 70, with minimum yield strength F_y = 30-38 ksi, and minimum tensile strength F_u = 55-90 ksi.

Floor Live and Dead Load Distribution

Dead and live floor loads are tabulated for each room in the Nuclear Island Common Basemat Structure. For each room, loads are distributed and applied to the floors. Concrete self-weight is based on concrete density of 150 pcf. Precipitation loads are

given in Table 2.1-1 and are not included in the floor live loads. Pool loads are also determined separately. Table 3E.1-8 provides the distribution of the dead and live floor loads for the NI Seismic Category I structures.

The following distributed loads are applied to the floors of the Safeguard Buildings:

- Uniformly distributed slab load (live) = 125 psf.
- Uniformly distributed slab load (dead) = 125 psf.
- Uniformly distributed grating load (live) = 175 psf.
- Uniformly distributed grating load (dead) = 25 psf.
- Uniformly distributed wall load (dead) = 25 psf/face.

The following distributed loads are applied to the floors of the Fuel Building:

- Uniformly distributed slab load (live) = 500 psf.
- Uniformly distributed slab load (dead) = 250 psf.
- Uniformly distributed grating load (live) = 175 psf.
- Uniformly distributed grating load (dead) = 25 psf.
- Uniformly distributed wall load (dead) = 25 psf/face.

The following distributed loads are applied to the floors of the Reactor Building:

- Uniformly distributed slab load (live) = 500 psf.
- Uniformly distributed slab load (dead) = 250 psf.
- Uniformly distributed grating load (live) = 175 psf.
- Uniformly distributed grating load (dead) = 25 psf.
- Uniformly distributed wall load (dead) = 50 psf/face.

Equipment Loads

The weight of major equipment is accounted for in the ANSYS NI static model. Local effects of major equipment loads not accounted for in the ANSYS NI static model, where applicable, are accounted for in the design of the critical section. Some of the major equipment loads are as follows:

Equipment	Elevation/Location	Weight (kips)
Crane SMF03	UFA29-090	12
Crane SMF02	UFA10-069	53

Polar crane	UJA40-001	1180
Reactor pressure vessel (RPV)	4'-11"	3624
Steam generator (SG)	4'-11"	1776 each
Reactor coolant pump (RCP)	4'-11"	474 each
Pressurizer (PZR)	UJA23-019	639
Equipment hatch	64'-0"	154
Air lock	4'-11"; 64'-0"	67; 61

Foundation Stability

The Nuclear Island Common Basemat Structure is evaluated for stability against overturning, sliding, and flotation for the soil profiles used in establishing the certified plant design. The tendon gallery is used as a shear key. The minimum factors of safety for the Nuclear Island Common Basemat Structure are listed in Table 3E.1-5. The calculated factors of safety against overturning, sliding, and flotation satisfy the acceptance criteria.

The sliding and overturning factors are determined using load combination containing dead load (D), lateral earth pressure (H), SSE (E'), hydrostatic load (F) and buoyant force (Fb). It is conservatively assumed that the E' and Fb occur simultaneously. The floatation factor of safety is determined based on dead load (D) and buoyant force (Fb). The dead load used in the analysis includes 25 percent of the live load, which is consistent with the generation of dynamic soil pressure due to SSE.

The maximum static and dynamic bearing pressure demands are reported in Table 3E.1-6. The static and dynamic bearing pressures were obtained from the SASSI analysis of the NI common basemat structure as described in Section 3.7.2. The maximum static bearing capacity demand corresponds to dead load of structure, equipment load, pool loads, 25% live load, and 75% precipitation load. The maximum static and dynamic bearing pressure demands are reported for the edge and corners of the basemat. The edge pressure was obtained by averaging the bearing pressures over an edge strip consisting of five rows of the finite element model (not including the corners). The corner pressures were obtained by averaging bearing pressures over a corner grid of 6x6 element.

Design Criteria

Design information and criteria for Seismic Category I structures are provided in Sections 2.4, 2.5, 3.3, 3.5, 3.7, 3.8.1, 3.8.2, 3.8.3, 3.8.4, 3.8.5 and Appendix 3E for Seismic Category I structures. A cross-reference between FSAR sections and information required by SRP Section 3.8.4, Appendix C is provided in Table 3.8-17.

Critical sections are designed to resist the forces and moments obtained from the global ANSYS analysis in addition to local loads not included in the ANSYS NI static model. CivilFEM (V11.0/4a/SP9) is a post-processing software used to extract forces

and moments from the ANSYS NI static model, for a given load combination. The CivilFEM Interface Macro (CIM V1.2) is a design tool developed to run ANSYS/ CivilFEM functions to design the reinforcement of a critical section subcomponent. The CIM reports the design data for each element and for each node of each element. The reinforcement is determined for each of the controlling load combinations in each direction (vertical and horizontal reinforcement in walls, horizontal reinforcement in slabs).

The nomenclature and sign convention for the ANSYS and CivilFEM forces and moments results are shown in Figure 3E.1-1 and Figure 3E.1-2. Forces and moments shown in Figure 3E.1-1 are defined as:

T_x=axial load in x-direction (k/ft).

T_y=axial load in y-direction (k/ft).

T_{xy}=in-plane shear load (k/ft).

N_x =out-of-plane shear load through the x-face (k/ft).

N_y=out-of-plane shear load through the y-face (k/ft).

M_x =bending moment about y-axis (k-ft/ft).

M_y=bending moment about x-axis (k-ft/ft).

M_{xy} =twisting moment (k-ft/ft).

The bending moments to be used for design (Mxu and Myu) are determined by combining the bending moments (Mx and My) and the twisting moment (Mxy) as follows:

Mxu = $(Mx / |Mx|)(|Mx| + |Mxy|)$ = design bending moment about y-axis (k-ft/ft)

Myu = $(My / |My|)(|My| + |Mxy|)$ = design bending moment about x-axis (k-ft/ft)

Forces and moments are used to determine the required area of steel in each direction for each face. Once the forces and moments are obtained, the reinforcement requirements and configuration are determined and checked to ensure applicable codes and standards are met. The reinforcements for concrete, walls, slabs and columns are shown as:

A_{stx} = Required top orthogonal reinforcement in the X-direction to carry combined axial and bending (in^2/ft).

A_{sbx} =Required bottom orthogonal reinforcement in the X-direction to carry combined axial and bending (in^2/ft).

A_{sx} =Required orthogonal reinforcement in the X-direction to carry in-plane shear (in^2/ft).

A_{sty} = Required top orthogonal reinforcement in the Y-direction to carry combined axial and bending (in^2/ft).

A_{sby} =Required bottom orthogonal reinforcement in the Y-direction to carry combined axial and bending (in^2/ft).

A_{sy} =Required orthogonal reinforcement in the Y-direction to carry in-plane shear (in^2/ft).

A_v = Required stirrup reinforcement based on the given spacing to carry out-of-plane shear (in^2).

Allowable stresses are determined for steel elements.

Table 3E.1-1—Nuclear Island Critical Sections

CS No.	Description of Critical Section	Selection Criteria
CS-01	RCB Liner Plate	Qualitative
CS-02	RCB Cylinder Wall and Buttress	Qualitative
CS-03	RCB Dome and Ring Girder Areas	Qualitative
CS-04	RCB Gusset Area	Qualitative
CS-05	RCB Equipment Hatch Area	Qualitative
CS-06	RBIS Primary Shield Wall/Reactor Pressure Vessel Support Area	Qualitative
CS-07	NI Basemat and RBIS Baseslab	Qualitative
CS-08	RBIS Operating Floor Slab Area	Quantitative
CS-09	RBIS Elevation +4 ft 11 in Heavy Slab and Support Walls	Quantitative
CS-10	RBIS Steam Generator Cubicle Area Walls and Slabs	Quantitative
CS-11	SB 2/3 Hardened Shell Walls from Top of Nuclear Island Basemat to Grade	Quantitative
CS-12	SB 2/3 Internal Structures Exterior Walls from Top of NI Basemat to Elevation 15 ft 5 in	Quantitative
CS-13	SB 2/3 Floor Slabs at Elevation 0 ft 0 in	Quantitative
CS-14	SB 1 Main Steam/Feedwater Valve Room Walls and Slabs	Quantitative
CS-15	SB 1/4 Exterior Walls from Top of NI Basemat to Elevation +15 ft 5 in	Quantitative
CS-16	FB Hardened Shell Walls from Top of the NI Basemat to Grade	Quantitative
CS-17	FBIS Major Walls from Top of NI Basemat to Bottom of Spent Fuel Pool (SFP) Slab	Quantitative
CS-18	FBIS SFP Walls and Floor Slab	Qualitative and Quantitative
CS-19	RSB Wall Areas and Connection between RSB and Safeguard Building/Fuel Building Roof Slabs	Quantitative
CS-20	RSB Dome to Wall Transition	Quantitative
CS-21	FB Hardened Shell Material Lock Area Roof Slab and Support Walls	Quantitative
CS-22	FBIS Floor Slab Above SFP Area and Support Walls	Quantitative
CS-23	RSB Lower Wall Areas	Quantitative
CS-24	NI Beams and Columns	Supplemental
CS-25	RCB Airlock & Main Steam/Feedwater Penetrations	Qualitative
CS-26	Fuel Transfer Tube Area	Qualitative
CS-36	Vent Stack	Supplemental

Table 3E.1-2—Independent Loads Considered in the ANSYS NI Static Model

Load Symbol	Load Description
D	Dead
E’	Seismic (Safe Shutdown Earthquake)
F	Hydrostatic
Fb	Buoyancy
H	Soil (Lateral Earth Pressure)
J0, J60	Post-Tensioning
L (includes Lprecip)	Live (includes Precipitation)
Pd	Design Pressure
Pt	Test Pressure (during Structural Integrity Test)
Ra	Accident Pipe Reactions
Ro	Normal Pipe Reactions
Td	Design Temperature
To	Operating Temperature
W	Wind
Wtw	Tornado or Hurricane Wind Pressure
Note 1	Vent Stack Loads

Notes:

1. This load is not an independent load but its effects must be considered for critical section design.

Table 3E.1-3—Independent Loads Not Considered in the ANSYS NI Static Model

Load Symbol	Load Description
A	Aircraft Hazard
B	Explosion Pressure Wave
D	Dead Load
F	Hydrostatic
Fa	Internal Flood Loads
G	Relief Valve Loads, High Energy Release Loads
L	Live Load
Psub	Sub-Compartment Pressurization
Ra	Accident Pipe Reactions
Ro	Normal Pipe Reactions
Rrj	Pipe Break Jet Impingement Loads
Rrm	Pipe Break Missile Loads
Rrr	Pipe Break Reactions
Td	Design Temperature
To	Normal Operating Temperature
Tt	Test Temperature (during SIT)
Wtm	Tornado or Hurricane Missile Loads
Wtp	Tornado Differential Pressure
	Accidental Torsion
	Differential Settlement/Construction Sequence Loads
	Gusset Critical Section Loads
	Fuel Rack Loads
	Vent Stack Loads
	Hydrogen Burn
	Severe Accident Loads

Table 3E.1-4—Summary of Load Combinations
Sheet 1 of 2

	Load Combination ID	Load Combination Constituents
RCB Concrete	A-01	D + L + H + F + Fb + J + Pt + Tt
	A-02	D + L + H + F + Fb + To + J + W
	A-03	D + L + H + F + Fb + To + Ro + J + G + Pv
	A-05	D + 1.3L + H + F + Fb + To + Ro + J + G + Pv +1.5W
	A-06	D + L + H + F + Fb + To + Ro + J + G + Pv + E’
	A-07	D + L + H + F + Fb + To + Ro + J + G + Pv + Wt
	A-08	D + L + H + F + Fb + J + G + 1.5Pd + Td + Ra
	A-09	D + L + H + F + Fb + J + G + Pd + Td + 1.25Ra
	A-10	D + L + H + F + Fb + J + 1.25G + 1.25Pd + Td + Ra
	A-11	D + L + H + F + Fb + J + G + 1.25W + 1.25Pd + Td + Ra
	A-13	D + L + H + F + Fb + To + J + G + W + Fa
	A-15	D + L + H + F + Fb + J + G + E’ + Pd + Td + Ra + Rr
RBIS Concrete	B-03	D + L + H + F + Fb + To + Ro + J + E’
	B-05	D + L + H + F + Fb + J + E’ + Fa + Pd + Td + Ra + Rr
	B-06	1.4D + 1.7L + 1.7H + 1.4F + 1.4Fb + 1.7Ro + 1.4J
	B-07	1.4D + 1.7L + 1.7H + 1.4F + 1.4Fb + 1.7Ro + 1.4J + 1.7W
	B-08	D + L + H + F + Fb + To + Ro + J + Wt
	B-09	D + L + H + F + Fb + J + Fa + 1.4Pd + Td + Ra
	B-10	1.05D + 1.3L + 1.3H + 1.05F + 1.05Fb + 1.2To + 1.3Ro + 1.05J
	B-11	1.05D + 1.3L + 1.3H + 1.05F + 1.05Fb + 1.2To + 1.3Ro + 1.05J + 1.3W
	B-12	D + L + H + F + Fb + J + E’ + Fa + Pd + Td + Ra
Other Cat. I Concrete	E-02	1.4D + 1.7L + 1.7H + 1.4F + 1.4Fb + 1.7Ro + 1.4J
	E-03	1.4D + 1.7L + 1.7H + 1.4F + 1.4Fb + 1.7Ro + 1.4J + 1.7W
	E-06	D + L + H + F + Fb + To + Ro + J + E’
	E-07	D + L + H + F + Fb + To + Ro + J + Wt
	E-09	D + L + H + F + Fb + J + E’ + Fa + Pd + Td + Ra
	E-10	D + L + H + F + Fb + J + Fa + 1.4Pd + Td + Ra + Rr
	E-11	1.05D + 1.3L + 1.3H + 1.05F + 1.05Fb + 1.2To + 1.3Ro + 1.05J
	E-12	1.05D + 1.3L + 1.3H + 1.05F + 1.05Fb + 1.2To + 1.3Ro + 1.05J + 1.3W
	E-13	D + L + H + F + Fb + J + E’ + Fa + Pd + Td + Ra

Table 3E.1-4—Summary of Load Combinations
Sheet 2 of 2

	Load Combination ID	Load Combination Constituents
Vent Stack (Note 1)	1000	D+L
	1001	D+L+W
	1002	D+L+Wt
	2002	D+L+Wh
	1003	D+L+W/4
	1004	D+L+Wt/4
	2004	D+L+Wh/4
	1005[3]	D+L+0.7VS
	1006[3]	D+L+VS
	1007[2]	D+L+SSE
	1008[2]	D+L-SSE
	1009[2]	0.9D (self weight) + SSE
	1010[2]	0.9D (self weight) - SSE

Notes:

1. Based on ASME STS-1-2006, including safety factors shown in Table 4.4.6.

2. Results from the SSE load are added or subtracted algebraically to the results from the remaining loads to create two permutations of the seismic load.

3. Load Combination 1005 uses reduced vortex shedding loads and is paired with the wind load combination 1001, while load combination 1006 uses full vortex shedding loads and is paired with the tornado/hurricane wind load combination 1002.

Table 3E.1-5—Minimum Factors of Safety for the Nuclear Island Common Basemat Structure

Analysis Case	Sliding			Overturning			Flotation	
	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated
5ae-h	1.1	1.1	1.1	1.1	1.7	2.0		
4ue-m	1.1	1.1	1.1	1.1	1.7	1.9		
1n2ue-s	1.1	1.9	1.9	1.1	2.6	2.9		
1n5ae-h	1.1	1.2	1.1	1.1	1.7	2.0		
hfub	1.1	3.8	3.7	1.1	5.6	5.3		
hflb	1.1	4.1	4.0	1.1	6.7	7.7		
hfbe	1.1	3.6	3.8	1.1	6.0	6.7		

Table 3E.1-6—Maximum Static and Dynamic Bearing Pressures for the NI Common Basemat Structure

Analysis Case	Static [ksf] (Dead Load) Edge	Dynamic [ksf] (Seismic + Dead Load)	
		Corner	Edge
1n2ues-cr	23.1	38.0	30.2
1n5aeh-cr	18.9	58.1	27.1
2sn4uem-cr	21.9	46.0	30.5
4uem-cr	22.9	56.2	30.0
5aeh-cr	21.1	58.5	26.8
hfbe-cr	18.8	32.0	22.2
hflb-cr	18.9	31.0	23.6
hfub-cr	18.4	32.2	22.5

Notes:

1. Analysis cases indicated with "-cr" represent the cracked case.

Table 3E.1-7—Critical Section Drawing General Notes

[General Notes Applicable to Concrete Design Performed in Accordance with ACI 349-01

1. *Connections details that are not specified within the critical section shall meet the following requirements:*

i. *Detailing of connections/joints shall meet ACI 349-01 requirements.*

ii. *Indicated panel reinforcing shall be continuous through the adjoining connections/joints.*

2. *Specified reinforcing shall be the minimum required for the indicated panel, where the panel is defined as a portion of a wall or floor slab bounded on all sides by intersecting members or free edges.*

3. *Construction joint locations that are required but not specified on the drawing shall be reviewed for the potential of additional shear friction reinforcing in accordance with Section 11.7.*

4. *Development/splicing/bending/placement of reinforcement shall be in accordance with Chapters 12 and 21.*

5. *Trim reinforcing not less than two #5 bars shall be provided around the perimeter of openings in accordance with Section 14.3.7.*

6. *ASTM A615 material shall conform to the additional requirements of Section 21.2.5.*

7. *Reinforcing for boundary elements or other special detailing requirements not addressed by Notes 1-6 above shall be as indicated on the reinforcing drawings.*

General Notes Applicable to Concrete Design Performed in accordance with ACI 359-04

1. Connections details that are not specified within the critical section shall meet the following requirements:

i. Detailing of connections/joints shall meet ACI 359-04 requirements.

ii. *Indicated panel reinforcing shall be continuous through the adjoining connections/joints.*

2. Specified reinforcing shall be the minimum required for the indicated panel, where the panel is defined as a portion of a wall or floor slab bounded on all sides by intersecting members or free edges.

3. *Construction joint locations that are required but not specified on the drawing shall be reviewed for the potential of additional shear friction reinforcing in accordance with Section CC-3424.*

4. *Development/splicing/bending/placement of reinforcement shall be in accordance with Sections CC-3530 and CC-4300.]**

Table 3E.1-8—Floor Dead and Live Loads
Sheet 1 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
SAFEGUARD BUILDING DIVISION 1											
-9.60M (-31.5ft)	1UJH01-002	122.33	27.50	point	dead	-31.85	-104.50	11.12	36.50		
	1UJH01-006	110.76	24.90	point	dead	-32.92	-108.00	-2.16	-7.10		
	1UJH01-024	104.53	23.50	point	dead	-45.17	-148.20	3.35	11.00		
	1UJH01-026	141.90	31.90	point	dead	-47.40	-155.50	-9.45	-31.00	150	
	1UJH01-008									200	
	1UJH01-005									125	
	1UJH01-026									150	
-5.00M (-16.4ft)	1UJH05-005	233.98	52.60	point	dead	-36.58	-120.50	7.01	23.00		
	1UJH05-008									250	
	1UJH05-026									175	
0.00	1UJH10-001	160	35.97	point-- free action	live						
		170	38.22	point-- free action	live						
	1UJH10-026	415.02	93.30	point	dead	-47.40	-155.50	-5.79	-19.00	150	
		250	56.21	point-- free action	live						
		250	56.21	point-- free action	live						
	1UJH10-004									175	

Table 3E.1-8—Floor Dead and Live Loads
Sheet 2 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
+4.70M (+15.4ft)	1UJK14-025	160	35.97	point-- free action	live						
		120	26.98	point-- free action	live						
		120	26.98	point-- free action	live						
	1UJK14-026	150	33.72	point	live	-44.50	-146.00	-5.75	-18.86		
		100	22.48	point	live	-50.29	-165.00	-5.75	-18.86		
	1UJK14-027	130	29.23	point	live	-51.82	-170.00	-10.15	-33.30		
+8.10M (+26.6ft)	1UJK18-024									175	
	1UJK18-025									175	
	1UJK18-026	129.89	29.20	point	dead	-29.87	-98.00	5.49	18.00	225	
		97.42	21.90	point	dead	-31.70	-104.00	12.50	41.00		
	1UJK18-027	104.53	23.50	point	dead	-48.16	-158.00	5.49	18.00	200	
+12.00M (39.4ft)	1UJK22-028	311.38	70.00	point	dead	-47.40	-155.50	-6.40	-21.00	150	
	1UJK22-030									150	
	1UJK22-039									150	
	1UJK22-047									175	
	1UJK22-057									175	
	1UJK22-046									175	
	1UJK22-056									175	

Table 3E.1-8—Floor Dead and Live Loads
Sheet 3 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	1UJK22-042									175	
	1UJK22-043									175	
	1UJK22-044									175	
	1UJK22-052									175	
	1UJK22-053									175	
	1UJK22-054									175	
	1UJK22-045									175	
	1UJK22-055									175	
+16.80M (55.1ft)	1UJK26-028	100	22.48	point-- free action	live						
	1UJK26-030	89.45	20.11	point	dead	-35.87	-117.70	11.96	39.25	200	
	2UJE26-001	130.24	29.28	point	dead	-30.97	-101.60	12.34	40.50	150	
+21.00M (68.9ft)	1UJK31-030									150	
	1UJE26-001									175	
	2UJE26-001									150	
	1UJE29-002	207.38	46.62	point	dead	-35.59	-116.75	-3.11	-10.20		
	2UJE29-002	207.38	46.62	point	dead	-35.59	-116.75	3.11	10.20		
+24.70M (+81.0ft)	2UJE34-003									225	
	1UJK34-025									175	
	1UJK34-031									225	

Table 3E.1-8—Floor Dead and Live Loads
Sheet 4 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	1UJE29-002									125	
	2UJE29-002									125	
	1UJE34-023	160	35.97	point	dead	-48.62	-159.51	9.38	30.77		
+29.30M (96.1ft)	1UJE39-001	92.08	20.70	point	dead	-30.11	-98.80	-4.51	-14.80	75	100
	2UJE39-001	92.08	20.70	point	dead	-30.11	-98.80	4.57	15.00	75	100
		100	22.48	point-- free action	live	-43.34	-142.19	10.05	32.97		
SAFEGUARD BUILDING DIVISION 2/3											
-9.60M (-31.5ft)	2UJH01-007	122.33	27.50	point	dead	-17.83	-58.50	27.22	89.30		
	2UJH01-009	110.76	24.90	point	dead	-3.35	-11.00	30.21	99.10		
	2UJH01-020	141.90	31.90	point	dead	-15.09	-49.50	46.02	151.00	150	
	2UJH01-024	118.32	26.60	point	dead	-3.20	-10.50	45.05	147.80		
	3UJH01-007	122.33	27.50	point	dead	17.80	58.40	27.22	89.30		
	3UJH01-009	110.76	24.90	point	dead	3.29	10.80	30.21	99.10		
	3UJH01-020	141.90	31.90	point	dead	14.78	48.50	45.11	148.00	150	
	3UJH01-024	118.32	26.60	point	dead	3.05	10.00	45.05	147.80		
	2UJH01-011									225	
	3UJH01-011									225	
-5.00M (-16.4ft)	2UJH05-006	233.98	52.60	point	dead	-14.73	-48.50	35.60	116.00	150	
	3UJH05-006	233.98	52.60	point	dead	14.48	47.50	35.60	116.00	150	

Table 3E.1-8—Floor Dead and Live Loads
Sheet 5 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	2UJH05-020									175	
	3UJH05-020									175	
0.00	2UJH10-003	250	56.21	point-- free action	live						
	3UJH10-003	250	56.21	point-- free action	live						
	2UJH10-006	250	56.21	point-- free action	live						
	2UJH10-010	260	58.45	point-- free action	live						
										125	
	2UJH10-020	382.55	86	point	dead	-15.70	-51.50	45.11		150	
		415.02	93.30	point	dead	-12.04	-39.50	45.72			
		250	56.21	point-- free action	live						
	3UJH10-006	250	56.21	point-- free action	live						
	3UJH10-020	382.55	86	point	dead	16.92	55.50	45.11	148.00	150	
		415.02	93.30	point	dead	12.04	39.50	45.72	150.00		
		250	56.21	point-- free action	live						
	2UJH10-002									150	

Table 3E.1-8—Floor Dead and Live Loads
Sheet 6 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	3UJH10-002									150	
+4.70M (+15.4ft)	2UJK14-002	160	35.97	point-- free action	live						
	3UJK14-002	160	35.97	point-- free action	live						
+8.10M (+26.6ft)	2UJK18-005									175	
	3UJK18-005									175	
	2UJK18-020									200	
	3UJK18-020									200	
	2UJK18-002	104.53	23.50	point	dead	-22.25	-73.00	25.91	85.00	200	
	3UJK18-002	104.53	23.50	point	dead	23.47	77.00	25.91	85.00	200	
	2UJK18-029									150	
	3UJK18-029									150	
+12.00M (+39.4ft)	2UJK22-028									200	
	3UJK22-028									200	
+16.30M (+53.5ft)	2UJK26-002									225	
	3UJK26-002									225	
	2UJK26-020									175	
	3UJK26-020									175	
	2UJK26-030									225	
	2UJK26-046									225	

Table 3E.1-8—Floor Dead and Live Loads
Sheet 7 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	3UJK26-005									225	
+21.00M (+68.9ft)	2UJK31-007									150	
	3UJK31-007									150	
	2UJK31-026									150	
	3UJK31-026									150	
	2UJK31-035									150	
	3UJK31-035									150	
	2UJK31-034									150	
	3UJK31-034									150	
	2UJK31-003									150	
	3UJK31-003									150	
	2UJK31-032									150	
	3UJK31-032									150	
	2UJK31-029									150	
	3UJK31-029									150	
	2UJK31-021	160	35.97	point	dead	-20.01	-65.65	47.16	154.72		
	3UJK31-021	160	35.97	point	dead	20.01	65.65	47.16	154.72		
+28.80M (+94.5ft)										75	100
SAFEGUARD BUILDING DIVISION 4											
-9.60M (-31.5ft)	4UJH01-002	122.33	27.50	point	dead	31.49	103.30	11.13	36.50		

Table 3E.1-8—Floor Dead and Live Loads
Sheet 8 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	4UJH01-006	110.76	24.90	point	dead	32.61	107.00	-2.16	-7.10		
	4UJH01-024	104.53	23.50	point	dead	45.11	148.00	3.35	11.00		
	4UJH01-026	141.90	31.90	point	dead	46.18	151.50	-9.45	-31.00	150	
	4UJH01-005									125	
	4UJH01-008									200	
	4UJH01-027									150	
-5.00M (-16.4ft)	4UJH05-005	233.98	52.60	point	dead	36.42	119.50	7.01	23.00		
	4UJH05-012	195.71	44.00	point	dead	31.09	102.00	-10.82	-35.50		
	4UJH05-026									175	
0.00	4UJH10-026	415.02	93.30	point	dead	47.09	154.50	-5.79	-19.00	150	
		396.29	89.08	point	dead	48.31	158.50	-10.06	-33.00		
		250	56.21	point--free action	live						
		250	56.21	point--free action	live						
	4UJH10-001	160	35.97	point--free action	live						
		160	35.97	point--free action	live						
	4UJH10-004									175	
+4.70M (+15.4ft)	4UJK14-027	130	29.23	point	live	51.82	170.00	-10.15	-33.30		
		100	22.48	point	live	50.27	164.93	-5.75	-18.86	140	
	4UJK14-026	150	33.72	point	live	44.50	146.00	-5.75	-18.86		
	4UJK14-025	160	35.97	point--free action	live						

Table 3E.1-8—Floor Dead and Live Loads
Sheet 9 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	4UJK14-029									175	
+8.10M (+26.6ft)	4UJK18-024									175	
	4UJK18-025									175	
	4UJK18-026	129.89	29.20	point	dead	29.87	98.00	5.49	18.00	225	
		97.42	21.90	point	dead	31.70	104.00	12.19	40.00		
	4UJK18-027	104.53	23.50	point	dead	47.85	157.00	5.79	19.00	200	
+12.00M (+39.4ft)	4UJK22-028	311.38	70.00	point	dead	45.57	149.50	-6.40	-21.00	150	
	4UJK22-030									150	
	4UJK22-039									150	
	4UJK22-042									175	
	4UJK22-043									175	
	4UJK22-044									175	
	4UJK22-045									175	
	4UJK22-046									175	
	4UJK22-052									175	
	4UJK22-053									175	
	4UJK22-054									175	
	4UJK22-055									175	
	4UJK22-056									175	
+16.80M (+55.1ft)	4UJK26-028	100	22.48	point--free action	live						

Table 3E.1-8—Floor Dead and Live Loads
Sheet 10 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	4UJK26-030	89.45	20.11	point	dead	35.87	117.70	11.96	39.25	200	
	3UJE26-001	130.24	29.28	point	dead	30.97	101.60	12.34	40.50	150	
+21.00M (+68.9ft)	4UJK31-030									150	
	4UJE26-001									175	
	3UJE26-001									150	
	4UJE29-002	207.38	46.62	point	dead	-35.59	-116.75	-3.11	-10.20		
	3UJE29-002	207.38	46.62	point	dead	-35.59	-116.75	3.11	10.20		
+24.70M (+81.0ft)	4UJK34-025									175	
	4UJK34-030									225	
	4UJK34-031									225	
	3UJE29-002									125	
	4UJE29-002									125	
	4UJE34-023	160	35.97	point	dead	48.62	159.51	9.38	30.77		
+29.30M (+96.1ft)	4UJE39-001	92.08	20.70	point	dead	30.08	98.70	-4.51	-14.80	75	100
	3UJE39-001	92.08	20.70	point	dead	30.08	98.70	4.57	15.00	75	100
		100	22.48	point--free action	live	43.34	142.19	10.05	32.97		
FUEL BUILDING											
-9.60M (-31.5ft)	UFA01-078	160.14	36.00	point	live	9.60	31.50	-44.55	-146.12		
	UFA01-010	160.14	36.00	point	live	-22.28	-73.08	-25.76	-84.50		
	UFA01-004									125	

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UFA01-033									125	
	UFA01-085									125	
	UFA01-083									125	
	UFA01-035									125	
	UFA01-095									125	
	UFA01-061									125	
	UFA01-054									125	
	UFA01-082									125	
	UFA01-075									125	
	UFA01-026									325	
	UFA01-038									300	
	UFA01-072									275	
	UFA01-073									275	
	UFA01-088									300	
	UFA01-042									375	
	UFA01-048									325	
	UFA01-049									325	
	UFA01-076									300	
	UFA01-077									300	
	UFA01-097									375	

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UFA01-098									350	
	UFA01-099									350	
	UFA01-024										750
	UFA01-001										125
	UFA01-017										100
	UFA01-051										125
	UFA01-079										100
-6.20M (-20.3ft)	UFA05-026	482.19	108.40	point	dead	-17.53	-57.50	-43.89	-144.00		
	UFA05-076	482.19	108.40	point	dead	19.05	60.80	-44.32	--145.42		
	UFA05-004									125	
	UFA03-001									125	125
	UFA03-002									125	
	UFA03-007									125	
	UFA03-006									125	
	UFA03-056									125	
	UFA03-051									125	125
	UFA03-058									125	
	UFA03-057									125	
	UFA05-054									125	
	UFA03-017										100

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UFA03-079										100
	UFA05-077										2600
-3.40M (-11.2ft)	UFA06-035	98.75	22.20	point	dead	-2.59	-8.50	-35.02	-115.00	125	
										300	
	UFA06-085	98.75	22.20	point	dead	-6.55	-21.50	-35.02	-115.00	125	
										300	
	UFA06-038									1220	
	UFA06-088									1220	
	UFA06-001									125	125
	UFA06-023									125	
	UFA06-024									125	
	UFA06-045									125	
	UFA06-095									125	
	UFA06-082									125	525
	UFA06-083									125	525
	UFA06-075									125	
	UFA06-074									125	
	UFA06-051									125	125
	UFA06-094									125	
	UFA06-084									125	

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UFA05-051										125
	UFA06-017										100
	UFA06-079										100
	UFA06-096										125
0.00	UFA10-084	259.78	58.40	point	dead	7.16	23.50	-33.83	-111.00		
	UFA10-057	230	51.71	point-- free action	live						
	UFA10-015	285	64.07	point--free action	live	-16.17	-53.05	-33.98	-111.48		200
		285	64.07	point--free action	live	-16.17	-53.05	-34.75	-114.01		
		285	64.07	point--free action	live	-16.17	-53.05	-35.52	-116.54		
		285	64.07	point--free action	live	-16.17	-53.05	-36.29	-119.06		
		285	64.07	point--free action	live	-16.17	-53.05	-37.06	-121.59		
		285	64.07	point--free action	live	-16.17	-53.05	-37.83	-124.11		
		285	64.07	point--free action	live	-16.17	-53.05	-38.60	-126.64		
		285	64.07	point--free action	live	-16.17	-53.05	-39.37	-129.17		
I		1534.64	345	point--free action	live						
	UFA10-002									125	
	UFA10-001									125	125
	UFA10-045									125	
	UFA10-021									125	

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UFA10-022									125	
	UFA10-035									125	
	UFA10-085									125	
	UFA10-007									125	
	UFA10-082									125	
	UFA10-070									125	
	UFA10-071									125	
	UFA10-095									125	
	UFA10-051									125	125
	UFA10-017										100
	UFA10-079										100
+3.70M (+12.1ft)	UFA10-015	100	22.48	point--free action	live						
		100	22.48	point--free action	live						
	UFA13-070	1252.17	281.50	point	dead	20.27	66.50	-34.14	-112.00		
	UFA13-071	1252.17	281.50	point	dead	20.27	66.50	-39.62	-130.00		
	UFA15-022									2175	
	UFA13-004									125	
	UFA15-001									125	125
	UFA15-045									125	
	UFA13-057										200

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UFA13-075									125	
	UFA13-056										200
	UFA13-083									125	
	UFA13-082									125	
	UFA13-085									125	
	UFA13-080									125	
	UFA15-096									125	
	UFA13-095									125	
	UFA13-051									125	125
	UFA13-054									125	
	UFA13-072										200
	UFA15-016									125	
	UFA15-002									125	
	UFA13-017										100
	UFA13-079										100
+7.40M (+24.3ft)	UFA18-015	125	28.10	point--free action	live					125	
		125	28.10	point--free action	live						
	UFA18-004									125	
	UFA18-045									125	
	UFA17-025									125	

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UFA17-053									125	
	UFA17-057										200
	UFA17-017										100
	UFA17-051										125
	UFA17-079										100
	UFA18-001										125
	UFA19-021										1960
+11.10M (+36.4ft)	UFA21-081										200
	UFA21-082										200
	UFA21-083										200
	UFA21-084										200
		300	67.45	point	dead	-12.65	-41.50	-34.15	-112.04		
		300	67.45	point	dead	0.29	0.95	-33.39	-109.55		
	UFA21-004									125	
	UFA21-002									125	
	UFA21-001									125	125
	UFA21-045									125	
	UFA21-015									125	
	UFA21-095									125	
	UFA21-051									125	125

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UFA21-053									125	
	UFA21-057										200
	UFA21-056									125	
	UFA21-097	158.35	35.60	point	dead	13.52	44.50	-44.81	-147.00		
	UFA21-017										100
	UFA21-079										100
+14.80M (+48.5ft)	UFA23-014									2285	
	UFA24-004									125	
	UFA24-001									125	125
	UFA24-045									125	
	UFA24-002									125	
	UFA23-015									125	
	UFA24-057										200
	UFA24-071									125	
	UFA24-086									125	
	UFA24-085									125	
	UFA24-070									125	
	UFA24-051									125	125
	UFA24-053									125	
	UFA24-017										100

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UFA24-079										100
+19.5M (+64.0ft)	UFA29-015	200	44.96	Point	live	-9.03	-29.63	-47.36	-155.38	125	225
		222.76	50.08	Point	dead	1.83	6.00	-31.91	-104.70		
		222.76	50.08	Point	dead	1.83	6.00	-41.51	-136.20		
	UFA29-001									125	125
	UFA29-005									125	
	UFA29-045									125	
	UFA29-090									125	225
	UFA29-054									125	
	UFA29-051									125	125
+24.20M (+79.4ft)	UFA10-069	470	105.67	point--free action	live						
		470	105.67	point--free action	live						
		120	26.98	point--free action	dead	15.70	51.51	-51.05	-167.49		
		120	26.98	point--free action	dead	23.95	78.58	-51.05	-167.49		
	UFA29-015	120	26.98	point--free action	live-max						
		120	26.98	point--free action	live-min						
	UFA34-010	180	40.47	point	dead	-22.03	-72.26	-27.13	-88.99		
	UFA35-078	180	40.47	point	dead	11.41	37.43	-44.76	-146.85		
	UFA34-001									125	125
	UFA34-045									125	

Table 3E.1-8—Floor Dead and Live Loads
Sheet 20 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
NUCLEAR AUXILIARY BUILDING											
+34.00M (+111.5ft)	UKA	120	26.98	point--free action	live	15.80	51.84	-28.95	-94.98	150	100
		120	26.98	point--free action	live	15.80	51.84	-41.20	-135.17		
REACTOR BUILDING											
-6.15M (-20.2ft)	UJA04-003	152.50	34.29	point	dead	10.77	35.32	-6.64	-21.77		
		152.50	34.29	point	dead	-10.77	-35.32	-6.64	-21.77		
		127.66	28.70	point	dead	13.66	44.80	-3.40	-11.16		
		127.66	28.70	point	dead	-13.66	-44.80	-3.40	-11.16		
		108.89	24.48	point	dead	12.18	39.97	2.20	7.21		
		108.89	24.48	point	dead	-12.18	-39.97	2.20	7.21		
		108.89	24.48	point	dead	5.11	16.75	12.19	40.00		
		108.89	24.48	point	dead	-5.11	-16.75	12.19	40.00		
		114.14	25.66	point	dead	-10.86	-35.63	7.51	24.64		
		114.14	25.66	point	dead	10.86	35.63	7.51	24.64		
	UJA11-001									1025	
		205.01	46.09	point	dead	-0.97	-3.17	0.12	0.38		
	UJA04-002	1979.36	445.00	point	dead	4.05	13.29	-9.34	-30.63		
		1979.36	445.00	point	dead	-5.51	-18.08	-9.78	-32.08		
		1979.36	445.00	point	dead	-0.63	-2.08	-14.67	-48.13		

Table 3E.1-8—Floor Dead and Live Loads
Sheet 21 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
-2.30M (-7.5ft)	UJA07-013	110	24.73	point--free action	live						
	UJA07-015	110	24.73	point--free action	live						
	UJA07-016	125	28.10	point--free action	live						
	UJA07-018	234.42	52.70	point	dead	-0.15	-0.50	10.36	34.00		
		195.28	43.90	point	dead	-0.46	-1.50	14.02	46.00		
		195.28	43.90	point	dead	-0.46	-1.50	15.55	51.00		
	UJA07-021	226	50.81	point	dead	-5.82	-19.09	-18.25	-59.86	300	
	UJA07-024									400	
	UJA07-026	328	73.74	point	dead	5.82	19.09	-18.25	-59.86	350	
	UJA07-027	328	73.74	point	dead	-2.89	-9.48	-18.25	-59.86	350	
	UJA07-020									325	
	UJA07-020									350	
+1.50M (+4.9ft)	UJA11-016	170	38.22	point--free action	live					175	125
	UJA11-019	636.10	143.00	point	dead	-0.15	-0.50	14.94	49.00		
	UJA11-024	127.66	28.70	point	dead	4.42	14.50	-14.63	-48.00		
		362	81.38	point	dead	9.81	32.18	-14.65	-48.05		
	UJA11-032	134.37	30.21	point	dead	17.94	58.84	0.26	0.85		
	UJA11-031	134.37	30.21	point	dead	-17.94	-58.84	0.26	0.85		
	Airlock	300	67.45	point	dead	0.00	0.00	24.24	79.51		
	UJA11-025									175	125

Table 3E.1-8—Floor Dead and Live Loads
Sheet 22 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UJA11-026									175	125
	UJA11-027									175	125
	UJA11-028									175	125
	UJA11-015									175	125
	UJA11-013									175	125
	UJA11-014									175	125
	UJA11-020									175	125
+5.15M (+16.9ft)	UJA15-013	1098.71	247.00	point	dead	-17.83	-58.50	-8.23	-27.00		
		127.51	28.67	point	dead	-17.29	-56.71	-1.16	-3.80		
	UJA15-014	1098.71	247.00	point	dead	-16.31	-53.50	10.97	36.00		
		127.51	28.67	point	dead	-17.29	-56.71	1.16	3.80		
	UJA15-015	1098.71	247.00	point	dead	16.31	53.50	10.97	36.00		
		127.51	28.67	point	dead	17.29	56.71	1.16	3.80		
	UJA15-016	1098.71	247.00	point	dead	17.53	57.50	-8.23	-27.00		
		127.51	28.67	point	dead	17.29	56.71	-1.16	-3.80		
	UJA11-002	89.26	20.07	point	dead	-5.70	-18.70	-12.75	-41.82		
	UJA11-005	88.27	19.85	point	dead	-10.24	-33.59	14.18	46.51		
	UJA11-006	88.27	19.85	point	dead	10.24	33.59	14.18	46.51		
	UJA15-023	110	24.73	point	live	-2.64	-8.66	-14.34	-47.04		
	UJA15-001	1860	418.17	point	dead	-3.81	-12.50	-5.23	-17.15		

Table 3E.1-8—Floor Dead and Live Loads
Sheet 23 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
		1860	418.17	point	dead	3.81	12.50	-5.23	-17.15		
	UJA15-021									350	
+8.70M (+28.5ft)	UJA18-015	108.87	24.48	point	dead	11.12	36.47	14.11	46.28	100	
	UJA18-014	109.36	24.59	point	dead	-10.75	-35.26	14.35	47.07	100	
	UJA18-020	122.61	27.57	point	dead	-5.56	-18.24	-13.34	-43.76		
	UJA15-021	130	29.23	point	live	2.31	7.58	-12.99	-42.61		
		130	29.23	point	live	3.50	11.48	-14.94	-49.00		
	UJA15-023	130	29.23	point	live	-1.60	-5.25	-12.57	-41.23		
	UJA15-001	410	92.18	point	live	2.25	7.38	-12.33	-40.44		
		130	29.23	point	live	3.50	11.48	-10.38	-34.05		
	UJA18-013									100	
	UJA18-016									100	
+13.80M (+45.3ft)	UJA23-041									300	
	UJA23-013									50	
	UJA23-014									75	
	UJA23-015									75	
	UJA23-016									50	
+19.50M (+64.0ft)	UJA	200	44.96	point	dead	-3.82	-12.53	1.26	4.13		
		200	44.96	point	dead	-3.82	-12.53	-0.15	-0.49		
		200	44.96	point	dead	-3.82	-12.53	-1.71	-5.61		

Table 3E.1-8—Floor Dead and Live Loads
Sheet 24 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
		200	44.96	point	dead	-3.82	-12.53	-3.14	-10.30		
		200	44.96	point	dead	-3.82	-12.53	-4.68	-15.35		
		200	44.96	point	dead	-3.82	-12.53	-6.24	-20.47		
		200	44.96	point	dead	-3.82	-12.53	-7.75	-25.43		
		200	44.96	point	dead	-3.82	-12.53	-9.15	-30.02		
		200	44.96	point	dead	-3.82	-12.53	-10.51	-34.48		
		200	44.96	point	dead	-3.82	-12.53	-11.62	-38.12		
		200	44.96	point	dead	-3.46	-11.35	3.42	11.22		
		200	44.96	point	dead	-2.59	-8.50	4.63	15.19		
		200	44.96	point	dead	3.82	12.53	1.26	4.13		
		200	44.96	point	dead	3.82	12.53	-0.15	-0.49		
		200	44.96	point	dead	3.82	12.53	-1.71	-5.61		
		200	44.96	point	dead	3.82	12.53	-3.14	-10.30		
		200	44.96	point	dead	3.82	12.53	-4.68	-15.35		
		200	44.96	point	dead	3.82	12.53	-6.24	-20.47		
		200	44.96	point	dead	3.82	12.53	-7.75	-25.43		
		200	44.96	point	dead	3.82	12.53	-9.15	-30.02		
		200	44.96	point	dead	3.82	12.53	-10.51	-34.48		
		200	44.96	point	dead	3.82	12.53	-11.62	-38.12		
		200	44.96	point	dead	3.46	11.35	3.42	11.22		

Table 3E.1-8—Floor Dead and Live Loads
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Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
		200	44.96	point	dead	2.59	8.50	4.63	15.19		
	UJA29-016	685	154.00	point	dead	12.07	39.60	-20.91	-68.60		835
		1125	252.92	point	dead	14.08	46.19	-13.88	-45.54		
		640	143.88	point	dead	8.58	28.15	-9.80	-32.15		
	UJA29-013										835
		640	143.88	point	dead	-8.58	-28.15	-9.80	-32.15		
		171.87	38.64	point	dead	-7.83	-25.70	-15.78	-51.78		
		171.87	38.64	point	dead	-8.42	-27.62	-14.37	-47.14		
		171.87	38.64	point	dead	-9.83	-32.26	-13.78	-45.22		
		171.87	38.64	point	dead	-11.25	-36.90	-14.37	-47.14		
		171.87	38.64	point	dead	-11.83	-38.82	-15.78	-51.78		
		171.87	38.64	point	dead	-11.25	-36.90	-17.20	-56.42		
		171.87	38.64	point	dead	-9.83	-32.26	-17.78	-58.34		
		171.87	38.64	point	dead	-8.42	-27.62	-17.20	-56.42		
		228.14	51.29	point	dead	4.18	13.70	-16.98	-55.70		
		228.14	51.29	point	dead	-4.18	-13.70	-16.98	-55.70		
	UJA29-023	270	60.70	point	dead	-19.35	-63.48	-16.15	-52.99		
+24.10M (+79.0ft)	UJA34-018	130	29.23	point	dead	-3.98	-13.06	10.53	34.55		
		130	29.23	point	dead	-1.84	-6.04	15.10	49.54		
		130	29.23	point	dead	-6.10	-20.01	13.86	45.47		

Table 3E.1-8—Floor Dead and Live Loads
Sheet 26 of 26

Elevation	Room Number	Magnitude of Load		Load Description	Load Type	Application				Area Dead Load (psf)	Area Live Load (psf)
						X-Coordinate		Y-Coordinate			
		Metric (kN)	US (kips)			Metric (m)	US (ft)	Metric (m)	US (ft)		
	UJA34-014	120	26.98	point	dead	-16.68	-54.72	-12.92	-42.39	275	
		445	100.04	point	dead	-11.97	-39.27	13.81	45.31		
	UJA34-015									275	
+28.50M (+93.5ft)	UJA	300	67.45	point	dead	12.70	41.67	13.86	45.47		835
		150	33.72	point	dead	6.05	19.85	19.10	62.66		
		200	44.96	point	dead	-4.79	-15.72	19.53	64.07		
		230	51.71	point	dead	-9.20	-30.18	9.79	32.12		
		230	51.71	point	dead	9.20	30.18	9.79	32.12		
		650	146.13	point	dead	4.29	14.07	13.56	44.49		
	UJA41-003	128	28.78	point	dead	-10.33	-33.89	-7.43	-24.38		
	UJA38-004	128	28.78	point	dead	-10.33	-33.89	7.43	24.38		
	UJA38-008	128	28.78	point	dead	10.33	33.89	-7.43	-24.38		
	UJA38-007	128	28.78	point	dead	10.33	33.89	7.43	24.38		
+34.45M (+113ft)	SG Platform										1253

Table 3E.1-9—Minimum Factors of Safety for the Nuclear Island Common Basemat Structure

Analysis Case	Sliding			Overturning			Flotation	
	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated X-DIR	Calculated Y-DIR	Required	Calculated
5ae-h	1.1	1.1	1.1	1.1	1.7	2.0	1.1	5.0
4ue-m	1.1	1.1	1.1	1.1	1.7	1.9	1.1	5.0
1n2ue-s	1.1	1.9	1.9	1.1	2.6	2.9	1.1	5.0
1n5ae-h	1.1	1.2	1.1	1.1	1.7	2.0	1.1	5.0
hfub	1.1	3.8	3.7	1.1	5.6	5.3	1.1	5.0
hflb	1.1	4.1	4.0	1.1	6.7	7.7	1.1	5.0
hfbe	1.1	3.6	3.8	1.1	6.0	6.7	1.1	5.0

Table 3E.1-10—Maximum Static and Dynamic Bearing Pressures for the NI Common Basemat Structure

Analysis Case	Static (ksf) (Dead Load) Edge	Dynamic (ksf) (Seismic + Dead Load)	
		Corner	Edge
1n2ues-cr	23.1	38.0	30.2
1n5aeh-cr	18.9	58.1	27.1
2sn4uem-cr	21.9	46.0	30.5
4uem-cr	22.9	56.2	30.0
5aeh-cr	21.1	58.5	26.8
hfbe-cr	18.8	32.0	22.2
hflb-cr	18.9	31.0	23.6
hfub-cr	18.4	32.2	22.5

Notes:

1. Analysis cases indicated with "-cr" represent the cracked case.

Figure 3E.1-1—Nomenclature and Sign Convention for ANSYS

T_x=axial load in x-direction (k/ft).

T_y=axial load in y-direction (k/ft).

T_{xy}=in-plane shear load (k/ft).

N_x =out-of-plane shear load through the x-face (k/ft).

N_y=out-of-plane shear load through the y-face (k/ft).

M_x =bending moment about y-axis (k-ft/ft).

M_y=bending moment about x-axis (k-ft/ft).

M_{xy} =twisting moment (k-ft/ft).

Figure 3E.1-2—Nomenclature and Sign Convention for CivilFEM

T_x=axial load in x-direction (k/ft).

T_y=axial load in y-direction (k/ft).

T_{xy}=in-plane shear load (k/ft).

N_x =out-of-plane shear load through the x-face (k/ft).

N_y=out-of-plane shear load through the y-face (k/ft).

M_x =bending moment about y-axis (k-ft/ft).

M_y=bending moment about x-axis (k-ft/ft).

M_{xy} =twisting moment (k-ft/ft).

Next File