UFC 3-301-01
1 June 2013
Change 4, 1 November 2018

UNIFIED FACILITIES CRITERIA (UFC)

STRUCTURAL ENGINEERING

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STRUCTURAL ENGINEERING

U.S. ARMY CORPS OF ENGINEERS

NAVAL FACILITIES ENGINEERING COMMAND (Preparing Activity)

AIR FORCE CIVIL ENGINEER CENTER

Record of Changes (changes are indicated by **1**\ ... /**1**/)

Change No.	**Date**	**Location**
1	15 May 2014	Updated wind data and other minor modifications.
2	20 June 2016	Adopts 2015 IBC
3	12 Sept 2016	Further updated to reflect 2015 IBC
4	1 Nov 2018	Added Environmental Severity Classification and humidity design requirements, and updated corrosion prevention requirements in 1-4.4, 2-4.1.5, 2-4.3, B-3.6, B-3.7 and B-5.4.

This UFC supersedes UFC 3-301-01, dated 27 January 2010 with change 3 of 31 January 2012.

FOREWORD

The Unified Facilities Criteria (UFC) system is prescribed by MIL-STD 3007 and provides planning, design, construction, sustainment, restoration, and modernization criteria, and applies to the Military Departments, the Defense Agencies, and the DoD Field Activities in accordance with USD (AT&L) Memorandum dated 29 May 2002. UFC will be used for all DoD projects and work for other customers where appropriate. All construction outside of the United States is also governed by Status of Forces Agreements (SOFA), Host Nation Funded Construction Agreements (HNFA), and in some instances, Bilateral Infrastructure Agreements (BIA.) Therefore, the acquisition team must ensure compliance with the most stringent of the UFC, the SOFA, the HNFA, and the BIA, as applicable.

UFC are living documents and will be periodically reviewed, updated, and made available to users as part of the Services' responsibility for providing technical criteria for military construction. Headquarters, U.S. Army Corps of Engineers (HQUSACE), Naval Facilities Engineering Command (NAVFAC), and Air Force Civil Engineer Center (AFCEC) are responsible for administration of the UFC system. Defense agencies should contact the preparing service for document interpretation and improvements. Technical content of UFC is the responsibility of the cognizant DoD working group. Recommended changes with supporting rationale should be sent to the respective service proponent office by the following electronic form: Criteria Change Request. The form is also accessible from the Internet sites listed below.

UFC are effective upon issuance and are distributed only in electronic media from the following source:

- Whole Building Design Guide web site http://dod.wbdg.org/.

Refer to UFC 1-200-01, *DoD Building Code (General Building Requirements)*, for implementation of new issuances on projects.

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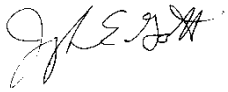

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UNIFIED FACILITIES CRITERIA (UFC)
REVISION SUMMARY SHEET

Subject: UFC 3-301-01, *Structural Engineering*

Cancels: UFC 3-301-01, *Structural Engineering* dated 27 January 2010 with change 3 of 31 January 2012

Description of Changes:

- This UFC adopts the structural design provisions of the 2012 *International Building Code* (2012 IBC) for use in DoD building design and renovation.
- Live load Table is updated to coordinate with 2015 IBC.
- Site-specific structural load data Tables for wind are updated to the ultimate design wind speed values from 2012 IBC which are the basic wind speed values from ASCE/SEI 7-10.
- Site-specific structural load data Tables for seismic ground motion parameters are updated to the risk-adjusted maximum considered earthquake values and include the peak ground accelerations from ASCE/SEI 7-10.

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- Revised Table E-1 Wind Speeds for Elmendorf AFB & Fort Richardson, Alaska.
- Added OCONUS seismic risk conversion equations in Table F-3 footnote.
- Eliminated call for specific type of joint in Section B.2 & E-3 (“control”).
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- Adopts 2015 IBC. (All references to 2012 IBC have been updated to 2015 IBC)
- Defines DOD specific special Inspection requirements.
- Updated seismic design value for the Kwajalein based on ERDC Report, *Probabilistic Seismic Hazard Analysis for Kwajalein Atoll, Republic of the Marshall Islands,* dated August 2015

Reasons for Changes:

- The updated UFC is designed to be consistent with and to supplement the guidance contained in 2015 IBC as modified by UFC 1-200-01.

Impact: There are negligible cost impacts. However, the following benefit should be realized:

- Load Tables ensure that the locations identified and the loadings described are complete and current with the most up-to-date available information.

- DoD structural design criteria are current with industry codes and standards.

Non-Unified Items: This document contains no non-unified items

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Description of Changes:

A footnote has been added to Table E-3, which allows for a 20% reduction in seismic acceleration values for Guam, based on a site specific ground motion study conducted by URS Corporation, dated April 1, 2016, and per ASCE 7-10 21.4.

Reason for Changes:

A site specific seismicity study for Guam was funded by the Air Force to determine whether the code prescribed seismic design force could be reduced. The study's findings, in combination with code prescribed procedures for site specific ground motion studies, allowed for a 20% reduction in seismic design force.

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TABLE OF CONTENTS

TABLES

FIGURES

CHAPTER 1 INTRODUCTION

1-1 PURPOSE AND SCOPE

This Unified Facility Criteria (UFC) provides requirements for structures designed and constructed for the Department of Defense (DoD). These technical requirements are based on the 2015 International Building Code (2015 IBC), as modified by UFC 1-200-01. This information shall be used by structural engineers to develop design calculations, specifications, plans, and design-build Requests for Proposal (RFPs).

1-2 BACKGROUND

UFC 1-200-01 uses and supplements 2015 IBC as the building code for DoD. Chapter 2 of this UFC further modifies the IBC for structural-specific design requirements and is organized by the chapter of IBC that each section modifies. Chapter 3 of this UFC further modifies ASCE/SEI 7-10 for structural-specific design requirements and is organized by the chapter of ASCE/SEI 7 that each section modifies. The climatic and seismic data included in this UFC are intended as tools to assist in the consistent interpretation of the corresponding data in the IBC at significant DoD installations within the United States, and as the basis for applying the provisions of UFC 1-200-01 to significant DoD installations outside of the United States. Chapter 4 provides additional guidance for the design of structures other than buildings. The 2015 IBC and ASCE/SEI 7-10 section modifications are one of four actions, according to the following legend:

[Addition] – Add new section, including new section number, not shown in 2015 IBC or ASCE/SEI 7-10.

[Deletion] – Delete referenced 2015 IBC or ASCE/SEI 7-10 section.

[Replacement] – Delete referenced 2015 IBC or ASCE/SEI 7-10 section or noted portion and replace it with the narrative shown.

[Supplement] – Add narrative shown as a supplement to the narrative shown in the referenced section of 2015 IBC or ASCE/SEI 7-10.

1-3 APPLICABILITY

This UFC applies to all service elements and contractors involved in the planning, design and construction of DoD facilities worldwide.

1-4 OTHER CRITERIA

Military criteria other than those listed in this document may be applicable to specific types of structure. Such structures shall meet the additional requirements of the applicable military criteria.

1-4.1 General Building Requirements

Comply with UFC 1-200-01, DoD Building Code (General Building Requirements). UFC 1-200-01 provides applicability of model building codes and government unique criteria for typical design disciplines and building systems, as well as for accessibility, antiterrorism, security, high performance and sustainability requirements, and safety. Use this UFC in addition to UFC 1-200-01 and the UFCs and government criteria referenced therein.

1-4.2 Seismic Design

For seismic design of buildings, refer to UFC 3-310-04.

1-4.3 Progressive Collapse

For design of buildings to resist progressive collapse, refer to UFC 4-023-03. \4\

1-4.4 Environmental Severity and Humid Locations.

The design must incorporate systems and details to meet the environmental corrosivity conditions for the specific project location, as defined by its Environmental Severity Classification (ESC). See UFC 1-200-01 for determination of ESC for project locations. The humidity conditions must also be considered during design - humid locations are those in ASHRAE climate zones 0A, 1A, 2A, 3A, 3C, 4C, and 5C (as identified in ASHRAE 90.1).

“Environmental severity” is defined as the corrosivity of the local environment of a given location or region. Environmental severity contributes directly to the occurrence of corrosion. The effects of corrosion and the rate at which they occur are consequences of the corrosion system, which is comprised of a material or physical system, the environment, and operational conditions. “Corrosion” is the deterioration of a material or its properties due to a reaction of that material with its chemical environment and is inclusive of the deterioration of all materials, which can be caused through sun exposure, mold and mildew, wind, and other environmental elements. /4/

1-5 REFERENCES

For references see Appendix A.

CHAPTER 2 MODIFICATIONS TO IBC

2-1 CHAPTER 16 - STRUCTURAL DESIGN

2-1.1 Section 1603 - CONSTRUCTION DOCUMENTS

2-1.1.1 1603.2 - Delegated Engineered Systems [Addition]

The Structural Designer of Record (DOR) for a structure may delegate responsibility for the design of systems or component parts of the structure to a qualified delegated engineer. Both the engineer of record for the structure and the delegated engineer must comply with the requirements of this UFC. The following are some examples of delegated systems.

a. Prefabricated wood components

b. Cast-in-place post-tensioned concrete structural systems

c. Precast, prestressed concrete components

d. Open web steel joists and joist girders

e. Pre-engineered metal buildings

f. Specialty foundation systems

g. Structural steel connections

h. Cold-formed steel joist/stud/truss framing and pre-fabricated components

i. Seismic design of nonstructural components

j. Proprietary track for under-hung cranes and monorails

k. Autoclaved aerated concrete

l. \2\ ATFP analysis (and/or testing) for building components /2/

The delegated engineer must sign and seal all work they design. The structural (DOR) must review all submittals that have been signed and sealed by the delegated engineer, to verify compliance with the design intent and the specified design criteria and to ensure coordination with the contract documents and other shop drawings. All submittals from the delegated engineer must be approved by the DOR prior to the start of fabrication of the system or component part and prior to any field construction that may be affected by the system or component part.

2-1.2 Section 1604 - GENERAL DESIGN REQUIREMENTS

2-1.2.1 1604.3 - Serviceability [Supplement]

The structural designer shall ensure that the maximum allowable frame drift is suiTable for the proposed structure considering occupancy, use/function, and all details of construction. See ASCE/SEI 7 Appendix C "Serviceability Considerations" including commentary, and Section B-1.1 of UFC 3-301-01 for additional guidance.

In the wind design of a building or a non-building structure, the lateral drift shall not exceed H/480 based on a wind speed with a 10 year MRI. See Figure CC-1 of ASCE/SEI 7 for wind speeds with a 10 year MRI. Consideration shall be given to the cladding system when evaluating lateral drift as a more stringent drift limitation may be appropriate depending on the cladding system.

Exception: The drift limits can be modified with concurrence/approval from the AHJ.

Wall systems and other building elements that are not part of the lateral force-resisting system shall be detailed to ensure that they are not susceptible to damage. Masonry and other brittle wall systems are particularly susceptible to damage if not properly integrated into the design to ensure that they can adequately resist the stresses resulting from the building deformations or are effectively isolated to prevent damage.

Exception: Reinforced concrete frame members not designed as part of the seismic force-resisting system shall comply with Section 18.14 of ACI 318.

All structural vertical load-bearing wall elements shall be considered to be part of the lateral force-resisting system. All applicable provisions of UFC 3-310-04 Table 2-1 shall apply.

2-1.2.2 1604.3.1 - Deflections [Replacement]

Deflections of structural members shall not exceed the more restrictive of the limitations of Sections 1604.3.2 through 1604.3.5 or those permitted by Table 1604.3, or Table 2-1 of UFC 3-301-01.

2-1.2.3 1604.5 - Risk Category [Replacement]

Each building and structure shall be assigned a risk category in accordance with Table 2-2 of UFC 3-301-01. Where referenced standard specifies an occupancy category, the risk category shall not be taken as lower than the occupancy category specified therein. Importance factors for snow load, seismic load, and ice for each risk category are also shown in Table 2-2 of UFC 3-301-01.

Note: IBC section 1604.5.1 shall remain in effect as written.

Table 2-1 Lateral Deflection Limits for Framing Supporting Exterior Wall Finishes
a,b,c

Brick veneer	L/600
Exterior Insulation Finish Systems	L/240
Cement board	L/360
Stone Masonry	VERIFY WITH STONE SUPPLIER
Plywood and Wood-Based Structural-Use Panels	L/240
Gypsum sheathing	L/240
Metal or vinyl siding \2\ and insulated metal panel /2/	L/240

Notes to Table 2-1, "LATERAL DEFLECTION LIMITS FOR FRAMING SUPPORTING EXTERIOR WALL FINISHES"

a. Lateral deflection limits under wind loads \2\ /2/.

b. The wind load is permitted to be taken as 0.42 times the "component and cladding" loads for the purpose of determining the deflection limits herein.

c. L shall be calculated as L = k*l, where k is the theoretical effective length factor, and l is the actual member length.

2-1.2.4 Table 1604.5 [Replacement]

Replace Table 1604.5 of the IBC with Table 2-2 of this UFC. (All references in the IBC to Table 1604.5 shall be interpreted as a reference to Table 2-2 of this UFC.)

Table 2-2 - Risk Category of Buildings and Other Structures

Risk Category	Nature of Occupancy	Seismic Factor I_E	Snow Factor I_S	Ice Factor I_i
I	**Buildings and other structures that represent a low hazard to human life in the event of failure, including, but not limited to:** • Agricultural facilities • Certain temporary facilities • Minor storage facilities	1.00	0.8	0.80
II	**Buildings and other structures except those listed in Risk Categories I, III, IV *and V***	1.00	1.00	1.00
III	**Buildings and other structures that represent a substantial hazard to human life *or represent significant economic loss* in the event of failure, including, but not limited to:** • Buildings and other structures whose primary occupancy is public assembly with an occupant load greater than 300 people • Buildings and other structures containing *elementary school, secondary school, or daycare facilities* with an occupant load greater than 250 • Buildings and other structures containing *adult education facilities, such as colleges and universities,* with an occupant load greater than 500 • Group I-2 occupancies with an occupant load of 50 or more resident care recipients but not having surgery or emergency treatment facilities • Group I-3 occupancies • Any other occupancy with an occupant load greater than 5,000[a] • Power-generating stations; water treatment facilities for poTable water, waste water treatment facilities, and other public utility facilities that are not included in Risk Categories IV *and V* • Buildings and other structures not included in Risk Categories IV *and V* containing sufficient quantities of toxic, flammable, or explosive materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with *NFPA 1: Fire Code*; and are sufficient to pose a threat to the public if released.[b] • *Facilities having high-value equipment, as designated by the AHJ*	1.25	1.10	1.25

Risk Category	Nature of Occupancy	Seismic Factor I_E	Snow Factor I_S	Ice Factor I_i
IV	**Buildings and other structures designed as essential facilities, including, but not limited to:** • Group I-2 occupancies having surgery or emergency treatment facilities • Fire, rescue, and police stations, and emergency vehicle garages • Designated earthquake, hurricane, or other emergency shelters • Designated emergency preparedness, communication, and operation centers, and other facilities required for emergency response • Power-generating stations and other utility facilities required as emergency backup facilities for Risk Category IV structures. • Buildings and other structures containing quantities of highly toxic materials that: Exceed maximum allowable quantities per control area as given in Table 307.1(1) or 307.1(2) or per outdoor control area in accordance with NFPA 1, Fire Code; and are sufficient to pose a threat to the public if released.[b] • Air traffic control tower (ATCT), Radar Approach Control Facility (RACF) and air traffic control centers unless the AHJ determines that the facility is classified as a non-essential facility and is not required for post-earthquake operations (i.e. minor facility, availability of an alternate temporary control facility, auxiliary outlying field, etc.). Contact the AHJ for additional guidance. • Emergency aircraft hangars that house aircraft required for post-earthquake emergency response; if no suiTable back up facilities exist • Buildings and other structures not included in Risk Category V, having DoD mission-essential command, control, primary communications, data handling, and intelligence functions that are not duplicated at geographically separate locations, as designated by the using agency • Water storage facilities and pump stations required to maintain water pressure for fire suppression	1.50	1.20	1.25

Risk Category	Nature of Occupancy	Seismic Factor I_E	Snow Factor I_S	Ice Factor I_i
V [c]	**Facilities designed as national strategic military assets, including, but not limited to:** • Key national defense assets (e.g. National Missile Defense facilities), as designated by the AHJ. • Facilities involved in operational missile control, launch, tracking, or other critical defense capabilities • Emergency backup power-generating facilities required for primary power for Category V occupancy • Power-generating stations and other utility facilities required for primary power for Category V occupancy, if emergency backup power generating facilities are not available Facilities involved in storage, handling, or processing of nuclear, chemical, biological, or radiological materials, where structural failure could have widespread catastrophic consequences, as designated by the AHJ.	1.0	1.50	1.50

Notes to Table 2-2, "Risk Category of Buildings and Other Structures"

a. For purposes of occupant load calculations, occupancies required by Table 1004.1.2 to use gross floor area calculations shall be permitted to use net floor area to determine the total occupant load.

b. Where approved by the building official, the classification of buildings and other structures as Risk Category III or IV based on their quantities of toxic, highly toxic or explosive materials is permitted to be reduced to Risk Category II, provided it can be demonstrated by hazard assessment in accordance with Section 1.5.3 of ASCE/SEI 7 that a release of the toxic, highly toxic or explosive material is not sufficient to pose a threat to the public.

c. A Risk Category has been added to address national strategic military assets. Structures in this risk category are designed to remain elastic during the MCE_R.

2-1.2.5 1604.11 - Fall Prevention and Protection [Addition]

When there is a hazard of falling from heights, fall prevention and protection measures shall be considered at a building or facility to protect personnel during occupancy and maintenance phases, or whenever there is a need or requirement to perform work at high locations, on equipment, near unprotected sides or edges, holes or openings, delivering material to or store equipment at heights as prescribed by the following standards:

- 29 CFR 1926, Subpart M,
- 29 CFR 1910, Subpart D
- Notices of Proposed Rulemaking, 29 CFR 1910
- ANSI/ASSP A1264.1
- ANSI/ASSP Z359

At the planning and design phase of a project, fall hazards shall be considered and eliminated whenever possible. Safe access to the work location at heights shall also be considered. When elimination or prevention of fall hazards is not feasible, the design shall include certified and labeled anchorages that are conveniently located to perform the work safely. The anchorages shall meet the requirements of the following standards:

- \2\ 29 CFR 1910, Subpart D /2/
- 29 CFR 1926.500, Subpart M,
- Notices of Proposed Rulemaking, 29 CFR 1910
- ANSI/ASSP Z359

Where fall protection is required in the vicinity of weight-handling equipment, care must be taken to prevent potential conflicts between the weight-handling equipment and the fall protection measures.

2-1.2.5.1 1604.11.1 – Loads, Load Combinations and Impact Factors [Addition]

For fall arrest loads that will impact the anchorages, in addition to load combinations and impact factors to be used in the design of personal fall protection systems, refer to ANSI/ASSP Z359.6.

2-1.2.5.2 1604.11.2 - Additional Fall Protection Considerations [Addition]

The design for anchorages attached to or embedded in concrete shall include consideration of both the static and the dynamic loads generated by the fall arrest system.

2-1.2.5.3 1604.12 - Expansion Joints [Addition]

Spacing of expansion joints shall follow the recommendations in *NAS Technical Report No. 65*.

2-1.3 Section 1607 - LIVE LOADS

2-1.3.1 1607.1 General [Replacement]

Live loads are those loads defined in Section 1602.1. Table D-1 of this UFC defines minimum uniformly distributed live loads and minimum concentrated live loads for the design of structures. Table D-1 is IBC Table 1607.1 with additional Occupancy or Use

classifications for military facilities. The classifications that have been added to IBC Table 1607.1 are shown in bold italics within Table D-1.

2-1.3.2 Table 1607.1 [Replacement]

Replace Table 1607.1 of the IBC with Table D-1 of this UFC. (All references in the IBC to Table 1607.1 shall be interpreted as references to Table D-1 of this UFC.)

2-1.3.3 1607.7.1 Loads [Replacement]

Where a structure does not restrict access for vehicles that exceed a 10,000 pound (4536 kg) gross vehicle weight rating, those portions of the structure subject to such loading shall be designed using the vehicular live loads, including consideration of impact and fatigue, in accordance with the AASHTO Bridge Design Specification.

2-1.3.4 1607.9. 5 Hangers [Addition]

For the purpose of design, the live load on hangers supporting floors and balconies shall be increased by 33 percent to account for impact.

2-1.3.5 1607.11 Distribution of Floor Loads [Supplement]

Add the following to the end of the paragraph: Partial floor live load distribution shall follow Section 4.3.3 of ASCE/SEI 7.

2-1.4 Section 1608 - SNOW LOADS

2-1.4.1 1608.4 - Specific Locations Within the United States [Addition]

Ground snow loads at DoD installations within the United States and its territories and possessions are identified in Table E-2 of UFC 3-301-01, to facilitate consistent interpretation of the information provided in Figure 1608.2 and Table 1608.2.

2-1.4.2 1608.5 - Specific Locations Outside of the United States [Addition]

Ground snow loads at specific locations outside of the United States and its territories and possessions are identified in Table F-2 of UFC 3-301-01. At locations where the ground snow load is not provided, use the best locally available information. For additional guidance contact the AHJ.

2-1.4.3 1608.6 - Snow Load Case Studies [Addition]

Snow load case studies may be done to clarify and refine snow loadings at site-specific locations with the approval of the AHJ. For Risk Category V facilities or where required by the AHJ, a site-specific study shall be conducted if the ground snow load is greater than 30 psf (1.4KPa). The methodology used to conduct snow load case studies at site-specific locations is presented in the Cold Regions Research and Engineering Laboratory (CRREL) report “Database and Methodology for Conducting Site Specific Snow Load Case Studies for the United States.”

2-1.5 Section 1609 - WIND LOADS

2-1.5.1 1609.1.1 – Determination of Wind Loads [Supplement]

Add the following to the list of exceptions:

7. For winds parallel to the ridge of open buildings, the wind load delivered to the main wind force resisting system from the bare frames or partially clad end walls shall be determined in accordance with Section 1.3.4.5.4 of the Metal Building System Manual.

2-1.5.2 1609.1.3 – Aircraft Hangar Wind Loads [Addition]

Wind load on main wind force resisting system of aircraft hangars shall be determined based on the following conditions:

- Hangar doors closed for winds at the maximum design velocity. The structural forces shall be calculated based upon the assumption of a "partially enclosed building." It is permissible to use the large volume reduction factor of ASCE/SEI 7 in determining the design wind pressures. It shall be assumed that a 1-inch (25-mm) strip around the perimeter of all hangar door panels is an opening and this shall be combined with the area of all unshielded fenestration.
- Hangar doors open to the maximum extent possible with a wind velocity of 60 mph (97 km/h). The structural forces shall be calculated upon the assumption of a "partially enclosed building." Use the total open door area in the large volume reduction factor calculation.

2-1.5.3 1609.2 - Definitions [Replacement]

Replace the definition of Wind-Borne Debris Region in this section and IBC Section 202 with the following:

WIND-BORNE DEBRIS REGION. For locations within the United States and its territories and possessions, areas within hurricane-prone regions located:

1. Within 1 mile (1.61 km) of the coastal mean high water line where the ultimate design wind speed is 130 mph (58 m/s) or greater; or

2. In areas where the ultimate design wind speed is 140 mph (62.5 m/s) or greater; or Hawaii.

For locations outside of the United States and its territories and possessions, regions where the ultimate design wind speed is 140 mph (63.6 m/s) or greater.

For Risk Category II buildings and structures and Risk Category III buildings and structures, except health care facilities, the windborne debris region shall be based on Risk Category II wind speeds. For Risk Category IV buildings and structures and Risk

Category III health care facilities, the windborne debris region shall be based on Risk Category III-IV wind speeds. For Risk Category V buildings and structures the windborne debris region shall be based on Risk Category V wind speeds.

2-1.5.4 1609.3 – Ultimate Design Wind Speed [Supplement]

Add the following to the end of the section: For Risk Category V facilities the ultimate design wind speed, V_{ult}, should be determined in accordance with Section 26.5.3 of ASCE/SEI 7.

2-1.5.5 1609.3.1 - Wind Speed Conversion [Replacement]

When required, the ultimate design wind speed shall be converted to a nominal design wind speed, V_{asd}, using Equation 16-33a.

$$V_{asd}=\sqrt{0.6}V_{ult} \qquad \text{(Equation 16-33a)}$$

When required, the ultimate design wind speed shall be converted to a fastest-mile wind speed, V_{fm}, using Equation 16-33b.

$$V_{fm}=(\sqrt{0.6}V_{ult}-10.5)/1.05 \qquad \text{(Equation 16-33b)}$$

2-1.5.6 1609.3.2 - Specific Locations Within the United States [Addition]

Ultimate design wind speeds at DoD installations within the United States and its territories and possessions are identified in Table E-1 of UFC 3-301-01 to facilitate consistent interpretation of the information provided in Figures 1609.3(1), 1609.3(2), and 1609.3(3). To determine the wind speed at a specific location not included in Table E-1 use the web application on the Applied Technology Council website at http://windspeed.atcouncil.org/

2-1.5.7 1609.3.3 - Specific Locations Outside of the United States [Addition]

Ultimate design wind speeds at specific locations outside of the United States and its territories and possessions are identified in Table F-1 of UFC 3-301-01. At locations where the ultimate design wind speed is not provided, use the best locally available information. For additional guidance, contact the AHJ.

Use a minimum wind speed of 100 mph (161 km/h) for Risk Category I, 110 mph (177 km/h) for Risk Category II, 115 mph (185 km/h) for Risk Category III and IV or 140 mph (225 km/h) for Risk Category V at all locations unless a lower wind speed is approved by the AHJ.

2-1.6 Section 1613 - EARTHQUAKE LOADS

2-1.6.1 1613.3.1.1 - Specific Locations Within the United States [Addition]

Seismic parameters at DoD installations within the United States and its territories and possessions are identified in Table E-3 of UFC 3-301-01 to facilitate consistent interpretation of the information provided in Figures 1613.3.1(1) through 1613.3.1(8).

The values in Table E-3 were determined utilizing the United States Geological Survey (USGS) U.S. Seismic Design Maps Web Application, for ASCE 7-10 and utilizing latitude and longitude data. This tool or other approved software may be used to determine seismic design data where site-specific location information is available, with the approval of the AHJ.

The seismic acceleration parameters in Table E-3 were typically determined at the approximate geographical centroid of the installation / city. For larger installations and where the potential seismic accelerations vary considerably over relatively short distances, it may not be appropriate to use the acceleration values at the installation centroid. In Table E-3 the larger installations are identified and location specific seismic parameters for sites within the installation shall be determined using the USGS web application. For additional guidance contact the AHJ.

2-1.6.2 1613.3.1.2 - Specific Locations Outside of the United States [Addition]

Seismic ground motion parameters at specific locations outside of the United States and its territories and possessions are identified in Table F-3 of UFC 3-301-01. For locations not shown, the best available information shall be used with the approval of the AHJ. Appendix G includes available seismic spectral acceleration maps at selected locations outside of the United States. These maps may be used to interpolate the seismic ground motions at locations that are not identified in Table F-3.

2-1.6.3 1613.3.1.3 – Site Specific Seismicity Study Process [Addition]

The site specific ground motion procedures in Chapter 21 of ASCE/SEI 7 may be used to determine ground motions for any structure.

2-1.7 Section 1615 – STRUCTURAL INTEGRITY [Deletion]

This section shall be deleted in its entirety.

2-2 CHAPTER 17 - SPECIAL INSPECTIONS AND TESTS

2-2.1 Section 1701 - GENERAL

2-2.1.1 1701.1 - Scope [Supplement]

Add the following paragraph after the first paragraph:

Contractual relationships and the composition of the architect / engineer / construction (AEC) team differ from that contemplated by the language of 2015 IBC, when doing DoD construction. When performing design or construction using typical methods for in-house design, AE design, and contracting for construction, 2015 IBC/ASCE/SEI 7-10 terms of Authority Having Jurisdiction and Building Official shall be as defined in UFC 1-200-01.

\2\ Unless noted otherwise the following substitutions shall apply for implementing the IBC.

- "building official" - interpreted as "Authority Having Jurisdiction" as referenced in UFC 1– 200–01).
- "owner" - interpreted as "Authority Having Jurisdiction"
- "permit applicant" - interpreted as "contractor"

[C] 2-2.1.1 1701.1 - Scope [Supplement]

The context of the IBC terms "permit", "permit application", "permit applicant", and "owner" must be modified for DoD projects. DoD functions as the building department/jurisdiction and the AHJ functions as the building official. When DoD advertises a project the building permit is effectively implied/granted. However the overall project may still require other permits related to site storm water, air quality, demolition disposal, etc.

/2/

2-2.2 Section 1703 - APPROVALS

2-2.2.1 1703.4 - Performance [Replacement]

New, unusual, or innovative materials, systems or methods previously untried may be incorporated into designs when evidence shows that such use is in the best interest of the Government from the standpoint of economy, lower life-cycle costs, and quality of construction. Supporting data, where necessary to assist in the approval of materials or assemblies not specifically provided for in the code, shall consist of valid evaluation

reports from International Code Council – Evaluation Services (ICC-ES), or other qualified testing and evaluation service with the prior approval of the AHJ.

2-2.2.2 1703.4.1 - Research and Investigation [Deletion]

This section shall be deleted in its entirety.

2-2.2.3 1703.4.2 - Research Reports [Deletion]

This section shall be deleted in its entirety.

2-2.3 Section 1704 – SPECIAL INSPECTIONS AND TESTS, CONTRACTOR RESPONSIBILITY AND STRUCTURAL OBSERVATIONS

\2\

2-2.3.1 1704.2 Special inspections and tests. [Replacement]

Replace the first paragraph with the following:

The contractor shall retain the services of one or more *approved agencies* to provide *special inspections* and tests during construction on the types of work specified in Section 1705 and identify the *approved agencies* to the *AHJ*. These *special inspections* and tests are in addition to the inspections by the *contractor* that are identified in Section 110.

2-2.3.2 1704.2.3 Statement of special inspections. [Replacement]

Replace the first paragraph with the following:

The DOR shall submit a statement of special inspections in accordance with Section 107.1. This statement shall be in accordance with Section 1704.3.
/2/

2-2.3.3 1704.6 – Structural Observations [Replacement]

Replace the first paragraph with the following:

\2\

Where required by the provisions of Section 1704.6.1 or 1704.6.2, structural observations shall be performed by the DOR or their designated representative. Structural observation does not include or waive the responsibility for the inspections in Section 110 or the special inspections in Section 1705 or other sections of this code.

/2/

2-2.3.4 1704.6.1 – Structural Observations for Seismic Resistance [Replacement]

Replace item number one with the following:

1 - The structure is classified as Risk Category III, IV or V in accordance with Table 2-2.

Replace item number three with the following:

3 - The structure is assigned to Seismic Design Category E, is classified as Risk Category I or II in accordance with Table 2-2, and is greater than two stories above grade plane.

2-2.3.5 1704.7 – Special Inspector of Record [Addition]

\2\ When the provisions of Section 1704.6.1 or 1704.6.2 apply,/2/ the services of a Special Inspector of Record (SIOR) shall be retained by the Contractor as a third party quality assurance agent (see Section 2-17.1 of UFC 1-200-01). The SIOR shall be a licensed professional engineer in a state accepTable to the AHJ. The SIOR shall submit qualifications accepTable to the AHJ.

2-2.3.6 1704.7.1 – Duties of the Special Inspector of Record (SIOR) [Addition]

The duties of the SIOR are defined in the following UFGS specifications;

Design-Bid-Build projects	- specification 01 45 35
Design-Build projects	- specification 01 45 35.05

/2/

2-2.3.7 1704.7.2 – Final Inspection Report [Addition]

When the work requiring Special Inspections is completed and all nonconforming items have been resolved to the satisfaction of the Registered Design Professional in Responsible Charge, the Contractor shall notify the SIOR to submit a Final Special Inspection Report to the AHJ, the Registered Design Professional in Responsible Charge, and the Contractor. The Final Special Inspection Report shall attest that Special Inspection has been performed on all work requiring Special Inspection and that all nonconforming work \2\ and corrections of all discrepancies noted in the daily reports /2/ was resolved to the satisfaction of the Registered Design Professional in Responsible Charge. The Final Special Inspection Report shall be signed, dated, and shall bear the seal of the SIOR.

2-2.4 Section 1705 – REQUIRED SPECIAL INSPECTIONS AND TESTS

2-2.4.1 1705.3.3 – Adhesive Anchors [Addition]

The engineer of record shall determine the proof load (see ACI 318 Section 17.8.2.1) to be used for field testing and shall indicate in the construction documents which anchors are considered critical for testing.

2-2.4.2 1705.12 – Special Inspections for Seismic Resistance [Supplement]

Add the following before the paragraph: Special Inspections itemized in Sections 1705.12.1 through 1705.12.9 shall apply to structures assigned to Risk Category V.

2-2.4.3 1705.12.6 – Plumbing, Mechanical and Electrical Components [Supplement]

Add the following after the paragraph:

Special inspection and verification are required for Designated Seismic Systems and shall be performed as required by this section and Table 2-3.

The Registered Design Professional in Responsible Charge shall prepare a Statement of Special Inspections in accordance with Section 1704 for the Designated Seismic Systems. The Statement of Special Inspections shall define the periodic walk-down inspections that shall be performed to ensure that the non-structural elements satisfy life safety mounting requirements. The walk-down inspections shall be performed by design professionals who are familiar with the construction and installation of mechanical, and electrical components, and their vulnerabilities to earthquakes. The selection of the design professional shall be subject to the approval of the AHJ.

Designated Seismic Systems shall require a final walk-down inspection by the Registered Design Professional in Responsible Charge and by the Nonstructural Component Design Review Panel for Risk Category V installations (see Section 4-1601.2.2 of UFC 3-310-04). The final review shall be documented in a report. The final report prepared by the Registered Design Professional in Responsible Charge shall include the following:

1. Record/observations of final site visit
2. Documentation that all required inspections were performed in accordance with the Statement of Special Inspections.
3. Documentation that the Designated Seismic Systems were installed in accordance with the construction documents and the requirements of Chapter 17, as modified by this section.

2-2.4.4 1705.13 – Testing for Seismic Resistance [Supplement]

Add the following before the first paragraph: Any requirements for structural testing for structures assigned to Seismic Design Category C or higher shall also apply to structures assigned to Risk Category V.

2-3 CHAPTER 18 - SOILS AND FOUNDATIONS

2-3.1 Section 1808 – FOUNDATIONS

2-3.1.1 1808.4 - Vibratory Loads [Supplement]

Add the following to the end of the paragraph: Design foundations in accordance with ACI 351.3R or ACI 350.4R, as applicable, and UFC 3-220-01.

2-3.1.2 1808.8.2.1 - Reinforcement [Addition]

For footings over three feet (914 mm) thick, the minimum ratio of reinforcement area to gross concrete area in each direction shall be 0.0015, with not less than one-half nor more than two-thirds of the total reinforcement required placed near any one face. Minimum bar size shall be No. 4 (#13M) with a maximum spacing of 12 inches (305 mm). [See 15.10.4 of 318-11]

2-3.2 Section 1809 - SHALLOW FOUNDATIONS

2-3.2.1 1809.5.1 - Frost Line Depth [Addition]

Depths to the frost line at specific locations within the United States and its territories and possessions are identified in Table E-2 of UFC 3-301-01. Frost line depths at specific locations outside of the United States are identified in Table F-2 of UFC 3-301-01. At locations where frost depths are not provided, use the best locally available information. For additional guidance contact the AHJ. For guidance on the depth of footings due to frost see Section B-2.3 of UFC 3-301-01.

Table 2-3 Required Special Inspections and Tests of Mechanical and Electrical Components*

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	Standard Reference	IBC Reference
1. Equipment Verification				
a. Verify model number and serial number are in conformance with project specific seismic qualification (PSSQ).		x		
b. Verify Tag ID is correct and installed per specifications.		x		
2. Equipment Mounting				
a. Verify that Anchor Base Bolting is installed per PSSQ		x		
b. Verify that Equipment Bracing is Installed per PSSQ		x		
c. Verify that Bracing Attachments are installed per PSSQ		x		
3. Utility Conduit/Piping				
a. Verify that Conduit/Piping is connected to the equipment per PSSQ (flex or rigid)		x		
b. Verify that Conduit/Piping is seismically supported independently of equipment and in accordance with PSSQ support requirements.		x		
4. Clearance				
a. Adjacent Equipment – Verify that there is adequate gap to eliminate possibility of pounding.		x		
b. Conduit/Piping - Verify that there is adequate gap to eliminate possibility of pounding.		x		

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	Standard Reference	IBC Reference

*All required inspections and verifications shall be carried out for each piece of equipment constituting part of the Designated Seismic Systems.

2-4 CHAPTER 19 - CONCRETE

2-4.1 Section 1901 – GENERAL

2-4.1.1 1901.7 - Construction Joints [Addition]

Provide construction, contraction, and expansion joints in structures in accordance with ACI 224.3R and ACI 318, Section 26.5.6.

2-4.1.2 1901.8 – Tension Ties [Addition]

Where reinforcement is used as a tension tie, splices shall be made with a full mechanical or full welded splice per ACI 318 Section 25.4.

2-4.1.3 1901.9 – Drying Shrinkage [Addition]

Concrete drying shrinkage shall be determined for the approved concrete mixture per ASTM C157/C157M as modified by ACI 364.3R and shall not exceed 0.05.

2-4.1.4 1901.10 – Lightweight Concrete Water Content [Addition]

All coarse lightweight aggregate used in a concrete mixture shall be saturated surface dry prior to mixing. The total allowable water in the concrete mixture shall account for the water in the aggregate and admixtures. The water-to- cementitious materials ratio shall not exceed 0.50. \4\

2-4.1.5 1901.11 – Unbonded Post-Tensioned Tendons [Addition]

Do not use unbonded post-tensioned tendons where post-tensioned concrete structure is in contact with seawater. /4/

2-4.2 Section 1904 - DURABILITY REQUIREMENTS

2-4.2.1 1904.3 - Corrosive Environments [Addition]

In a marine environment where concrete is subjected to salt-water wave action and spray, reinforcement protection shall be in accordance with ACI 357R. \4\

2-4.3 Section 1905 – MODIFICATIONS TO ACI

2-4.3.1 1905.1.9 - ACI 318, Section 20.6.1.3.1 [Addition]

Nonprestressed cast-in-place concrete members in project locations with Environmental Severity Classifications (ESC) of C3 thru C5 must have, at a minimum, a specified concrete cover for reinforcement at least that given in Table 2-4 for concrete structures. See UFC 1-200-01 for determination of ESC for project locations.

Table 2-4 Specified Concrete Cover for Cast-In-Place Nonprestressed Concrete Members in Project Locations With ESC of C3 - C5

Concrete exposure	Member	Reinforcement	Specified cover, in. (mm)
Cast against and permanently in contact with ground	Slab-on-Grade	W31 or D31 wire, and smaller	½ of slab thickness, but not less than 2 in (50 mm)
	All other	All	3 in (75 mm)
Exposed to weather or in contact with ground	All	All	3 in (75 mm)
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 11 bar and smaller	1 in (25 mm)
	Beams, columns, pedestals, and tension ties	Primary reinforcement, stirrups, ties, spirals, and hoops	2 in (50 mm)
Waterfront (10 feet below and 10 feet above mean low tide)	All	All	3 in (75 mm)

2-4.3.2 1905.1.10 ACI 318, Section 20.6.1.3.2 [Addition]

Cast-in-place prestressed concrete members must have a specified concrete cover for reinforcement, ducts, and end fittings at least that given in Table 2-5 for concrete structures in project locations with Environmental Severity Classifications (ESC) of C3 thru C5. SEE UFC 1-200-01 FOR DETERMINATION OF ESC FOR PROJECT LOCATIONS.

Table 2-5 Specified Concrete Cover for Cast-In-Place Prestressed Concrete Members In Project Locations with ESC of C3 - C5

Concrete exposure	Member	Reinforcement	Specified cover, in. (mm)
Cast against and permanently in contact with ground	Slab-on-Grade	W31 or D31 wire, and smaller	½ of slab thickness, but not less than 2 in. (50 mm)
	All other	All	3 in (75 mm)
Exposed to weather or in contact with ground	All	All	2 in (50 mm)
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 11 bar and smaller	1 ½ in (37.5 mm)
	Beams, columns, pedestals, and tension ties	Primary reinforcement, stirrups, ties, spirals, and hoops	2 in (50 mm)
Waterfront (10 feet (3 m) below and 10 feet (3 m) above mean low tide)	All	All	2 in (50 mm)

2-4.3.3 1905.1.11 ACI 318, Section 20.6.1.3.3 [Addition]

Precast nonprestressed or prestressed concrete members manufactured under plant conditions must have specified concrete cover for reinforcement, ducts, and end fittings at least that given in Table 2-6 for concrete structures in project locations with Environmental Severity Classifications (ESC) of C3 thru C5. See UFC 1-200-01 for determination of ESC for project locations.

Table 2-6 Specified Concrete Cover for Precast Nonprestressed or Prestressed Concrete Members Manufactured Under Plant Conditions in Project Locations with ESC of C3 - C5

Concrete exposure	Member	Reinforcement	Specified cover, in. (mm)
Exposed to weather or in contact with ground	All	All	2 in (50 mm)
Not exposed to weather or in contact with ground	Slabs, joists, and walls	No. 11 bar and smaller	1 in (25 mm)
	Beams, columns, pedestals, and tension ties	Primary reinforcement, stirrups, ties, spirals, and hoops	2 in (50 mm)
Waterfront (10 feet (3 m) below and 10 feet (3 m) above mean low tide)	All	All	3 in (75 mm)

/4/

2-4.4 Section 1906 – STRUCTURAL PLAIN CONCRETE

2-4.4.1 1906.1 - Scope [Deletion]

Delete the exception to this section in its entirety.

2-4.5 Section 1907 - MINIMUM SLAB PROVISIONS

2-4.5.1 1907.1 - General [Replacement]

Replace the first line of the paragraph to read: The thickness of concrete floor slabs supported directly on the ground shall not be less than 4 inches (102 mm).

2-4.5.2 1907.2 - Slab-on-Ground Design [Addition]

Slabs-on-ground shall be designed in accordance with ACI 360R, except slabs-on-ground supporting aircraft loading shall be designed in accordance with UFC 3-260-02.

2-4.5.2.1 1907.2.1 - Wall Loads on Slab-on-Ground [Addition]

Slabs-on-ground shall have adequate thickness to support wall line load as indicated in Tables 2-4 and 2-5. The thickened portion shall have a minimum width as shown in Figure 2-1.

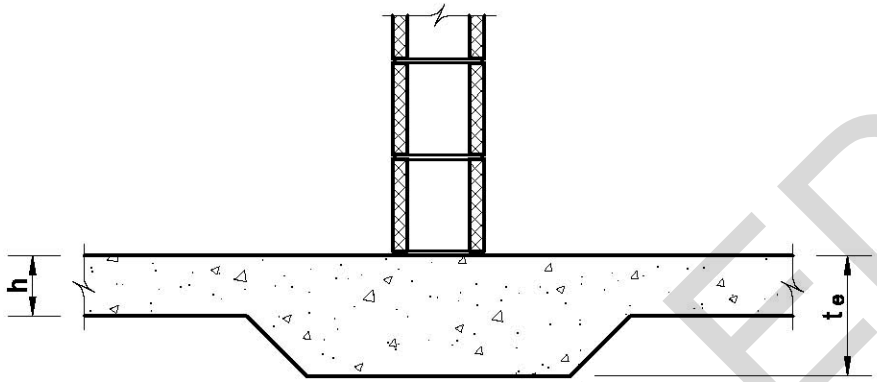
2-4.5.2.2 1907.2.2 - Slab-on-Ground Over Permafrost [Addition]

Design and construction of slabs-on-ground over permafrost shall be in accordance with UFC 3-130-01 and UFC 3-130-04.

2-4.5.2.3 1907.2.3 - Post-Tensioned Slab-on-Ground [Addition]

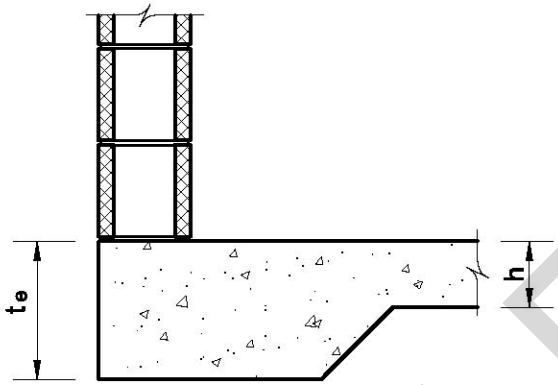
The design of post-tensioned slabs-on-ground shall be in accordance with PTI DC10.1.

Table 2-7 Maximum Allowable Wall Load at a Thickened Slab for Wall Load Near Center of Slab or Near Keyed or Doweled Joints



Thickness of Thickened Floor Slab, t_e	Slab Line Load Capacity, P			
	Flexural Strength [a] of Concrete			
	550 psi (3.9 MPa)	600 psi (4.1 MPa)	650 psi (4.5 MPa)	700 psi (4.8 MPa)
4 in (102 mm)	425 lb/ft (6.2 kN/m)	455 lb/ft (6.6 kN/m)	485 lb/ft (7.1 kN/m)	510 lb/ft (7.4 kN/m)
5 in (127 mm)	565 lb/ft (8.2 kN/m)	600 lb/ft (8.8 kN/m)	640 lb/ft (9.3 kN/m)	675 lb/ft (9.9 kN/m)
6 in (152 mm)	710 lb/ft (10.4 kN/m)	755 lb/ft (11.0 kN/m)	805 lb/ft (11.7 kN/m)	850 lb/ft (12.4 kN/m)
7 in (178 mm)	860 lb/ft (12.6 kN/m)	920 lb/ft (13.4 kN/m)	975 lb/ft (14.2 kN/m)	1030 lb/ft (15.0 kN/m)
8 in (203 mm)	1015 lb/ft (14.8 kN/m)	1080 lb/ft (15.8 kN/m)	1150 lb/ft (16.8 kN/m)	1215 lb/ft 17.7 kN/m)
9 in (229 mm)	1175 lb/ft (17.1 kN/m)	1255 lb/ft (18.3 kN/m)	1330 lb/ft (19.4 kN/m)	1410 lb/ft (20.6 kN/m)
10 in (254 mm)	1340 lb/ft (19.6 kN/m)	1430 lb/ft (20.9 kN/m)	1520 lb/ft (22.2 kN/m)	1605 lb/ft (23.4 kN/m)

Table 2-8 Maximum Allowable Wall Load at a Thickened Slab for Wall Load Near Free Edge



Thickness of Thickened Floor Slab, t_e	Slab Line Load Capacity, P			
	Flexural Strength [a] of Concrete			
	550 psi (3.9 MPa)	600 psi (4.1 MPa)	650 psi (4.5 MPa)	700 psi (4.8 MPa)
4 in (102 mm)	330 lb/ft (4.8 kN/m)	355 lb/ft (5.2 kN/m)	375 lb/ft (5.5 kN/m)	395 lb/ft (5.8 kN/m)
5 in (127 mm)	435 lb/ft (6.4 kN/m)	465 lb/ft (6.8 kN/m)	495 lb/ft (7.2 kN/m)	525 lb/ft (7.7 kN/m)
6 in (152 mm)	550 lb/ft (8.0 kN/m)	585 lb/ft (8.5 kN/m)	620 lb/ft (9.1 kN/m)	660 lb/ft (9.6 kN/m)
7 in (178 mm)	665 lb/ft (9.7 kN/m)	710 lb/ft (10.4 kN/m)	755 lb/ft (11.0 kN/m)	800 lb/ft (11.7 kN/m)
8 in (203 mm)	785 lb/ft (11.5 kN/m)	840 lb/ft (12.3 kN/m)	890 lb/ft (13.0 kN/m)	945 lb/ft (13.8 kN/m)
9 in (229 mm)	910 lb/ft (13.3 kN/m)	975 lb/ft (14.2 kN/m)	1035 lb/ft (15.1 kN/m)	1090 lb/ft (15.9 kN/m)
10 in (254 mm)	1040 lb/ft (15.2 kN/m)	1110 lb/ft (16.2 kN/m)	1180 lb/ft (17.2 kN/m)	1245 lb/ft (18.2 kN/m)

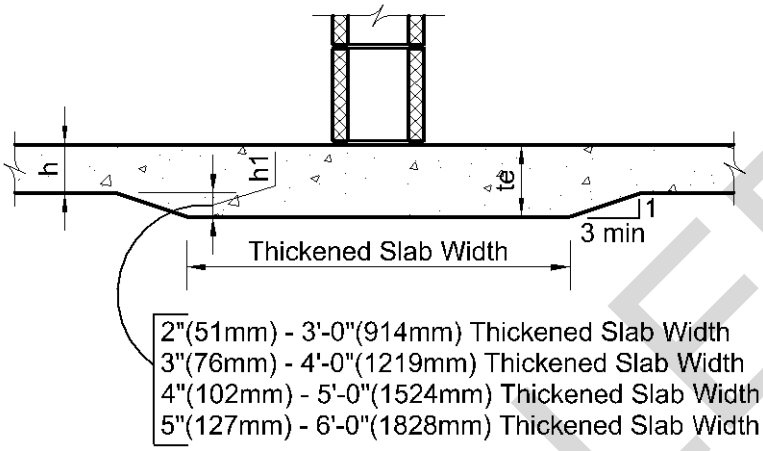
Notes for Table 2-4 and Table 2-5: The allowable wall loads are based on a modulus of subgrade reaction (k) of 100 pounds per cubic inch (27.1 MPa/m). The thickness of the thickened slab will be computed by multiplying the above thickness by a constant factor. Constants for other subgrade moduli are tabulated below.

Modulus of Subgrade Reaction (k)	25 pci (6.8 MPa/m)	50 pci (13.6 MPa/m)	100 pci (27.1 MPa/m)	200 pci (54.3 MPa/m)	300 pci (81.4 MPa/m)
Constant Factor	1.3	1.1	1.0	0.9	0.8

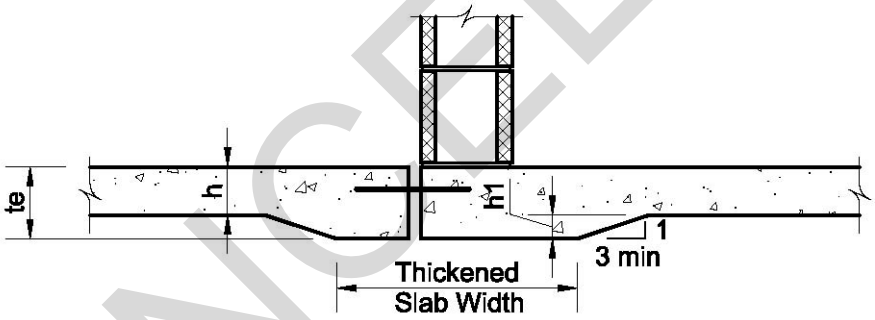
For other modulus of subgrade reaction values, the constant values may be considered equal to $\sqrt[5]{100/\mathrm{k}}\sqrt[5]{100/k}$, ($\sqrt[5]{27.1/k}$ metric).

[a] For this application, the flexural strength of concrete was assumed equal to $9\sqrt{\mathrm{f'c}}\sqrt{f'c}$, ($0.75\sqrt{f'c}$ metric) where f'_c is the specified compressive strength of concrete in pounds per square inch (MPa).

FIGURE 2-1 Widths of Thickened Slabs and Slab Edge Conditions under Wall Loads

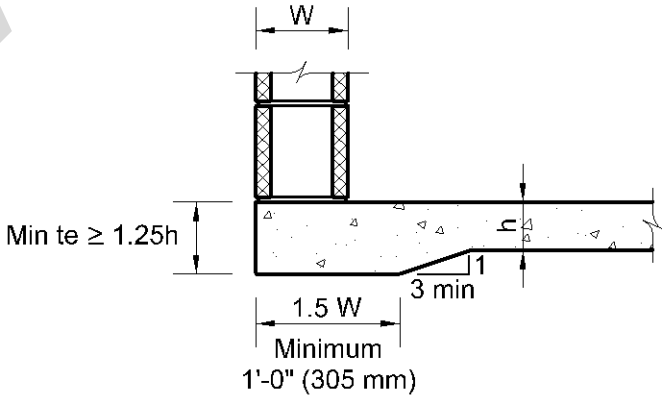


A) SLABS LOADED NEAR THE CENTER



See Figure 2-1 (A) for slab width

B) SLABS LOADED NEAR A KEYED OR DOWELED JOINT



C) SLABS LOADED NEAR A FREE EDGE

2-5 CHAPTER 21 - MASONRY

2-5.1 Section 2101 - GENERAL

2-5.1.1 2101.2.1 - Allowable Stress Design [Addition]

Masonry shall be designed as reinforced unless the element is isolated from the structure so that vertical and lateral forces are not imparted to the element.

2-5.1.2 2101.2.2 - Strength Design [Addition]

Masonry shall be designed as reinforced unless the element is isolated from the structure so that vertical and lateral forces are not imparted to the element.

2-5.1.3 2101.2.3 - Empirical Design [Addition]

Masonry shall not be designed by the empirical method.

Renumber Section 2101.2.1 to 2101.2.4.

\2\ /2/

2-5.1.4 2101.4 - Shear Wall Construction [Addition]

Shear walls shall be running bond construction only; stack bond construction is not permitted.

2-5.2 Section 2104 - CONSTRUCTION

2-5.2.1 2104.1.1 - Placing Mortar and Units [Addition]

Masonry walls below grade and elevator shaft walls shall be grouted solid.

2-5.2.2 2104.1.2 - Installation of Wall Ties [Addition]

Corrugated metal brick ties shall not be used.

2-5.2.3 2104.1.3 - Joint Reinforcement [Addition]

Horizontal wall reinforcement shall be continuous around wall corners and through wall intersections, unless the intersecting walls are separated. Reinforcement that is spliced in accordance with the applicable provisions of ACI 530 shall be considered continuous.

Renumber Sections 2104.1.1 and 2104.1.2 as 2104.1.4 and 2104.1.5, respectively.

2-5.2.4 2104.1.6 - Concrete Masonry Control Joints [Addition]

Spacing and placement of control joints shall be in accordance with NCMA TEK 10-2C or 10-3.

2-5.2.5 2104.1.7 - Vertical Brick Expansion Joints [Addition]

Spacing, placement, and size of vertical brick expansion joints shall be in accordance with BIA Technical Notes 18 and 18A.

2-5.3 Section 2109 - EMPIRICAL DESIGN OF MASONRY [Deletion]

This section shall be deleted in its entirety.

2-6 CHAPTER 22 - STEEL

2-6.1 Section 2204 - CONNECTIONS

2-6.1.1 2204.2 - Bolting [Supplement]

Add the following to the end of the paragraph: Compressible-washer-type direct tension indicators or twist-off-type tension-control bolts conforming to RCSC, *Specification for Structural Joints Using High-Strength Bolts* shall be provided at all bolted connections.

2-6.2 Section 2205 - STRUCTURAL STEEL

2-6.2.1 2205.1 - General [Supplement]

Add the following to the end of the paragraph: Structural steel floor framing systems shall be designed for vibration serviceability in accordance with AISC Design Guide 11.

2-6.2.2 2205.3 - Steel Structures in Corrosive Environments [Addition]

Steel structures or elements exposed to weather, salt spray or other corrosive environments shall be protected through coatings, galvanizing or the use of stainless alloy. Select the appropriate system or material to suit the anticipated exposure. For steel deck exposed to spray from salt, salt water, or brackish water, provide ASTM A653/A653M G90 galvanizing. For cold-formed steel members exposed to spray from salt, salt water, or brackish water, provide ASTM A653/A653M G90 galvanizing and connect with corrosion-resistant fasteners. See Section B-5.4 of UFC 3-301-01 for additional guidance.

2-6.3 Section 2210 - COLD-FORMED STEEL

2-6.3.1 2210.1.1.2 – Steel Roof Deck [Supplement]

Add the following to the end of the paragraph: Steel roof deck shall not be thinner than 22-gauge.

2-6.3.2 2210.1.1.4 - Steel Deck Diaphragms [Addition]

Design of steel deck diaphragms for in-plane and out-of-plane loads shall be in accordance with the SDI DDM03.

\2\ /2/

2-6.4 Section 2211 - COLD-FORMED STEEL LIGHT-FRAMED CONSTRUCTION

2-6.4.1 2211.6.1 - Diagonal Bracing Material [Addition]

Diagonal bracing material shall be ASTM A653/A653M steel without rerolling, which induces strain hardening and reduces the elongation of the material and is therefore not desirable for performance under seismic loading.

2-6.4.2 2211.8 - Floor Vibrations [Addition]

Cold-formed steel framing systems shall be designed for vibration serviceability in accordance with the proposed design procedure in *Floor Vibration Design Criterion for Cold-Formed C-Shaped Supported Residential Floor Systems* by Kraus. The proposed design procedure is based on residential construction, but is applicable to all applications of cold-formed floor construction.

2-6.4.3 2211.9 - Brick Veneer/Steel Stud Walls [Addition]

Design of steel stud backup for brick veneer shall follow the recommendations from BIA Technical Note 28B. In particular, the recommendations for minimum stud gage, minimum galvanization, minimum anchorage of studs to track, welding of studs, use of deflection track, allowable stud deflection, wall sheathing, and water-resistant barrier shall be followed.

2-6.4.4 2211.10 - Cold-Formed Steel Connections [Addition]

Cold-formed steel members shall be interconnected with screw fasteners or by welding. The use of pneumatic nailing is permitted only for the connection of cold-formed members to members made of other materials.

2-6.4.5 2211.11 - Galvanized Cold-Formed Framing [Addition]

Cold-formed steel members exposed to spray from salt, salt water, brackish water, or seawater shall be galvanized per ASTM A653/A653M G90 and all fasteners shall be corrosion-resistant.

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CHAPTER 3 MODIFICATIONS TO ASCE/SEI 7

3-1 CHAPTER 1 – GENERAL

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3-1.1 1.3.1 – Strength and Stiffness [Supplement]

Add to the end of Item c.: During the design concept stage of development, documentation shall be submitted to the AHJ for approval of the performance based design approach.

/2/

3-1.2 1.3.1.3 – Performance Based Procedures [Replacement]

Structural and nonstructural components and their connections shall be demonstrated by a combination of analysis and testing to provide a reliability not less than that expected for similar components designed in accordance with the Strength Procedures of Section 1.3.1.1 when subject to the influence of dead, live, environmental, and other loads. Consideration shall be given to uncertainties in loading and resistance.

3-1.3 1.3.1.3.3 – Documentation [Replacement]

The procedures used to demonstrate compliance with this section and the results of analysis and testing shall be documented in one or more reports submitted for prior approval to the AHJ and to an independent peer review.

3-2 CHAPTER 2 – COMBINATIONS OF LOADS

3-2.1 2.3.5 – Load Combinations Including Self-Straining Loads [Supplement]

Add to the end of the paragraph: The effect of load T shall be taken into consideration on a structure, its impact on serviceability and long term performance of the facility shall be evaluated. For further information, see ASCE/SEI 7 Section C2.3.5.

3-2.2 2.4.4 – Load Combinations Including Self-Straining Loads [Supplement]

Add to the end of the paragraph: The effect of load T shall be taken into consideration on a structure, its impact on serviceability and long term performance of the facility shall be evaluated. For further information, see ASCE/SEI 7 Section C2.4.4.

3-2.3 2.5.1 – Applicability [Replacement]

Where required by UFC 4-023-03, strength and stability shall be checked to ensure that structures are capable of resisting the effects of progressive collapse with the load combinations provided in UFC 4-023-03.

3-2.4 2.5.2 – Load Combinations [Deletion]

This section shall be deleted in its entirety.

3-2.5 2.5.3 – Stability Requirements [Deletion]

This section shall be deleted in its entirety.

3-3 CHAPTER 7 – SNOW LOADS

3-3.1 7.4 – Sloped Roof Snow Loads, p_s [Supplement]

Add to the end of the paragraph: Where obstructions occur on the roof from equipment such as photovoltaic panels, lightning cable systems, etc., the potential for snow buildup around the obstructions shall be considered.

3-4 CHAPTER 11 – SEISMIC DESIGN CRITERIA

\2\

3-4.1 11.1.3 – Applicability [Supplement]

Add the following at the end of the section:
Building or structures that are not routinely occupied, but whose primary purpose supports human activities, such as training towers, shall not be classified as non-building structures unless specifically approved by the AHJ.

/2/

3-4.2 11.2 – Definitions [Replacement]

Replace the definition for Moment Frame with the following:

Moment Frame: A frame in which members and joints resist lateral forces by flexure as well as along the axis of the members. Moment frames are categorized as intermediate moment frames (IMF), ordinary moment frames (OMF), and special moment frames (SMF). \2\ Every joint shall be restrained against rotation. /2/

3-5 CHAPTER 15 – SEISMIC DESIGN REQUIREMENTS FOR NONBUILDING STRUCTURES

3-5.1 15.4.5 – Drift Limitations [Replacement]

Non-building structures similar to buildings shall comply with lateral drift requirements as specified for buildings in Chapter 12, ASCE/SEI 7.

Exception: The drift limitations of Section 12.12.1 need not apply to non-building structures if a rational analysis accepTable to the AHJ indicates they can be exceeded without adversely affecting structural stability or attached or interconnected components and elements such as walkways and piping. P-delta effects shall be considered where critical to the function or stability of the structure.

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CHAPTER 4 OTHER STRUCTURES

4-1 HIGHWAY BRIDGE DESIGN

Design of highway bridges shall be in accordance with AASHTO LRFD Bridge Design Specifications. Design examples are available at http://bridges.transportation.org/Pages/DESIGNEXAMPLES.aspx and in the PCI Bridge Design Manual.

4-2 RAILROAD BRIDGE DESIGN

Design of railroad bridges shall be in accordance with the AREMA Manual for Railway Engineering.

4-3 TANKS FOR LIQUID STORAGE

Design of tanks for liquid storage shall be in accordance with NFPA 22, AWWA D100, AWWA D103, AWWA D110 and AWWA D120 as applicable.

4-4 TANKS FOR PETROLEUM STORAGE

Design of tanks for petroleum storage shall be in accordance with UFC 3-460-01.

4-5 ENVIRONMENTAL ENGINEERING CONCRETE STRUCTURES

Design of environmental engineering concrete structures shall be in accordance with ACI 350.

4-6 PRESTRESSED CONCRETE TANKS

Design of prestressed concrete tanks shall be in accordance with ACI 372R.

4-7 WATER TREATMENT FACILITIES

Design of water treatment facilities shall be in accordance with the WEF Manual of Practice 8.

4-8 TRANSMISSION TOWERS AND POLES

Design of transmission towers shall be in accordance with ASCE 10. Design of transmission poles shall be in accordance with IEEE Standards Association's National Electric Safety Code.

4-9 ANTENNA TOWERS

Design of antenna towers shall be in accordance with ANSI/TIA-222-G.

4-10 PEDESTRIAN BRIDGES

Design of pedestrian bridges shall be in accordance with the AASHTO LRFD Guide Specifications for Design of Pedestrian Bridges.

APPENDIX A REFERENCES

AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS
http://www.transportation.org/

LRFD Bridge Design Specifications, Customary U.S. Units

LRFD Guide Specifications for the Design of Pedestrian Bridges

AMERICAN CONCRETE INSTITUTE
http://www.concrete.org/general/home.asp

ACI 223R, Guide for the Use of Shrinkage-Compensating Concrete

ACI 224R, Control of Cracking in Concrete Structures

ACI 224.3R, Joints in Concrete Construction

ACI 302.1R, Guide for Concrete Floor and Slab Construction

ACI 302.2R, Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials

ACI 318-14, Building Code Requirements for Structural Concrete

ACI 350.4R, Design Considerations for Environmental Engineering Concrete Structures

ACI 350, Code Requirements for Environmental Engineering Concrete Structures

ACI 351.3R, Foundations for Dynamic Equipment

ACI 357R, Guide for the Design and Construction of Fixed Offshore Concrete Structures

ACI 360R, Guide to Design of Slabs-on-Ground

ACI 364.3R, Guide for Cementitious Repair Material Data Sheet

ACI 372R, Design and Construction of Circular Wire and Strand-Wrapped Prestressed Concrete Structures

AMERICAN INSTITUTE OF STEEL CONSTRUCTION
http://www.aisc.org/

AISC 360-10, Specification for Structural Steel Buildings

AISC Design Guide 1, Base Plate and Anchor Rod Design

AISC Design Guide 3, Serviceability Design Considerations for Steel Buildings, Second Edition

AISC Design Guide 11, Floor Vibrations Due to Human Activity

RCSC Specification for Structural Joints Using High-Strength Bolts

Shear Transfer in Exposed Column Base Plates, Ivan Gomez, Amit Kanvinde, Chris Smith and Gregory Deierlein

AMERICAN IRON AND STEEL INSTITUTE
http://www.steel.org/

Effective Lengths for Laterally Unbraced Compression Flanges of Continuous Beams Near Intermediate Supports, J. H. Garrett, Jr., G. Haaijer, and K. H. Klippstein, Proceedings, Sixth Specialty Conference on Cold-Formed Steel Structures (http://www.ccfssonline.org/)

\4\ AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS

http://www.ashrae.org

ANSI/ASHRAE/IESNA Standard 90.1, Energy Standards for Buildings Except Low Rise Residential Buildings /4/

AMERICAN SOCIETY OF SAFETY PROFESSIONALS
https://www.assp.org

ANSI/ASSP Z359, Fall Protection Code

ANSI/ASSP Z359.6, Specifications and Design Requirements for Active Fall Protection Systems

ANSI/ASSP A1264.1, Safety Requirements for Workplace Walking/Working Surfaces and Their Access; Workplace Floor, Wall and Roof Openings, Stairs and Guardrails Systems Standard

AMERICAN RAILWAY ENGINEERING AND MAINTENANCE-OF-WAY ASSOCIATION
http://www.arema.org/

Manual for Railway Engineering

AMERICAN SOCIETY OF CIVIL ENGINEERS
http://www.asce.org

ASCE/SEI 7-10 Including Supplement No. 1, Minimum Design Loads for Buildings and Other Structures

ASCE/SEI 10, Design of Latticed Steel Transmission Structures

ASCE/SEI 32, Design and Construction of Frost-Protected Shallow Foundations

ASCE/SEI 41-13, Seismic Evaluation and Retrofit of Existing Buildings

AMERICAN WATER WORKS ASSOCIATION
http://www.awwa.org/

AWWA D100, Welded Carbon Steel Tanks for Water Storage

AWWA D103, Factory-Coated Bolted Steel Tanks for Water Storage

AWWA D110, Wire- and Strand-Wound, Circular, Prestressed Concrete Water Tanks

AWWA D120, Thermosetting Fiberglass-Reinforced Plastic Tanks

ASM INTERNATIONAL (formerly American Society for Metals)
http://www.asminternational.org/

ASM Handbook Volume 13B Corrosion: Materials

ASTM INTERNATIONAL (formerly American Society for Testing and Materials)
http://www.astm.org/

ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process

ASTM C157/C157M, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete

BRICK INDUSTRY ASSOCIATION (formerly Brick Institute Of America**)**
http://www.gobrick.com/

BIA Technical Note 18, Volume Changes – Analysis and Effects of Movement

BIA Technical Note 18A, Accommodating Expansion of Brickwork

BIA Technical Note 28B, Brick Veneer/Steel Stud Walls

COLD REGIONS RESEARCH AND ENGINEERING LABORATORY
http://www.erdc.usace.army.mil/Locations/ColdRegionsResearchandEngineeringLaboratory.aspx

Database and Methodology for Conducting Site Specific Snow Load Case Studies for the United States

FEDERAL EMERGENCY MANAGEMENT AGENCY
http://www.fema.gov/

FEMA P-361, Safe Rooms for Tornadoes and Hurricanes: Guidance for Community and Residential Safe Rooms, Third Edition (2015)

FEMA P-1026 / March 2015, Seismic Design of Rigid Wall – Flexible Diaphragm Buildings: An Alternate Procedure

INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS
www.ieee.org

IEEE Standards Association, National Electric Safety Code (NESC)

INTERNATIONAL CODE COUNCIL
http://www.iccsafe.org/

International Building Code, 2015 Edition

MCGRAW-HILL
http://www.mhprofessional.com/

Metal Building System Design and Specification, Alexander Newman

METAL BUILDING MANUFACTURERS ASSOCIATION
http://www.mbma.com/

Metal Building Systems Manual, 2012 Edition

NATIONAL ACADEMY OF SCIENCES
http://www.nationalacademies.org/

Technical Report No. 65, Expansion Joints in Buildings

NATIONAL CONCRETE MASONRY ASSOCIATION
http://www.ncma.org

TEK 10-2C, Control Joints for Concrete Masonry Walls – Empirical Method

TEK 10-3, Control Joints for Concrete Masonry Walls – Alternative Engineered Method

NATIONAL FIRE PROTECTION ASSOCIATION
http://www.nfpa.org/

NFPA 22, Standard for Water Tanks for Private Fire Protection

OCCUPATIONAL SAFETY & HEALTH ADMINISTRATION
http://www.osha.gov/

29 CFR, Part 1926, Safety and Health Regulations for Construction

29 CFR, Part 1910, Occupational Safety and Health Standards for General Industry

29 CFR, Part 1910, Notices of Proposed Rulemaking

POST-TENSIONING INSTITUTE
http://www.post-tensioning.org/

PTI DC10.1, Design of Post-Tensioned Slabs-on-Ground

PRECAST/PRESTRESSED CONCRETE INSTITUTE
http://www.pci.org/

PCI MNL-133, Bridge Design Manual, 3rd Edition

STEEL DECK INSTITUTE
http://www.sdi.org/

SDI DDM03, Diaphragm Design Manual Third Edition

STRUCTURAL ENGINEERS ASSOCIATION OF CALIFORNIA
http://www.seaoc.org/

SEAOC PV1-2012, Structural Seismic Requirements and Commentary for Rooftop Solar Photovoltaic Arrays

SEAOC PV2-2012, Wind Design for Low-Profile Solar Photovoltaic Arrays on Flat Roofs

TELECOMMUNICATIONS INDUSTRY ASSOCIATION
http://www.tiaonline.org/

ANSI/TIA-222-G, Structural Standards for Antenna Supporting Structures and Antennas

THE MASONRY SOCIETY
http://www.masonrysociety.org/

Masonry Standard Joint Committee's (MSJC), TMS 402-13/ACI 530-13/ASCE 5-13, TMS 602-13/ACI 530.1-13/ASCE 6-13, Building Code Requirements and Specification for Masonry Structures

UNITED STATES DEPARTMENT OF DEFENSE, UNIFIED FACILITIES CRITERIA
http://dod.wbdg.org/

UFC 1-200-01, DoD Building Code (General Building Requirements)

UFC 3-110-03, Roofing

UFC 3-130-01, General Provisions - Arctic and Subarctic Construction

UFC 3-130-04, Foundations for Structures - Arctic and Subarctic Construction

UFC 3-130-06, Calculation Methods for Determination of Depth of Freeze and Thaw in Soil – Arctic and Subarctic Construction

\4\UFC 3-190-06, Protective Coatings and Paints/4/

UFC 3-220-01, Geotechnical Engineering

UFC 3-260-02, Pavement Design for Airfields

UFC 3-310-04, Seismic Design of Buildings

UFC 3-320-06A, Concrete Floor Slabs on Grade Subjected to Heavy Loads

UFC 3-460-01, Design: Petroleum Fuel Facilities

\4\UFC 3-570-01, Cathodic Protection/4/

UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings

UFC 4-023-03, Design of Buildings to Resist Progressive Collapse

UFGS, Unified Facilities Guide Specifications

UNITED STATES GEOLOGICAL SURVEY

USGS National Center, Earthquake Hazards Program, http://geohazards.usgs.gov/designmaps/us/

U.S. Seismic Design Maps Web Application, for the 2015 version of the International Building Code

VIRGINIA TECH
http://www.vt.edu/

Floor Vibration Design Criterion for Cold-Formed C-Shaped Supported Residential Floor systems, Master's Thesis, Cynthia A. Kraus

WATER ENVIRONMENT FEDERATION
http://www.wef.org/

WEF MOP 8, Design of Municipal Wastewater Treatment Plants

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APPENDIX B BEST PRACTICES

B-1 STRUCTURAL DESIGN.

B-1.1 Building Drift Limits

\2\ The topic of serviceability is addressed in IBC Section 1604.3 which requires: "Structural systems and members thereof shall have adequate stiffness to limit deflections and lateral drift." However, the section is obviously focused on structural members, not an entire building or structure.

ASCE 7 Section 12.12 requires interstory drift caused by code-prescribed seismic forces to be within tolerable limits. These are the only mandatory building drift limits of the IBC.

ASCE 7 Appendix C, Serviceability Considerations, which is non-mandatory, states: "Lateral deflection or drift of structures and deformation of horizontal diaphragms and bracing systems due to wind effects shall not impair the serviceability of the structure." The extensive commentary on this appendix discusses how the above objective might be accomplished, but leaves it to engineering judgment that should be exercised in consultation with the building client. /2/

. The establishment of accepTable drift limits and load combinations that must be considered in evaluating serviceability does require significant engineering judgment. Application of a requirement that is too stringent can significantly impact the cost of a structure. Requirements that are too lax can lead to damage of rigidly connected components.

The *Metal Building Systems Manual* provides guidance for allowable drift due to wind loads for pre-engineered metal buildings, and serviceability recommendations for metal buildings can also be found in Chapter L of AISC 360 with additional guidance in AISC *Steel Design Guide 3*.

When separate support columns are used for top-running cranes, they should be supported so that differential movement between the crane columns and building columns, due to differences in stiffness, does not overstress either column and result in local column buckling.

B-1.2 Impact Resistant Glazing

Buildings which are subjected to tornado winds can suffer some of the same missile impact damage to the exterior façade of the building as those located in windborne debris regions. The loss of glazing on a building due to missile impact can render the facility inoperable. The loss of glazing will also cause an increase in internal pressure in the building causing further damage. Consideration should be given to providing impact

resistant glazing on facilities in tornado prone areas similar to what is required in windborne debris regions. Tornado prone regions are the areas of the United States that have had five or more recorded EF3, EF4 or EF5 tornadoes per Figure 2-2 in FEMA P-361.

B-1.3 Hard Wall Buildings

In buildings constructed of load bearing tilt-up or precast structural walls, the loss of the roof diaphragm during a high wind event can lead to total collapse of the structure. The following are several possible methods to mitigate this hazard:

- Create enough fixity between the bottom of the panels and the foundation to provide stability to the wall panels in the event of the loss of the roof diaphragm.
- Limit the length of continuous wall panels between full height lateral cross bracing elements to better restrain the wall panels.
- Provide a system of robust continuous ties across the roof diaphragm to preserve the walls if the roof diaphragm fails.

\2\ FEMA has just issued an important publication, FEMA P-1026, on the seismic design of these buildings. /2/

B-1.4 Wind and Seismic Loads on Photovoltaic Arrays

\2\ The 2015 IBC has added Section 1510.7.1 on the wind resistance of rooftop-mounted photovoltaic panels and modules. /2/ Guidance on the design wind and seismic loads for rooftop-mounted photovoltaic arrays can be found in *Wind Design for Low-Profile Solar Photovoltaic Arrays on Flat Roofs* (SEAOC PV2-2012) and *Structural Seismic Requirements and Commentary for Rooftop Solar Photovoltaic Arrays* (SEAOC PV1-2012), prepared by the Structural Engineers Association of California Solar Photovoltaic Systems Committee. When designing support structures for photovoltaic arrays, review requirements in UFC 3-110-03 Roofing concerning roof mounted systems including the requirement that supports be permanently affixed to the structure, which means that ballasted systems are not permitted. \2\ The 2015 IBC has added Section 1607.12.5 which requires that roof structures that provide support for photovoltaic panel systems be designed in accordance with that section. This section does not disallow ballasted systems. /2/

B-1.5 Wind Loads on Buildings with Large Openings

When determining wind loads on building containing large openings such as overhead doors in warehouses, maintenance shops, etc., it is recommended that the criteria for hangars in Section 2-1.5.2 of this UFC be used.

B-2 SOILS AND FOUNDATIONS

B-2.1 Gable Bent Footings

Moment frame reactions from metal building gable bents have horizontal thrusts at column bases which can be resisted by several methods. For large thrust forces (40 to 50 kips (118 kN to 222 kN)), tie rods are usually cost-effective. The tie rods can be embedded in a thickened slab or can be part of a tie beam between column foundations. For smaller thrust forces, hairpin reinforcing bars may be used to transfer the thrust force from the column anchor bolts into the slab-on-ground reinforcement, which acts as the tie between the columns. However, each of these methods requires close attention to detailing of \1\ /1/ joints in the slab, isolation joints around a foundation pier and other possible interruptions in the continuous slab reinforcement between columns. Also, future renovation that might require trenching across the continuous slab reinforcement could result in the loss of the tension tie. A third method is to design the foundation for an overturning moment due to the thrust force at the base of the column. Each of these methods can provide the necessary resistance to the thrust force, but needs to be evaluated for each project condition. For further discussion on the design of foundations for gable bent reactions, refer to *Metal Building System Design and Specification* by Alexander Newman.

B-2.2 Footings on Expansive Soils

In the presence of expansive soils, footings must be designed to withstand expansive soil movement in order to prevent significant damage to structures. Cyclical expansive soil movement from soil water content, usually caused by a combination of inadequate drainage and seasonal wetting and drying cycles, are especially troublesome. Base the design on soil testing and recommendations by qualified geotechnical engineers. Ensure soil investigations include estimates of settlement, heave, and recommendations to mitigate effects of expansive soil movement. Ensure positive drainage away from structures that will prevent ponding close to structures. Guidance on design of foundations on expansive soils can be found in UFC 3-220-01.

B-2.3 Footings Depth Due to Frost

The depth to which frost penetrates at a site depends on the climate, the type of soil, the moisture in the soil and the surface cover (e.g., pavement kept clear of snow vs. snow covered turf). If the supporting soil is warmed by heat from a building, frost penetration is reduced considerably. The values in Tables E-2 and F-2 represent the depth of frost penetration to be expected if the ground is bare of vegetation and snow cover, the soil is non-frost susceptible (NFS), well-drained (i.e., dry) sand or gravel, and no building heat is available. Thus, these values represent the deepest (i.e., worst case) frost penetration expected in each area. Most building foundations can be at a shallower depth without suffering frost action. (However, other considerations besides frost penetration may affect foundation depth, such as erosion potential or moisture

desiccation). For interior footings, which under service conditions are not normally susceptible to frost, the potential effects of frost heave during construction should be considered. Design values for heated and unheated buildings may be obtained by reducing the values in Tables E-2 and F-2 according to Figure B-1. For buildings heated only infrequently, the curve in Figure B-1 for unheated buildings should be used. The curves in Figure B-1 were established with an appreciation for the variability of soil and the understanding that some portions of the building may abut snow-covered turf while other portions abut paved areas kept clear of snow. Foundations should be placed at or below the depths calculated above. The foundation of heated buildings may be placed at a shallower depth than calculated above if protected from frost action by insulation on the cold side, see Figure C1 of SEI/ASCE 32. For more information on the design of foundation insulation, see SEI/ASCE 32. Additional information on which more refined estimates of frost penetration can be made, based on site-specific climatic information, the type of ground cover, and soil conditions, is contained in UFC 3-130-06.

Figure B-1 Footing Depth Example: The minimum depth needed for footings of a hospital and an unheated vehicle storage building to be built in Fort Drum, New York, is calculated to protect them from frost action. The tabulated frost penetration value for Fort Drum is 94 inches (Table E-2). Using the “heated” curve in Figure B-1, footings for the hospital should be located 4 feet below the surface. Using the “unheated” curve, footings for the unheated garage should be located 5.5 feet below the surface.

B-3 CONCRETE

B-3.1 Slab-on-Ground Concrete Strength

For slabs-on-ground subject to forklift traffic, it is recommended that the minimum compressive strength for the concrete be 4,000 psi (27.6 MPa) for pneumatic tire traffic and 5,000 psi (34.5 MPa) for steel tire traffic.

\1\

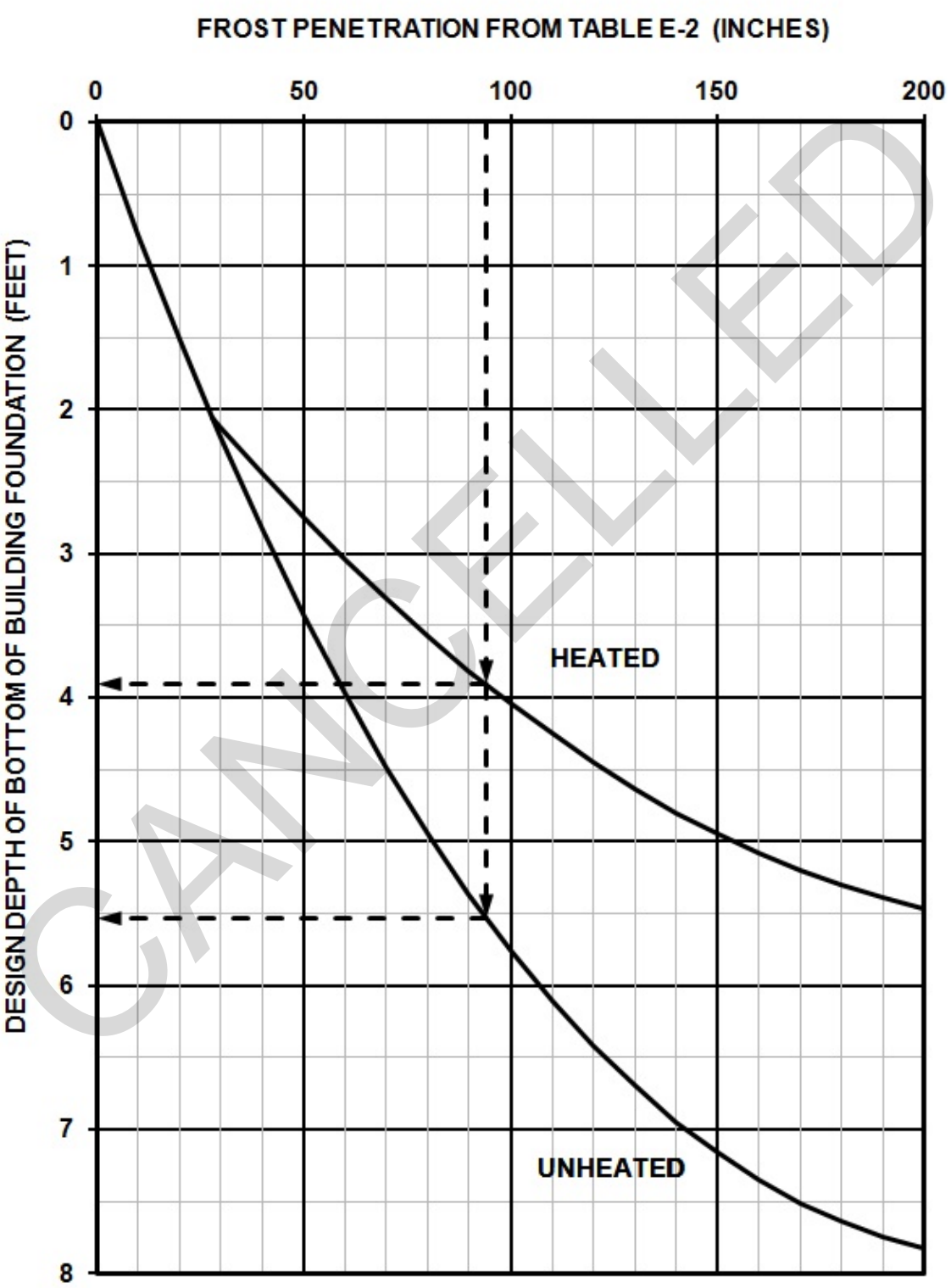
B-3.2 Slab-on-Ground Joints

/1/

For slabs-on-ground, it is recommended that the \1\ /1/ joints align across the building floor plate to avoid joints ending abruptly at the edge of a panel. Joints that end abruptly at an adjacent panel edge could cause a crack to propagate into the adjacent panel. For locations where placement of joints at a panel edge are unavoidable, refer to UFC 3-320-06A for additional reinforcement requirements to minimize crack propagation.

Location of \1\ /1/ joints in slabs-on-ground need to be coordinated with the joints in hard-surface finishes to avoid having the \1\ /1/ joints telegraph through the hard-surface finish.

Figure B-1 Design Depth of Bottom of Building Foundation



B-3.3 Slab-on-Ground Drying Shrinkage

Cracking in slabs generally results from drying shrinkage and restraint caused by friction between the slab and subgrade. Curling and warping occur due to differential shrinkage when the top of the slab dries to lower moisture content than the bottom of the slab. Recommendations for reducing the effects of drying shrinkage can be found in ACI 360R, ACI 224R, and ACI 302.1R. Shrinkage compensating concrete can also be used to reduce shrinkage cracking. See recommendations in ACI 223R.

B-3.4 Slab-on-Ground Vapor Retarder/Barrier

To facilitate proper moisture control of a slab-on-ground to meet the moisture limits of water-based adhesives and durability during construction, it is recommended that the vapor retarder have a minimum thickness of 10 mil (250 µm) with a maximum permeance rating of 0.04 perm. Where moisture is a critical issue under the floor covering, such as wood floors, and a vapor barrier required, it is recommended to reduce the maximum permeance rating to 0.01 perm. For further guidance on slabs to receive moisture-sensitive floor coverings refer to ACI 302.2R. \2\ Note that the 2015 IBC has minimum vapor barrier requirements in Section 1907. /2/

B-3.5 Post-Installed Adhesive Concrete Anchors

It is recommended that adhesive anchors be proof loaded during special inspections of critical anchors to the lesser of 50 percent of the expected peak load based on adhesive bond strength or 80 percent of the anchor yield strength with the proof load being sustained for a minimum of 10 seconds. \4\

B-3.6 Use of Aluminum and Concrete

Protect aluminum placed against concrete and cement masonry surfaces. Coat the contact surface of the aluminum with primer and two coats of bitumen or protect by gasketing or protective tape. Synthetic or rubber-base sealants may be used as protective barriers in addition to the coating where applicable.

B-3.7 Air-Entraining Agents

Air-entraining agents are used to improve workability of concrete, minimize volume changes, reduce bleeding, and minimize the porosity of the concrete. The strength of the concrete is decreased in proportion to the amount of entrainment. /4/

B-4 MASONRY

B-4.1 Masonry Veneer Base Detail

The base of the masonry veneer should be placed on a shelf angle or a foundation ledge that is lower than the base of the steel stud wall by at least 4 inches (102 mm).

The width of this shelf angle or foundation ledge will include the width of the masonry veneer and the cavity. This width should not be less than two-thirds of the veneer thickness plus the minimum air space.

B-5 STEEL

B-5.1 Shelf Angles for Masonry

Shelf angles should be hot-dip galvanized structural steel members. Angles should be provided in segments approximately 10 feet (3 m) in length, with gaps between segments. Shelf angles should be detailed to allow enough gaps for thermal expansion and contraction of the steel in angle runs and at building corners. Corners of buildings should have corner pieces with each leg no less than 4 feet (1.2 m) in length where possible.

Limit deflection of horizontal legs of shelf angles under masonry loading to 1/16 inch (1.6 mm) at the end of the horizontal leg. Rotation of the shelf angle support should be included in the horizontal leg displacement calculation.

B-5.2 Cold-Formed Continuous Beams and Joists

Guidance on determining the effective length of the unbraced compression flange for cold-formed continuous beams and joists can be found in AISI *Effective Lengths for Laterally Unbraced Compression Flanges of Continuous Beams Near Intermediate Supports*.

B-5.3 Masonry Veneer/Steel Stud Wall Detailing

Recommended details for masonry veneer/steel stud wall assemblies can be found in BIA Technical Note 28B.

B-5.4 Steel Structures in Corrosive Environments

Steel structures designed for \4\corrosion prone locations as identified in UFC 1-200-01, /4/should include consideration of the following corrosion protection measures:\4\

a. Use designs that minimize the impact of corrosion

- Avoid the use of uncoated or coated structural steel exposed to weather when access limits or prevents maintenance of the steel or coating system. /4/

- Box-shaped members should be designed so that all inside surfaces may be readily inspected, cleaned, and painted, or should be closed entirely, except when hot-dip galvanized, to prevent exposure to moisture.

- The legs of two back-to-back angle members, when not in contact, should have a minimum separation of 3/8 inch (9.5 mm) to permit air circulation.

- Pockets or depressions in horizontal members should have drain holes to prevent water from ponding in low areas. Positive drainage should be provided away from exposed steel. Column bases should be terminated on concrete curbs or piers above grade, and tops of curbs or piers should be pitched to drain. \4\

- Where structural components are adequately protected from the elements, connectors may be made up of bolts and welds. Welded connections are recommended where structural components are exposed to the elements. If bolted connections are required for location, economic, or structural reasons, keep them to the minimum.

- Design connections to preclude pockets or recesses that can trap dust, debris, and moisture. Peen and powder brush welded joints and remove all trace of weld flux (slag). Avoid intermittent welds; require that welds be continuous and designed to completely seal off all contact surfaces of the structural members.

b. Consider galvanizing under the coating system in structures where exposure to severe corrosion is anticipated. When galvanized steel cannot be used, select coating systems with a zinc rich primer. Surface preparation includes sandblasting or mechanical brushing to near white steel prior to coating application. Where possible, have structural steel shipped pre-primed, with prime coating touch up in the field. After steel construction is completed, touch up all damaged primer and finish coats with the identical paint material. UFC 3-190-06 provides general criteria on protective coatings and paints.

c. Consideration should be given to providing cathodic protection to steel members exposed in salt water or corrosive soils. Consult UFC 3-570-01 for requirements for cathodic protection systems. /4/

d. Structural members embedded in concrete and exterior railing, handrails, fences, guardrails, and anchor bolts should be galvanized or constructed of stainless steel.

e. Dissimilar metals, (e.g., aluminum and steel, stainless steel and carbon steel, zinc-coated steel and uncoated steel) should be isolated by appropriate means to avoid the creation of galvanic cells which can occur when dissimilar metals come in contact. \4\ Bituminous paints, heavy-mil plastic tape, or neoprene-type gasketing may be used as a protective coating between dissimilar metals. Where it becomes necessary that

relatively incompatible metals must be assembled in the design, employ other methods to minimize or prevent galvanic corrosion.

f. Where fasteners are exposed to the weather, specify galvanized ferrous metals, stainless steel, brass, bronze, copper, aluminum, or other corrosion resistant metals. In addition, consider the electrolytic action of dissimilar metals in the selection of various metallic items, particularly where concrete is a component. Do not use ferrous metal as finishing strips or as components of other securement systems, even if a protective coating is to be provided. /4/

g. Consult a corrosion specialist certified by NACE International to recommend material protection for elements exposed to heavy industrial pollution, chemicals, or corrosive soils.

h. For increased serviceability and compatibility with fireproofing, use galvanized steel deck in accordance with ASTM A653/A653M.

i. Note that some common grades of stainless alloy such as 304 or 316 are susceptible to corrosion when immersed in salt or brackish water. \4\ Duplex stainless steels and 316L may be suiTable for immersion in these environments. /4/

Further guidance for designing steel structures in corrosive environments can be found in ASM *Handbook Volume 13B*.

B-5.5 Steel Structures in Arctic and Antarctic Zones

For carbon steel, the transition from ductile to brittle behavior occurs within temperatures to be expected in Arctic and Antarctic zones. Ductility is important for structures in high seismic areas. Toughness, a characteristic also affected by cold temperatures, is important for structures which could be subjected to cyclic or impact loads. Design of structures which could be subjected to cyclic or impact loads in cold climates should include consideration of the following measures to mitigate potential fatigue and fracture problems:

a. Provide ample fillets to avoid stress risers.

b. Use bolted joints whenever possible. If welded joints are used, take precautions to eliminate gas and impurities in welds. Proper preheating and post-cooling are essential.

c. Use low-carbon steels and nickel-alloy steels that have good toughness characteristics at low temperatures.

B-5.6 Steel Column Base Plate Shear Transfer

Shear transfer between column base plates and the concrete foundation elements can be accomplished through several load paths including shear friction between the base plate and grout, anchor rod bearing or shear key bearing. The design provisions in AISC *Design Guide 1: Base Plate and Anchor Rod Design* should be followed when designing base plates for shear. Research and full scale testing of base plates in shear, conducted at the University of California, Berkeley, provide further guidance on recommended shear friction coefficient, anchor rod bending length, and concrete capacity design of shear key bearing. Results of the testing can be found in the research report *Shear Transfer in Exposed Column Base Plates*, published by AISC.

B-5.7 Steel Joist Connections

Connections between open web steel joists and supporting girders or joist girders and building columns are in many instances covered by typical details provided by the joist supplier, which may not provide the needed capacity for lateral or uplift loading. Each joist connection should be designed specifically for the project and take into consideration the lateral and uplift loads acting on the connection.

B-6 WOOD

B-6.1 Connections

When using prescriptive guidelines in building codes for nailed wood connections, careful consideration needs to be given to ensure a complete load path from the roof to the foundation. The use of metal plate connections for roof trusses, top plates and sill plates is an effective way to provide a more robust load path.

APPENDIX C ABBREVIATIONS

AASHTO ..... American Association of State Highway and Transportation Officials

ACI ..... American Concrete Institute

AHJ ..... Authority Having Jurisdiction

AISC ..... American Institute of Steel Construction

ANSI ..... American National Standards Institute

AOB ..... Air Operations Building

AREMA ..... American Railway Engineering and Maintenance-of-Way Association

ASCE ..... American Society of Civil Engineers

ASM ..... American Society for Metals

ASTM ..... American Society of Testing and Materials

ATCT ..... Air Traffic Control Tower

AWWA ..... American Water Works Association

BIA ..... Brick Industry Association

CRREL ..... Cold Regions Research and Engineering Laboratory

CS ..... Case Study

DoD ..... Department of Defense

\2\ DOR ..... Designer of Record /2/

\4\ ESC Environmental Severity Classification /4/

%g ..... Percent of Gravity

FEMA ..... Federal Emergency Management Agency

IBC.....International Building Code

ICC-ES.....International Code Council – Evaluation Services

IMF.....Intermediate Moment Frame

in.....Inches

kg.....Kilogram

kg/m^3.....Kilograms per Cubic Meter

km/h.....Kilometers per Hour

kN.....Kilonewton

kN/m.....Kilonewton per Meter

kN/m^2.....Kilonewton per Square Meter

kPa.....Kilopascal

lbs.....Pounds

lb/ft.....Pounds per Foot

lb/ft^2.....Pounds per Square Foot

lb/in^2.....Pounds per Square Inch

m.....Meter

m^2.....Square Meter

m/s.....Meters per Second

mil.....0.001 Inch

mm.....Millimeter

mm^2.....Square Millimeter

MCE$_R$.....Risk-Targeted Maximum Considered Earthquake

MPa.....Megapascal

MPa/m.....Megapascal per Meter

mph.....Miles per Hour

MRI.....Mean Recurrence Interval

NACE.....National Association of Corrosion Engineers

NCMA.....National Concrete Masonry Association

NFPA.....National Fire Protection Association

NFS.....Non-Frost Susceptible

OMF.....Ordinary Moment Frame

pci.....Pounds per Cubic Inch

PGA.....Maximum Considered Earthquake Geometric Mean (MCE_G) Peak Ground Acceleration as defined in ASCE 7-10

psf.....Pounds per Square Foot

psi.....Pounds per Square Inch

PSSQ.....Project Specific Seismic Qualification

RACF.....Radar Approach Control Facility

RCSC.....Research Council on Structural Connections

S_S.....Risk-Targeted Maximum Considered Earthquake (MCE_R) 0.2-Second Spectral Response Acceleration as determined by IBC Section 1613.3.1

S_1.....Risk-Targeted Maximum Considered Earthquake (MCE_R) 1.0-Second Spectral Response Acceleration as determined by IBC Section 1613.3.1

$S_{S,5/50}$.....Short-period (0.2-second) spectral response acceleration with a 5% probability of being exceeded in 50 years. For reduced “BSE-2E” hazard for existing buildings to be used with target performance objectives as defined in ASCE 41-13. In accordance with ASCE 41-13, the short period BSE-2E spectral response acceleration need not be greater than S_S modified for site class (“BSE-2N”).

$S_{1,5/50}$ ..... Long-period (1.0-second) spectral response acceleration with a 5% probability of being exceeded in 50 years. For reduced "BSE-2E" hazard for existing buildings to be used with target performance objectives as defined in ASCE 41-13. In accordance with ASCE 41-13, the 1.0-second BSE-2E spectral response acceleration need not be greater than S_1 modified for site class ("BSE-2N").

$S_{S,10/50}$..... Short-period (0.2-second) spectral response acceleration with a 10% probability of being exceeded in 50 years

$S_{1,10/50}$..... Long-period (1.0-second) spectral response acceleration with a 10% probability of being exceeded in 50 years

$S_{S,20/50}$..... Short-period (0.2-second) spectral response acceleration with a 20% probability of being exceeded in 50 years. Reduced "BSE-1E" hazard for existing buildings to be used with target performance objectives as defined in ASCE 41-13. In accordance with ASCE 41-13, the short period BSE-1E spectral response acceleration need not be greater than 2/3 of S_S modified for site class ("BSE-1N").

$S_{1,20/50}$ Long-period (1.0-second) spectral response acceleration with a 20% probability of being exceeded in 50 years. Reduced "BSE-1E" hazard for existing buildings to be used with target performance objectives as defined in ASCE 41-13. In accordance with ASCE 41-13, the 1.0-second BSE-1E spectral response acceleration need not be greater than 2/3 of S_1 modified for site class ("BSE-1N").

SEAOC..... Structural Engineers Association of California

SIOR ..... Special Inspector of Record

SMF..... Special Moment Frame

SWR..... Special Wind Region

UFC..... Unified Facilities Criteria

\2\ UFGS ..... Unified Facilities Guide Specifications /2/

µm..... micrometer (micron)

V_{ASD}..... Nominal Design Wind Speed

V_{FM} ..... Fastest Mile Wind Speed

V_{ULT}..... Ultimate Design Wind Speed

WEF ..... Water Environment Federation

APPENDIX D MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS

D-1 REFERENCES.

All section references are to the International Building Code (IBC) 2015. Table D-1 includes 2015 IBC Table 1607.1 with additional Occupancy or Use classification for military facilities that are shown in bold italics.

Table D-1 Minimum Uniformly Distributed Live Loads and Minimum Concentrated Live Loads[g]

OCCUPANCY OR USE	UNIFORM		CONCENTRATED	
	(kPa)	(psf)	(kN)	(lbs.)
1. Apartments (see residential)	---	---	---	---
2. Access floor systems				
Office use	2.4	50	8.9	2,000
Computer use	4.8	100	8.9	2,000
3. Ammunition Storage				
High explosives (one story)	***23.9***	***500***	---	---
Inert explosives (one story)	***23.9***	***500***	---	---
Pyrotechnics (one story)	***23.9***	***500***	---	---
Small arms (one story)	***23.9***	***500***	---	---
Torpedo (one story)	***16.8***	***350***	---	---
4. Armories and drill rooms	7.2[m]	150[m]	---	---
5. Assembly areas				---
Fixed seats (fastened to floor)	2.9[m]	60[m]	---	---
Follow spot, projection and control rooms	2.4	50	---	---
Lobbies	4.8[m]	100[m]	---	---
Movable seats	4.8[m]	100[m]	---	---
Stage floors	7.2[m]	150[m]	---	---
Platforms (assembly)	4.8[m]	100[m]	---	---
Other assembly areas	4.8[m]	100[m]	---	---
6. Balconies and decks[h] ***(Balconies serving as primary means of egress for multiple rooms shall be considered as corridors.)***	4.8	100	---	---
7. Battery charging room	***9.6***	***200***	***---***	***---***
8. Boiler houses	***9.6***	***200***	***---***	***---***
9. Catwalks	1.9	40	1.33	300
10. Cleaning gear / trash room compactor	***3.6***	***75***	***---***	***---***
11. Cold Storage (Food or provision freezer)				
First floor	***19.2***	***400***	***---***	***---***
Upper floors	***14.4***	***300***	***---***	***---***

OCCUPANCY OR USE	UNIFORM		CONCENTRATED	
	(kPa)	(psf)	(kN)	(lbs.)
12. Command Duty Officer Day room	***2.9***	***60***	***---***	***---***
13. Cornices	2.9	60	---	---
14. Corridors First floor Other floors	4.8 Same as occupancy served except as indicated	100 Same as occupancy served except as indicated	---	---
15. Court rooms	***3.8***	***80***	***---***	***---***
16. Dining rooms and restaurants	4.8[m]	100[m]	---	---
17. Decks – (See Item 6.)				
18. Dwellings (see residential)	---	---	---	---
19. Elevator machine room grating (on area of 50.8 mm x 50.8 mm (2 in. x 2 in.))	---	---	1.33	300
20. Finish light floor plate construction (on area of 25.4 mm x 25.4 mm (1 in. x 1 in.))	---	---	0.89	200
21. Fire escapes On single-family dwellings only	4.8 1.9	100 40	---	---
22. Galleys ***Dishwashing rooms*** ***General kitchen area*** ***Provision storage (not refrigerated)*** ***Preparation room*** ***Meat*** ***VegeTable***	 ***14.4*** ***12.0*** ***9.6*** ***12.0*** ***4.8***	 ***300*** ***250*** ***200*** ***250*** ***100***	***---***	***---***
23. Garages (passenger vehicles only) Trucks & buses	1.9[m] See Section 1607.7 - IBC	40[m] See Section 1607.7 - IBC	Note a See Section 1607.7 - IBC	Note a See Section 1607.7 - IBC
24. Generator rooms	***9.6***	***200***	***---***	***---***
25. Guard House	***3.6***	***75***	***---***	***---***
26. Handrails, guards and grab bars	See Section 1607.8 - IBC	See Section 1607.8 - IBC	See Section 1607.8 - IBC	See Section 1607.8 - IBC
27. Helipads[n]	See Section 1607.6 - IBC	See Section 1607.6 - IBC	See Section 1607.6 - IBC	See Section 1607.6 - IBC
28. Hospitals Corridors above first floor Operating rooms, laboratories Patient rooms	 3.8 2.9 1.9	 80 60 40	 4.45 4.45 4.45	 1,000 1,000 1,000
29. Hotels (see residential)	---	---	---	---
30. Incinerators; charging room	***7.2***	***150***	***---***	***---***
31. Laboratories, normal scientific equipment	***6.0***	***125***	***---***	***---***
32. Latrines / Heads / Toilets / Washroom	***3.6***	***75***	***---***	***---***

OCCUPANCY OR USE	UNIFORM		CONCENTRATED	
	(kPa)	(psf)	(kN)	(lbs.)
33. Libraries				
Reading rooms	2.9	60	4.45	1,000
Stack rooms	7.2[b,m]	150[b,m]	4.45	1,000
Corridors above first floor	3.8	80	4.45	1,000
34. Manufacturing				
Light	6.0[m]	125[m]	8.9	2,000
Heavy	12.0[m]	250[m]	13.34	3,000
35. Marquees, except one- and two-family dwellings	3.6	75	---	---
36. Mechanical equipment room (general) [p]	***4.8***	***100***	***---***	***---***
37. Mechanical room (HVAC)	***6.0***	***125***	***---***	***---***
38. Mechanical telephone and radio equipment room	***7.2***	***150***	***---***	***---***
39. Morgue	***4.8***	***100***	***---***	***---***
40. Office buildings				
File and computer rooms shall be designed for heavier loads based on anticipated occupancy	---	---	---	---
Lobbies and first floor corridors	4.8	100	8.9	2,000
Offices	2.4	50	8.9	2,000
Corridors above first floor	3.8	80	8.9	2,000
41. Penal Institutions				
Cell blocks	1.9	40	---	---
Corridors	4.8	100		
42. Post offices				
General area	***4.8***	***100***	***---***	***---***
Work rooms	***6.0***	***125***		
43. Power plants	***9.6***	***200***	***---***	***---***
44. Projection booths	***4.8***	***100***	***---***	***---***
45. Pump houses	***4.8***	***100***	***---***	***---***
46. Recreation room	***4.8***	***100***	***---***	***---***
47. Recreational uses:				
Bowling alleys, poolrooms and similar uses	3.6[m]	75[m]		
Dance halls and ballrooms	4.8[m]	100[m]		
Gymnasiums	4.8[m]	100[m]		
Reviewing stands, grandstands and bleachers	4.8[c,m]	100[c,m]	---	---
Stadiums and arenas with fixed seats (fastened to floor)	2.9[c,m]	60[c,m]		
48. Receiving rooms (radio) including roof areas supporting antennas and electronic equipment	***7.2***	***150***	***---***	***---***
49. Refrigeration storage rooms				
Dairy	***9.6***	***200***	***---***	***---***
Meat	***12.0***	***250***	***---***	***---***
VegeTable	***13.2***	***275***	***---***	***---***

OCCUPANCY OR USE	UNIFORM		CONCENTRATED	
	(kPa)	(psf)	(kN)	(lbs.)
50. Residential				
One & two family dwellings				
UninhabiTable attics without storage[i]	0.5	10	---	---
UninhabiTable attics with storage[i,j,k]	1.0	20	---	---
HabiTable attics and sleeping areas[k]	1.4	30	---	---
Canopies, including marquees	1.0	20	---	---
All other areas	1.9	40		
Hotels and multifamily dwellings				
Private rooms & corridors serving them	1.9	40	---	---
Corridors serving as primary means of egress to multiple private rooms	***3.8***	***80***	---	---
Public rooms[m] and corridors serving them	4.8	100	---	---
51. Roofs				
All roof surfaces subject to maintenance workers	---	---	1.33	300
Awnings and canopies:				
Fabric construction supported by a skeleton structure	0.23 Nonreducible	5 Nonreducible	---	---
All other construction, except one and two-family dwellings	1.0 1.0	20 20	--- ---	--- ---
Ordinary flat, pitched, and curved roofs (that are not occupiable)				
Where primary roof members are exposed to a work floor at single panel point of lower chord of roof trusses or any point along primary structural members supporting roofs:				
Over manufacturing,	---	---	8.9	2000
storage warehouses, and repair garages	---	---	1.33	300
All other primary roof members	4.8 4.8[m]	100 100[m]	--- ---	--- ---
Occupiable roofs:	Note l	Note l	Note l	Note l
Roof gardens	***1.0***	***20***		
Assembly areas				
All other similar areas				
Roof of PV shade structures				
52. Schools				
Classrooms	1.9	40	4.45	1,000
Corridors above first floor	3.8	80	4.45	1,000
First floor corridors	4.8	100	4.45	1,000

OCCUPANCY OR USE	UNIFORM		CONCENTRATED	
	(kPa)	(psf)	(kN)	(lbs.)
53. Scuttles, skylight ribs, and accessible ceilings	---	---	0.89	200
54. Shops: Manufacturing and Industrial				
Aircraft utility	***9.6***	***200***	***---***	***---***
Assembly and repair	***12.0***	***250***	***---***	***---***
Bombsight (w/o shielding)	***6.0***	***125***	***---***	***---***
Carpenter	***6.0***	***125***	***---***	***---***
Electrical	***14.4***	***300***	***---***	***---***
Engine overhaul	***14.4***	***300***	***---***	***---***
55. Sidewalks, vehicular driveways and yards, subject to trucking	12.0[d,m]	250[d,m]	35.6[e]	8,000[e]
56. Stairs and exits				
One- and two-family dwellings	1.9	40	1.3[f]	300[f]
All other	4.8	100	1.3[f]	300[f]
57. Storage warehouses (shall be designed for heavier loads if required for anticipated storage)				
General				
Light	6.0[m]	125[m]		
Heavy	11.97[m]	250[m]		
Aircraft	***9.58***	***200***	---	---
Building Materials	***11.97***	***250***		
Drugs, paint, oil	***9.58***	***200***		
Dry Provisions	***14.36***	***300***		
Groceries, wine, Liquor	***14.36***	***300***		
Light Tools	***7.2***	***150***		
Pipe & metal	***47.88***	***1000***		
Paint and oil (one story)	***23.94***	***500***		
Hardware	***14.36***	***300***		
58. Stores				
Retail				
First floor	4.8	100	4.45	1,000
Upper floors	3.6	75	4.45	1,000
Wholesale, all floors	6.0[m]	125[m]	4.45	1,000
59. Tailor shop	***3.6***	***75***	***---***	***---***
60. Telephone exchange rooms and central computer IT server spaces	***7.2***	***150***	***8.9***	***2000***
61. Vehicle barriers	See Section 1607.8.3 - IBC	See Section 1607.8.3 - IBC	See Section 1607.8.3 - IBC	See Section 1607.8.3 - IBC
62. Walkways and elevated platforms (other than exit ways)	2.9	60	---	---
Range Towers, Climbing Towers and other Multi-story Training Towers	***4.8***	***100***		
Pedestrian Bridges	***AASHTO[o]***	***AASHTO[o]***		
63. Yards and terraces, pedestrian	4.8[m]	100[m]	---	---

Notes to Table D-1, "Minimum Uniformly Distributed Live Loads, L_o, and Minimum Concentrated Live Loads"

For SI: 1 inch = 25.4 mm, 1 square inch = 645.16 mm^2, 1 square foot = 0.0929 m^2, 1 pound per square foot = 0.0479 kN/m^2 = 0.0479 kPa, 1 pound = 0.004448 kN, 1 pound per cubic foot = 16 kg/m^3.

a. Floors in garages or portions of building used for the storage of motor vehicles shall be designed for the uniformly distributed live loads of this Table or the following concentrated loads: (1) for garages restricted to passenger vehicles accommodating not more than nine passengers, 3,000 pounds (13.34 kN) acting on an area of 4.5 inches x 4.5 inches (114 mm x 114 mm); (2) for mechanical parking structures without slab or deck which are used for storing passenger vehicles only, 2,250 pounds (10.0 kN) per wheel.

b. The loading applies to stack room floors that support non-mobile, double-faced library book stacks, subject to the following limitations:
   1) The nominal book stack unit height shall not exceed 90 inches (2,290mm).
   2) The nominal shelf depth shall not exceed 12 inches (305mm) for each face; and
   3) Parallel rows of double-faced book stacks shall be separated by aisles not less than 36 inches (915 mm) wide.

c. Design in accordance with the ICC 300.

d. Other uniform loads in accordance with an approved method containing provisions for truck loadings shall also be considered where appropriate.

e. The concentrated wheel load shall be applied on an area of 4.5 inches by 4.5 inches (114mm x 114mm).

f. The minimum concentrated load on stair treads shall be applied on an area of 2 inches by 2 inches (51mm x 51mm). This load need not be assumed to act concurrently with the uniform load.

g. Where snow loads occur that are in excess of the design conditions, the structure shall be designed to support the loads due to the increased loads caused by drift buildup or a greater snow design determined by the \2\ AHJ /2/. (See IBC Section 1608).

h. See IBC Section 1604.8.3 for decks attached to exterior walls.

i. UninhabiTable attics without storage are those where the maximum clear height between the joist and rafter is less than 42 inches (1067 mm), or where there are not two or more adjacent trusses with the same web configuration capable of accommodating an assumed rectangle 42 inches (1067 mm) high by 24 inches (610 mm) in width, or greater, within the plane of the truss. This live load need not be assumed to act concurrently with any other live load requirements.

j. UninhabiTable attics with storage are those where the maximum clear height between the joist and rafter is 42 inches (1067 mm) or greater, or where there are

two or more adjacent trusses with the same web configuration capable of accommodating an assumed rectangle 42 inches (1067 mm) high by 24 inches (610 mm) in width, or greater, within the plane of the trusses.
The live load need only be applied to those portions of the joists or truss bottom chords where both of the following conditions are met:

1) The attic area is accessible from an opening not less than 20 inches (508 mm) in width by 30 inches (762 mm) in length that is located where the clear height in the attic is a minimum of 30 inches (762 mm); and
2) The slopes of the joists or truss bottom chords are no greater than two units vertical in 12 units horizontal.

The remaining portions of the joist or truss bottom chords shall be designed for a uniformly distributed concurrent live load of not less than 10 psf (0.5 kPa).

k. Attic spaces served by stairways other than the pull-down type shall be designed to support the minimum live load specified for habiTable attics and sleeping rooms.

l. Areas of occupiable roofs, other than roof gardens and assembly areas, shall be designed for appropriate loads as approved by the \2\ AHJ /2/. Unoccupied landscaped areas of roof shall be designed in accordance with IBC Section 1607.12.3.

m. Live load reduction is not permitted unless specific exceptions of IBC Section 1607.10 apply.

n. Helipads supporting military aircraft shall be designed to support the actual aircraft weight and impact loading due to landing.

o. For live loads on pedestrian bridges see AASHTO LRFD *Guide Specifications for the Design of Pedestrian Bridges.*

p. All attics with mechanical units shall be designed for a mechanical equipment room loading.

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APPENDIX E SITE-SPECIFIC STRUCTURAL LOADING DATA – UNITED STATES, ITS TERRITORIES AND POSSESSIONS

E-1 WIND LOADING DATA TABLE.

Site-specific structural wind loading data for DoD locations within the United States, its territories and possessions is provided in Table E-1.

E-2 SNOW LOADING AND FROST PENETRATION DATA TABLE.

Site-specific structural snow loading and frost penetration data for DoD locations within the United States, its territories and possessions is provided in Table E-2.

E-3 EARTHQUAKE LOADING DATA TABLE.

Site-specific earthquake loading data for DoD locations within the United States, its territories and possessions is provided in Table E-3.

TABLE E-1 Wind Loading Data – United States, Its Territories and Possessions

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
Alabama	Anniston Army Depot	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Birmingham	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort McClellan	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Rucker	**112**	**120**	**128**	**156**	**180**	**193**	**206**	**250**
	Maxwell-Gunther AFB / Montgomery	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Mobile	**142**	**155**	**165**	**201**	**229**	**249**	**266**	**323**
	Redstone Arsenal / Huntsville	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Alaska	Clear AS	**105**	**110**	**115**	**140**	**169**	**177**	**185**	**225**
	Eielson AFB	**105**	**110**	**115**	**140**	**169**	**177**	**185**	**225**
\1\ **Note 2 /**1/	Elmendorf AFB	**120**	**132**	**135**	**164**	**193**	**212**	**217**	**264**
	Fort Greely	**105**	**110**	**115**	**140**	**169**	**177**	**185**	**225**
\1\ **Note 2** /1/	Fort Richardson	**135**	**145**	**150**	**182**	**217**	**233**	**241**	**294**
	Fort Wainwright	**105**	**110**	**115**	**140**	**169**	**177**	**185**	**225**
	Galena AFB	**114**	**122**	**129**	**157**	**183**	**196**	**208**	**252**
Alaska	Juneau	**121**	**133**	**138**	**168**	**195**	**214**	**222**	**270**

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
	Ketchikan	**126**	**138**	**144**	**175**	**203**	**222**	**232**	**282**
	Kodiak	**150**	**160**	**165**	**201**	**241**	**257**	**266**	**323**
	Sitka	**139**	**148**	**150**	**182**	**224**	**238**	**241**	**294**
	Valdez	**128**	**138**	**146**	**178**	**206**	**222**	**235**	**286**
Arizona	Davis-Monthan AFB / Tucson AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Huachuca	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Luke Air Force Base	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Phoenix	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	MCAS Yuma	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Yuma Proving Ground	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Arkansas	Little Rock AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Pine Bluff Arsenal	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
California	Alameda	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	MCLB Barstow	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Beale AFB	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	MCMWTC Bridgeport	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	MCB Camp Pendleton	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	NWS China Lake	**118 SWR**	**126 SWR**	**135 SWR**	**164 SWR**	**190 SWR**	**203 SWR**	**218 SWR**	**265 SWR**
	NSWC Corona	**100 SWR**	**110 SWR**	**115 SWR**	**140 SWR**	**161 SWR**	**177 SWR**	**185 SWR**	**225 SWR**
	NRTF Dixon	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Edwards AFB	**100 SWR**	**110 SWR**	**115 SWR**	**140 SWR**	**161 SWR**	**177 SWR**	**185 SWR**	**225 SWR**
	El Centro NAF	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Fort Hunter Ligget	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Fort Irwin	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Fresno ANG	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
California	NAS Lemoore	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Los Angeles AFB / El Segundo	**100 SWR**	**110 SWR**	**115 SWR**	**140 SWR**	**161 SWR**	**177 SWR**	**185 SWR**	**225 SWR**
	Los Angeles	**100 SWR**	**110 SWR**	**115 SWR**	**140 SWR**	**161 SWR**	**177 SWR**	**185 SWR**	**225 SWR**
	March ARB	**100 SWR**	**110 SWR**	**115 SWR**	**140 SWR**	**161 SWR**	**177 SWR**	**185 SWR**	**225 SWR**
	McClellan AFB / Sacramento	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	NWC Mohave Range	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Presidio of Monterey	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Point Mugu / Port Hueneme	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	San Diego Region NAS North Island NAB Coronado MCRD MCAS Miramar Naval Medical Ctr San Diego NS Point Loma	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Moffett Field - Onizuka / Sunnyvale	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	San Clemente Island Naval Reservation	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	San Nicolas Island	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Seal Beach NWS	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
California	Seal Beach NWS – Concord Detachment	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Sierra Army Depot / Herlong	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Stockton / San Joaquin	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Travis AFB	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	MCB Twentynine Palms	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Vandenberg AFB	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
Colorado	Buckley AFB / Aurora	**105 SWR**	**115 SWR**	**120 SWR**	**146 SWR**	**169 SWR**	**185 SWR**	**193 SWR**	**235 SWR**
	Denver	**105 SWR**	**115 SWR**	**120 SWR**	**146 SWR**	**169 SWR**	**185 SWR**	**193 SWR**	**235 SWR**
	Fort Carson	**105 SWR**	**115 SWR**	**120 SWR**	**146 SWR**	**169 SWR**	**185 SWR**	**193 SWR**	**235 SWR**
	Cheyenne Mountain AS / NORAD	**105 SWR**	**115 SWR**	**120 SWR**	**146 SWR**	**169 SWR**	**185 SWR**	**193 SWR**	**235 SWR**
	Peterson AFB / Colorado Springs	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Schriever AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	USAF Academy	**105 SWR**	**115 SWR**	**120 SWR**	**146 SWR**	**169 SWR**	**185 SWR**	**193 SWR**	**235 SWR**
Connecticut	NSB New London / Groton	**124**	**135**	**145**	**176**	**200**	**217**	**233**	**284**
Delaware	Dover AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
District of Columbia	**Washington Region** Bolling AFB Anacostia NS Fort McNair Marine Barracks NRL Washington NDW / Anacostia Pentagon Walter Reed	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Florida	Avon Park AS	**129**	**139**	**148**	**180**	**208**	**224**	**238**	**290**
	Cape Canaveral AFS	**134**	**146**	**156**	**190**	**216**	**235**	**251**	**305**
	Eglin AFB	**131**	**141**	**152**	**185**	**211**	**227**	**245**	**297**
	Homestead	**158**	**170**	**181**	**220**	**254**	**274**	**291**	**354**
	Hurlburt Field	**134**	**145**	**156**	**190**	**216**	**233**	**251**	**305**
	NAS Jacksonville / MCSF Blount Island / Jacksonville	**116**	**126**	**136**	**165**	**187**	**203**	**219**	**266**
	NAS Key West	**170**	**180**	**200**	**243**	**274**	**290**	**322**	**391**
	MacDill AFB	**133**	**143**	**151**	**184**	**214**	**230**	**243**	**296**
	NAS Mayport	**119**	**129**	**140**	**170**	**192**	**208**	**225**	**274**
	HQ Southcom / Miami	**155**	**167**	**178**	**216**	**249**	**269**	**286**	**348**
	Orlando	**127**	**137**	**146**	**178**	**204**	**220**	**235**	**286**
	NAS Panama City	**125**	**135**	**145**	**176**	**201**	**217**	**233**	**284**
	Patrick AFB	**138**	**150**	**160**	**195**	**222**	**241**	**257**	**313**
	NAS Pensacola	**142**	**153**	**165**	**201**	**229**	**246**	**266**	**323**
	Tampa	**131**	**140**	**150**	**182**	**211**	**225**	**241**	**294**
	Tyndall AFB	**122**	**133**	**144**	**175**	**196**	**214**	**232**	**282**
	NAS Whiting Field / Milton	**134**	**146**	**156**	**190**	**216**	**235**	**251**	**305**
Georgia	MCLB Albany	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Georgia	Athens NCSC	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
	Dobbins AFB / Atlanta NAS	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Benning	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Gordon	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort McPherson / Fort Gillem	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Stewart	**115**	**126**	**137**	**167**	**185**	**203**	**220**	**268**
	Hunter Army Airfield / Savannah	**121**	**134**	**147**	**179**	**195**	**216**	**237**	**288**
	NSB Kings Bay	**115**	**124**	**136**	**165**	**185**	**200**	**219**	**266**
	Moody AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Robins AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Hawaii	PMRF Barking Sands, Kauai	**115 SWR**	**130 SWR**	**145 SWR**	**176 SWR**	**185 SWR**	**209 SWR**	**233 SWR**	**283 SWR**
	MCBH Kaneohe Bay	**115 SWR**	**130 SWR**	**145 SWR**	**176 SWR**	**185 SWR**	**209 SWR**	**233 SWR**	**283 SWR**
	Pohakuloa Training Area	**115 SWR**	**130 SWR**	**145 SWR**	**176 SWR**	**185 SWR**	**209 SWR**	**233 SWR**	**283 SWR**
	Pearl Harbor Region: Camp H.M. Smith Fort Shafter Hickam AFB Pearl Harbor Tripler AMC	**115 SWR**	**130 SWR**	**145 SWR**	**176 SWR**	**185 SWR**	**209 SWR**	**233 SWR**	**283 SWR**
	Wahiawa Region: **Lualualei** Wahiawa Naval Reservation Wheeler AFB Schofield Barracks	**115 SWR**	**130 SWR**	**145 SWR**	**176 SWR**	**185 SWR**	**209 SWR**	**233 SWR**	**283 SWR**
Idaho	ARD Bayview	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Idaho	Boise ANG	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
	Mountain Home AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Illinois	Fort Sheridan / Chicago	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Great Lakes	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Rock Island Arsenal	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Scott AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Springfield	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Indiana	Crane NWSC	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Grissom ARB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Benjamin Harrison / Indianapolis	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Iowa	Des Moines	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Kansas	Fort Leavenworth	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Riley	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	McConnell AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Kentucky	Fort Campbell	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Knox	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Louisville	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Richmond	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Louisiana	Barksdale AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Polk / Leesville	**105**	**115**	**122**	**148**	**169**	**185**	**196**	**239**
	NAS JRB New Orleans / Belle Chasse	**137**	**148**	**158**	**192**	**220**	**238**	**254**	**309**
Maine	NAS Brunswick	**105**	**116**	**124**	**151**	**169**	**187**	**200**	**243**
	NRTF Cutler	**105**	**115**	**121**	**147**	**169**	**185**	**195**	**237**
	PNSY Kittery	**111**	**121**	**132**	**161**	**179**	**195**	**212**	**258**
	Winter Harbor NSGA	**106**	**116**	**125**	**152**	**171**	**187**	**201**	**245**
Maryland	Aberdeen Proving Ground	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
	Adelphi	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Andrews AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Carderock NSWC / Bethesda	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Bloods Island	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Edgewood Arsenal	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Detrick / Fredrick	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Fort Meade	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Indian Head NSWC	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Martin State ANG	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	NS Pax River , Webster Field / St. Inigoes	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	U.S. Naval Academy / Annapolis	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Massachusetts	Fort Devens / Ayer	**111**	**122**	**132**	**161**	**179**	**196**	**212**	**258**
	Hanscom AFB	**115**	**125**	**136**	**165**	**185**	**201**	**219**	**266**
	Natick	**117**	**127**	**138**	**168**	**188**	**204**	**222**	**270**
	Otis AGB / Falmouth	**131**	**140**	**151**	**184**	**211**	**225**	**243**	**296**
	Westover ARB	**108**	**119**	**128**	**156**	**174**	**192**	**206**	**250**
Michigan	Battle Creek	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Detroit Arsenal / Warren	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Selfridge ANG Base	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Minnesota	Minneapolis – St Paul	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Mississippi	Stennis / Bay St. Louis	**144**	**158**	**171**	**208**	**232**	**254**	**275**	**335**

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
	Columbus AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Gulfport	**147**	**160**	**174**	**212**	**237**	**257**	**280**	**341**
	Jackson	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Keesler AFB	**148**	**160**	**176**	**214**	**238**	**257**	**283**	**344**
	NAS Meridian	**106**	**116**	**122**	**148**	**171**	**187**	**196**	**239**
	Pascagoula NS	**149**	**160**	**177**	**215**	**240**	**257**	**285**	**346**
	Vicksburg	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Missouri	Fort Leonard Wood	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Kansas City	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Overland	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	St. Louis	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Whiteman AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Montana	Great Falls ANG	**105 SWR**	**115 SWR**	**120 SWR**	**146 SWR**	**169 SWR**	**185 SWR**	**193 SWR**	**235 SWR**
	Malmstrom AFB	**105 SWR**	**115 SWR**	**120 SWR**	**146 SWR**	**169 SWR**	**185 SWR**	**193 SWR**	**235 SWR**
Nebraska	Offutt AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Lincoln	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Nevada	NAS Fallon	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Indian Springs AFS	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Nellis AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Nellis AF Range	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
New Jersey	NWS Earle / Colts Neck	**107**	**117**	**126**	**153**	**172**	**188**	**203**	**247**
	Fort Dix / Trenton	**105**	**115**	**122**	**148**	**169**	**185**	**196**	**239**
	Fort Monmouth	**109**	**119**	**128**	**156**	**175**	**192**	**206**	**250**
	Lakehurst	**108**	**118**	**127**	**154**	**174**	**190**	**204**	**249**
	McGuire AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
New Jersey	Picatinny Arsenal	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
New Mexico	Albuquerque	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**

Table E-1

State	Base / City	Wind Speed (mph) Risk Category I	II	III-IV	V	Wind Speed (km/h) Risk Category I	II	III-IV	V
	Cannon AFB	105	115	120	146	169	185	193	235
	Holloman AFB	105	115	120	146	169	185	193	235
	Kirtland AFB	105	115	120	146	169	185	193	235
	White Sands	105	115	120	146	169	185	193	235
New York	Buffalo	105	115	120	146	169	185	193	235
	Fort Drum	105	115	120	146	169	185	193	235
	Fort Hamilton / Brooklyn	106	116	123	150	171	187	198	241
	Griffis AFB / Rome	105	115	120	146	169	185	193	235
	NIAGARA FALLS IAP	105	115	120	146	169	185	193	235
	NSU Saratoga Springs	105	115	120	146	169	185	193	235
	Stewart ANG / Newburgh	105	115	120	146	169	185	193	235
	Syracuse	105	115	120	146	169	185	193	235
	West Point	105 SWR	115 SWR	120 SWR	146 SWR	169 SWR	185 SWR	193 SWR	235 SWR
	Watervliet Arsenal / Albany	105	115	120	146	169	185	193	235
North Carolina	MCAS Cherry Point	128	138	147	179	206	222	237	288
	Fort Bragg	109	119	128	156	175	192	206	250
	Harvey Point	114	122	131	159	183	196	211	256
	Jacksonville Region MCB Camp Lejeune MCAS New River	130	140	148	180	209	225	238	290
	Pope AFB	109	119	127	154	175	192	204	249
	Raleigh	105	115	120	146	169	185	193	235
North Carolina	Seymour Johnson AFB	113	122	131	159	182	196	211	256
North Dakota	Grand Forks AFB	105	115	120	146	169	185	193	235

Table E-1

State	Base / City	Wind Speed (mph) Risk Category I	II	III-IV	V	Wind Speed (km/h) Risk Category I	II	III-IV	V
	NRTF La Moure	105	115	120	146	169	185	193	235
	Minot AFB	105	115	120	146	169	185	193	235
Ohio	Cleveland	105	115	120	146	169	185	193	235
	DSC Whitehall / Columbus	105	115	120	146	169	185	193	235
	Wright-Patterson AFB	105	115	120	146	169	185	193	235
	Youngstown ARS / Vienna	105	115	120	146	169	185	193	235
Oklahoma	Altus AFB	105	115	120	146	169	185	193	235
	Fort Sill	105	115	120	146	169	185	193	235
	McAlester Army Ammunition Plant	105	115	120	146	169	185	193	235
	Tinker AFB / Oklahoma City	105	115	120	146	169	185	193	235
	Tulsa	105	115	120	146	169	185	193	235
	Vance AFB	105	115	120	146	169	185	193	235
Oregon	Portland	100 SWR	110 SWR	115 SWR	140 SWR	161 SWR	177 SWR	185 SWR	225 SWR
Pennsylvania	ARS Coraopolis / Pittsburg	105	115	120	146	169	185	193	235
	Carlisle Barracks	105	115	120	146	169	185	193	235
	Fort Indiantown Gap / Annville	105	115	120	146	169	185	193	235
	Letterkenny / Chambersburg	105	115	120	146	169	185	193	235
	Mechanicsburg	105	115	120	146	169	185	193	235
	Philadelphia	105	115	120	146	169	185	193	235
	New Cumberland / Defense Depot Susquehanna	105	115	120	146	169	185	193	235
Pennsylvania	Tobyhanna Army Depot	105	115	120	146	169	185	193	235
	Willow Grove ARS / NAS	105	115	120	146	169	185	193	235

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
Rhode Island	NS Newport	**129**	**140**	**150**	**182**	**208**	**225**	**241**	**294**
South Carolina	MCAS Beaufort	**125**	**139**	**152**	**185**	**201**	**224**	**245**	**297**
	Charleston Region: Charleston AFB NWS Charleston	**130**	**144**	**154**	**187**	**209**	**232**	**248**	**301**
	Columbia Region: McEntire Fort Jackson Shaw AFB	**110**	**120**	**131**	**159**	**177**	**193**	**211**	**256**
	MCRD Parris Island	**126**	**140**	**152**	**185**	**203**	**225**	**245**	**297**
South Dakota	Ellsworth AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Tennessee	Arnold AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	NSWC LCC / Memphis	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	NSA Mid-South / Millington	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Nashville	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Texas	NAS JRB, Carswell / Fort Worth	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	NAS Corpus Christi	**137**	**149**	**158**	**192**	**220**	**240**	**254**	**309**
	Dallas / Irving	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Dyess AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Ellington ANG / Houston	**132**	**141**	**150**	**182**	**212**	**227**	**241**	**294**
	Fort Bliss / El Paso	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Texas	Fort Hood / Killeen	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Goodfellow AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**

Table E-1

State	Base / City	Wind Speed (mph) Risk Category I	II	III-IV	V	Wind Speed (km/h) Risk Category I	II	III-IV	V
	NS Ingleside	136	146	155	188	219	235	249	303
	NAS Kingsville	129	137	146	178	208	220	235	286
	Laughlin AFB	105	115	120	146	169	185	193	235
	Red River Army Depot / Texarkana	105	115	120	146	169	185	193	235
	San Antonio Region Brooks AFB Fort Sam Houston Kelly AFB Lackland AFB Randolph AFB	105	115	120	146	169	185	193	235
	Sheppard AFB	105	115	120	146	169	185	193	235
Utah	Dugway Proving Ground	105	115	120	146	169	185	193	235
	Hill AFB	105	115	120	146	169	185	193	235
	Salt Lake City	105	115	120	146	169	185	193	235
	Tooele Army Depot	105	115	120	146	169	185	193	235
Virginia	Dahlgren	105	115	120	146	169	185	193	235
	Dam Neck / Virginia Beach Ocean front	114	123	133	162	183	198	214	260
	Fort A. P. Hill	105	115	120	146	169	185	193	235
	Fort Belvoir	105	115	120	146	169	185	193	235
	Fort Eustis	105	115	120	146	169	185	193	235
	Fort Lee	105	115	120	146	169	185	193	235
	Fort Monroe	107	116	123	150	172	187	198	241
	Fort Myer	105	115	120	146	169	185	193	235
	Fort Story	113	121	131	159	182	195	211	256
Virginia	Henderson Hall / Arlington	105	115	120	146	169	185	193	235

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
	Langley AFB / Hampton	**106**	**115**	**121**	**147**	**171**	**185**	**195**	**237**
	NAB Little Creek	**110**	**118**	**127**	**154**	**177**	**190**	**204**	**249**
	Norfolk Region: Camp Elmore Craney Island Depot Norfolk Naval Base	**108**	**117**	**124**	**151**	**174**	**188**	**200**	**243**
	Norfolk Shipyard – Naval Hospital / Portsmouth	**108**	**117**	**125**	**152**	**174**	**188**	**201**	**245**
	NSA Northwest / Chesapeake	**109**	**118**	**127**	**154**	**175**	**190**	**204**	**249**
	NAS Oceana / Virginia Beach	**113**	**121**	**131**	**159**	**182**	**195**	**211**	**256**
	MCB Quantico	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Radford AAP	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Defense Supply Ctr / Richmond	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Wallops Island	**116**	**125**	**134**	**163**	**187**	**201**	**216**	**262**
	Yorktown Region: Camp Perry Cheatham Annex Yorktown NWS	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Washington	NS Everett	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Fairchild AFB	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Fort Lewis / Tacoma	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Indian Island SWC	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	NRS Jim Creek	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
Washington	Keyport / Bangor Engin. Sta Annex	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	McChord AFB	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**

Table E-1

		Wind Speed (mph)				Wind Speed (km/h)			
		Risk Category				Risk Category			
State	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
	Puget Sound Region: Bangor NSB Bremerton NS Puget Sound NSY	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	NAS Whidbey Island / Oak Harbor	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Seattle	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
West Virginia	Allegheny Ballistics Lab	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Beckley	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Huntington	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Sugar Grove NRS	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Wisconsin	Fort McCoy	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	General Mitchell AFRC / Milwaukee	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
	Madison	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
Wyoming	F. E. Warren AFB	**105**	**115**	**120**	**146**	**169**	**185**	**193**	**235**
American Samoa	Pago Pago / Tutuila Island	**150**	**160**	**170**	**207**	**241**	**257**	**274**	**333**
Mariana Islands	Guam	**180**	**195**	**210**	**255**	**290**	**314**	**338**	**411**
	Saipan / Tinian	**177**	**190**	**203**	**247**	**285**	**306**	**327**	**397**
Puerto Rico	NRTF Aguada	**140**	**151**	**160**	**195**	**225**	**243**	**257**	**313**
	Fort Buchanan	**150**	**159**	**168**	**204**	**241**	**256**	**270**	**329**
	Ramey AFB	**140**	**150**	**161**	**196**	**225**	**241**	**259**	**315**
	NS Roosevelt Roads	**156**	**169**	**178**	**216**	**251**	**272**	**286**	**348**
Puerto Rico	Sebana Seca NRS	**149**	**158**	**166**	**202**	**240**	**254**	**267**	**325**

Notes to TABLE E-1, "WIND LOADING DATA – UNITED STATES, ITS TERRITORIES AND POSSESSIONS"

SWR - Special wind regions where unusual geographic conditions require consideration for potential unusual wind conditions. The wind speeds shown are minimum values. The potential for higher wind speeds due to unusual geographic conditions should also be considered.

1) Wind speeds for NWS China Lake have been increased based on local information.

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2) Wind speeds for Elmendorf AFB and Fort Richardson, Alaska are based on Municipality of Anchorage maps entitled**,** “Three Second Gust Wind Zones”.

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Table E-2 Snow Loading And Frost Penetration Data – United States, Its Territories and Possessions

Table E-2		Ground Snow	Frost Penetration (b)	Ground Snow	Frost Penetration (b)
State	**Base / City**	**(psf)**	**(in)**	**(kPa)**	**(mm)**
Alabama	Anniston Army Depot	**5**	**6**	**0.24**	**152**
	Birmingham	**5**	**6**	**0.24**	**152**
	Fort McClellan	**5**	**6**	**0.24**	**152**
	Fort Rucker	**0**	**0**	**0**	**0**
	Maxwell-Gunther AFB / Montgomery	**5**	**4**	**0.24**	**102**
	Mobile	**0**	**0**	**0**	**0**
	Redstone Arsenal / Huntsville	**10**	**9**	**0.48**	**229**
Alaska	Clear AS	**60**		**2.87**	
	Eielson AFB	**70**	**permafrost**	**2.87**	**permafrost**
	Elmendorf AFB	**50**	**129**	**2.4**	**3277**
	Fort Greely	**60**	**Permafrost**	**2.87**	**permafrost**
	Fort Richardson	**50**	**129**	**2.4**	**3277**
	Fort Wainwright	**60**	**permafrost**	**2.87**	**permafrost**
	Galena AFB	**60**		**2.87**	
	Juneau	**60**	**86**	**2.87**	**2184**
	Ketchikan			**0**	
	Kodiak	**30**	**86**	**1.44**	**2184**
	Sitka	**50**	**56**	**2.4**	**1422**
	Valdez	**170**	**136**	**7.66**	**3454**
Arizona	Davis-Monthan AFB / Tucson AFB	**5**	**0**	**0**	**0**
	Fort Huachuca	**10**	**0**	**0.48**	**0**
	Luke Air Force Base	**0**	**5**	**0**	**127**
	Phoenix	**0**	**0**	**0**	**0**
	MCAS Yuma	**0**	**0**	**0**	**0**
	Yuma Proving Ground	**0**	**0**	**0**	**0**
Arkansas	Little Rock AFB	**10**	**14**	**0.48**	**356**

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
Arkansas	Pine Bluff Arsenal	**10**	**9**	**0.48**	**229**
California	Alameda	**0**		**0**	
	MCLB Barstow	**5**	**18**	**0**	**457**
	Beale AFB	**0**		**0**	
	MCMWTC Bridgeport	**150**	**36**	**7.19**	**914**
	MCB Camp Pendleton	**0**	**4**	**0**	**102**
	NWS China Lake	**5**	**22**	**0**	**559**
	NSWC Corona	**0**	**0**	**0**	**0**
	NRTF Dixon	**0**	**0**	**0**	**0**
	Edwards AFB	**5**	**22**	**0**	**559**
	El Centro NAF	**0**	**0**	**0**	**0**
	Fort Hunter Ligget	**0**	**0**	**0**	**0**
	Fort Irwin	**0**	**22**	**0**	**559**
	Fresno ANG	**0**	**0**	**0**	**0**
	NAS Lemoore	**0**	**0**	**0**	**0**
	Los Angeles AFB / El Segundo	**0**	**0**	**0**	**0**
	Los Angeles	**0**	**0**	**0**	**0**
	March ARB	**0**	**0**	**0**	**0**
	McClellan AFB / Sacramento	**0**	**5**	**0**	**127**
	NWC Mohave Range	**0**	**22**	**0**	**559**
	Presidio of Monterey	**0**	**4**	**0**	**102**
	Point Mugu / Port Hueneme	**0**	**0**	**0**	**0**
	San Diego Region NAS North Island NAB Coronado MCRD MCAS Miramar Naval Medical Ctr San Diego NS Point Loma	**0**	**0**	**0**	**0**

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
California	Moffett Field - Onizuka /	**0**	**0**	**0**	**0**
	Sunnyvale				
	San Clemente Island Naval Reservation	**0**	**0**	**0**	**0**
	San Nicolas Island	**0**	**0**	**0**	**0**
	Seal Beach NWS	**0**	**0**	**0**	**0**
	Seal Beach NWS – Concord Detachment	**0**	**0**	**0**	**0**
	Sierra Army Depot / Herlong	**15**	**54**	**0.72**	**1372**
	Stockton / San Joaquin	**0**	**4**	**0**	**102**
	Travis AFB	**0**	**0**	**0**	**0**
	MCB Twentynine Palms	**5**	**5**	**0**	**127**
	Vandenberg AFB	**0**	**0**	**0**	**0**
Colorado	Buckley AFB / Aurora	**20**	**52**	**0.96**	**1321**
	Denver	**20**	**52**	**0.96**	**1321**
	Fort Carson	**15**	**38**	**0.72**	**965**
	Cheyenne Mountain AS / NORAD	**15**	**38**	**0.72**	**965**
	Peterson AFB / Colorado Springs	**30**	**38**	**1.44**	**965**
	Schriever AFB	**30**	**\1\ 38 /1/**	**1.44**	
	USAF Academy	**30**	**38**	**1.44**	**965**
Connecticut	NSB New London / Groton	**30**	**38**	**1.44**	**965**
Delaware	Dover AFB	**25**	**22**	**1.2**	**559**

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
District of Columbia	**Washington Region** Bolling AFB Anacostia NS Fort McNair Marine Barracks NRL Washington NDW / Anacostia Pentagon Walter Reed	**25**	**26**	**1.2**	**660**
Florida	Avon Park AS	**0**	**0**	**0**	**0**
	Cape Canaveral AFS	**0**	**0**	**0**	**0**
	Eglin AFB	**0**	**0**	**0**	**0**
	Homestead	**0**	**0**	**0**	**0**
	Hurlburt Field	**0**		**0**	
	NAS Jacksonville / MCSF Blount Island / Jacksonville	**0**	**0**	**0**	**0**
	NAS Key West	**0**	**0**	**0**	**0**
	MacDill AFB	**0**	**0**	**0**	**0**
	NAS Mayport	**0**	**0**	**0**	**0**
	HQ Southcom / Miami	**0**	**0**	**0**	**0**
	Orlando	**0**	**0**	**0**	**0**
	NAS Panama City	**0**	**0**	**0**	**0**
	Patrick AFB	**0**	**0**	**0**	**0**
	NAS Pensacola	**0**	**0**	**0**	**0**
	Tampa	**0**	**0**	**0**	**0**
	Tyndall AFB	**0**	**0**	**0**	**0**
	NAS Whiting Field / Milton	**0**	**0**	**0**	**0**
Georgia	MCLB Albany	**0**	**0**	**0**	**0**
	Athens NCSC	**5**		**0.24**	
	Dobbins AFB / Atlanta NAS	**5**		**0.24**	
	Fort Benning	**5**	**0**	**0.24**	**0**

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
Georgia	Fort Gordon	**10**	**0**	**0.48**	**0**
	Fort McPherson / Fort Gillem	**5**		**0.24**	
	Fort Stewart	**0**	**0**	**0**	**0**
	Hunter Army Airfield / Savannah	**0**	**0**	**0**	**0**
	NSB Kings Bay	**0**	**0**	**0**	**0**
	Moody AFB	**0**	**0**	**0**	**0**
	Robins AFB	**5**	**0**	**0.24**	**0**
Hawaii	PMRF Barking Sands, Kauai	**0**	**0**	**0**	**0**
	MCBH Kaneohe Bay	**0**	**0**	**0**	**0**
	Pohakuloa Training Area	**0**	**0**	**0**	**0**
	Pearl Harbor Region: Camp H.M. Smith Fort Shafter Hickam AFB Pearl Harbor Tripler AMC	**0**	**0**	**0**	**0**
	Wahiawa Region: Lualualei Wahiawa Naval Reservation Wheeler AFB Schofield Barracks	**0**	**0**	**0**	**0**
Idaho	ARD Bayview	**10**		**0.48**	
	Boise ANG	**10**		**0.48**	
	Mountain Home AFB	**20**	**64**	**0.96**	**1626**
Illinois	Fort Sheridan / Chicago	**25**	**59**	**1.2**	**1499**
	Great Lakes	**30**	**64**	**1.2**	**1626**
	Rock Island Arsenal	**20**	**64**	**0.96**	**1626**
	Scott AFB	**20**	**38**	**0.96**	**965**

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
Illinois	Springfield	**20**		**0.96**	
Indiana	Crane NWSC	**20**	**36**	**0.96**	**914**
	Grissom ARB	**20**	**49**	**0.96**	**1245**
	Fort Benjamin Harrison / Indianapolis	**20**	**44**	**0.96**	**1118**
Iowa	Des Moines	**25**	**82**	**1.2**	**2083**
Kansas	Fort Leavenworth	**20**	**54**	**0.96**	**1372**
	Fort Riley	**20**	**52**	**0.96**	**1321**
	McConnell AFB	**25**	**38**	**1.2**	**965**
Kentucky	Fort Campbell	**15**	**22**	**0.72**	**559**
	Fort Knox	**15**	**32**	**0.72**	**813**
	Louisville	**15**	**32**	**0.72**	**813**
	Richmond	**15**		**0.72**	**0**
Louisiana	Barksdale AFB	**5**	**7**	**0.24**	**178**
	Fort Polk / Leesville	**5**	**0**	**0.24**	**0**
	NAS JRB New Orleans / Belle Chasse	**0**	**0**	**0**	**0**
Maine	NAS Brunswick	**60**	**86**	**2.4**	**2184**
	NRTF Cutler	**50**	**86**	**2.4**	**2184**
	PNSY Kittery	**50**	**48**	**2.4**	**1220**
	Winter Harbor NSGA	**50**	**86**	**2.4**	**2184**
Maryland	Aberdeen Proving Ground	**25**	**29**	**1.2**	**737**
	Adelphi	**25**	**24**	**1.2**	**610**
	Andrews AFB	**25**	**26**	**1.2**	**660**
	Carderock NSWC / Bethesda	**25**	**20**	**1.2**	**508**
	Bloods Island	**20**		**0.96**	
	Edgewood Arsenal	**25**	**29**	**1.2**	**737**
	Fort Detrick / Fredrick	**30**	**29**	**1.44**	**737**
	Fort Meade	**25**	**26**	**1.2**	**660**
Maryland	Indian Head NSWC	**25**	**22**	**1.2**	**559**

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
	Martin State ANG	25	29	1.2	737
	NS Pax River , Webster Field / St. Inigoes	20	26	0.96	660
	U.S. Naval Academy / Annapolis	25	26	1.2	660
Massachusetts	Fort Devens / Ayer	50	64	2.4	1626
	Hanscom AFB	50	54	2.4	1372
	Natick	50		2.4	
	Otis AGB / Falmouth	35	38	1.2	965
	Westover ARB	35	64	1.68	1626
Michigan	Battle Creek	30		1.44	
	Detroit Arsenal / Warren	25	61	1.2	1549
	Selfridge ANG Base	25	59	1.2	1499
Minnesota	Minneapolis – St Paul	50	125	2.4	3175
Mississippi	Stennis / Bay St. Louis	0		0	
	Columbus AFB	10	7	0.48	178
	Gulfport	0	0	0	0
	Jackson	5	5	0.24	127
	Keesler AFB	0	0	0	0
	NAS Meridian	5	5	0.24	127
	Pascagoula NS	0	0	0	0
	Vicksburg	5		0.24	
Missouri	Fort Leonard Wood	20	36	0.96	914
	Kansas City	20	49	0.96	1245
	Overland	20		0.96	
	St. Louis	20	38	0.96	965
	Whiteman AFB	20	46	0.96	1168
Montana	Great Falls ANG	20	107	0.96	2718
	Malmstrom AFB	20	107	0.96	2718
Nebraska	Offutt AFB	25	73	1.2	1854

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
	Lincoln	25	64	1.2	1626
Nevada	NAS Fallon	10	23	0.24	584
	Indian Springs AFS	5	7	0.24	178
	Nellis AFB	5	7	0.24	178
	Nellis AF Range	5	7	0.24	178
New Jersey	NWS Earle / Colts Neck	20		0.96	
	Fort Dix / Trenton	25	29	1.2	737
	Fort Monmouth	25	32	0.96	813
	Lakehurst	25	29	1.2	737
	McGuire AFB	25	29	1.2	737
	Picatinny Arsenal	35	52	1.68	1321
New Mexico	Albuquerque	10	18	0.48	457
	Cannon AFB	15	18	0.72	457
	Holloman AFB	5	4	0.24	102
	Kirtland AFB	10	18	0.48	457
	White Sands	5	4	0.24	102
New York	Buffalo	45	59	2.16	1499
	Fort Drum	70	94	3.35	2388
	Fort Hamilton / Brooklyn	25		1.2	
	Griffis AFB / Rome	60	86	2.87	2184
	NIAGARA FALLS IAP	35	59	1.68	1499
	NSU Saratoga Springs	50		2.4	
	Stewart ANG / Newburgh	35	54	1.68	1372
	Syracuse	40	73	1.92	1854
	West Point	35	54	1.44	1372
	Watervliet Arsenal / Albany	40	82	1.92	2083
North Carolina	MCAS Cherry Point	10	0	0.48	0

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
	Fort Bragg	10	0	0.48	0
	Harvey Point	10	0	0.48	0
	Jacksonville Region MCB Camp Lejeune MCAS New River	10	0	0.48	0
	Pope AFB	10	0	0.48	0
	Raleigh	15		0.72	
	Seymour Johnson AFB	10	4	0.48	102
North Dakota	Grand Forks AFB	60	156	2.87	3962
	NRTF La Moure	40		1.92	
	Minot AFB	40	163	1.92	4140
Ohio	Cleveland	20	52	0.96	1321
	DSC Whitehall / Columbus	20	46	0.96	1168
	Wright-Patterson AFB	20	49	0.96	1245
	Youngstown ARS / Vienna	20		0.96	
Oklahoma	Altus AFB	10	14	0.48	356
	Fort Sill	10	14	0.48	356
	McAlester Army Ammunition Plant	10	16	0.48	406
	Tinker AFB / Oklahoma City	10	18	0.48	457
	Tulsa	10	23	0.48	584
	Vance AFB	15	22	0.72	559
Oregon	Portland	10	14	0.48	356
Pennsylvania	ARS Coraopolis / Pittsburg	25	38	1.2	965
	Carlisle Barracks	25	36	1.2	914
	Fort Indiantown Gap / Annville	35	49	1.68	1245

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
Pennsylvania	Letterkenny / Chambersburg	**30**	**36**	**1.44**	**914**
	Mechanicsburg	**25**		**1.2**	
	Philadelphia	**25**	**30**	**1.2**	**762**
	New Cumberland / Defense Depot Susquehanna	**25**		**1.2**	**0**
	Tobyhanna Army Depot	**50**	**52**	**2.4**	
	Willow Grove ARS / NAS	**30**		**1.44**	**0**
Rhode Island	NS Newport	**30**	**35**	**1.44**	**889**
South Carolina	MCAS Beaufort	**5**	**0**	**0.24**	**0**
	Charleston Region: Charleston AFB NWS Charleston	**5**	**0**	**0.24**	**0**
	Columbia Region: McEntire Fort Jackson Shaw AFB	**10**	**0**	**0.48**	**0**
	MCRD Parris Island	**0**	**0**	**0**	**0**
South Dakota	Ellsworth AFB	**20**	**86**	**0.96**	**2184**
Tennessee	Arnold AFB	**10**		**0.48**	
	NSWC LCC / Memphis	**10**	**0**	**0.48**	**0**
	NSA Mid-South / Millington	**10**		**0.48**	
	Nashville	**10**	**22**	**0.48**	**559**
Texas	NAS JRB, Carswell / Fort Worth	**5**	**7**	**0.24**	**178**
	NAS Corpus Christi	**0**	**0**	**0**	**0**
	Dallas / Irving	**5**	**7**	**0.24**	**178**
	Dyess AFB	**5**	**7**	**0.24**	**178**
	Ellington ANG / Houston	**0**	**0**	**0**	**0**

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
	Fort Bliss / El Paso	10	0	0.24	0
	Fort Hood / Killeen	5	6	0.24	152
	Goodfellow AFB	5	5	0.24	127
	NS Ingleside	0	0	0	0
	NAS Kingsville	0	0	0	0
	Laughlin AFB	0	0	0	0
	Red River Army Depot / Texarkana	5	8	0.24	203
	San Antonio Region Brooks AFB Fort Sam Houston Kelly AFB Lackland AFB Randolph AFB	5	0	0.24	0
	Sheppard AFB	5	11	0.24	279
Utah	Dugway Proving Ground	10	54	0.48	1372
	Hill AFB	47	73	2.26	1854
	Salt Lake City	15	59	0.72	1499
	Tooele Army Depot	25	52	1.2	1321
Virginia	Dahlgren	25	22	1.2	559
	Dam Neck / Virginia Beach Ocean front	10	5	0.48	127
	Fort A. P. Hill	25		1.2	
	Fort Belvoir	25	26	1.2	660
	Fort Eustis	15	9	0.72	229
	Fort Lee	20	14	0.96	356
	Fort Monroe	10	9	0.48	229
	Fort Myer	25	26	1.2	660
	Fort Story	10	9	0.48	229
	Henderson Hall / Arlington	25	26	1.2	660
	Langley AFB / Hampton	10	9	0.48	229
	NAB Little Creek	10	9	0.48	229

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
Virginia	Norfolk Region: Camp Elmore Craney Island Depot Norfolk Naval Base	**10**	**9**	**0.48**	**229**
	Norfolk Shipyard – Naval Hospital / Portsmouth	**10**	**9**	**0.48**	**229**
	NSA Northwest / Chesapeake	**10**	**9**	**0.48**	**229**
	NAS Oceana / Virginia Beach	**10**	**9**	**0.48**	**229**
	MCB Quantico	**25**	**22**	**1.2**	**559**
	Radford AAP	**25**	**22**	**1.2**	**559**
	Defense Supply Ctr / Richmond	**20**	**18**	**0.96**	**457**
	Wallops Island	**20**		**0.96**	
	Yorktown Region: Camp Perry Cheatham Annex Yorktown NWS	**15**	**9**	**0.72**	**229**
Washington	NS Everett	**15 (a)**		**0.72(a)**	
	Fairchild AFB	**42**	**64**	**2.01**	**1626**
	Fort Lewis / Tacoma	**15 (a)**	**9**	**0.72(a)**	**229**
	Indian Island SWC	**15 (a)**		**0.72(a)**	
	NRS Jim Creek	**15 (a)**		**0.72(a)**	
	Keyport / Bangor Engin. Sta Annex	**15 (a)**	**9**	**0.72(a)**	**229**
	McChord AFB	**15**	**9**	**0.72**	**229**
	Puget Sound Region: Bangor NSB Bremerton NS Puget Sound NSY	**15 (a)**	**9**	**0.72(a)**	**229**
	NAS Whidbey Island / Oak Harbor	**15 (a)**		**0.72(a)**	

Table E-2

State	Base / City	Ground Snow (psf)	Frost Penetration (b) (in)	Ground Snow (kPa)	Frost Penetration (b) (mm)
Washington	Seattle	**20**	**9**	**0.72**	**229**
West Virginia	Allegheny Ballistics Lab	**CS**		**CS**	
	Beckley	**30**		**1.44**	
	Huntington	**20**	**22**	**0.96**	**559**
	Sugar Grove NRS	**30**	**38**	**1.44**	**965**
Wisconsin	Fort McCoy	**40**	**114**	**1.92**	**2896**
	General Mitchell AFRC / Milwaukee	**30**	**75**	**1.44**	**1905**
	Madison	**35**	**86**	**1.44**	**2184**
Wyoming	F. E. Warren AFB	**20**	**59**	**0.96**	**1499**
American Samoa	Pago Pago / Tutuila Island	**0**	**0**	**0**	**0**
Mariana Islands	Guam	**0**	**0**	**0**	**0**
	Saipan / Tinian	**0**	**0**	**0**	**0**
Puerto Rico	All	**0**	**0**	**0**	**0**

Notes to TABLE E-2, "SNOW LOADING AND FROST PENETRATION DATA – UNITED STATES, ITS TERRITORIES AND POSSESSIONS"

(a) – Ground snow load to be used for Navy facilities at identified locations in Washington State equals 25 psf (1.20 kPa).

(b) – See best practice B-2.3 for footing depths considering frost.

CS – Site specific case studies are required to establish ground snow loads.

Table E-3 Earthquake Loading Data – United States, Its Territories and Possessions

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Alabama	Anniston Army Depot	12	24	10	15	7	10	5	6	3
	Birmingham	14	26	10	16	7	10	5	6	2
	Fort McClellan	12	23	10	15	7	10	5	6	3
	Fort Rucker	4	10	6	6	4	4	3	3	2
	Maxwell-Gunther AFB / Montgomery	6	14	8	9	5	6	4	4	2
	Mobile	5	10	6	7	4	4	3	2	1
	Redstone Arsenal / Huntsville	12	25	12	18	9	12	5	6	3
Alaska	Clear AS	40	98	38	70	27	50	20	34	14
	Eielson AFB	39	96	37	69	26	49	19	33	13
	Elmendorf AFB	50	150	68	131	59	105	45	79	33
	Fort Greely	28	72	38	50	28	38	21	27	14
	Fort Richardson	50	150	69	130	60	104	46	78	33
	Fort Wainwright	40	99	38	71	27	51	19	34	13
	Galena AFB	19	44	17	29	12	20	8	13	5
	Juneau	21	54	36	38	26	28	20	20	14
	Ketchikan	10	26	23	18	17	14	13	10	9
	Kodiak	64	154	90	142	74	114	57	86	41

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Alaska	Sitka	**33**	**95**	**60**	**68**	**47**	**54**	**37**	**41**	**28**
	Valdez	**54**	**150**	**77**	**125**	**60**	**96**	**43**	**69**	**29**
Arizona	Davis-Monthan AFB / Tucson AFB	**11**	**27**	**8**	**18**	**5**	**11**	**3**	**7**	**2**
	Fort Huachuca	**10**	**24**	**7**	**16**	**5**	**10**	**3**	**6**	**2**
	Luke Air Force Base	**7**	**17**	**6**	**11**	**4**	**7**	**3**	**5**	**2**
	Phoenix	**7**	**17**	**6**	**12**	**4**	**8**	**3**	**5**	**2**
	MCAS Yuma	**26**	**73**	**27**	**50**	**19**	**38**	**15**	**28**	**11**
	Yuma Proving Ground **(a)**	**10**	**31**	**16**	**20**	**11**	**16**	**9**	**12**	**7**
Arkansas	Little Rock AFB	**24**	**46**	**18**	**32**	**13**	**17**	**6**	**7**	**2**
	Pine Bluff Arsenal	**18**	**35**	**15**	**24**	**10**	**13**	**5**	**6**	**2**
California	Alameda	**51**	**150**	**60**	**162**	**61**	**127**	**47**	**95**	**34**
	MCLB Barstow	**59**	**144**	**55**	**104**	**38**	**71**	**27**	**47**	**18**
	Beale AFB	**18**	**52**	**25**	**34**	**17**	**27**	**13**	**20**	**10**
	MCMWTC Bridgeport	**42**	**110**	**37**	**78**	**26**	**57**	**19**	**39**	**13**
	MCB Camp Pendleton **(a)**	**40**	**109**	**42**	**76**	**30**	**58**	**23**	**43**	**17**
	NWS China Lake **(a)**	**43**	**115**	**39**	**82**	**28**	**62**	**21**	**43**	**15**
	NSWC Corona	**86**	**225**	**85**	**175**	**66**	**127**	**47**	**84**	**32**
	NRTF Dixon	**40**	**114**	**41**	**79**	**29**	**61**	**23**	**45**	**17**
	Edwards AFB **(a)**	**38**	**100**	**43**	**70**	**31**	**54**	**24**	**40**	**18**
	El Centro NAF **(a)**	**60**	**157**	**62**	**183**	**66**	**144**	**51**	**108**	**37**

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
California	Fort Hunter Ligget	**44**	**115**	**41**	**80**	**29**	**60**	**22**	**43**	**16**
	Fort Irwin **(a)**	**38**	**98**	**38**	**70**	**27**	**51**	**20**	**35**	**14**
	Fresno ANG	**22**	**61**	**25**	**40**	**17**	**30**	**13**	**23**	**10**
	NAS Lemoore	**41**	**107**	**37**	**76**	**27**	**56**	**20**	**40**	**15**
	Los Angeles AFB / El Segundo	**60**	**163**	**60**	**117**	**42**	**87**	**31**	**61**	**23**
	Los Angeles	**74**	**202**	**73**	**147**	**52**	**109**	**38**	**76**	**27**
	March ARB	**50**	**150**	**60**	**144**	**57**	**113**	**44**	**84**	**32**
	McClellan AFB / Sacremento	**19**	**57**	**27**	**38**	**18**	**30**	**14**	**23**	**11**
	NWC Mohave Range **(a)**	**57**	**140**	**55**	**101**	**38**	**69**	**25**	**45**	**16**
	Presidio of Monterey	**61**	**154**	**57**	**113**	**41**	**80**	**29**	**53**	**19**
	Point Mugu / Port Hueneme	**78**	**208**	**73**	**153**	**53**	**108**	**38**	**71**	**26**
	San Diego Region									
	NAS North Island	**54**	**121**	**46**	**85**	**31**	**52**	**20**	**31**	**13**
	NAB Coronado	**56**	**124**	**48**	**86**	**31**	**52**	**20**	**31**	**13**
	MCRD	**55**	**122**	**47**	**84**	**31**	**51**	**20**	**32**	**13**
	MCAS Miramar	**44**	**106**	**41**	**74**	**28**	**49**	**20**	**33**	**14**
	Naval Medical Ctr	**53**	**120**	**46**	**82**	**30**	**50**	**20**	**31**	**13**
	San Diego NS	**49**	**112**	**43**	**78**	**28**	**49**	**19**	**31**	**13**
	NS Point Loma	**53**	**120**	**46**	**84**	**31**	**52**	**20**	**32**	**13**

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
California	Moffett Field – Onizuka / Sunnyvale	**50**	**150**	**60**	**144**	**53**	**115**	**41**	**87**	**30**
	San Clemente Island Naval Reservation	**29**	**71**	**26**	**49**	**17**	**35**	**13**	**24**	**10**
	San Nicolas Island	**20**	**52**	**22**	**35**	**15**	**26**	**12**	**19**	**9**
	Seal Beach NWS	**58**	**153**	**57**	**108**	**39**	**78**	**29**	**55**	**21**
	Seal Beach NWS – Concord Detachment	**62**	**163**	**60**	**173**	**59**	**131**	**44**	**93**	**32**
	Sierra Army Depot / Herlong	**37**	**95**	**34**	**69**	**24**	**50**	**17**	**33**	**12**
	Stockton / San Joaquin	**58**	**149**	**49**	**110**	**35**	**77**	**25**	**50**	**18**
	Travis AFB	**56**	**152**	**52**	**108**	**37**	**80**	**28**	**57**	**21**
	MCB Twentynine Palms **(a)**	**52**	**135**	**48**	**96**	**33**	**70**	**25**	**49**	**18**
	Vandenberg AFB **(a)**	**37**	**96**	**35**	**69**	**25**	**50**	**19**	**35**	**14**
Colorado	Buckley AFB / Aurora	**8**	**17**	**6**	**11**	**4**	**7**	**2**	**4**	**1**
	Denver	**9**	**18**	**6**	**11**	**4**	**7**	**3**	**4**	**1**
	Fort Carson	**9**	**18**	**6**	**12**	**4**	**7**	**3**	**5**	**2**
	Cheyenne Mountain AS / NORAD	**9**	**18**	**6**	**12**	**4**	**7**	**3**	**4**	**2**
	Peterson AFB / Colorado Springs	**9**	**17**	**6**	**11**	**4**	**7**	**3**	**4**	**2**
	Schriever AFB	**8**	**16**	**6**	**10**	**4**	**7**	**3**	**4**	**1**

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Colorado	USAF Academy	**10**	**19**	**6**	**12**	**4**	**7**	**3**	**4**	**2**
Connecticut	NSB New London / Groton	**8**	**16**	**6**	**10**	**4**	**6**	**2**	**3**	**1**
Delaware	Dover AFB	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
District of Columbia	**Washington Region**									
	Bolling AFB	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	Anacostia NS	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	Fort McNair	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	Marine Barracks	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	NRL Washington	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	NDW / Anacostia	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	Pentagon	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	Walter Reed	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
Florida	Avon Park AS	**3**	**7**	**3**	**4**	**2**	**2**	**1**	**1**	**1**
	Cape Canaveral AFS	**3**	**7**	**4**	**4**	**3**	**3**	**1**	**1**	**1**
	Eglin AFB	**4**	**9**	**5**	**5**	**4**	**4**	**3**	**2**	**1**
	Homestead	**2**	**4**	**2**	**2**	**1**	**1**	**1**	**1**	**0.3**
	Hurlburt Field	**4**	**8**	**5**	**5**	**4**	**3**	**2**	**2**	**1**
	NAS Jacksonville / MCSF Blount Island / Jacksonville	**5**	**11**	**6**	**8**	**4**	**4**	**2**	**2**	**1**
	NAS Key West	**1**	**2**	**1**	**1**	**1**	**1**	**0.4**	**1**	**0.3**
	MacDill AFB	**3**	**6**	**3**	**3**	**2**	**2**	**1**	**1**	**1**

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Florida	NAS Mayport	6	12	6	8	4	5	3	2	1
	HQ Southcom / Miami	2	4	2	2	1	1	1	1	0.3
	Orlando	4	8	4	5	3	3	1	1	1
	NAS Panama City	3	8	5	5	4	3	2	2	1
	Patrick AFB	3	7	4	4	2	2	1	1	1
	NAS Pensacola	4	9	5	5	4	3	2	2	1
	Tampa	3	6	3	4	2	2	1	1	1
	Tyndall AFB	3	7	5	5	3	3	2	2	1
	NAS Whiting Field / Milton	5	10	6	6	4	4	3	2	1
Georgia	MCLB Albany	5	11	6	7	5	5	3	3	2
	Athens NCSC	10	21	9	14	7	9	4	6	3
	Dobbins AFB / Atlanta NAS	10	20	9	14	7	9	4	6	3
	Fort Benning	5	12	7	8	5	6	3	4	2
	Fort Gordon	13	27	11	18	7	11	5	6	3
	Fort McPherson / Fort Gillem	8	18	9	12	6	8	4	5	2
	Fort Stewart	11	22	10	15	7	9	4	4	2
	Hunter Army Airfield / Savannah	16	31	12	21	8	11	4	5	2
	NSB Kings Bay	6	13	7	9	5	5	3	3	1

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Georgia	Moody AFB	5	11	6	7	4	5	3	3	2
	Robins AFB	7	15	8	10	6	7	4	4	2
Hawaii	PMRF Barking Sands, Kauai	9	17	5	12	3	8	2	5	1
	MCBH Kaneohe Bay	27	59	17	42	12	30	8	20	6
	Pearl Harbor Region:									
	Camp H.M. Smith	27	57	17	41	11	28	8	19	5
	Fort Shafter	27	58	17	41	12	29	8	19	5
	Hickam AFB	26	57	16	41	11	28	8	19	5
	Pearl Harbor	26	57	16	41	11	28	8	19	5
	Tripler AMC	27	58	17	41	12	29	8	19	5
	Pohakuloa Training Area	58	150	60	154	69	127	57	113	44
	Wahiawa Region:									
	Lualualei	25	54	15	38	10	27	7	17	5
	Wahiawa Naval Res	26	56	16	40	11	28	8	18	5
	Wheeler AFB	26	55	16	40	11	27	8	18	5
	Schofield Barracks	25	55	15	39	10	27	7	18	5
Idaho	ARD Bayview	16	37	12	25	8	16	6	10	4
	Boise ANG	12	30	10	20	7	14	5	10	4
	Mountain Home AFB	11	26	9	17	6	12	5	8	3
Illinois	Fort Sheridan / Chicago	6	12	6	7	4	5	3	3	1

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
	Great Lakes	6	12	6	7	4	4	2	2	1
	Rock Island Arsenal	5	11	6	7	4	5	3	3	1
	Scott AFB	26	49	18	35	13	22	7	11	3
	Springfield	10	21	11	15	8	10	4	5	2
Indiana	Crane NWSC	14	29	12	20	9	13	5	7	3
	Grissom ARB	5	12	7	8	5	6	3	3	2
	Fort Benjamin Harrison / Indianapolis	7	15	8	11	6	7	4	4	2
Iowa	Des Moines	3	7	5	4	3	3	2	2	1
Kansas	Fort Leavenworth	5	11	6	7	4	5	3	3	1
	Fort Riley	8	15	6	8	4	5	2	3	1
	McConnell AFB	5	11	6	7	4	4	2	3	1
Kentucky	Fort Campbell **(a)**	25	49	20	36	14	21	8	10	3
	Fort Knox	10	22	11	16	8	10	5	6	3
	Louisville	10	21	11	15	8	10	5	6	3
	Richmond	9	19	9	13	7	8	4	5	2
Louisiana	Barksdale AFB	6	13	7	9	5	6	3	3	1
	Fort Polk / Leesville	5	10	6	7	4	4	2	2	1
	NAS JRB New Orleans / Belle Chasse	5	9	5	6	4	3	2	2	1
Maine	NAS Brunswick	12	23	8	14	5	9	3	5	2
	NRTF Cutler	13	23	7	13	5	8	3	4	2

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State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Maine	PNSY Kittery	**15**	**27**	**8**	**16**	**5**	**9**	**3**	**5**	**2**
	Winter Harbour NSGA	**10**	**19**	**7**	**11**	**4**	**7**	**3**	**4**	**2**
Maryland	Aberdeen Proving Ground	**8**	**15**	**5**	**9**	**3**	**5**	**2**	**3**	**1**
	Adelphi	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	Andrews AFB	**6**	**12**	**5**	**7**	**3**	**5**	**2**	**3**	**1**
	Carderock NSWC / Bethesda	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	Bloods Island	**4**	**10**	**5**	**6**	**3**	**4**	**2**	**2**	**1**
	Edgewood Arsenal	**7**	**14**	**5**	**9**	**3**	**5**	**2**	**3**	**1**
	Fort Detrick / Fredrick	**6**	**13**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	Fort Meade	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	Indian Head NSWC	**6**	**12**	**5**	**8**	**4**	**5**	**2**	**3**	**1**
	Martin State ANG	**7**	**14**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
	NS Pax River , Webster Field / St. Inigoes	**5**	**11**	**5**	**7**	**3**	**4**	**2**	**2**	**1**
	U.S. Naval Academy / Annapolis	**6**	**12**	**5**	**8**	**3**	**5**	**2**	**3**	**1**
Massachusetts	Fort Devens / Ayer	**11**	**21**	**7**	**13**	**5**	**8**	**3**	**5**	**2**
	Hanscom AFB	**12**	**22**	**7**	**13**	**5**	**8**	**3**	**5**	**2**
	Natick	**10**	**20**	**7**	**12**	**4**	**7**	**3**	**4**	**2**
	Otis AGB / Falmouth	**8**	**16**	**6**	**10**	**4**	**6**	**2**	**3**	**1**

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Massachusetts	Westover ARB	8	17	7	11	4	7	3	4	2
Michigan	Battle Creek	4	9	5	6	4	4	2	2	1
	Detroit Arsenal / Warren	4	9	5	6	3	4	2	2	1
	Selfridge ANG Base	4	9	5	6	3	4	2	2	1
Minnesota	Minneapolis – St Paul	2	5	3	3	2	2	1	1	1
Mississippi	Stennis / Bay St. Louis	5	10	6	6	4	4	2	2	1
	Columbus AFB	11	23	12	17	8	10	5	5	2
	Gulfport	5	10	6	6	4	4	2	2	1
	Jackson	8	16	9	11	6	7	4	3	2
	Keesler AFB	5	10	6	6	4	4	2	2	1
	NAS Meridian	9	18	9	12	6	8	4	4	2
	Pascagoula NS	5	10	6	6	4	4	2	2	1
	Vicksburg	8	16	9	11	6	7	3	3	2
Missouri	Fort Leonard Wood	13	26	13	19	9	11	5	5	2
	Kansas City	5	11	7	8	5	5	3	3	1
	Overland	20	39	16	28	11	17	6	9	3
	St. Louis	22	43	17	31	12	19	7	9	3
	Whiteman AFB	6	13	8	9	6	6	3	3	2
Montana	Great Falls ANG	7	19	7	13	5	9	4	7	3
	Malmstrom AFB	7	17	7	12	5	8	3	6	2
Nebraska	Offutt AFB	5	10	5	6	3	4	2	2	1
	Lincoln	7	13	5	8	3	4	2	2	1

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State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Nevada	NAS Fallon	29	78	27	54	19	40	15	29	11
	Indian Springs AFS	20	51	17	35	12	25	9	17	6
	Nellis AFB	21	53	17	36	12	24	8	15	6
	Nellis AF Range **(a)**	21	53	17	36	12	24	8	15	6
New Jersey	NWS Earle / Colts Neck	13	23	6	13	4	7	2	4	1
	Fort Dix / Trenton	11	20	6	12	4	7	2	3	1
	Fort Monmouth	13	23	6	13	4	7	2	4	1
	Lakehurst	11	20	6	11	4	7	2	3	1
	McGuire AFB	11	20	6	12	4	7	2	3	1
	Picatinny Arsenal	14	24	7	14	4	8	3	4	2
New Mexico	Albuquerque	18	44	13	30	9	18	6	11	3
	Cannon AFB	4	9	3	6	2	4	1	2	1
	Holloman AFB	13	31	10	19	6	12	4	7	2
	Kirtland AFB	19	47	14	29	9	18	6	11	3
	White Sands	18	46	14	22	7	13	4	7	2
New York	Buffalo	12	21	6	12	4	7	2	3	1
	Fort Drum	12	24	8	16	6	10	4	6	2
	Fort Hamilton / Brooklyn	16	27	7	15	4	8	3	4	1
	Griffis AFB / Rome	8	18	7	11	5	7	3	5	2
	NIAGARA FALLS IAP	12	21	6	12	4	7	2	3	1
	NSU Saratoga Springs	10	21	8	13	5	9	3	5	2

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State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
New York	Stewart ANG / Newburgh	**11**	**21**	**7**	**13**	**4**	**7**	**3**	**4**	**2**
	Syracuse	**6**	**14**	**6**	**9**	**4**	**6**	**3**	**4**	**2**
	West Point	**13**	**23**	**7**	**13**	**4**	**8**	**3**	**4**	**2**
	Watervliet Arsenal / Albany	**9**	**19**	**7**	**12**	**5**	**8**	**3**	**5**	**2**
North Carolina	MCAS Cherry Point	**6**	**12**	**6**	**8**	**4**	**5**	**2**	**2**	**1**
	Fort Bragg	**11**	**21**	**10**	**15**	**6**	**8**	**4**	**4**	**2**
	Harvey Point	**4**	**10**	**5**	**6**	**3**	**4**	**2**	**2**	**1**
	Jacksonville Region									
	MCB Camp Lejeune	**7**	**15**	**7**	**10**	**5**	**5**	**3**	**3**	**1**
	MCAS New River	**8**	**15**	**7**	**10**	**5**	**6**	**3**	**3**	**1**
	Pope AFB	**11**	**21**	**10**	**15**	**6**	**8**	**4**	**4**	**2**
	Raleigh	**7**	**15**	**8**	**11**	**5**	**6**	**3**	**3**	**2**
	Seymour Johnson AFB	**7**	**15**	**7**	**10**	**5**	**6**	**3**	**3**	**1**
North Dakota	Grand Forks AFB	**2**	**4**	**2**	**2**	**1**	**1**	**1**	**1**	**0.4**
	NRTF La Moure	**2**	**4**	**2**	**2**	**1**	**1**	**1**	**1**	**0.4**
	Minot AFB	**2**	**5**	**2**	**3**	**1**	**2**	**1**	**1**	**0.5**
Ohio	Cleveland	**10**	**17**	**6**	**10**	**4**	**6**	**3**	**3**	**2**
	DSC Whitehall / Columbus	**5**	**12**	**6**	**8**	**4**	**5**	**3**	**3**	**2**
	Wright-Patterson AFB	**8**	**16**	**7**	**10**	**5**	**6**	**3**	**4**	**2**

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State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Ohio	Youngstown ARS / Vienna	10	18	6	10	4	6	3	3	2
Oklahoma	Altus AFB	8	16	6	9	4	5	2	3	1
	Fort Sill	18	42	12	13	5	7	3	3	1
	McAlester Army Ammunition Plant	9	18	8	11	5	7	3	4	2
	Tinker AFB / Oklahoma City	16	27	8	16	5	9	3	4	2
	Tulsa	6	13	7	9	5	6	3	3	2
	Vance AFB	9	17	6	10	4	6	3	3	1
Oregon	Portland	42	96	40	71	30	48	20	30	11
Pennsylvania	ARS Coraopolis / Pittsburg	5	11	5	7	4	5	3	3	2
	Carlisle Barracks	6	13	5	8	3	5	2	3	1
	Fort Indiantown Gap / Annville	8	16	6	9	4	6	2	3	1
	Letterkenny / Chambersburg	6	12	5	8	3	5	2	3	1
	Mechanicsburg	7	14	5	8	4	5	2	3	1
	Philadelphia	11	21	6	12	4	7	2	4	1
	New Cumberland / Defense Depot Susquehanna	7	14	5	9	4	5	2	3	1
	Tobyhanna Army Depot	9	17	6	10	4	6	3	4	2

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		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Pennsylvania	Willow Grove ARS / NAS	**12**	**21**	**6**	**12**	**4**	**7**	**2**	**4**	**1**
Rhode Island	NS Newport	**8**	**16**	**6**	**10**	**4**	**6**	**2**	**3**	**1**
South Carolina	MCAS Beaufort	**32**	**56**	**19**	**35**	**11**	**18**	**5**	**7**	**2**
	Charleston Region:									
	Charleston AFB	**101**	**147**	**49**	**86**	**24**	**34**	**8**	**11**	**3**
	NWS Charleston	**111**	**158**	**53**	**95**	**27**	**35**	**9**	**11**	**3**
	Columbia Region:									
	McEntire	**25**	**46**	**15**	**32**	**10**	**18**	**6**	**8**	**3**
	Fort Jackson	**23**	**42**	**15**	**29**	**10**	**17**	**6**	**8**	**3**
	Shaw AFB	**28**	**50**	**17**	**34**	**11**	**18**	**6**	**8**	**3**
	MCRD Parris Island	**27**	**49**	**17**	**31**	**10**	**16**	**5**	**7**	**2**
South Dakota	Ellsworth AFB	**6**	**12**	**4**	**7**	**3**	**5**	**2**	**3**	**1**
Tennessee	Arnold AFB	**12**	**25**	**12**	**18**	**9**	**12**	**5**	**7**	**3**
	NSWC LCC / Memphis	**50**	**101**	**35**	**71**	**24**	**35**	**10**	**13**	**4**
	NSA Mid-South / Millington	**56**	**113**	**39**	**79**	**26**	**40**	**12**	**15**	**4**
	Nashville	**14**	**29**	**14**	**21**	**10**	**13**	**6**	**7**	**3**
Texas	NAS JRB, Carswell / Fort Worth	**4**	**9**	**5**	**6**	**3**	**4**	**2**	**2**	**1**
	NAS Corpus Christi	**3**	**6**	**2**	**3**	**1**	**2**	**1**	**1**	**0.3**

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State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Texas	Dallas / Irving	5	10	5	6	4	4	2	2	1
	Dyess AFB	3	7	4	4	2	3	2	2	1
	Ellington ANG / Houston	3	7	4	4	3	3	2	1	1
	Fort Bliss / El Paso	13	30	9	20	6	13	4	7	2
	Fort Hood / Killeen	3	6	4	4	3	3	2	1	1
	Goodfellow AFB	3	6	3	4	2	2	1	1	1
	NS Ingleside	3	6	2	3	1	2	1	1	0.3
	NAS Kingsville	3	6	2	3	1	2	1	1	0.3
	Laughlin AFB	2	5	2	3	1	2	1	1	0.4
	Red River Army Depot / Texarkana	7	14	8	10	6	6	3	3	2
	San Antonio Region									
	Brooks AFB	4	9	3	4	2	2	1	1	1
	Fort Sam Houston	4	8	3	4	2	2	1	1	1
	Kelly AFB	4	8	3	4	2	2	1	1	0.5
	Lackland AFB	4	8	3	4	2	2	1	1	0.4
	Randolph AFB	4	8	3	4	2	2	1	1	1
	Sheppard AFB	7	14	6	8	4	5	2	3	1
Utah	Dugway Proving Ground	15	37	14	26	10	18	7	12	5
	Hill AFB	54	129	43	82	27	48	16	28	9
	Salt Lake City	49	119	44	85	30	51	17	28	9

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Utah	Tooele Army Depot	30	77	26	51	18	35	12	22	8
Virginia	Dahlgren	6	12	5	8	4	5	2	3	1
	Dam Neck / Virginia Beach Ocean front	4	9	5	6	3	3	2	2	1
	Fort A. P. Hill	7	15	6	9	4	5	2	3	1
	Fort Belvoir	6	12	5	8	3	5	2	3	1
	Fort Eustis	5	11	5	7	3	4	2	2	1
	Fort Lee	8	16	6	9	4	6	2	3	1
	Fort Monroe	4	10	5	6	3	4	2	2	1
	Fort Myer	6	12	5	8	3	5	2	3	1
	Fort Story	4	9	5	6	3	4	2	2	1
	Henderson Hall / Arlington	6	12	5	8	3	5	2	3	1
	Langley AFB / Hampton	5	10	5	6	3	4	2	2	1
	NAB Little Creek	4	9	5	6	3	4	2	2	1
	Norfolk Region:									
	Camp Elmore	4	10	5	6	3	4	2	2	1
	Craney Island Depot	5	10	5	6	3	4	2	2	1
	Norfolk Naval Base	4	10	5	6	3	4	2	2	1
	Norfolk Shipyard – Naval Hospital / Portsmouth	4	10	5	6	3	4	2	2	1
	NSA Northwest / Chesapeake	4	9	5	6	3	4	2	2	1

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Virginia	NAS Oceana / Virginia Beach	**4**	**9**	**5**	**6**	**3**	**4**	**2**	**2**	**1**
	MCB Quantico	**6**	**13**	**5**	**8**	**4**	**5**	**2**	**3**	**1**
	Defense Supply Ctr / Richmond	**10**	**19**	**6**	**10**	**4**	**6**	**3**	**3**	**1**
	Radford AAP	**14**	**25**	**9**	**15**	**6**	**9**	**4**	**5**	**2**
	Wallops Island	**4**	**8**	**4**	**5**	**3**	**3**	**2**	**2**	**1**
	Yorktown Region:									
	Camp Peary	**5**	**11**	**5**	**7**	**4**	**4**	**2**	**3**	**1**
	Cheatham Annex	**5**	**11**	**5**	**7**	**3**	**4**	**2**	**2**	**1**
	Yorktown NWS	**5**	**10**	**5**	**7**	**3**	**4**	**2**	**2**	**1**
Washington	NS Everett	**55**	**133**	**50**	**92**	**36**	**65**	**25**	**44**	**16**
	Fairchild AFB	**14**	**32**	**12**	**21**	**8**	**14**	**5**	**9**	**3**
	Fort Lewis / Tacoma	**50**	**128**	**51**	**92**	**37**	**68**	**26**	**48**	**18**
	Indian Island SWC	**54**	**130**	**53**	**94**	**38**	**69**	**27**	**47**	**18**
	NRS Jim Creek	**47**	**116**	**45**	**84**	**33**	**61**	**23**	**42**	**16**
	Keyport / Bangor Engin. Sta Annex	**52**	**133**	**53**	**96**	**39**	**72**	**28**	**50**	**19**
	McChord AFB	**50**	**128**	**50**	**92**	**36**	**69**	**26**	**48**	**18**

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Washington	Puget Sound Region:									
	Bangor NSB	**66**	**157**	**61**	**109**	**43**	**76**	**30**	**52**	**19**
	Bremerton NS	**63**	**152**	**60**	**107**	**43**	**76**	**30**	**52**	**20**
	Puget Sound NSY	**66**	**157**	**61**	**109**	**43**	**77**	**30**	**52**	**20**
	NAS Whidbey Island / Oak Harbor	**54**	**129**	**51**	**93**	**37**	**66**	**26**	**44**	**16**
	Seattle	**60**	**144**	**56**	**101**	**40**	**73**	**28**	**49**	**18**
West Virginia	Allegheny Ballistics Lab	**6**	**12**	**5**	**7**	**4**	**5**	**3**	**3**	**2**
	Beckley	**10**	**19**	**8**	**12**	**5**	**7**	**4**	**4**	**2**
	Huntington	**7**	**15**	**7**	**10**	**5**	**6**	**4**	**4**	**2**
	Sugar Grove NRS	**6**	**14**	**6**	**9**	**4**	**6**	**3**	**3**	**2**
Wisconsin	Fort McCoy	**3**	**5**	**4**	**3**	**3**	**2**	**2**	**1**	**1**
	General Mitchell AFRC / Milwaukee	**4**	**9**	**5**	**6**	**3**	**3**	**2**	**2**	**1**
	Madison	**4**	**8**	**5**	**5**	**3**	**3**	**2**	**2**	**1**
Wyoming	F. E. Warren AFB	**8**	**16**	**6**	**11**	**4**	**7**	**2**	**4**	**1**
American Samoa	Pago Pago / Tutuila Island	**17**	**41**	**16**	**30**	**11**	**21**	**8**	**14**	**6**
Mariana Islands	Guam (b)	**90**	**279**	**68**	**208**	**51**	**151**	**37**	**105**	**25**
Mariana Islands	Saipan / Tinian	**58**	**178**	**45**	**129**	**33**	**92**	**23**	**64**	**16**
Puerto Rico	NRTF Aguada	**49**	**131**	**50**	**91**	**35**	**68**	**26**	**48**	**19**
	Fort Buchanan	**41**	**100**	**40**	**71**	**29**	**53**	**22**	**38**	**15**

Table E-3

State	Base / City	Seismic Data (Site Class B)								
		PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Puerto Rico	Ramey AFB	**50**	**134**	**50**	**94**	**36**	**70**	**27**	**51**	**19**
	NS Roosevelt Roads	**40**	**98**	**37**	**69**	**27**	**52**	**20**	**37**	**14**
	Sebana Seca NRS	**41**	**101**	**40**	**72**	**29**	**54**	**22**	**38**	**15**

Notes to Table E-3, "Earthquake Loading Data – United States, Its Territories and Possessions"

(a) – Seismic parameters are provided at the geographic centroid of the installation. However, due to the size of the installation and the considerable variation of the seismic accelerations over short distances within the installation, location specific parameters shall be determined using the USGS U.S. Seismic Design Map Web Application, which could result in higher seismic parameters than provided in this Table.

\3\

(b) – Acceleration values indicated for Guam may be reduced by 20% based on a site specific ground motion study conducted by URS Corporation dated April 1, 2016, and per ASCE 7-10 21.4.

/3/

APPENDIX F SITE-SPECIFIC STRUCTURAL LOADING DATA – OUTSIDE OF THE UNITED STATES, ITS TERRITORIES AND POSSESSIONS

F-1 WIND LOADING DATA TABLE.

Site-specific structural wind loading data for potential DoD locations outside of the United States, its territories and possessions is provided in Table F-1.

F-2 SNOW LOADING AND FROST PENETRATION DATA TABLE.

Site-specific structural snow loading and frost penetration data for potential DoD locations outside of the United States, its territories and possessions is provided in Table F-2.

F-3 EARTHQUAKE LOADING DATA TABLE.

Site-specific earthquake loading data for potential DoD locations outside of the United States, its territories and possessions is provided in Table F-3.

Table F-1 Wind Loading Data – Outside of The United States, Its Territories And Possessions

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a) Risk Category I	II	III-IV	V	Wind Speed (km/h) - Note (a) Risk Category I	II	III-IV	V
Africa	**Djibouti**	Djibouti	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
	Egypt	Alexandria	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Morocco	Casablanca	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
Asia	**Afghanistan**	Kabul	**100 (92)**	**110 (99)**	**115 (105)**	**140 (128)**	**161 (148)**	**177 (159)**	**185 (170)**	**225 (206)**
	Bahrain	NSA Bahrain	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	India	Bombay (Mumbai)	**107**	**115**	**123**	**150**	**173**	**185**	**198**	**241**
		Calcutta (Kolkata)	**134**	**144**	**154**	**187**	**216**	**232**	**248**	**302**
		Madras (Chennai)	**108**	**116**	**124**	**151**	**175**	**187**	**200**	**243**
		New Delhi	**107**	**115**	**123**	**150**	**173**	**185**	**198**	**241**
	Iraq	Baghdad	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Basra	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
	Japan	NAF Atsugi	**118**	**126**	**135**	**164**	**190**	**203**	**218**	**265**
		MCAS Iwakuni	**141**	**152**	**162**	**197**	**228**	**244**	**261**	**318**
		Iwo Jima	**248**	**265**	**284**	**345**	**398**	**427**	**457**	**556**
		Misawa AFB	**119**	**128**	**137**	**166**	**192**	**205**	**220**	**267**
		Okinawa (All installations)	**212**	**227**	**243**	**296**	**341**	**366**	**392**	**476**

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a) Risk Category I	II	III-IV	V	Wind Speed (km/h) - Note (a) Risk Category I	II	III-IV	V
		Sagamihara	118	126	135	164	190	203	218	265
Asia	Japan	Sasebo	118	126	135	164	190	203	218	265
		Tokyo	118	126	135	164	190	203	218	265
		COMFLTACT Yokosuka	118	126	135	164	190	203	218	265
		Yokota AFB, Honshu	118	126	135	164	190	203	218	265
		Camp Zama	118	126	135	164	190	203	218	265
	Kuwait	Kuwait City	100 (0)	110 (0)	115 (0)	140 (0)	161 (0)	177 (0)	185 (0)	225 (0)
	Oman	Areas south and west of Jabal Akehadar								
		- Ibri	124	133	142	173	199	214	229	278
		- Nazwa	124	133	142	173	199	214	229	278
		Batinah Coast								
		- Ash Shinash	124	133	142	173	199	214	229	278
		- Sib	124	133	142	173	199	214	229	278
		- Suhar	124	133	142	173	199	214	229	278
		Central, Southern, and Coastal Areas Sur to Sarfait								
		- Barik	136	145	156	189	218	234	250	304
		- Dawqa	136	145	156	189	218	234	250	304

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a) Risk Category I	II	III-IV	V	Wind Speed (km/h) - Note (a) Risk Category I	II	III-IV	V
		- Hayma	136	145	156	189	218	234	250	304
Asia	Oman	- Salalah	136	145	156	189	218	234	250	304
		- Shalim	136	145	156	189	218	234	250	304
		High Jabal Locations								
		- Miskin	136	145	156	189	218	234	250	304
		- Sumail	136	145	156	189	218	234	250	304
		- Rikshah	136	145	156	189	218	234	250	304
		- Shaww	136	145	156	189	218	234	250	304
		Kuria Muria Island	141	152	162	197	228	244	261	318
		Masirah Island	141	152	162	197	228	244	261	318
		Mussandam Island	141	152	162	197	228	244	261	318
	Pakistan	Peshawar	104	111	119	145	167	179	192	233
	Qatar	Doha	100 (0)	110 (0)	115 (0)	140 (0)	161 (0)	177 (0)	185 (0)	225 (0)
	Saudi Arabia	Dhahran	103	110	118	143	165	177	189	230
	Saudi Arabia	Hafr al Batin	100 (94)	110 (101)	115 (108)	140 (132)	161 (152)	177 (163)	185 (174)	225 (212)
		Khamis Mushayt	100 (94)	110 (101)	115 (108)	140 (132)	161 (152)	177 (163)	185 (174)	225 (212)
		Jeddah	100 (94)	110 (101)	115 (108)	140 (132)	161 (152)	177 (163)	185 (174)	225 (212)

TABLE F-1

			Wind Speed (mph) - Note (a)				Wind Speed (km/h) - Note (a)			
			Risk Category				Risk Category			
Continent / Region	**Country**	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
Asia	**Saudi Arabia**	Jubail	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
		Qadimah	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
		Riyadh	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
		Tabuk	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
	South Korea	Camp Casey	**124**	**133**	**142**	**173**	**199**	**214**	**229**	**278**
		Camp Hialeah, Busan	**130**	**139**	**149**	**181**	**209**	**224**	**239**	**291**
		Camp Humphreys / Pyongtaek	**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
		Chinhae	**124**	**133**	**142**	**173**	**199**	**214**	**229**	**278**
		Kimpo AFB	**124**	**133**	**142**	**173**	**199**	**214**	**229**	**278**
		Kunsan / Kunsan City	**118**	**126**	**135**	**164**	**190**	**203**	**218**	**265**
		Osan AFB / Songtan	**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
		Pohang	**130**	**139**	**149**	**181**	**209**	**224**	**239**	**291**
		Seoul	**124**	**133**	**142**	**173**	**199**	**214**	**229**	**278**
		Taegu	**136**	**145**	**156**	**189**	**218**	**234**	**250**	**304**
		Uijongbu	**124**	**133**	**142**	**173**	**199**	**214**	**229**	**278**

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a) Risk Category I	II	III-IV	V	Wind Speed (km/h) - Note (a) Risk Category I	II	III-IV	V
Asia	**South Korea**	Yongsan	**124**	**133**	**142**	**173**	**199**	**214**	**229**	**278**
	Vietnam	Da Nang	**141**	**152**	**162**	**197**	**228**	**244**	**261**	**318**
		Ho Chi Minh City	**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
		Nha Trang	**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
	Taiwan	Tainan	**141**	**152**	**162**	**197**	**228**	**244**	**261**	**318**
		Taipei	**153**	**164**	**176**	**214**	**247**	**264**	**283**	**344**
		Tsoying	**130**	**139**	**149**	**181**	**209**	**224**	**239**	**291**
	Thailand	Bangkok	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
		Chiang Mai	**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
		Sattahip	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
		Udonthani	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
	Turkey	Ankara	**117**	**125**	**134**	**163**	**188**	**201**	**215**	**262**
		Incirlik AB / Adana	**100 (83)**	**110 (88)**	**115 (95)**	**140 (115)**	**161 (133)**	**177 (142)**	**185 (152)**	**225 (185)**
		Izmir AS	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Karamursel	**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
Central America	**Canal Zone**		**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
Europe	**Belgium**	Brussels	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Kester	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Kleine Brogel	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a) Risk Category I	II	III-IV	V	Wind Speed (km/h) - Note (a) Risk Category I	II	III-IV	V
Europe	**Belgium**	Shape - Chievres	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
	Bosnia - Herzegovina	Tuzla AFB	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
	England	RAF Alconbury, Molesworth / Huntingdon	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Birmingham	**105**	**112**	**120**	**146**	**169**	**181**	**194**	**236**
		RAF Croughton / Brackley	**118**	**126**	**135**	**164**	**190**	**203**	**218**	**265**
		RAF Fairford	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		RAF Lakenheath / Lakeheath Village	**118**	**126**	**135**	**164**	**190**	**203**	**218**	**265**
		USNA UK / London	**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
		RAF Menwith Hill / Harrogate	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		RAF Mildenhall	**123**	**131**	**141**	**171**	**197**	**211**	**226**	**275**
		Plymouth	**111**	**119**	**127**	**155**	**178**	**191**	**205**	**249**
		RAF Upwood / Ramsey	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a) Risk Category I	II	III-IV	V	Wind Speed (km/h) - Note (a) Risk Category I	II	III-IV	V
Europe	**England**	JMF St. Mawgan / Cornwall	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Sculthorpe AB	**117**	**125**	**134**	**163**	**188**	**201**	**215**	**262**
		Southport	**123**	**131**	**141**	**171**	**197**	**211**	**226**	**275**
		South Shields	**117**	**125**	**134**	**163**	**188**	**201**	**215**	**262**
		Spurn Head	**117**	**125**	**134**	**163**	**188**	**201**	**215**	**262**
	Germany	Ansbach	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Bamberg	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Baumholder	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Bremen	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
		Buechel Air Base / Cochem	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Darmstadt	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Garmisch AST	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Geilenkirchen	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Grafenwoehr	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		Hanau	**100 (65)**	**110 (69)**	**115 (74)**	**140 (90)**	**161 (104)**	**177 (112)**	**185 (120)**	**225 (146)**
		Heidelberg	**100 (65)**	**110 (69)**	**115 (74)**	**140 (90)**	**161 (104)**	**177 (112)**	**185 (120)**	**225 (146)**
		Hohenfels	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Illesheim	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a) Risk Category I	II	III-IV	V	Wind Speed (km/h) - Note (a) Risk Category I	II	III-IV	V
Europe	**Germany**	Kaiserslautern	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Kalkar	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Mannheim	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Munich	**116**	**124**	**133**	**161**	**186**	**199**	**213**	**259**
		Ramstein AB	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Rhein-Main Air Base	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
		Schweinfurt	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Spangdahlem Air Base	**100 (65)**	**110 (69)**	**115 (74)**	**140 (90)**	**161 (104)**	**177 (112)**	**185 (120)**	**225 (146)**
		Stuttgart	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		Vilseck	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Wiesbaden / Mainz / Dexheim	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Wuerzburg / Kitzingen / Giebelstadt	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
	Greece	Athens	**108**	**116**	**124**	**151**	**175**	**187**	**200**	**243**
		Larissa	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		NAS Souda Bay / Mouzouras	**101**	**110**	**116**	**141**	**163**	**177**	**187**	**228**
	Iceland	Keflavik - NSA	**136**	**145**	**156**	**189**	**218**	**234**	**250**	**304**
		Thorshofn	**172**	**184**	**197**	**240**	**277**	**297**	**318**	**386**

TABLE F-1

			Wind Speed (mph) - Note (a)				Wind Speed (km/h) - Note (a)			
			Risk Category				Risk Category			
Continent / Region	**Country**	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
Europe	**Italy**	Aviano AB	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
		Brindisi / San Vito	**130**	**139**	**149**	**181**	**209**	**224**	**239**	**291**
		Camp Darby Livorno	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Gaeta - NSA	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
		Ghedi	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		NSA La Maddalena	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
		NSA Naples	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
		Niscemi	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		NAS Sigonella	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		Vicenza	**100 (94)**	**110 (101)**	**115 (108)**	**140 (132)**	**161 (152)**	**177 (163)**	**185 (174)**	**225 (212)**
	Netherlands	Volkel Air Base	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		AF North Brunssum	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		Schinnen	**100 (83)**	**110 (88)**	**115 (95)**	**140 (115)**	**161 (133)**	**177 (142)**	**185 (152)**	**225 (185)**
	Northern Ireland	Londonderry	**157**	**168**	**180**	**219**	**252**	**270**	**289**	**352**

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a) Risk Category I	II	III-IV	V	Wind Speed (km/h) - Note (a) Risk Category I	II	III-IV	V
Europe	**Norway**	Stavanger	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
	Portugal	Azores / Lajes Field	**141**	**152**	**162**	**197**	**228**	**244**	**261**	**318**
		Southlant / Oeiras	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
	Scotland	Aberdeen	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		Edinburgh	**117**	**125**	**134**	**163**	**188**	**201**	**215**	**262**
		Edzell	**100**	**110**	**115**	**140**	**161**	**177**	**185**	**225**
		Glasgow	**117**	**125**	**134**	**163**	**188**	**201**	**215**	**262**
		Prestwick	**118**	**126**	**135**	**164**	**190**	**203**	**218**	**265**
		Stornoway	**141**	**152**	**162**	**197**	**228**	**244**	**261**	**318**
		Thurso	**124**	**133**	**142**	**173**	**199**	**214**	**229**	**278**
	Spain	Madrid / JHQ SW	**100 (98)**	**110 (105)**	**115 (112)**	**140 (136)**	**161 (157)**	**177 (169)**	**185 (181)**	**225 (220)**
		Moron AB	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
		NS Rota	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		San Pablo	**138**	**148**	**158**	**192**	**222**	**238**	**255**	**310**
		HRF Valencia	**100 (0)**	**110 (0)**	**115 (0)**	**140 (0)**	**161 (0)**	**177 (0)**	**185 (0)**	**225 (0)**
	Spain	Zaragoza	**138**	**148**	**158**	**192**	**222**	**238**	**255**	**310**
North America	**Canada**	Argentia NAS, Newfoundland	**136**	**145**	**156**	**189**	**218**	**234**	**250**	**304**
		Churchill, Manitoba	**126**	**135**	**145**	**176**	**203**	**218**	**233**	**283**

TABLE F-1

			Wind Speed (mph) - Note (a)				Wind Speed (km/h) - Note (a)			
			Risk Category				Risk Category			
Continent / Region	**Country**	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
North America	**Canada**	Cold Lake, Alberta	**100 (95)**	**110 (102)**	**115 (110)**	**140 (133)**	**161 (154)**	**177 (165)**	**185 (176)**	**225 (214)**
		Edmonton, Alberta	**100 (99)**	**110 (106)**	**115 (114)**	**140 (138)**	**161 (159)**	**177 (171)**	**185 (183)**	**225 (222)**
		E. Harmon AFB, Newfoundland	**133**	**143**	**153**	**186**	**214**	**230**	**246**	**299**
		Fort William, Ontario	**100 (95)**	**110 (102)**	**115 (110)**	**140 (133)**	**161 (154)**	**177 (165)**	**185 (176)**	**225 (214)**
		Frobisher, NWT	**126**	**135**	**145**	**176**	**203**	**218**	**233**	**283**
		Goose Airport, Newfoundland	**105**	**112**	**120**	**146**	**169**	**181**	**194**	**236**
		Ottawa, Ontario	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		St. John's, Newfoundland	**134**	**144**	**154**	**187**	**216**	**232**	**248**	**302**
		Toronto, Ontario	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		Winnipeg, Manitoba	**100 (97)**	**110 (104)**	**115 (111)**	**140 (135)**	**161 (156)**	**177 (167)**	**185 (178)**	**225 (217)**
	Greenland	Narsarssuak AB	**164**	**176**	**188**	**229**	**264**	**283**	**303**	**368**
		Simiutak AB	**196**	**210**	**224**	**273**	**315**	**338**	**361**	**439**
		Sondrestrom AB	**141**	**152**	**162**	**197**	**228**	**244**	**261**	**318**

TABLE F-1

Continent / Region	Country	Base / City	Wind Speed (mph) - Note (a) Risk Category I	II	III-IV	V	Wind Speed (km/h) - Note (a) Risk Category I	II	III-IV	V
North America	Greenland	Thule AB	159	171	183	222	256	275	294	357
Atlantic Ocean	Ascension Island		100 (79)	110 (85)	115 (91)	140 (110)	161 (127)	177 (136)	185 (146)	225 (177)
Caribbean Sea	The Bahamas	Eleuthera Island	174	187	200	243	281	301	322	392
		Grand Bahama Island	174	187	200	243	281	301	322	392
		Grand Turk Island	190	203	218	265	305	327	350	426
Caribbean Sea	The Bahamas	Great Exuma Island	174	187	200	243	281	301	322	392
	Cuba	NS Guantanamo Bay	124	133	142	173	199	214	229	278
	Trinidad Island	Port of Spain	100 (70)	110 (75)	115 (80)	140 (97)	161 (112)	177 (120)	185 (128)	225 (156)
Indian Ocean	British Indian Ocean Territory	NSF Diego Garcia	124	133	142	173	199	214	229	278
Pacific Ocean	Australia	H.E. Holt / N.W. Cape	153	164	176	214	247	264	283	344
		Woomera	100 (94)	110 (101)	115 (108)	140 (132)	161 (152)	177 (163)	185 (174)	225 (212)
	Caroline Islands	Koror, Paulau Islands	112	120	128	156	180	193	207	251

TABLE F-1

			Wind Speed (mph) - Note (a)				Wind Speed (km/h) - Note (a)			
			Risk Category				Risk Category			
Continent / Region	**Country**	**Base / City**	**I**	**II**	**III-IV**	**V**	**I**	**II**	**III-IV**	**V**
Pacific Ocean	**Caroline Islands**	Ponape	**130**	**139**	**149**	**181**	**209**	**224**	**239**	**291**
	Johnston Atoll		**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
	Marcus Island		**177**	**190**	**203**	**247**	**285**	**305**	**326**	**397**
	Marshall Islands	Kwajalein	**124**	**133**	**142**	**173**	**199**	**214**	**229**	**278**
		Wake Island	**130**	**139**	**149**	**181**	**209**	**224**	**239**	**291**
	Midway Island		**112**	**120**	**128**	**156**	**180**	**193**	**207**	**251**
	Philipine Islands	Clark AFB	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		Sangley Point	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
		Subic Bay	**106**	**114**	**122**	**148**	**171**	**183**	**196**	**238**
	Samoa	Apia / Upolu	**177**	**190**	**203**	**247**	**285**	**305**	**326**	**397**

Notes to Table F-1, "WIND LOADING DATA – OUTSIDE OF THE UNITED STATES, ITS TERRITORIES AND POSSESSIONS"

Note (a) – Use a minimum wind speed of 100 mph (161 km/h) for Risk Category I, 110 mph (177 km/h) for Risk Category II, 115 mph (185 km/h) for Risk Category III and IV or 140 mph (225 km/h) for Risk Category V for all locations unless a lower wind speed is approved by the AHJ. Wind speeds shown in parenthesis are local data that are less than the minimum wind speed and may only be used if approved by the AHJ. Where there is a zero in the parenthesis, no local data is currently available.

Table F-2 Snow Loading and Frost Penetration Data – Outside of The United States, Its Territories and Possessions

TABLE F-2

Continent / Region	Country	Base / City	Ground Snow (psf)	Frost Penetration (a) (in)	Ground Snow (kPa)	Frost Penetration (a) (mm)
Africa	**Djibouti**	Djibouti	**0**	**0**	**0**	**0**
	Egypt	Alexandria	**0**	**0**	**0**	**0**
	Morocco	Casablanca	**0**	**0**	**0**	**0**
Asia	**Afghanistan**	Kabul				
	Bahrain	NSA Bahrain	**0**	**0**	**0**	**0**
	India	Bombay (Mumbai)	**0**	**0**	**0**	**0**
		Calcutta (Kolkata)	**0**	**0**	**0**	**0**
		Madras (Chennai)	**0**	**0**	**0**	**0**
		New Delhi	**0**	**0**	**0**	**0**
	Iraq	Baghdad				
		Basra				
	Japan	NAF Atsugi	**21**	**6**	**1**	**152**
		MCAS Iwakuni	**12**	**10**	**0.57**	**254**
		Iwo Jima	**0**	**0**	**0**	**0**
		Misawa AFB	**58**	**30**	**2.78**	**762**
		Okinawa (All installations)	**0**	**0**	**0**	**0**
Asia	**Japan**	Sagamihara	**21**	**6**	**1**	**152**
		Sasebo	**12**	**6**	**0.57**	**152**
		Tokyo	**15**	**6**	**0.71**	**152**
		COMFLTACT Yokosuka	**12**	**6**	**0.57**	**152**
		Yokota AFB, Honshu	**21**	**6**	**1**	**161**
		Camp Zama	**21**	**6**	**1.00**	**152**
	Kuwait	Kuwait City	**0**	**0**	**0**	**0**
	Oman	Areas south and west of				

TABLE F-2

Continent / Region	Country	Base / City	Ground Snow (psf)	Frost Penetration (a) (in)	Ground Snow (kPa)	Frost Penetration (a) (mm)
		Jabal Akehadar				
		- Ibri	**0**	**0**	**0**	**0**
		- Nazwa	**0**	**0**	**0**	**0**
		Batinah Coast				
		- Ash Shinash	**0**	**0**	**0**	**0**
		- Sib	**0**	**0**	**0**	**0**
		- Suhar	**0**	**0**	**0**	**0**
		Central, Southern, and Coastal Areas Sur to Sarfait				
		- Barik	**0**	**0**	**0**	**0**
Asia	**Oman**	- Dawqa	**0**	**0**	**0**	**0**
		- Hayma	**0**	**0**	**0**	**0**
		- Salalah	**0**	**0**	**0**	**0**
		- Shalim	**0**	**0**	**0**	**0**
		High Jabal Locations				
		- Miskin	**0**	**0**	**0**	**0**
		- Sumail	**0**	**0**	**0**	**0**
		- Rikshah	**0**	**0**	**0**	**0**
		- Shaww	**0**	**0**	**0**	**0**
		Kuria Muria Island	**0**	**0**	**0**	**0**
		Masirah Island	**0**	**0**	**0**	**0**
		Mussandam Island	**0**	**0**	**0**	**0**
	Pakistan	Peshawar	**10**	**6**	**0.48**	**152**
	Qatar	Doha	**0**	**0**	**0**	**0**
	Saudi Arabia	Dhahran	**0**	**0**	**0**	**0**
		Hafr al Batin	**0**	**0**	**0**	**0**
		Khamis Mushayt	**0**	**0**	**0**	**0**

TABLE F-2

Continent / Region	Country	Base / City	Ground Snow (psf)	Frost Penetration (a) (in)	Ground Snow (kPa)	Frost Penetration (a) (mm)
		Jeddah	0	0	0	0
		Jubail	0	0	0	0
Asia	Saudi Arabia	Qadimah	0	0	0	0
		Riyadh	0	0	0	0
		Tabuk	0	0	0	0
	South Korea	Camp Casey	20	48	0.96	1219
		Camp Hialeah, Pusan	20	24	0.96	610
		Camp Humphreys / Pyongtaek	20	45	0.96	1143
		Chinhae	20	24	0.96	610
		Kimpo AFB	20	48	0.96	1219
		Kunsan / Kunsan City	20	30	0.96	762
		Osan AFB / Songtan	20	45	0.96	1143
		Pohang	20	24	0.96	610
		Seoul	20	48	0.96	1219
		Taegu	20	40	0.96	1016
		Uijongbu	20	48	0.96	1219
		Yongsan	20	45	0.96	1143
	Vietnam	Da Nang	0	0	0	0
		Ho Chi Minh City	0	0	0	0
		Nha Trang	0	0	0	0
Asia	Taiwan	Tainan	0	0	0	0
		Taipei	0	0	0	0
		Tsoying	0	0	0	0
	Thailand	Bangkok	0	0	0	0
		Chiang Mai	0	0	0	0
		Sattahip	0	0	0	0
		Udonthani	0	0	0	0
	Turkey	Ankara	20	24	0.96	610

TABLE F-2

Continent / Region	Country	Base / City	Ground Snow (psf)	Frost Penetration (a) (in)	Ground Snow (kPa)	Frost Penetration (a) (mm)
		Incirlik AB / Adana	**0**	**5**	**0**	**127**
		Izmir AS				
		Karamursel	**15**	**12**	**0.72**	**305**
Central America	**Canal Zone**		**0**	**0**	**0**	**0**
Europe	**Belgium**	Brussels				
		Kester				
		Kleine Brogel				
		Shape - Chievres				
	Bosnia - Herzegovina	Tulza AFB				
Europe	**England**	RAF Alconbury, Molesworth / Huntingdon				
		Birmingham	**15**	**12**	**0.72**	**305**
		RAF Croughton / Brackley	**15**	**15**	**0.72**	**381**
		RAF Fairford				
		RAF Lakenheath / Lakeheath Village	**15**	**15**	**0.72**	**381**
		USNA UK / London	**15**	**12**	**0.72**	**305**
		RAF Menwith Hill / Harrogate				
		RAF Mildenhall	**15**	**12**	**0.72**	**305**
		Plymouth	**10**	**12**	**0.48**	**305**
		RAF Upwood / Ramsey				
		JMF St. Mawgan / Cornwall				
		Sculthorpe AB	**15**	**12**	**0.72**	**305**

TABLE F-2

Continent / Region	Country	Base / City	Ground Snow (psf)	Frost Penetration (a) (in)	Ground Snow (kPa)	Frost Penetration (a) (mm)
Europe	**England**	Southport	**10**	**12**	**0.48**	**305**
		South Shields	**15**	**12**	**0.72**	**305**
		Spurn Head	**15**	**12**	**0.72**	**305**
	Germany	Ansbach				
		Bamberg				
		Baumholder				
		Bremen	**25**	**30**	**1.2**	**762**
		Buechel Air Base / Cochem				
		Darmstadt				
		Garmisch AST				
		Geilenkirchen				
		Grafenwoehr	**25**	**0**	**1.2**	**0**
		Hanau	**25**	**25**	**1.2**	**635**
		Heidelberg	**25**	**30**	**1.2**	**762**
		Hohenfels				
		Illesheim				
		Kaiserslautern				
		Kalkar				
		Mannheim				
		Munich	**40**	**36**	**1.92**	**914**
Europe	**Germany**	Ramstein AB				
		Rhein-Main Air Base	**25**	**30**	**1.2**	**762**
		Schweinfurt				
		Spangdahlem Air Base	**25**	**30**	**1.2**	**762**
		Stuttgart	**45**	**36**	**2.16**	**914**
		Vilseck				
		Wiesbaden / Mainz / Dexheim				

TABLE F-2

Continent / Region	Country	Base / City	Ground Snow (psf)	Frost Penetration (a) (in)	Ground Snow (kPa)	Frost Penetration (a) (mm)
		Wuerzburg / Kitzingen / Giebelstadt	25	35	1.2	889
	Greece	Athens	5	0	0.24	0
		Larissa				
		NAS Soudi Bay / Mouzouras	5	0	0.24	0
	Iceland	Keflavik - NSA	30	24	1.44	610
	Iceland	Thorshofn	30	36	1.44	914
	Italy	Aviano AB	35	18	1.68	457
		Brindisi / San Vito	5	6	0.24	152
Europe	Italy	Camp Darby Livorno				
		Gaeta - NSA	20	0	0.96	0
		Ghedi				
		NSA La Maddalena	20	5	0.96	127
		NSA Naples	20	5	0.96	127
		Niscemi	20	5	0.96	127
		NAS Sigonella	20	5	0.96	127
		Vicenza	35	25	1.68	635
	Netherlands	Volkel Air Base				
		AF North Brunssum				
		Schinnen	15	20	0.72	508
	Northern Ireland	Londonderry	15	12	0.72	305
	Norway	Stavanger				
	Portugal	Azores / Lajes Field	0	0	0	0
		Southlant / Oeiras				
	Scotland	Aberdeen	15	12	0.72	305
		Edinburgh	15	12	0.72	305

TABLE F-2

Continent / Region	Country	Base / City	Ground Snow (psf)	Frost Penetration (a) (in)	Ground Snow (kPa)	Frost Penetration (a) (mm)
Europe	**Scotland**	Edzell	**15**	**12**	**0.72**	**305**
		Glasgow	**15**	**12**	**0.72**	**305**
		Prestwick	**15**	**12**	**0.72**	**305**
		Stornoway	**15**	**12**	**0.72**	**305**
		Thurso	**15**	**12**	**0.72**	**305**
	Spain	Madrid / JHQ SW	**10**	**6**	**0.48**	**152**
		Moron AB				
		NS Rota	**5**	**5**	**0.24**	**127**
		San Pablo	**5**	**6**	**0.24**	**152**
		HRF Valencia				
		Zaragoza	**10**	**6**	**0.48**	**152**
North America	**Canada**	Argentia NAS, Newfoundland	**47**	**36**	**2.25**	**914**
		Churchill, Manitoba	**66**	**permafrost**	**3.16**	**permafrost**
		Cold Lake, Alberta	**41**	**72**	**1.96**	**1829**
		Edmonton, Alberta	**27**	**60**	**1.29**	**1524**
		E. Harmon AFB, Newfoundland	**86**	**60**	**4.12**	**1524**
		Fort William, Ontario	**73**	**60**	**3.5**	**1524**
North America	**Canada**	Frobisher, NWT	**50**	**permafrost**	**2.4**	**permafrost**
		Goose Airport, Newfoundland	**100**	**60**	**4.79**	**1524**
		Ottawa, Ontario	**60**	**48**	**2.87**	**1219**
		St. John's, Newfoundland	**72**	**36**	**3.45**	**914**
		Toronto, Ontario	**40**	**36**	**1.92**	**914**
		Winnipeg, Manitoba	**45**	**60**	**2.16**	**1524**

TABLE F-2

Continent / Region	Country	Base / City	Ground Snow (psf)	Frost Penetration (a) (in)	Ground Snow (kPa)	Frost Penetration (a) (mm)
	Greenland	Narsarssuak AB	**30**	**60**	**1.44**	**1524**
		Simiutak AB	**25**	**60**	**1.2**	**1524**
		Sondrestrom AB	**20**	**permafrost**	**0.96**	**permafrost**
		Thule AB	**25**	**permafrost**	**1.2**	**permafrost**
Atlantic Ocean	**Ascension Island**		**0**	**0**	**0**	**0**
Caribbean Sea	**The Bahamas**	Eleuthera Island	**0**	**0**	**0**	**0**
		Grand Bahama Island	**0**	**0**	**0**	**0**
Caribbean Sea	**The Bahamas**	Grand Turk Island	**0**	**0**	**0**	**0**
		Great Exuma Island	**0**	**0**	**0**	**0**
	Cuba	NS Guantanamo Bay	**0**	**0**	**0**	**0**
	Trinidad Island	Port of Spain	**0**	**0**	**0**	**0**
Indian Ocean	**British Indian Ocean Territory**	NSF Diego Garcia	**0**	**0**	**0**	**0**
Pacific Ocean	**Australia**	H.E. Holt / N.W. Cape	**0**	**0**	**0**	**0**
		Darwin	**0**	**0**	**0**	**0**
		Woomera	**0**	**0**	**0**	**0**
	Caroline Islands	Koror, Paulau Islands	**0**	**0**	**0**	**0**
		Ponape	**0**	**0**	**0**	**0**
	Johnston Atoll		**0**	**0**	**0**	**0**
	Marcus Island		**0**	**0**	**0**	**0**
	Marshall Islands	Kwajalein	**0**	**0**	**0**	**0**
		Wake Island	**0**	**0**	**0**	**0**
Pacific Ocean	**Midway Island**		**0**	**0**	**0**	**0**

TABLE F-2

Continent / Region	Country	Base / City	Ground Snow (psf)	Frost Penetration (a) (in)	Ground Snow (kPa)	Frost Penetration (a) (mm)
	Philipine Islands	Clark AFB	**0**	**0**	**0**	**0**
		Sangley Point	**0**	**0**	**0**	**0**
		Subic Bay	**0**	**0**	**0**	**0**
	Samoa	Apia / Upolu	**0**	**0**	**0**	**0**

Notes to Table F-2, "Snow Loading and Frost Penetration Data – Outside of The United States, Its Territories and Possessions"

(a) – See best practice B-2.3 for footing depths considering frost.

Table F-3 Earthquake Loading Data – Outside of The United States, Its Territories and Possessions

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Africa	**Algeria**	Algiers	**38**	**101**	**48**			**53**	**25**		
		Oran	**24**	**63**	**30**			**33**	**16**		
	Angola	Luanda	**2**	**6**	**3**			**3**	**1**		
	Benin	Cotonou	**4**	**11**	**5**			**6**	**3**		
	Botswana	Gaborone	**1**	**3**	**1**			**1**	**1**		
	Burkino Faso	Ougadougou	**18**	**46**	**22**			**24**	**11**		
	Burundi	Bujumbura	**26**	**69**	**33**			**36**	**17**		
	Cameroon	Douala	**6**	**17**	**8**			**9**	**4**		
		Yaounde	**10**	**27**	**13**			**14**	**7**		
	Central African Republic	Bangui	**10**	**27**	**13**			**14**	**7**		
	Chad	N'Djamena	**2**	**6**	**3**			**3**	**1**		
	Congo	Brazzaville	**4**	**10**	**5**			**6**	**3**		
	Democratic Republic of the Congo	Bukavu	**30**	**78**	**37**			**41**	**19**		
		Kinshasa	**5**	**10**	**2**			**4**	**1**		
		Lubumbashi	**15**	**39**	**19**			**21**	**10**		
Africa	**Cote d'Ivoire**	Abidjan	**1**	**4**	**2**			**2**	**1**		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
	Djibouti	Djibouti	**39**	**102**	**41**			**48**	**21**		
	Egypt	Alexandria	**9**	**24**	**12**			**12**	**7**		
		Cairo	**27**	**71**	**33**			**37**	**17**		
		Port Said	**26**	**68**	**32**			**36**	**17**		
	Equatorial Guinea	Malabo	**6**	**17**	**8**			**9**	**4**		
	Eritrea	Asmara	**17**	**45**	**21**			**24**	**11**		
	Ethiopia	Addis Ababa	**22**	**58**	**27**			**30**	**14**		
	Gabon	Libreville	**10**	**27**	**13**			**14**	**7**		
	Gambia	Banjul	**4**	**10**	**5**			**6**	**3**		
	Ghana	Accra	**14**	**37**	**18**			**20**	**9**		
	Guinea	Conakry	**14**	**38**	**18**			**20**	**9**		
	Guinea-Bissau	Bissau	**0.4**	**1**	**0.5**			**1**	**0.3**		
	Kenya	Nairobi	**12**	**32**	**15**			**17**	**8**		
	Lesotho	Maseru	**3**	**7**	**3**			**3**	**2**		
	Liberia	Monrovia	**9**	**22**	**11**			**12**	**6**		
	Libya	Tripoli	**23**	**60**	**28**			**31**	**15**		
	Madagascar	Antananarivo	**7**	**19**	**9**			**10**	**5**		
	Malawi	Blantyre	**19**	**49**	**23**			**25**	**12**		
		Lilongwe	**11**	**28**	**13**			**15**	**7**		
		Zomba	**19**	**51**	**24**			**27**	**13**		
Africa	**Mali**	Bamako	**5**	**10**	**2**			**4**	**1**		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
	Mauritania	Nouakchott	**3**	**8**	**4**			**4**	**2**		
	Morocco	Casablanca	**10**	**26**	**12**			**14**	**7**		
		Kenitra	**11**	**28**	**13**			**15**	**7**		
		Rabat	**10**	**27**	**13**			**14**	**7**		
		Tangier	**18**	**47**	**22**			**24**	**12**		
	Mozambique	Maputo	**4**	**11**	**5**			**6**	**3**		
	Niger	Niamey	**0.1**	**0.2**	**0.1**			**0.1**	**0.1**		
	Nigeria	Ibadan									
		Kaduna	**2**	**6**	**3**			**3**	**1**		
		Lagos	**0.1**	**0.3**	**0.1**			**0.1**	**0.1**		
	Rwanda	Kigali	**11**	**29**	**14**			**15**	**7**		
	Senegal	Dakar	**3**	**8**	**4**			**4**	**2**		
	Sierra Leone	Freetown	**14**	**37**	**17**			**19**	**9**		
	Somalia	Mogadishu	**4**	**10**	**5**			**6**	**3**		
	South Africa	Cape Town	**10**	**27**	**13**			**14**	**7**		
		Durban	**11**	**30**	**14**			**16**	**7**		
		Johannesburg	**1**	**3**	**1**			**2**	**1**		
		Natal	**3**	**7**	**3**			**4**	**2**		
		Pretoria	**1**	**3**	**1**			**2**	**1**		
	Swaziland	Mbabane	**7**	**19**	**9**			**10**	**5**		
Africa	**Tanzania**	Dar es Salaam	**7**	**18**	**8**			**9**	**4**		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
		Zanzibar	5	12	6			6	3		
	Togo	Lome	15	39	19			21	10		
	Tunisia	Tunis	36	95	45			50	24		
	Uganda	Kampala	18	46	22			24	11		
	Zambia	Lusaka	9	23	11			12	6		
	Zimbabwe	Harare	2	6	3			3	1		
Asia	**Afghanistan**	Bagram	66	146	84			73	35		
		Gardeyz	26	63	30			35	17		
		Herat	26	62	32			16	5		
		Jalalabad	45	106	39			59	21		
		Kabul	48	111	58			61	28		
		Kandahar	13	32	19			18	10		
		Lashkar Gah	7	16	11			9	5		
		Mazar-e Sharif	33	78	27			41	15		
		Pol-e Charkhi	42	100	47			57	26		
		Qalat	35	79	45			41	20		
	Bahrain	Manama	11	28	13			15	7		
		NSA Bahrain	12	32	15			17	8		
	Bangladesh	Dhaka	28	73	34			38	18		
	Brunei	Bandar Seri Begawan	15	39	18			20	10		
Asia	**Burma**	Mandalay	80	211	100			111	52		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
		Rangoon	31	81	38			42	20		
	China	Beijing (Peking)	22	59	28			31	15		
		Chengdu	18	46	22			24	11		
		Chongqing	3	9	4			5	2		
		Guangzhou (Canton)	5	14	7			7	4		
		Harbin	5	13	6			7	3		
		Nanjing	9	25	12			13	6		
		Qingdao (Tsingtao)	13	33	16			17	8		
		Shanghai	7	18	9			10	5		
		Shenyang	35	93	44			49	23		
		Tianjin (Tientsan)	29	76	36			40	19		
		Wuhan	3	8	4			4	2		
	Hong Kong	Hong Kong	5	13	6			7	3		
	India	Bombay (Mumbai)	10	27	12			14	7		
		Calcutta (Kolkata)	20	52	25			28	13		
		Madras (Chennai)	6	15	7			8	4		
		New Delhi	28	74	35			39	18		
	Indonesia	Bandung	66	172	82			90	43		
		Jakarta	55	145	68			76	36		
		Medan	45	117	55			61	29		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Asia	**Indonesia**	Surabaya	**39**	**101**	**48**			**53**	**25**		
	Iran	Isfahan	**36**	**95**	**45**			**50**	**24**		
		Shiraz	**69**	**182**	**86**			**95**	**45**		
		Tabriz	**72**	**190**	**90**			**100**	**47**		
		Tehran	**82**	**215**	**102**			**113**	**53**		
	Iraq	Baghdad	**50**	**130**	**70**			**68**	**38**		
		Basra	**39**	**103**	**49**			**54**	**26**		
		Kirkuk	**66**	**173**	**93**			**91**	**49**		
	Israel	Haifa	**55**	**144**	**68**			**75**	**36**		
		Jerusalem	**43**	**112**	**53**			**59**	**28**		
		Tel Aviv	**38**	**100**	**47**			**52**	**25**		
	Japan	NAF Atsugi	**75**	**196**	**93**			**103**	**49**		
		Fukuoka	**27**	**71**	**33**			**37**	**18**		
		Itazuke AFB	**29**	**77**	**36**			**40**	**19**		
		MCAS Iwakuni	**38**	**99**	**47**			**52**	**25**		
		Iwo Jima	**36**	**94**	**45**			**50**	**23**		
		Kobe	**76**	**199**	**94**			**104**	**49**		
		Misawa AFB	**50**	**130**	**69**			**68**	**36**		
		Okinawa (All installations)	**66**	**173**	**93**			**91**	**49**		
		Osaka	**71**	**187**	**88**			**98**	**46**		
		Sagamihara	**75**	**196**	**93**			**103**	**49**		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Asia	**Japan**	Sapporo	**40**	**105**	**50**			**55**	**26**		
		Sasebo	**36**	**95**	**45**			**50**	**23**		
		Tokyo	**75**	**196**	**93**			**103**	**48**		
		COMFLTACT Yokosuka	**75**	**196**	**93**			**103**	**49**		
		Yokohama	**75**	**196**	**93**			**103**	**49**		
		Yokota AFB, Honshu	**80**	**210**	**99**			**110**	**52**		
		Camp Zama	**75**	**196**	**93**			**103**	**49**		
	Jordan	Amman	**28**	**74**	**35**			**39**	**18**		
	Kuwait	Ali Al Salem	**10**	**25**	**12**			**13**	**6**		
		Kuwait City	**22**	**57**	**27**			**30**	**14**		
	Laos	Vientiane	**22**	**57**	**27**			**30**	**14**		
	Lebanon	Beirut	**60**	**157**	**74**			**82**	**39**		
	Malaysia	Kuala Lumpur	**22**	**59**	**28**			**31**	**15**		
	Nepal	Kathmandu	**98**	**258**	**122**			**135**	**64**		
	Oman	Areas south and west of Jabal Akehadar									
		- Ibri	**36**	**96**	**45**			**51**	**23**		
		- Nazwa	**35**	**92**	**44**			**48**	**23**		
		Batinah Coast									
		- Ash Shinash	**66**	**174**	**82**			**91**	**43**		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Asia	**Oman**	- Sib	**52**	**136**	**64**			**72**	**34**		
		- Suhar	**60**	**157**	**74**			**83**	**39**		
		Central, Southern, and Coastal Areas Sur to Sarfait									
		- Barik									
		- Dawqa	**1**	**4**	**1**			**2**	**1**		
		- Hayma									
		- Salalah	**3**	**8**	**4**			**4**	**3**		
		- Shalim									
		High Jabal Locations									
		- Miskin	**43**	**113**	**53**			**59**	**27**		
		- Sumail	**43**	**112**	**53**			**59**	**28**		
		- Rikshah	**39**	**103**	**49**			**54**	**26**		
		- Shaww	**40**	**104**	**50**			**55**	**26**		
		Kuria Muria Island									
		Masirah Island	**8**	**20**	**10**			**10**	**5**		
		Muscat	**49**	**130**	**61**			**68**	**32**		
		Mussandam Island	**90**	**235**	**112**			**123**	**59**		
		Madah	**76**	**199**	**94**			**105**	**49**		
	Pakistan	Islamabad	**52**	**135**	**64**			**71**	**34**		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Asia	**Pakistan**	Karachi	**29**	**77**	**36**			**40**	**19**		
		Lahore	**47**	**123**	**58**			**64**	**30**		
		Peshawar	**42**	**110**	**52**			**58**	**27**		
	Qatar	Doha	**2**	**6**	**7**			**3**	**4**		
	Saudi Arabia	Dhahran	**4**	**10**	**5**			**6**	**3**		
		Hafr al Batin	**6**	**16**	**7**			**8**	**4**		
		Jeddah	**20**	**51**	**25**			**26**	**13**		
		Jubail	**14**	**37**	**17**			**20**	**9**		
		Khamis Mushayt	**2**	**6**	**2**			**3**	**1**		
		Qadimah	**10**	**25**	**12**			**13**	**7**		
		Riyadh	**2**	**6**	**7**			**3**	**4**		
		Tabuk	**11**	**29**	**14**			**15**	**8**		
	Singapore	All	**15**	**39**	**19**			**21**	**10**		
	Sir Lanka	Colombo	**1**	**3**	**1**			**1**	**1**		
	South Korea	Camp Casey	**6**	**16**	**7**			**8**	**4**		
		Camp Hialeah, Busan	**12**	**31**	**15**			**17**	**8**		
		Camp Humphreys / Pyongtaek	**8**	**20**	**9**			**10**	**5**		
		Chinhae	**7**	**18**	**9**			**9**	**4**		
		Kimhae	**7**	**19**	**9**			**10**	**5**		
		Kimpo AFB	**6**	**16**	**7**			**9**	**4**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Asia	**South Korea**	Kunsan / Kunsan City	**7**	**18**	**9**			**9**	**4**		
		Kwangju	**5**	**14**	**6**			**7**	**3**		
		Osan AFB / Songtan	**8**	**20**	**9**			**10**	**5**		
		Pohang	**6**	**15**	**7**			**8**	**4**		
		Seoul	**7**	**18**	**9**			**9**	**4**		
		Taegu	**12**	**30**	**14**			**15**	**8**		
		Uijongbu	**7**	**18**	**9**			**9**	**4**		
		Yongsan / Seoul	**7**	**18**	**9**			**10**	**4**		
	Syria	Aleppo	**26**	**68**	**32**			**35**	**17**		
		Damascus	**32**	**83**	**39**			**43**	**21**		
	Taiwan	Changhua	**110**	**288**	**136**			**151**	**71**		
		Kao-hsiung	**100**	**263**	**124**			**138**	**65**		
		Tainan	**96**	**251**	**119**			**132**	**62**		
		Taipei	**130**	**341**	**161**			**178**	**85**		
		Tsoying	**100**	**263**	**124**			**138**	**65**		
	Thailand	Bangkok	**11**	**29**	**14**			**15**	**8**		
		Chiang Mai	**11**	**29**	**13**			**15**	**7**		
		Sattahip	**8**	**22**	**11**			**12**	**5**		
		Songkhla	**12**	**31**	**15**			**16**	**8**		
		Udonthani	**10**	**25**	**12**			**13**	**7**		
		Udorn	**10**	**25**	**12**			**13**	**6**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Asia	**Turkey**	Ankara	**40**	**104**	**50**			**54**	**26**		
		Incirlik AB / Adana	**42**	**110**	**52**			**57**	**27**		
		Istanbul	**58**	**153**	**72**			**80**	**38**		
		Izmir AS	**97**	**254**	**120**			**133**	**62**		
		Karamursel	**56**	**146**	**69**			**77**	**36**		
	United Arab Emirates	Abu Dhabi	**43**	**112**	**53**			**59**	**28**		
		Dubai	**67**	**177**	**84**			**93**	**44**		
	Vietnam	Da Nang	**7**	**19**	**9**			**10**	**5**		
		Ho Chi Minh City	**6**	**15**	**7**			**8**	**4**		
		Nha Trang	**5**	**13**	**7**			**7**	**4**		
	Yemen	Aden City	**15**	**38**	**18**			**20**	**9**		
		Sanaa	**14**	**36**	**17**			**19**	**9**		
Central America	**Belize**	Belmopan	**21**	**56**	**27**			**29**	**14**		
	Canal Zone		**37**	**97**	**46**			**51**	**25**		
	Costa Rica	San Jose	**112**	**294**	**139**			**154**	**73**		
	El Salvador	San Salvador	**68**	**179**	**85**			**94**	**44**		
	Guatemala	Guatemala	**67**	**177**	**83**			**93**	**44**		
	Honduras	Tegucigalpa	**40**	**105**	**50**			**55**	**26**		
Europe	**Albania**	Tirana	**45**	**117**	**55**			**61**	**29**		
	Austria	Salzburg	**17**	**44**	**21**			**23**	**11**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Europe	**Austria**	Vienna	**20**	**52**	**24**			**27**	**13**		
	Belgium	Antwerp	**8**	**21**	**10**			**11**	**5**		
		Brussels	**13**	**34**	**16**			**18**	**8**		
		Kester	**14**	**38**	**17**			**20**	**9**		
		Kleine Brogel	**12**	**33**	**16**			**18**	**8**		
		Shape - Chievres	**22**	**57**	**27**			**30**	**14**		
	Bosnia - Herzegovina	Tuzla AFB	**37**	**97**	**46**			**51**	**23**		
	Bulgaria	Sofia	**47**	**122**	**58**			**64**	**30**		
	Cyprus	Nicosia	**47**	**124**	**59**			**65**	**31**		
	Czech Republic	Prague	**5**	**13**	**6**			**7**	**3**		
	Denmark	Copenhagen	**5**	**12**	**6**			**6**	**3**		
	England	RAF Alconbury, Molesworth / Huntingdon	**7**	**19**	**9**			**10**	**5**		
		Birmingham	**9**	**23**	**11**			**12**	**5**		
		RAF Croughton / Brackley	**11**	**29**	**14**			**15**	**8**		
		RAF Fairford	**6**	**17**	**7**			**9**	**4**		
		RAF Lakenheath / Lakeheath Village	**6**	**16**	**7**			**9**	**4**		
		Liverpool	**9**	**24**	**11**			**13**	**6**		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Europe	**England**	USNA UK / London	**5**	**13**	**4**			**7**	**1**		
		RAF Menwith Hill / Harrogate	**8**	**22**	**11**			**12**	**5**		
		RAF Mildenhall	**6**	**16**	**7**			**9**	**4**		
		Plymouth	**8**	**21**	**10**			**11**	**5**		
		RAF Upwood / Ramsey	**6**	**17**	**7**			**9**	**4**		
		JMF St. Mawgan / Cornwall	**8**	**21**	**5**			**11**	**3**		
		Sculthorpe AB	**6**	**17**	**7**			**9**	**4**		
		Southport	**9**	**24**	**12**			**13**	**7**		
		South Shields	**4**	**12**	**6**			**7**	**3**		
		Spurn Head	**6**	**17**	**7**			**9**	**4**		
	Finland	Helsinki	**2**	**5**	**2**			**3**	**1**		
	France	Bordeaux	**7**	**17**	**8**			**9**	**4**		
		Istres AFB	**14**	**38**	**18**			**20**	**9**		
		Lyon	**11**	**30**	**14**			**16**	**7**		
		Marseille	**18**	**47**	**22**			**24**	**12**		
		Nice	**17**	**43**	**20**			**23**	**11**		
		Strasbourg	**17**	**45**	**21**			**23**	**11**		
	Germany	Ansbach	**10**	**25**	**12**			**13**	**7**		
		Babenhausen	**14**	**36**	**17**			**19**	**9**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Europe	**Germany**	Bamberg	**8**	**22**	**10**			**11**	**5**		
		Baumholder	**10**	**26**	**12**			**14**	**7**		
		Berlin	**2**	**5**	**2**			**3**	**1**		
		Bonn	**17**	**44**	**21**			**23**	**11**		
		Bremen	**4**	**10**	**5**			**6**	**3**		
		Buechel Air Base / Cochem	**13**	**34**	**16**			**18**	**9**		
		Darmstadt	**16**	**42**	**20**			**22**	**10**		
		Dusseldorf	**12**	**32**	**15**			**17**	**8**		
		Frankfurt am Main	**15**	**40**	**19**			**21**	**10**		
		Garmisch AST	**18**	**48**	**22**			**25**	**12**		
		Geilenkirchen	**22**	**58**	**27**			**30**	**14**		
		Giebelstadt	**9**	**23**	**11**			**12**	**6**		
		Grafenwoehr	**10**	**25**	**12**			**13**	**7**		
		Hamburg	**4**	**10**	**5**			**5**	**2**		
		Hanau	**15**	**40**	**19**			**21**	**10**		
		Heidelberg	**15**	**40**	**19**			**21**	**10**		
		Hohenfels	**10**	**27**	**12**			**14**	**7**		
		Illesheim	**9**	**24**	**12**			**12**	**7**		
		Kaiserslautern	**10**	**26**	**12**			**14**	**7**		
		Kalkar	**9**	**23**	**11**			**12**	**5**		
		Kitzingen	**8**	**22**	**11**			**12**	**5**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Europe	**Germany**	Landstuhl	**9**	**25**	**12**			**13**	**6**		
		Mannheim	**16**	**42**	**20**			**22**	**10**		
		Munich	**10**	**27**	**12**			**14**	**7**		
		Ramstein AB	**10**	**25**	**12**			**13**	**7**		
		Rhein-Main Air Base	**16**	**41**	**20**			**22**	**10**		
		Schweinfurt	**8**	**22**	**10**			**11**	**5**		
		Spangdahlem Air Base	**10**	**25**	**12**			**13**	**7**		
		Stuttgart	**18**	**46**	**22**			**24**	**12**		
		Vaihingen an der Enz	**15**	**41**	**19**			**21**	**10**		
		Vilseck	**9**	**23**	**11**			**12**	**5**		
		Wiesbaden / Mainz / Dexheim	**15**	**40**	**19**			**21**	**10**		
		Wuerzburg / Kitzingen / Giebelstadt	**8**	**22**	**11**			**12**	**5**		
	Greece	Athens	**32**	**85**	**40**			**44**	**21**		
		Kavalla	**43**	**114**	**54**			**60**	**28**		
		Larissa	**56**	**147**	**32**			**77**	**17**		
		Nea Makri	**35**	**91**	**43**			**48**	**22**		
		Rhodes	**55**	**144**	**68**			**75**	**36**		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Europe	**Greece**	NAS Souda Bay / Mouzouras	**48**	**126**	**42**			**66**	**22**		
		Thessaloniki	**57**	**149**	**70**			**78**	**37**		
	Hungary	Budapest	**19**	**49**	**23**			**25**	**12**		
		Taszar AB	**23**	**60**	**29**			**31**	**15**		
	Iceland	Keflavik - NSA	**40**	**105**	**50**			**55**	**26**		
		Reykjavik	**37**	**96**	**46**			**50**	**24**		
		Thorshofn	**20**	**51**	**24**			**26**	**13**		
	Italy	Aviano AB	**46**	**125**	**50**			**67**	**23**		
		Brindisi / San Vito	**7**	**21**	**13**			**13**	**7**		
		Camp Darby Livorno	**21**	**58**	**15**			**34**	**8**		
		Florence	**22**	**62**	**20**			**36**	**11**		
		Gaeta - NSA	**11**	**39**	**25**			**24**	**14**		
		Genoa	**12**	**35**	**11**			**20**	**5**		
		Ghedi	**27**	**75**	**19**			**41**	**10**		
		NSA La Maddalena	**9**	**24**	**12**			**13**	**7**		
		Milan	**8**	**27**	**7**			**16**	**4**		
		NSA Naples	**28**	**79**	**32**			**45**	**18**		
		Niscemi	**29**	**82**	**51**			**37**	**18**		
		Palermo	**30**	**84**	**26**			**46**	**14**		
		Rome	**16**	**52**	**19**			**32**	**10**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Europe	**Italy**	Siculiana	**9**	**29**	**16**			**17**	**9**		
		NAS Sigonella	**55**	**139**	**92**			**64**	**31**		
		Trieste	**19**	**55**	**20**			**32**	**11**		
		Turin	**8**	**28**	**5**			**17**	**2**		
		Vicenza	**27**	**76**	**21**			**43**	**11**		
	Luxembourg	Luxembourg	**9**	**22**	**11**			**12**	**6**		
	Malta	Valletta	**11**	**30**	**14**			**16**	**7**		
	Netherlands	Amsterdam	**5**	**14**	**6**			**7**	**3**		
		AF North Brunssum	**22**	**58**	**27**			**31**	**14**		
		Schinnen	**2**	**6**	**7**			**3**	**4**		
		Volkel Air Base	**12**	**31**	**15**			**17**	**8**		
	Northern Ireland	Belfast	**3**	**9**	**4**			**5**	**2**		
		Londonderry	**3**	**8**	**4**			**4**	**3**		
	Norway	Oslo	**6**	**16**	**7**			**8**	**4**		
		Stavanger	**13**	**34**	**16**			**18**	**8**		
	Poland	Krakow	**8**	**20**	**9**			**10**	**5**		
		Poznan	**2**	**6**	**3**			**3**	**1**		
		Waraszawa	**5**	**12**	**6**			**6**	**3**		
		Warsaw	**4**	**11**	**5**			**6**	**3**		
	Portugal	Azores / Lajes Field	**66**	**173**	**93**			**91**	**49**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Europe	**Portugal**	Lisbon	**27**	**71**	**34**			**37**	**18**		
		Oporto	**26**	**68**	**32**			**35**	**17**		
		Southlant / Oeiras	**24**	**64**	**31**			**34**	**16**		
	Republic of Ireland	Dublin	**4**	**10**	**5**			**5**	**2**		
	Romania	Bucharest	**42**	**110**	**52**			**58**	**27**		
	Russia	Moscow	**3**	**7**	**3**			**4**	**2**		
		St. Petersburg (Leningrad)	**3**	**7**	**3**			**4**	**2**		
	Scotland	Aberdeen	**4**	**10**	**5**			**6**	**3**		
		Edinburgh	**7**	**18**	**9**			**9**	**4**		
		Edzell	**4**	**11**	**5**			**6**	**3**		
		Glasgow	**8**	**22**	**11**			**12**	**5**		
		Hamilton	**7**	**19**	**9**			**10**	**5**		
		Prestwick	**5**	**13**	**6**			**7**	**3**		
		Renfrew	**9**	**23**	**11**			**12**	**6**		
		Stornoway	**4**	**10**	**5**			**6**	**3**		
		Thurso	**4**	**9**	**4**			**4**	**3**		
	Serbia and Montenegro	Belgrade	**39**	**102**	**48**			**53**	**25**		
		Zagrebac	**42**	**109**	**52**			**57**	**27**		
	Slovakia	Bratislava	**22**	**59**	**28**			**31**	**15**		
	Spain	Barcelona	**24**	**63**	**30**			**33**	**16**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
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Europe	**Spain**	Bilbao	**13**	**34**	**16**			**18**	**8**		
		Madrid / JHQ SW	**5**	**13**	**7**			**7**	**4**		
		Moron AB	**24**	**64**	**30**			**34**	**16**		
		NS Rota	**29**	**76**	**35**			**40**	**18**		
		San Pablo	**5**	**14**	**6**			**7**	**3**		
		Sevilleja de la Jara	**5**	**13**	**6**			**7**	**3**		
		HRF Valencia	**26**	**69**	**33**			**36**	**17**		
		Zaragoza	**6**	**16**	**7**			**9**	**4**		
	Sweden	Goteborg	**6**	**15**	**7**			**8**	**4**		
		Stockholm	**3**	**8**	**4**			**4**	**2**		
	Switzerland	Bern	**18**	**46**	**22**			**24**	**11**		
		Geneva	**19**	**49**	**23**			**25**	**12**		
		Zurich	**16**	**41**	**19**			**21**	**10**		
	Ukraine	Kiev	**3**	**7**	**3**			**4**	**2**		
North America	**Canada**	Argentia NAS, Newfoundland	**6**	**14**	**5**			**7**	**3**		
		Calgary	**9**	**12**	**3**			**6**	**2**		
		Churchill, Manitoba	**4**	**8**	**2**			**3**	**1**		
		Cold Lake, Alberta	**4**	**8**	**2**			**3**	**1**		
		Edmonton, Alberta	**4**	**8**	**2**			**3**	**1**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
North America	**Canada**	E. Harmon AFB, Newfoundland	**4**	**10**	**5**			**4**	**2**		
		Fort William, Ontario	**4**	**8**	**2**			**3**	**1**		
		Frobisher, NWT	**4**	**8**	**2**			**3**	**1**		
		Goose Airport, Newfoundland	**4**	**11**	**4**			**5**	**2**		
		Halifax	**9**	**19**	**6**			**9**	**3**		
		Montreal	**33**	**58**	**11**			**22**	**4**		
		Ottawa, Ontario	**32**	**57**	**11**			**22**	**4**		
		St. John's, Newfoundland	**6**	**14**	**5**			**7**	**3**		
		Toronto, Ontario	**12**	**18**	**5**			**8**	**2**		
		Vancouver	**49**	**101**	**31**			**46**	**16**		
		Winnipeg, Manitoba	**4**	**8**	**2**			**3**	**1**		
	Greenland	Narsarssuak AB	**12**	**33**	**17**			**18**	**9**		
		Simiutak AB	**12**	**33**	**17**			**18**	**9**		
		Sondrestrom AB	**9**	**23**	**11**			**12**	**5**		
		Thule AB	**15**	**39**	**18**			**20**	**9**		
	Mexico	Ciudad Juarez	**7**	**19**	**9**			**10**	**5**		
		Guadalajara	**59**	**154**	**73**			**81**	**38**		
		Hermosillo	**19**	**49**	**23**			**25**	**12**		
		Matamoros	**1**	**2**	**1**			**1**	**1**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
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North America	**Mexico**	Mazatlan	**39**	**102**	**48**			**54**	**25**		
		Merida	**1**	**4**	**2**			**2**	**1**		
		Mexico City	**23**	**60**	**28**			**31**	**15**		
		Monterrey	**9**	**23**	**11**			**12**	**6**		
		Nuevo Laredo	**6**	**16**	**7**			**8**	**4**		
		Tijuana	**37**	**97**	**46**			**51**	**24**		
South America	**Argentina**	Buenos Aires	**21**	**38**	**8**			**15**	**4**		
	Bolivia	La Paz	**24**	**51**	**20**			**26**	**11**		
	Brazil	Belem	**1**	**1**	**0.3**			**1**	**0.3**		
		Belo Horizonte	**1**	**1**	**0.3**			**1**	**0.3**		
		Brasilia	**1**	**1**	**0.3**			**1**	**0.3**		
		Manaus	**8**	**21**	**7**			**5**	**1**		
		Porto Alegre	**1**	**1**	**1**			**1**	**0.3**		
		Recife	**4**	**11**	**4**			**4**	**1**		
		Rio de Janeiro	**1**	**4**	**2**			**1**	**1**		
		Salvador	**13**	**33**	**11**			**1**	**0.3**		
		Sao Paulo	**3**	**10**	**4**			**3**	**1**		
	Chile	Santiago	**94**	**221**	**102**			**131**	**60**		
		Valparaiso	**132**	**316**	**141**			**187**	**82**		
	Colombia	Bogota	**44**	**99**	**36**			**53**	**21**		

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South America	**Ecuador**	Guayaquil	**81**	**190**	**84**			**111**	**48**		
		Quito	**90**	**212**	**82**			**102**	**45**		
	Paraguay	Asuncion	**3**	**7**	**3**			**4**	**1**		
	Peru	Lima	**95**	**230**	**98**			**134**	**56**		
		Piura	**97**	**232**	**103**			**134**	**59**		
	Uruguay	Montevideo	**18**	**32**	**7**			**13**	**3**		
	Venezuela	Caracas	**48**	**107**	**45**			**53**	**21**		
		Maracaibo	**43**	**93**	**39**			**45**	**18**		
Atlantic Ocean	**Ascension Island**										
Caribbean Sea	**Bahamas**	Eleuthera Island	**1**	**2**	**1**			**1**	**1**		
		Grand Bahama Island	**1**	**2**	**1**			**1**	**1**		
		Grand Turk Island	**23**	**61**	**29**			**32**	**16**		
		Great Exuma Island	**8**	**20**	**10**			**11**	**5**		
		Nassau	**3**	**7**	**4**			**4**	**2**		
	Barbados	Bridgetown	**15**	**39**	**19**			**21**	**10**		
	Cuba	Havana	**10**	**27**	**13**			**14**	**7**		
		NS Guantanamo Bay	**50**	**132**	**62**			**69**	**33**		
	Dominica	Roseau	**43**	**113**	**53**			**59**	**28**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Caribbean Sea	**Dominican Republic**	Santo Domingo	**69**	**182**	**86**			**95**	**45**		
	Grenada	Saint George's	**43**	**113**	**53**			**59**	**28**		
	Guadeloupe	Basse-Terre	**52**	**137**	**65**			**72**	**34**		
	Haiti	Port-au-Prince	**75**	**189**	**79**			**102**	**40**		
		Cap-Haitien	**58**	**150**	**60**			**91**	**37**		
	Jamaica	Kingston	**58**	**152**	**72**			**80**	**38**		
	Martinique	Fort-de-France	**39**	**102**	**48**			**54**	**25**		
	Montserrat	Plymouth	**65**	**170**	**81**			**89**	**42**		
	Saint Croix	Frederiksted	**32**	**84**	**30**			**44**	**16**		
	Saint John	Bethany	**43**	**117**	**41**			**66**	**23**		
	Saint Kitts and Nevis	Basseterre	**60**	**157**	**74**			**82**	**39**		
	Saint Lucia	Castries	**36**	**94**	**45**			**49**	**23**		
	Saint Thomas	Charlotte Amalie	**43**	**117**	**41**			**66**	**23**		
	Saint Vincent and The Grenadines	Port Elizabeth	**21**	**56**	**26**			**29**	**14**		
	Trinidad & Tobago	Scarborough	**45**	**117**	**55**			**61**	**29**		
		Trinidad NS	**66**	**174**	**82**			**91**	**43**		
		Port of Spain	**68**	**180**	**84**			**95**	**44**		

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Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
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Caribbean Sea	**Vieques**	Isabel Segunda	**37**	**99**	**36**			**54**	**20**		
Indian Ocean	**British Indian Ocean Territory**	NSF Diego Garcia	**28**	**73**	**35**			**39**	**18**		
Pacific Ocean	**Australia**	Brisbane	**12**	**32**	**15**			**17**	**8**		
		Canberra	**19**	**49**	**23**			**26**	**12**		
		Darwin	**16**	**43**	**20**			**23**	**10**		
		H.E. Holt / N.W. Cape	**19**	**49**	**23**			**25**	**12**		
		Melbourne	**19**	**49**	**23**			**26**	**12**		
		Perth	**18**	**47**	**22**			**25**	**12**		
		Sydney	**18**	**46**	**22**			**24**	**11**		
		Woomera	**19**	**49**	**23**			**25**	**12**		
	Caroline Islands	Koror, Paulau Islands	**28**	**73**	**35**			**39**	**18**		
		Ponape	**41**	**108**	**51**			**56**	**27**		
		Yap	**31**	**82**	**39**			**43**	**20**		
	Fiji	Suva	**23**	**60**	**28**			**31**	**15**		
	Johnston Atoll		**54**	**143**	**67**			**75**	**35**		
	Marcus Island		**38**	**100**	**47**			**52**	**25**		

Table F-3

Continent / Region	Country	Base / City	Seismic Data (Site Class B)								
			PGA (%g)	S_S (%g)	S_1 (%g)	$S_{S,5/50}$ (%g)	$S_{1,5/50}$ (%g)	$S_{S,10/50}$ (%g)	$S_{1,10/50}$ (%g)	$S_{S,20/50}$ (%g)	$S_{1,20/50}$ (%g)
Pacific Ocean	**Marshall Islands**	Majuro	**49**	**127**	**60**			**67**	**32**		
\2\		Kwajalein	**14**	**32**	**9**	**22**	**6**	**14**	**4**	**9**	**2**
/2/		Wake Island	**55**	**144**	**68**			**75**	**35**		
	Midway Island										
	New Zealand	Auckland	**23**	**56**	**27**			**33**	**16**		
		Wellington	**72**	**172**	**82**			**101**	**48**		
	Papau New Guinea	Port Moresby	**31**	**82**	**39**			**43**	**20**		
	Philipine Islands	Baguio	**66**	**172**	**81**			**90**	**43**		
		Cebu	**46**	**120**	**57**			**63**	**30**		
		Clark AFB	**64**	**167**	**79**			**87**	**42**		
		Manila	**77**	**203**	**96**			**106**	**50**		
		Sangley Point	**78**	**204**	**97**			**107**	**51**		
		Subic Bay	**71**	**186**	**88**			**97**	**46**		
	Saipan	Capitol Hill	**58**	**178**	**45**			**92**	**23**		
	Samoa	Apia / Upolu	**13**	**33**	**15**			**17**	**8**		
	Tinian		**59**	**183**	**46**			**95**	**24**		

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Table F-3 Footnotes:

1 - SS,5/50 values can be interpolated via the following equations:
Ss,5/50 = (Ss,10/50)^0.5642 · (Ss)^0.4358.
S1,5/50 = (S1,10/50)^0.5642 · (S1)^0.4358.

2 - Ss,20/50 values can be interpolated via the following equations:
Ss,20/50 = (Ss,10/50)^1.4544 / (Ss)^0.4544.
S1,20/50 = (S1,10/50)^1.4544 / (S1)^0.4544.
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APPENDIX G SEISMIC SPECTRAL ACCELERATION MAPS AT SELECTED LOCATIONS OUTSIDE OF THE UNITED STATES, ITS TERRITORIES AND POSSESSIONS

FIGURE G-1 Afghanistan – Risk-Targeted Maximum Considered Earthquake Horizontal Ground Motion of 0.2-Second Spectral Response Acceleration (5 Percent of Critical Damping), Site Class B

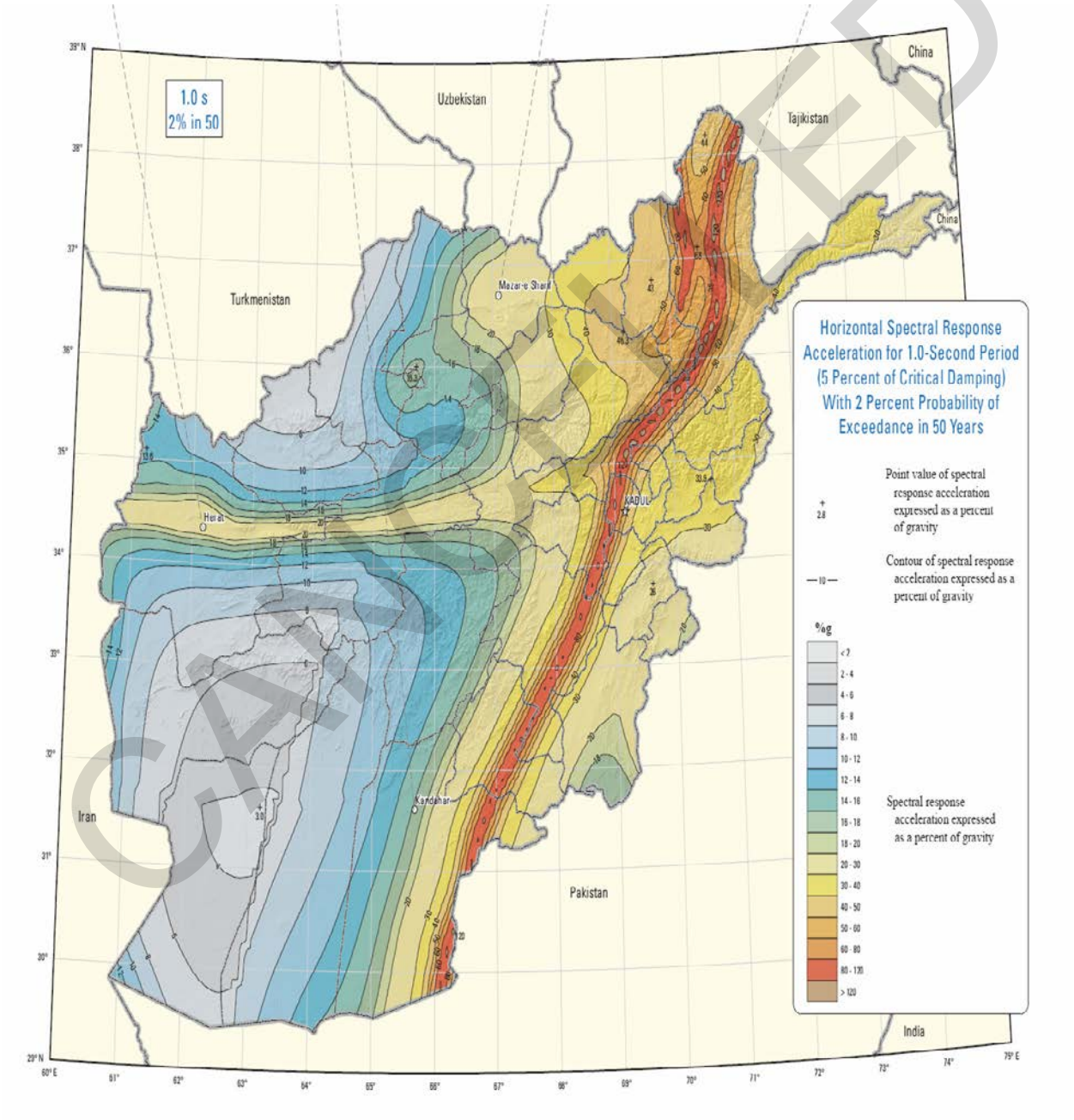

FIGURE G-2 Afghanistan – Risk-Targeted Maximum Considered Earthquake Horizontal Ground Motion of 1-Second Spectral Response Acceleration (5 Percent of Critical Damping), Site Class B