NIST Technical Note XXXX-2022

Standards of Seismic Safety for Existing Federally Owned and Leased Buildings

ICSSC Recommended Practice 10 (RP 10-22)

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Cover Photos: Robert A. Young Federal Building in St. Louis, MO, owned and managed by the U.S. General Services Administration (GSA). The building constructed during 1931-1933 completed a seismic retrofit in 2019 using fluid viscous dampers. Photos courtesy of GSA.

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January 2022

U.S. Department of Commerce
Name, *Secretary*

National Institute of Standards and Technology
Name, *Under Secretary of Commerce for Standards and Technology* and *Director*

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Dedication

This edition of the *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings* is dedicated to the memory of Mr. Ugo Morelli, who represented the Federal Emergency Management Agency as the manager of the program on seismic safety of new buildings from 1982 to 1991 and a similar program on existing buildings from 1984 until his retirement in 2002. After retirement, he graciously served as a *pro bono* member of the National Earthquake Hazards Reduction Program Office at the National Institute of Standards and Technology. Mr. Morelli provided superior leadership in all major early efforts to develop seismic evaluation and retrofit standards for existing buildings, as well as in efforts by the federal agencies to improve seismic safety in their existing buildings. His passionate leadership will have long-lasting impact on seismic safety in the United States.

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Acknowledgements

The Interagency Committee on Seismic Safety in Construction (ICSSC) developed this edition of the *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings* as part of the continuing effort to achieve seismic safety in existing buildings owned or leased by the Federal Government. An initial draft of this document was developed for the National Institute of Standards and Technology (NIST) on behalf of the ICSSC by a committee of experts organized by the Applied Technology Council (ATC). The ICSSC subsequently revised that draft to develop this edition, which was reviewed and approved by the ICSSC membership.

The ICSSC wishes to thank the following people who participated on the initial ATC project.

- Jon Heintz
- Robert Pekelnicky
- David Bonowitz
- James Cagley

The following individuals representing a participating ICSSC agency contributed to this edition of the *Standards*: NIST, as the lead agency of the National Earthquake Hazards Reduction Program (NEHRP) and chair of the ICSSC, gratefully acknowledges all participating agencies of the ICSSC identified in Appendix D.

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Department of the Air Force

Department of Veterans Affairs

Federal Aviation Administration

Federal Bureau of Prisons

Federal Emergency Management Agency
General Services Administration
Los Alamos National Laboratory
National Aeronautics and Space Administration
National Institute of Standards and Technology
National Park Service
Naval Facilities Engineering Command
Tennessee Valley Authority
U.S. Army Corps of Engineers
U.S. Department of Agriculture
U.S. Geological Survey

Preface

The National Earthquake Hazards Reduction Program (NEHRP) was created in 1977 by Public Law 95-124[1]. In 1978, the Interagency Committee on Seismic Safety in Construction (ICSSC) was created as a part of NEHRP and is composed of representatives of all federal agencies engaged in construction, financing of construction, or related activities. The mission of the ICSSC is to assist federal agencies in developing and incorporating earthquake risk reduction measures in their ongoing programs.

Public Law 101-614[2] mandated the ICSSC to develop standards for assessing and enhancing the seismic safety of existing buildings constructed for or leased by the Federal Government. The ICSSC issued the first edition of *Standards of Seismic Safety for Existing Federally Owned or Leased Buildings* (or *Standards*) in 1994 as ICSSC Recommended Practice (RP) 4[3]. Subsequently, Executive Order 12941[4]: *Seismic Safety of Existing Federally Owned or Leased Buildings* adopted the *Standards* as the minimum level acceptable for use by federal agencies in assessing the seismic safety of their owned and leased buildings and in mitigating unacceptable seismic risks in those buildings. RP 4 was updated in 2002 as ICSSC RP 6[5] (2nd edition), and RP 6 was updated in 2011 as ICSSC RP 8[6] (3rd edition). This document is the 4th edition, designated as RP 10, and is a major update to RP 8. This document is officially cited[7] as RP 10-22 to distinguish the year of publication; future editions will continue as RP 10, *e.g.*, the 5th edition of the *Standards* will be RP 10-28 to reflect an anticipated publication in 2028.

The *Standards* was adopted by Executive Order (EO) 13717[8]: *Establishing a Federal Earthquake Risk Management Standard*. EO 13717 establishes seismic requirements for new and existing buildings that will be constructed, altered, leased, financed, or regulated by the Federal Government. EO 13717 requires that agencies whose activities are covered by the order adopt the *Standards* as the minimum level acceptable for managing the earthquake risks in their existing building portfolio or leased space. The EO further requires the ICSSC to review and update the *Standards* as needed to comply with the order at the maximum interval of every 6 years. EO 13717 rescinds EO 12941.

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[1] P.L. 95-124: *Earthquake Hazards Reduction Act of 1977*. 91 Stat. 1098; 7 Oct. 1977.
[2] P.L. 101-614: *National Earthquake Hazards Reduction Program Reauthorization Act of 1990*. 104 Stat. 3231; 16 Nov. 1990.
[3] NIST (1994). *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings*, ICSSC Recommended Practice 4 (RP 4): NISTIR 5382. National Institute of Standards and Technology, Gaithersburg, MD.
[4] United States, Executive Office of the President [William Clinton]. Executive Order 12941: *Seismic Safety of Existing Federally Owned or Leased Buildings*. 1 Dec. 1994. Federal Register, Vol. 59, No. 232, 5 Dec. 1994.
[5] NIST (2002). *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings*, ICSSC Recommended Practice 6 (RP 6): NISTIR 6762. National Institute of Standards and Technology, Gaithersburg, MD.
[6] NIST (2011). *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings*, ICSSC Recommended Practice 8 (RP 8): NIST GCR 11-917-12. National Institute of Standards and Technology, Gaithersburg, MD.
[7] NIST (2022). *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings*, ICSSC Recommended Practice 10 (RP 10-22): NIST Technical Note XXXX-2022. National Institute of Standards and Technology, Gaithersburg, MD. http://dx.doi.org/10.6028/XXXX.
[8] United States, Executive Office of the President [Barack Obama]. Executive Order 13717: *Establishing a Federal Earthquake Risk Management Standard*. 2 Feb. 2016. Federal Register, Vol. 81, No. 24, 5 Feb. 2016.

The S*tandards* supports EO 13717 to enhance the seismic resilience of agencies by reducing risk to lives of building occupants and improving the probability of continued performance of buildings essential to agency operations and functions following future earthquakes. As such, the *Standards* provides the minimum requirements for when a seismic evaluation of a federally owned or leased existing building is required (mandatory evaluation process) and guidance when an evaluation should be prioritized by an agency (voluntary evaluation process). The *Standards* additionally provides the minimum target performance objective used for the evaluation to constrain agency exposure to seismic risks to an acceptable level. This performance objective is also used to design and assess retrofit strategies, in the case when retrofitting the building is selected as the mitigation strategy.

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Executive Summary

RP 10 supports federal agencies to identify conditions in an existing building that may pose unacceptable seismic risks to the agency given an undesirable performance of the building during an earthquake. Agency exposure to unacceptable risks is generally determined through a seismic evaluation and risk assessment of the building. RP 10 provides triggers for a seismic evaluation for project circumstances such as major alterations, additions, or repairs, as well as change of use or leasing requirements. Evaluation necessitated by triggers is referred to as the mandatory evaluation process. RP 10 additionally addresses risk awareness by having agencies proactively implement evaluations based on inventory screening, which is independent of passive trigger requirements identified in the mandatory evaluation process. This process is referred to as the voluntary evaluation process. RP 10 provides recommendations to assist an agency develop a screening process. RP 10 also identifies buildings exempt from seismic evaluation.

RP 10 provides the minimum seismic performance objective for evaluation of existing buildings owned or leased by the Federal Government. The basic performance objective is based on risk to occupant safety in a large, rare earthquake by total or partial collapse of the building. Higher performance objectives based on risk of loss of operative systems, extended re-occupancy and recovery time, or economic losses are provided. RP 10 references model building codes published by the International Code Council as well as national consensus standards published by the American Society of Civil Engineers to provide the basis for defining seismic performance objectives, evaluation procedures, and, where necessary, retrofit criteria.

RP 10 contains four chapters as follows:

- Chapter 1, *Scope and Application* describes the purpose of RP 10, provides circumstances that necessitate or prioritize a need for a seismic evaluation, specifies buildings that are exempt from seismic evaluation, and identifies how compliance with RP 10 can be demonstrated or achieved;
- Chapter 2, *Performance Objective* identifies the minimum performance objective for existing buildings, for both evaluation and retrofit, if needed;
- Chapter 3, *Evaluation Requirements* identifies minimum requirements for conducting a seismic evaluation of an existing building; and
- Chapter 4, *Mitigation Requirements* outlines minimum requirements for mitigating agency exposure to unacceptable seismic risks, by retrofitting the building systems or by some other mechanism.

The current policy is provided in Executive Order 13717, which requires agencies that own an existing building and/or lease space in an existing building to adopt RP 10 as the minimum level acceptable for managing the earthquake risks in that building. RP 10 is written as recommended practices. Agencies may adopt RP 10 as is or may amend its provisions to fit the needs of the

agency. Many provisions in RP 10 provide the ability for an agency to develop their own procedures. In no case shall the agency procedure result in a target seismic performance or evaluation methodology that does not meet the minimum requirements provided in RP 10.

Chapter 1
Scope and Application

1.0 Scope and Referenced Codes and Standards

The purpose of the *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings: ICSSC Recommended Practice 10*, hereafter referred to as RP 10, is to support federal agencies in maintaining and enhancing the seismic safety of their building portfolio. RP 10 builds upon previous efforts by the Interagency Committee on Seismic Safety in Construction (ICSSC) in support of the National Earthquake Hazards Reduction Program (NEHRP).

RP 10 provides guidance to the agencies to assess their seismic risk exposure through their building portfolio by providing:

1. circumstances that necessitate a seismic evaluation of an existing building to measure compliance with an agency-selected performance objective;
2. recommendations to proactively necessitate a seismic evaluation of an existing building determined by a voluntary screening process to potentially pose unacceptable risks;
3. a minimum seismic performance objective for identifying unacceptable seismic risks across their building portfolio; and
4. supporting documentation for developing a balanced, agency-conceived and agency-controlled seismic risk management program.

The purpose for performing a seismic evaluation as outlined in this document is to predict if potential damage to a building and/or its contents for a given earthquake hazard level poses unacceptable risks to an agency. These risks include, but are not limited to:

- total or partial collapse of a building;
- loss of life or life-threatening injuries to building occupants or the public-at-large;
- interruption of building function or agency mission, either short- or long-term; and
- direct economic losses from damage to the building and/or its contents and indirect losses by absence of provided services.

Compliance with this document is accomplished by determining if a building meets a minimum performance objective, which is intended to provide an acceptable level of exposure to earthquake-related risks. The performance objectives use *Risk Categories* to address enhanced criteria required for *essential* (Risk Category IV) or *high occupancy* (Risk Category III) facilities. An agency can develop a higher performance objective than provided here when deemed necessary.

The current policy is provided in Executive Order 13717, which requires agencies that own an existing building and/or lease space in an existing building to adopt RP 10 as the minimum level acceptable for managing the earthquake risks in that building. RP 10 is written as recommended practices. Agencies may adopt RP 10 as is or may amend its provisions to fit the needs of the agency. Many provisions in RP 10 provide the ability for an agency to develop their own procedures. In no case shall the agency procedure result in a target seismic performance or evaluation methodology that does not meet the minimum requirements provided in RP 10.

RP 10 supersedes *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings: ICSSC Recommended Practice 8* (NIST 2011), hereafter referred to as RP 8. Appendix A provides the history of *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings* and its relationship to documents published by the Federal Emergency Management Agency (FEMA), the International Code Council (ICC), and the American Society of Civil Engineers / Structural Engineering Institute (ASCE/SEI). Appendix B provides a high-level cross reference between RP 8 and RP 10. Appendix C provides a workflow of the mandatory and voluntary evaluation processes. Appendix D provides a list of agencies currently participating on the ICSSC.

RP 10 references the following national consensus-developed model building codes, standards, or guidelines:

- 2018 *International Building Code* (IBC) (ICC 2018a);
- 2018 *International Existing Building Code* (IEBC) (ICC 2018b);
- 2018 *International Residential Code* (IRC) (ICC 2018c);
- ASCE/SEI 41-17, *Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 2017a);
- ASCE/SEI 7-16, *Minimum Design Loads for Buildings and Other Structures* (ASCE 2017b);
- FEMA P-154, *Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook* (FEMA 2015);
- FEMA P-58, *Seismic Performance Assessment of Buildings* (FEMA 2018);
- FEMA P-50, Volumes 1-7, *Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings* (FEMA 2012a); and
- FEMA E-74: *Reducing the Risks of Nonstructural Earthquake Damage—a Practical Guide* (FEMA 2012b).

If an agency has adopted a newer edition of any of these references, the newer edition shall be used. Executive Order 13717 shall govern the adoption of the IBC and IRC.

Detached one- and two-family dwellings that are not in the purview of the IEBC and IBC, shall be evaluated for seismic risks in accordance with the IRC, FEMA P-50, or an agency-specific methodology where equivalency, as a minimum, to the IRC can be demonstrated.

1.1 Performance Compliance

An in-service building, whether occupied or unoccupied, not exempt from seismic evaluation in accordance with Section 1.3, is deemed to comply with the minimum seismic performance objective for the applicable Risk Category if it satisfies both of the following:

A. The building is not subject to any of the circumstances necessitating a seismic evaluation given in Section 1.2.1.
B. The building has been voluntarily screened and shown not to include any of the circumstances that may pose an unacceptable risk to the agency given in Section 1.2.2.

Exceptions to B:

1. The building qualifies as a benchmark building in accordance with Section 1.4;
2. The building has been previously seismically evaluated and determined to comply with the selected performance objective in accordance with Chapters 2 and 3;
3. The building has been previously seismically retrofitted or otherwise mitigated to comply with the selected performance objective in accordance with Chapters 2 and 4; or
4. A risk assessment has determined that the building does not pose an unacceptable risk to the agency.

In order to demonstrate compliance with the selected performance objective, the agency shall assign a Risk Category to the building under consideration, but in no case shall it be lower than what would be assigned to the building in accordance with Section 1604.5 of the IBC.

1.2 Circumstances Initiating a Seismic Evaluation

Two seismic evaluation initiating processes are covered in this section. Section 1.2.1 describes a mandatory process in which a building is required to be seismically evaluated due to modifications to the building or to the contractual agreement with the agency. Section 1.2.2 describes a voluntary process in which an agency can proactively prioritize seismic evaluations of buildings to identify potentially unacceptable risks.

1.2.1 Mandatory Evaluation Process

The following agency-identified programming or building conditions shall necessitate a seismic evaluation of an in-service building, whether occupied or unoccupied, in accordance with Chapter 3, unless exempted by Section 1.3. If necessitated, the building shall be shown to comply with the selected minimum seismic performance objective for the applicable Risk Category given in Chapter 2. The programming actions or building conditions include:

a. a change in occupancy or use of a building that results in an increase in the assigned Risk Category or an increase in live load or dead load by more than 10 percent on any floor;
b. an addition or alteration to a building that increases the seismic load on any existing seismic load-carrying structural element by more than 10 percent, decreases the capacity of any existing seismic load-carrying structural component by any amount, or results in a structural irregularity as defined in ASCE/SEI 7;

> *Exception*: A seismic evaluation will not be required if performance compliance of the original building has been established and the agency can demonstrate that the addition or alteration will not adversely affect the performance compliance.

c. an addition, alteration, or repair to a building assigned to Seismic Design Category (SDC) C, as defined by the IBC, that will extend its in-service life beyond its design life (50 years from the original year of construction), where the project construction cost is more than 50 percent of the current pre-construction replacement cost of the building (not including tenant supplied operational service equipment and fit-outs[1] or seismic mitigation efforts);
d. an addition, alteration, or repair to a building assigned to SDC D, E, or F, as defined by the IBC, that will extend its in-service life beyond its design life (50 years from the original year of construction), where the project construction cost is more than 30 percent of the current pre-construction replacement cost of the building (not including tenant supplied operational service equipment and fit-outs[1] or seismic mitigation efforts);
e. a repair of substantial structural damage, as defined in the IEBC, of the structural system in a building;

> *Exception*: A seismic evaluation will not be required if performance compliance of the building has been established and the agency can demonstrate that the repair will return the building, as a minimum, to the pre-event compliance state.

f. a building added to an agency inventory through either purchase or donation, or brought back into service after being out-of-service or decommissioned for more than ten years;
g. a federal agency enters into or renews one or more leases for a total floor area of 10,000 ft^2 (930 m^2) or more in a building that would otherwise be subject to the requirements of RP 10; or
h. a building is being relocated from its current site; or

> *Exception*: A seismic evaluation will not be required if performance compliance of the building has been established and the agency can demonstrate that the relocation will not adversely affect the performance compliance.

[1] 'Fit-out' is the process of making interior spaces of a building suitable for occupation. The term is used in relation to space development, where construction of the structural and nonstructural building systems is completed by the agency/owner and the space tenant completes interior construction required for tenant operations.

i. a building is designated by an agency to pose an *Unacceptable Risk Exposure* to the agency—see Section 1.8, Item *f*.

1.2.2 Voluntary Evaluation Process

Agencies shall implement a proactive process to seismically screen any in-service building, whether occupied or unoccupied, where damage during an earthquake may pose unacceptable risks to the agency—see Section 1.0 for critical seismic risks. The screening process shall be the responsibility of the agency. Any building not satisfying the screening process shall necessitate a seismic evaluation in accordance with Chapter 3, unless exempted by Section 1.3. The following circumstances can be considered to trigger a seismic evaluation depending on the agency-developed screening process, but not limited to:

1. Buildings that have structural vulnerabilities and have been shown in past earthquakes to create unacceptable risks. Potential indicators of unacceptable risks may be due to the following:

    a. a Final Level 1 Score after a rapid visual screening using FEMA P-154 is equal to or less than 2.0;
    b. an agency-approved screening (or risk assessment) methodology indicates that an existing building does not satisfy the agency-selected minimum risk target provided in Chapter 2 of this document, or a more stringent agency-developed risk target;
    c. a building assigned to SDC D or higher, as defined by the IBC, and constructed prior to the benchmark building identified in Section 1.4; or
    d. other agency developed circumstances.

2. Buildings that have plan or use vulnerabilities that may impede evacuation of building occupants or recovery of building contents after an earthquake. Potential indicators of unacceptable risks may be due to the following:

    a. means of egress that do not satisfy the provisions in the IBC;
    b. occupancy or use designates the building as Risk Category III or IV, but the building was not originally designed or retrofitted as Risk Category III or IV; or
    c. other agency developed circumstances.

3. Buildings that the agency has classified as necessary for carrying out any agency function where prolonged interruption after an earthquake would detrimentally impact the mission of the agency.
4. Buildings that the agency has determined would create excessive economic burdens to the agency due to direct economic losses from damage to the building and/or its contents or due to indirect losses from absence of provided services.

1.3 Exemptions

Every building shall be assigned a Risk Category and a Seismic Design Category as defined by the IBC. Figures C1.3-1(a) through C1.3-1(g) provide maps for an agency to quickly identify the Seismic Design Category for a building for the conterminous United States, Alaska, Hawaii, Puerto Rico, Guam and the Mariana Islands, and American Samoa. See user note if a more accurate value is required based on differing parameters for a building than that used in the maps.

> **User Note: *If a more detailed analysis for the SDC is required.***
> The user is referred to: https://hazards.atcouncil.org/. The user will enter either the address or the coordinates for the building and select "Seismic". On the next screen, the user will select the reference document (i.e., IBC or ASCE 7), the Risk Category assigned to the building, and the Site Class for the building site.

The following buildings are exempt from seismic evaluation, through either a mandatory or voluntary process:

a. buildings designated as any Risk Category assigned to SDC A;
b. buildings designated as Risk Category I or II assigned to SDC B;
c. buildings designated as Risk Category I or II assigned to SDC C and containing a total area less than 10,000 ft^2 (930 m^2);
d. detached one- and two-family dwellings that are located where the mapped short period spectral response acceleration, S_S, is less than 0.4*g* or assigned to SDC C or lower as defined by the IRC;
e. buildings designated as Risk Category I intended only for agricultural use or low-hazard or low-risk storage that have incidental human occupancy not exceeding two persons per 100 ft^2 (10 m^2) of space for a total of less than two hours per day;
f. one-story buildings of steel or wood light-frame construction designated as Risk Category I, II, or III with floor areas less than 5,000 ft^2 (465 m^2);
g. buildings programmed to be removed from agency inventory in less than five years; or
h. buildings containing space leased by the Federal Government for a cumulative occupancy time of less than five years.

1.4 Benchmark Buildings

In-service buildings, whether occupied or unoccupied, that qualify as Benchmark Buildings per Section 3.3 of ASCE/SEI 41 are deemed to comply with the minimum performance objective for the applicable Risk Category. Section 3.3 of ASCE/SEI 41 is only applicable for the Basic Performance Objectives for Existing Buildings (BPOE) given in Chapter 2 and only for the Risk Category for which the building was originally designed. If a building qualifies as a Benchmark Building, the geologic hazards shall be permitted to be benchmarked. The nonstructural components shall only be permitted to be benchmarked if the design and construction of the

bracing and anchorage for the components is in accordance with the 2000 IBC, or later, and construction in accordance with the design drawings has been verified by the agency.

Buildings that have been seismically evaluated or retrofitted to comply with RP 8 may be permitted to be benchmarked as conforming to RP 10 (only for the BPOE). An agency shall demonstrate performance equivalency to RP 8 as a minimum to benchmark a building that has been seismically evaluated or retrofitted to comply with any prior edition of this document.

The structural system or nonstructural system in a building cannot be benchmarked if it is older than 50 years, determined from either the original year of construction or the last seismic retrofit certified by a design professional, see Section 1.9. The systems cannot be benchmarked if a lease will extend beyond their 50-year design life.

1.5 Leased Buildings and Leased Space within a Building

The following provisions shall apply to federally and non-federally owned buildings whose space is partially or entirely leased by an agency, unless the building is exempt under the provisions of Section 1.3:

a. No new leases or lease renewals/extensions shall be made for buildings, or space within, that do not comply with RP 10.

   Exception: If no building conforming to the requirements of RP 10 is available within the delineated service area that meets the needs of the federal agency, it is permitted to pursue a lease in a non-compliant building, subject to prioritizing lower risk buildings identified by rapid visual screening using FEMA P-154. The agency shall maintain a justification record for each non-conforming building where space is leased by the agency.

b. The agency shall obtain from the building owner a certification by a design professional as defined in Section 1.9 that the building conforms to the benchmark criteria or performance objective in Chapter 2 prior to the execution of a lease.
c. In leased space, nonstructural components that will be replaced by the agency once possession of the space is taken or whose damage would not affect safety or required performance or function within the space, including safe egress from the space, need not be evaluated.

1.6 Privately Owned Buildings on Federal Land

RP 10 shall apply to privately owned existing buildings located on federal land. Application of RP 10 to evaluate and potentially mitigate seismic risks is the responsibility of the building owner.

1.7 Historic Buildings

RP 10 shall apply to buildings designated as historic buildings. Non-conformance with RP 10 should not be construed as cause to demolish or abandon a historic building subject to preservation legislation where retrofit is technically feasible.

1.8 Additional Requirements

The following measures shall be implemented by each federal agency:

a. assurance of compliance with the provisions of RP 10 and all codes and standards referenced herein;
b. development and dissemination of agency-specific policies consistent with RP 10, including consideration of past policies and their current applicability;
c. designation of Risk Category for the building when assessing applicability of RP 10 provisions to a specific project, screening, risk assessment, or evaluation;
d. selection of agency-specific performance objective and its sequential performance levels and corresponding seismic hazard level when assessing applicability of RP 10 provisions to a specific project screening, risk assessment, or evaluation;
e. assurance that consistent measures of quality control are included in such policies and applied to all phases of evaluation and retrofit design and construction in a manner consistent with the IEBC and ASCE/SEI 41; and
f. designation of a building by an agency after seismic evaluation and risk assessment in accordance with Chapter 3 that it poses either an *Acceptable Risk Exposure* (ARE) or an *Unacceptable Risk Exposure* (URE) to the agency. An agency can designate a building as an URE prior to a seismic evaluation and risk assessment if deemed necessary. URE was previously designated as *Exceptionally High Risk* in prior editions of this document. See Section 3.3 for information regarding building designation and reporting.

1.9 Qualifications of Evaluators, Designers, and Reviewers

All building seismic evaluations and risk assessments, risk mitigation strategies, and retrofit designs shall be conducted by a design professional qualified to perform the type of work being considered. Approval of qualifications of the design professional shall be the responsibility of the agency. Final construction documents for a seismic retrofit design shall be approved by a registered design professional in responsible charge, as defined by the IEBC, duly authorized to practice in the locale of the building.

For independent peer reviews, analysis techniques, or retrofit concepts required by RP 10, an individual, or group, qualified in the field of structural engineering shall be utilized by the federal agencies. Reviewers shall be design professionals qualified to perform the type of work being considered and approved by the agency.

Evaluations regarding potential foundation vulnerabilities or geologic site hazards shall be conducted by geotechnical engineers or engineering geologists, qualified to perform the type of work being considered. Approval of qualifications shall be the responsibility of the agency.

1.10 Items Not Addressed

RP 10 is not intended to cover stand-alone, non-building structures such as bridges, transmission towers, industrial towers and equipment, piers and wharves, or hydraulic structures or other lifeline components.

RP 10 does not address the consequences of:

- other environmental hazards such as wind, flood, snow, or climatic changes;
- fire;
- blast;
- tsunami;
- geotechnical earthquake hazards not addressed in ASCE/SEI 41;
- Human-induced earthquakes (an agency is permitted to adapt RP 10 for an agency-specific policy for areas where the ground motion hazard from this activity has been determined); or
- volcanic activity (an agency is permitted to adapt RP 10 for an agency-specific policy for areas where the ground motion hazard from this activity has been determined).

RP 10 also does not address criteria for:

- repair of deteriorated buildings, including damage caused by previous earthquakes except as specifically identified in Section 1.2;
- buildings assigned to an agency-specific Risk Category not addressed in the referenced codes and standards;
- preparation of post-earthquake response and recovery plans; or
- seismic instrumentation of federal buildings. Agencies are encouraged to explore the efficacy of instrumenting specific buildings in accordance with IBC Appendix L that would enhance their seismic safety and support advancing government-wide seismic risk mitigation strategies.

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Chapter 2
Performance Objective

2.0 Scope

This chapter defines the minimum performance objective for each applicable Risk Category to be used in a seismic evaluation and risk assessment of a building or retrofit strategy. An agency may select or develop an enhanced performance objective that requires a higher level of performance.

Section 2.1 provides the minimum performance objective if a deterministic seismic evaluation is used, in accordance with Chapter 3. Section 2.2 provides the minimum performance objective based on conditional risk probability targets when a probabilistic seismic evaluation is used, in accordance with Chapter 3. See Chapters 3 and 4 for any limitations on evaluation procedures.

2.1 Minimum Performance Objective for Deterministic Seismic Evaluation

Table 2-1 specifies the minimum performance objective for each of the circumstances in the mandatory evaluation process given in Section 1.2.1 when ASCE/SEI 41 is used for the seismic evaluation. Two performance objectives are given depending on the circumstance: Basic Performance Objectives Equivalent to New Building Design Standards (BPON) or Basic Performance Objectives for Existing Buildings (BPOE). The minimum performance objective for an evaluation prioritized through a voluntary evaluation process, given in Section 1.2.2, is the BPOE. If deemed necessary by an agency, an enhanced performance objective greater than that specified in Table 2-1 is permitted.

A performance objective is comprised of a set of paired structural and nonstructural performance levels coupled with a seismic hazard level covering the range of Risk Categories. Paired structural and nonstructural performance levels and seismic hazard level are given in Section 2.1.1 for the BPON and Section 2.1.2 for the BPOE.

2.1.1 Basic Performance Objective Equivalent to New Building Standards

Table 2-2 presents the performance levels and corresponding seismic hazard level to be used when the BPON performance objective is required or selected. Table 2-2 replicates Table 303.3.1 in the IEBC and Table 2-3 in ASCE/SEI 41.

2.1.2 Basic Performance Objective for Existing Buildings

Table 2-3 presents the performance levels and corresponding seismic hazards level to be used when the BPOE performance objective is required or selected. Table 2-3 replicates Table 303.3.2 in the IEBC and Table 2-1 in ASCE/SEI 41.

Table 2-1. Minimum Performance Objective for use in ASCE 41 based on Project Type

Project Type	Section 1.2.1 Item	Minimum Performance Objective for Evaluation and Retrofit
Change of Occupancy or Use	a [1]	BPON
Alteration	b [1]	Addition: BPON Alteration: BPOE
SDC C, project cost > 50%	c [1]	Addition: BPON Alteration: BPOE Repair: BPOE Occupancy: BPON
SDC D – F, project cost > 30%	d [1]	Addition: BPON Alteration: BPOE Repair: BPOE Occupancy: BPON
Repair of substantial structural damage	e [1]	BPOE
Acquisition by purchase or donation	f	BPOE
Lease or lease renewal	g	BPOE
Relocation	h [1]	BPON

Note 1: Project type defined in the IEBC.

Table 2-2. Building Performance Levels for the BPON

Risk Category	Component System	Building Performance Level BSE-1N [1]	Building Performance Level BSE-2N [1]
I and II	Structural	Life Safety	Collapse Prevention
	Nonstructural	Position Retention	Hazard Reduced
III	Structural	Damage Control	Limited Safety
	Nonstructural	Position Retention	Hazard Reduced
IV	Structural	Immediate Occupancy	Life Safety
	Nonstructural	Operational	Hazard Reduced

Note 1: Seismic hazard levels are defined in ASCE/SEI 41 Section 2.4.

Table 2-3. Building Performance Levels for the BPOE

Risk Category	Component System	Building Performance Level BSE-1E [1]	BSE-2E [1]
I or II	Structural	Life Safety	Collapse Prevention
	Nonstructural	Life Safety	Hazard Reduced
III	Structural	Damage Control	Limited Safety
	Nonstructural	Position Retention	Hazard Reduced
IV	Structural	Immediate Occupancy	Life Safety
	Nonstructural	Position Retention	Hazard Reduced

Note 1: Seismic hazard levels are defined in ASCE/SEI 41 Section 2.4.

2.2 Minimum Performance Objective for Probabilistic Seismic Evaluation

Table 2-4 specifies the minimum seismic conditional probability targets for risk assessments of existing buildings using a probabilistic evaluation approach. If deemed necessary by an agency, more stringent performance targets than those specified are permitted. An agency may select which risks are applicable to the agency; a complete assessment shall analyze all seismic risks equal to and lower than the selected risk target (i.e., risk analysis). If a Risk Analysis 3 is performed, the agency has the choice to perform a Risk Analysis 2a or 2b, or both if desired, in addition to a Risk Analysis 1.

Table 2-4. Minimum Conditional Targets

Risk Analysis	Risk	Risk Category	Conditional Probability	Seismic Hazard Level
1	Total or partial collapse	I	20%	MCE_R [1]
		II	10%	
		III	5%	
		IV	2.5%	
2a	Average Annualized Loss of life or life-threatening injury to building occupants	I	0.015%	MCE_R [1]
		II	0.007%	
		III	0.004%	
		IV	0.002%	
2b	Interruption of intended function or mission, longer than two weeks after official inspection	I	--	10% Probability of Exceedence in 50 Years [2]
		II	40%	
		III	30%	
		IV	20%	
3	Economic mean loss of 20% of replacement cost	I	--	10% Probability of Exceedence in 50 Years [2]
		II	50%	
		III	30%	
		IV	10%	

Note 1: Seismic hazard level is defined in ASCE/SEI 7 Chapter 11.
Note 2: Seismic hazard level is based on uniform hazard analysis and developed using tools provided by USGS (https://earthquake.usgs.gov/hazards/interactive).

Chapter 3
Evaluation Requirements

3.0 Purpose

The purpose of a seismic evaluation is to determine whether a building contains any vulnerabilities that would increase the chance that the building would not meet an agency-selected seismic performance objective given an earthquake intensity. Seismic evaluation of a building shall be performed to ensure compliance with the selected performance objective, as specified in Section 1.1. The performance objective for the evaluation shall be established by the agency having jurisdiction over the building, subject to the minimum requirements given in Chapter 2.

Once an agency has determined that a seismic evaluation of a specific building is required, based on a mandatory or voluntary process as defined in Chapter 1, the agency can select one of the following evaluation techniques:

- Deterministic approach with an implicit risk assessment, Section 3.1
- Probabilistic approach with an explicit risk assessment, Section 3.2

A building shall be designated after a seismic evaluation and risk assessment in accordance with Section 3.3.

3.1 Deterministic Seismic Evaluation

ASCE/SEI 41 shall be used to conduct a deterministic seismic evaluation in accordance with IEBC Section 303.3.1, Item 2, for the BPON and Section 303.3.2, Item 3, for the BPOE.

> *Exception*: A Tier 1 or Tier 2 Evaluation Procedure, when permitted for the building type, shall be permitted to demonstrate compliance with the BPON. If the outcome of the evaluation indicates compliance with the BPON, then a Tier 3 Evaluation Procedure shall be conducted to verify that compliance.

An alternative evaluation methodology that is more relevant to the agency is permitted, provided that the quality of the alternative evaluation results is demonstrated to meet or exceed that provided by an ASCE/SEI 41 evaluation. It is the responsibility of the agency to approve any alternative methodology.

For evaluation of buildings assigned to Risk Category I, II, or III, structural performance compliance at the BSE-1E or BSE-1N seismic hazard level may be assumed if structural performance compliance at the BSE-2E or BSE-2N seismic hazard level is demonstrated.

An agency-approved seismic risk assessment that employs the outcome of the evaluation methodology shall be used to determine if the building poses an unacceptable risk to the agency. In the absence of such assessment, the building shall be designated by the agency as posing an unacceptable risk exposure to the agency if:

- more than fifteen percent of the total structural components resisting seismic force or deformation in a building in one direction do not meet a building performance level associated with the performance objective, or
- more than fifty percent of the structural components resisting seismic force or deformation in one story in one direction do not meet a building performance level associated with the performance objective.

or

- more than fifteen percent of the total nonstructural components in a building do not meet a building performance level associated with the performance objective, or
- more than thirty percent of the nonstructural components in one story in one direction do not meet a building performance level associated with the performance objective.

3.1.1 Nonstructural Component Evaluation

The initial scope for evaluation of the seismic performance of the nonstructural components in a building is determined by the selected performance objective. The final scope of a nonstructural component evaluation may be modified on a project-specific basis by the agency as follows:

a. For buildings assigned to Risk Category I or II, a nonstructural component need only be evaluated for the 'Life Safety' performance level if evaluation for the 'Position Retention' performance level would, in the judgment of the agency, disproportionately affect project feasibility.
b. If initial evaluation indicates that damage to nonstructural components would pose an unacceptable risk exposure to the occupants or to the agency mission, the agency may supplement the initial scope with evaluation considering the 'Life Safety' performance level at the BSE-2E or BSE-2N seismic hazard level.

3.2 Probabilistic Seismic Evaluation

FEMA P-58 shall be used to conduct a probabilistic seismic evaluation of the structural and nonstructural systems. An alternative evaluation methodology that is more relevant to the agency is permitted, provided that the quality of the alternative evaluation results is demonstrated to meet

or exceed that provided by a FEMA P-58 evaluation. It is the responsibility of the agency to approve any alternative methodology.

An agency-approved seismic risk assessment that employs the outcome of the evaluation methodology shall be used to determine if the building poses an unacceptable risk to the agency. In the absence of such assessment, the building shall be designated by the agency as posing an unacceptable risk exposure to the agency if the results from the probabilistic seismic evaluation do not satisfy the risk targets conditioned on the occurrence of the given earthquake hazard.

3.3 Designation of a Building After Seismic Evaluation

A building determined to comply with the agency-selected performance objective by a seismic risk assessment in accordance with Section 3.1 or Section 3.2 shall be designated by the agency as posing an Acceptable Risk Exposure (ARE)—see Section 1.8, Item *f*. No further mitigation efforts are required to reduce identified seismic risk(s), unless voluntarily done so by the agency.

A building determined not to comply with the agency-selected performance objective by a seismic risk assessment in accordance with Section 3.1 or Section 3.2 shall be designated by the agency as posing an Unacceptable Risk Exposure (URE)—see Section 1.8, Item *f*. Mitigation of identified seismic risk(s) is required if the evaluation was necessitated by the mandatory process or the building shall be added to the agency's mitigation programming inventory if the evaluation was prioritized within the voluntary process.

A record of a building designated as URE shall be provided to the person in charge of facility construction or programming for the agency within two months after the evaluation that includes the following information, but not limited to:

- Building data (location, occupancy, function);
- Identified seismic risk(s) posed to the agency given what seismic hazard; and
- Basic cost estimate of a proposed mitigation strategy in accordance with Chapter 4.

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Chapter 4
Mitigation Requirements

4.0 Purpose

The purpose of seismic mitigation is to reduce unacceptable risks posed to an agency (or exposure to the risks) by, but not limited to:

- improving the seismic performance of a building with a retrofit strategy to meet an agency-selected performance objective given an earthquake intensity;
- repurposing a building;
- modifying the contractual agreements between owner and tenant;
- removal of the building from an agency inventory;
- demolition[2] or permanent evacuation of the building; or
- change in occupancy or use of the building such that it is no longer subject to evaluation and mitigation requirements in accordance with Section 1.2 or the building becomes exempt in accordance with Section 1.3.

This chapter discusses evaluating a retrofit strategy against the performance objective.

4.1 Seismic Evaluation of a Seismic Retrofit Strategy

Retrofit strategies for structural and nonstructural components in a building shall be developed as needed to ensure compliance with the selected performance objective, as specified in Section 1.1. As a minimum, ASCE/SEI 41 shall be used to design a retrofit strategy in accordance with Chapter 3. The performance objective and methodology to assess a retrofit strategy shall be the same as that selected for the initial seismic evaluation. Table 4-1 provides the deterministic evaluation procedures prescribed in ASCE/SEI 41 for assessment of retrofit strategies based on the selected performance objective. An evaluation procedure not permitted by ASCE/SEI 41 may not be used to assess a retrofit strategy. There are no limitations when using a probabilistic evaluation approach using FEMA P-58 to assess a retrofit strategy.

If new components are used to replace existing components, the new components shall be designed in accordance with ASCE/SEI 41 and detailed and constructed in compliance with the applicable building code.

[2] See Section 1.7 for limitations for designated historic buildings.

Table 4-1. Evaluation Procedures in ASCE/SEI 41 for Assessing a Retrofit Strategy

Evaluation Procedure	Performance Objective	
	BPON	**BPOE**
Tier 1	Not Permitted	Not Permitted
Tier 2	Not Permitted	Permitted [1]
Tier 3	Permitted	Permitted

Note 1: See ASCE/SEI 41 Section 3.4.1 for when a Tier 2 evaluation procedure is not permitted.

4.2 Phased Retrofitting to meet a Performance Objective

Seismic risk reduction by phased retrofitting of a building is acceptable as an interim step in a complete seismic mitigation plan. Phased retrofitting shall comply with the following conditions:

a. The complete retrofit construction shall not be divided into more than three phases nor take longer than two years per phase. Each retrofit phase is documented as part of a complete mitigation plan showing the length of each phase and the overall completion schedule;
b. Each retrofit phase is designed and assessed in accordance with this chapter;
c. No retrofit phase may result in a reduction, even temporarily, in the predicted performance of the existing building or in the creation of a new structural irregularity or the worsening of an existing structural irregularity; and
d. All new or retrofitted structural components shall be detailed and connected to the existing structure in accordance with ASCE/SEI 41.

4.3 Nonstructural Retrofit Scope

The initial scope for assessment of the retrofit strategy for the nonstructural components in a building shall be set by the selected performance objective. The final scope of the assessment may be modified on a project-specific basis in coordination with a modified evaluation scope as permitted by Section 3.1.1. The user is referred to FEMA E-74: *Reducing the Risks of Nonstructural Earthquake Damage—a Practical Guide* (FEMA 2012) for additional guidance.

Chapter C1
Scope and Application

C1.0 Scope and Referenced Code and Standards

Executive Order (EO) 13717 requires that each agency that owns or leases an existing building adopt the *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings* (or *Standards*) as the minimum level acceptable for managing the earthquake risks in that building. The *Standards* is developed, issued, and maintained by the Interagency Committee on Seismic Safety in Construction (ICSSC). The EO requires the ICSSC to publish updated *Standards* for assessing and enhancing the earthquake resilience of existing federally owned or leased buildings as needed at the maximum interval of every 6 years. This document is the fourth edition of the *Standards*, designated as Recommended Practice (RP) 10, and is an update to its predecessor, RP 8. This document is officially cited as RP 10-22 to distinguish the year of publication, *e.g.*, the next edition will be RP 10-28 for the 2028 edition.

Seismic safety is a choice based on risk exposure. EO 13717 mandates the Federal Government to take proactive steps to enhance the resilience of buildings that are owned, leased, financed, or regulated by the Federal Government. RP 10 is a tool for an agency to realize and manage seismic risks posed to the agency by damage sustained in an existing building in their inventory during an earthquake. RP 10 can also be used to support mitigation strategies to reduce identified seismic risks. EO 13717 requires the agencies to adopt the latest versions of model building codes and referenced standards. These codes and standards provide the basis for defining the minimum seismic performance objectives, evaluation procedures, and, where necessary, retrofit criteria. As such, RP 10 was updated to reference these model building codes, published by the International Code Council, as well as two national consensus standards published by the American Society of Civil Engineers. Any code or standard used by an agency not identified in RP 10 shall be shown by the agency to be equivalent and compatible to the referenced documents. It is the responsibility of the agency to adopt newer codes and standards as they are released in accordance with EO 13717.

Seismic risks posed to an agency by an existing building and/or its contents subjected to an earthquake can be mitigated in various ways, including demolition or changes of occupancy/use of inadequately constructed buildings, earthquake insurance, or retrofit of structural and nonstructural systems. RP 10 uses the term "retrofit" to mean alteration or strengthening of existing structural or nonstructural components so the building can meet or exceed the selected performance objective. Past editions of the Standards used the term "rehabilitation," but it is now standard practice to call these measures "retrofit."

The requirements of RP 10 are intended to apply when triggered or prioritized by Section 1.2 and only after RP 10 is formally adopted by an agency by EO 13717. RP 10 is not intended to be applied retroactively to judge the adequacy of past good-faith agency efforts that might have applied different triggers, different scopes of work, different engineering criteria, or found to be in compliance with RP 8. An agency has the ability to amend the provisions as needed to fit within the needs of the agency, but in no case shall the amendments result in target performance or evaluation requirement less than the provisions.

C1.1 Performance Compliance

Compliance with RP 10 means that the building under consideration meets the minimum performance objective, which is intended to provide an acceptable level of exposure to seismic risks. A building must satisfy two criteria to satisfy the performance objective. First, the building does not trigger a mandatory evaluation in accordance with Section 1.2.1. Second, the building satisfies an agency-approved screening methodology as part of the voluntary evaluation in accordance with Section 1.2.2. There are exceptions to bypass the latter if the building has already been evaluated, retrofitted, benchmarked, or otherwise shown to not pose an unacceptable risk to the agency. Because RP 10 works through a series of prioritizations (Section 1.2) and allows various exemptions (Section 1.3 or Section 1.4), many existing buildings will comply with RP 10 without the need for a seismic evaluation.

For a building determined not to be in compliance with an agency-selected performance objective, mitigation of seismic risks is required if the evaluation was necessitated within the mandatory evaluation process or the building is added to the agency's mitigation programming if the evaluation was prioritized within the voluntary evaluation process. Any building not in compliance shall be categorized by the agency an Unacceptable Risk Exposure (URE); this was termed "Exceptionally High Risk" (EHR) in previous editions of this document. Defining a building as an EHR was subjective and often times had nothing to do with a risk posed to an agency, which in most cases is determined after a risk assessment based on a seismic evaluation. A Risk Category IV building should not be classified as an EHR (now URE) because it is assigned a higher risk category, without understanding that the building does pose a risk to the agency.

Compliance with RP 10 does not imply compliance with local jurisdictional or agency-specific requirements that may be more stringent. When a project is undertaken, the agency and its consultants should review the specific building codes, agency requirements, and other ordinances to determine all requirements that may apply. Where RP 10 makes more stringent requirements than the local building code and required ordinances, it is intended that the requirements of RP 10 should govern.

RP 10 uses the Risk Category assignment to set the performance objective for evaluation and retrofit, if needed. RP 10 provides different requirements for buildings that are deemed to be *high occupancy* (Risk Category III) or *essential* (Risk Category IV) to the mission of the agency, or that

justify higher levels of safety for an *ordinary* building. RP 8 made this distinction using a safety-based objectives or occupancy-based objectives.

C1.2 Circumstances Initiating a Seismic Evaluation

RP 10 provides for two processes for an agency to determine the need to evaluate their exposure to seismic risks given damage to a building:

- Mandatory Evaluation Process
- Voluntary Evaluation Process

The mandatory evaluation process requires an agency to conduct a seismic evaluation of an existing building going through a physical or contractual change. The voluntary evaluation process is an effort where the agency proactively screens a building or group of buildings, commonly within a mission focus, to prioritize a seismic evaluation(s) to gain awareness of agency exposure to any seismic risks given damage during a future earthquake.

RP 10 works through a set of "triggers"—conditions or changes of circumstance that merit a review of the anticipated seismic performance of a building. For a mandatory evaluation, any identified risk mitigation efforts are required to be added to the work involved with the physical or contractual change. For a voluntary evaluation, any identified risk mitigation efforts are based on the agency's current needs and resources.

The intent is to capitalize on circumstances in which the agency has made or is considering, a significant investment in the building, or a decision about how it intends to use or rely on the building. Mitigation of seismic risks identified by an evaluation is intended to gradually reduce the overall seismic risk posed to the agency by unanticipated damage to their existing building portfolio. When seismic improvements are done concurrently with significant non-seismic construction, the cost and disruption attributable to the seismic retrofit is minimized.

It is often cost-beneficial to make seismic improvements when structural or nonstructural components are exposed in the course of work. Therefore, agencies are encouraged to consider a voluntary seismic evaluation work when an alteration project does not meet the cost threshold in Item d or Item e.

The intent of the triggers from both processes is to establish a basis for complying with the prescribed minimum level of seismic safety for existing buildings owned or leased by the Federal Government. As such, RP 10 supports implementing Executive Order 13717. The triggers in RP 10 are mostly related to changes to a building that will increase its operational life or value (*e.g.*, extensive renovation), or will increase the seismic risk posed to an agency (*e.g.*, a change of occupancy or acquisition of a deficient building). Like the triggers in Section 1.2, the exemptions in Section 1.3 make distinctions based on risk, as represented by the Seismic Design Category

(SDC) assigned to a building. SDC accounts for the Risk Category of a building and for the potential shaking intensity at the building site. Triggers and exemptions in RP 10 were coordinated with the IEBC.

C1.2.1 Mandatory Evaluation Process Triggers

Section 1.2.1 provides a list of programming actions or building conditions that trigger a mandatory seismic evaluation.

- Item *a* triggers an evaluation when changes to the occupancy or use either: 1) increases the Risk Category of the building or 2) increases the design gravity loads by more than 10 percent on any floor. Both cases will increase the seismic demand on the structural and/or nonstructural systems. This differs from item *b* in that the increase in seismic demand is not a result of changes to the building systems.
- Item *b* triggers an evaluation when physical changes to the building increases the seismic demand on the existing structural and/or nonstructural systems (*i.e.*, adds mass). An evaluation is also triggered if changes decrease the seismic resistance of any building system or changes create or worsen a structural irregularity. This alteration trigger is different from Item *c* and Item *d* because it is not based on the cost of the modifications.
- Item *b* triggers an evaluation, and possible mitigation, of a building based on construction that maintains or creates a new prohibited structural irregularity or degrades the seismic strength of the building. The trigger references the requirements of the IEBC to the extent that an agency has adopted the IEBC as an applicable code. This alteration trigger is different from Item d and Item e because it is not based on cost.
- Item *c* triggers an evaluation in a moderate seismic zone assigned to SDC C (buildings assigned to SDC B are generally exempt per Section 1.3) where renovations are intended to extend its service life beyond 50 years from the original construction date. The cost trigger of 50 percent of replacement value is meant to approximate a renovation that makes the remaining useful life close to that of a new building. The replacement cost is the cost to build a building of similar size, location, and quality of architectural finishes intended for the same use as the as-built building before the addition, alteration, or repair in current time value.
- Item *d* triggers an evaluation in a high seismic zone (SDC D or greater) based on project cost of 30 percent of replacement value. The lower cost trigger was selected to force consideration of the value of making significant non-seismic improvements to a building that pose potentially significant seismic risk. See the discussion for Item *c* regarding replacement cost.
- Item *e* addresses repair of a damaged building. RP 10 references the provisions of the IEBC, which rely on a defined level of damage called "substantial structural damage." The determination of whether the threshold of substantial has been met requires engineering judgment, since even the IEBC definition relies on assessment of lost structural capacity.

If the damage was caused by an earthquake, another way to set the threshold would be to consider whether a small but damaging earthquake would likely lead to poor performance in a future larger event. This concept of disproportionate structural damage is expected to be adopted by future editions of the IEBC, and it represents a useful way for agencies to think about their seismic risks, but RP 10 does not yet require such a determination.

- Items *f* and *g* are based on a contractual changes by either adding a building to an agency inventory or leasing space. They are intended to prevent deficient buildings from being added or leased. They are not intended to apply to buildings temporarily under federal ownership such as those in the assets of failed banks placed under federal guardianship.
- Item *h* covers buildings that are being relocated.
- Item *i* captures a building that an agency has designated as posing unacceptable risks to the agency. This designation could occur as part of a seismic evaluation triggered by the mandatory or voluntary processes, or by a default designation because of a constructed condition or current state of the building without the need for a seismic evaluation.

Items *b* through *e* use the terms addition, alteration, or repair to match the terminology in Section 202 of the IEBC. Routine maintenance of a building is neither repair nor alteration; its costs should not trigger seismic evaluation under RP 10. However, extensive deferred maintenance should be considered as a repair under Item *e*.

C1.2.2 Voluntary Evaluation Process Triggers

Section 1.2.2 provides a list of screening targets that can trigger a seismic evaluation when the building does not satisfy specific circumstances. Section 1.2.2 provides several circumstances that can be used by the agency in developing their screening methodology. Section 1.2.2 also permits agencies to develop their own targets based on agency mission, construction, occupancy and use, or other impacts on the agency.

- Item 1 covers circumstances involving buildings with structural vulnerabilities that can increase the risk of collapse or loss of life.
- Item 2 covers circumstances involving buildings with plan or use vulnerabilities that can increase the risk of loss of life or life-threatening injuries by impeding response and recovery efforts of the building occupants or operational contents.
- Item 3 covers the case when an agency has prioritized a facility and pre-determined that normal anticipated downtime for repairs can potentially create a significant disruption to the agency mission and/or services provided. A seismic evaluation is thus triggered to estimate a measure of downtime to support decision making. The determination of 'normal anticipated downtime' for an agency is based on engineering judgment depending on construction conditions, construction date, and the building code used for design.

- Item 4 covers the case when an agency has prioritized a facility and pre-determined that potential costs associated with repairs and normal anticipated downtime creates a significant economic burden on the agency. A seismic evaluation is thus triggered to estimate a measure of economic losses and needs to support decision making. The determination of 'normal anticipated downtime' for an agency is based on engineering judgment depending on construction conditions, construction date, and the building code used for design.

C1.3 Exemptions

This section provides building characteristics, construction conditions, and/or location that permit a building to be exempt from a seismic evaluation. Exemption is given in the cases when performance during an earthquake will not pose an unacceptable seismic risk to an agency. RP 10 references the IBC for the determination of the seismic hazard parameters for a building and may require the involvement of a building official, registered design professional, or an individual familiar with the relevant building code provisions to interpret the parameters for an agency.

Figures C1.3-1(a) through C1.3-1(g) provide maps for an agency to quickly identify the Seismic Design Category for a building for the conterminous United States, Alaska, Hawaii, Puerto Rico, Guam and the Mariana Islands, and American Samoa. These maps are based on IBC data using the default soil condition. An online tool is provided in Section 1.3 for cases where a more accurate value is required based on differing parameters for a building than that used in the maps.

Buildings that are not expected to pose unacceptable seismic safety risks are generally exempt from RP 10 procedures. However, these exemptions do not apply to buildings assigned to Risk Category IV, which are expected to provide acceptable re-occupancy and recovery, as well as safety. See Chapter 2 regarding the expectations for buildings assigned to different risk categories.

The exemptions provided in this section are based on ICSSC member judgment and past policies. They have been modified to better align with requirements in the IEBC. It is possible that these exemptions may conflict with other jurisdictional codes, ordinances, or building regulations. Therefore, buildings exempt from RP 10 might still require seismic evaluation or retrofit because of more stringent governing provisions in the jurisdictional codes or ordinances. It is the responsibility of each agency to determine the governing codes for a given project.

- Items *a* and *b* address buildings located where the seismic hazard is low enough that no systematic seismic design is required for buildings. This is the basis for SDC A and for the most part SDC B. For similar reasons, RP 10 does not require consideration of seismic risk in existing buildings in this SDC A or B, except for projects that would explicitly trigger seismic evaluation and retrofit provisions found in the IEBC or building classified as Risk Category III or IV in SDC B.

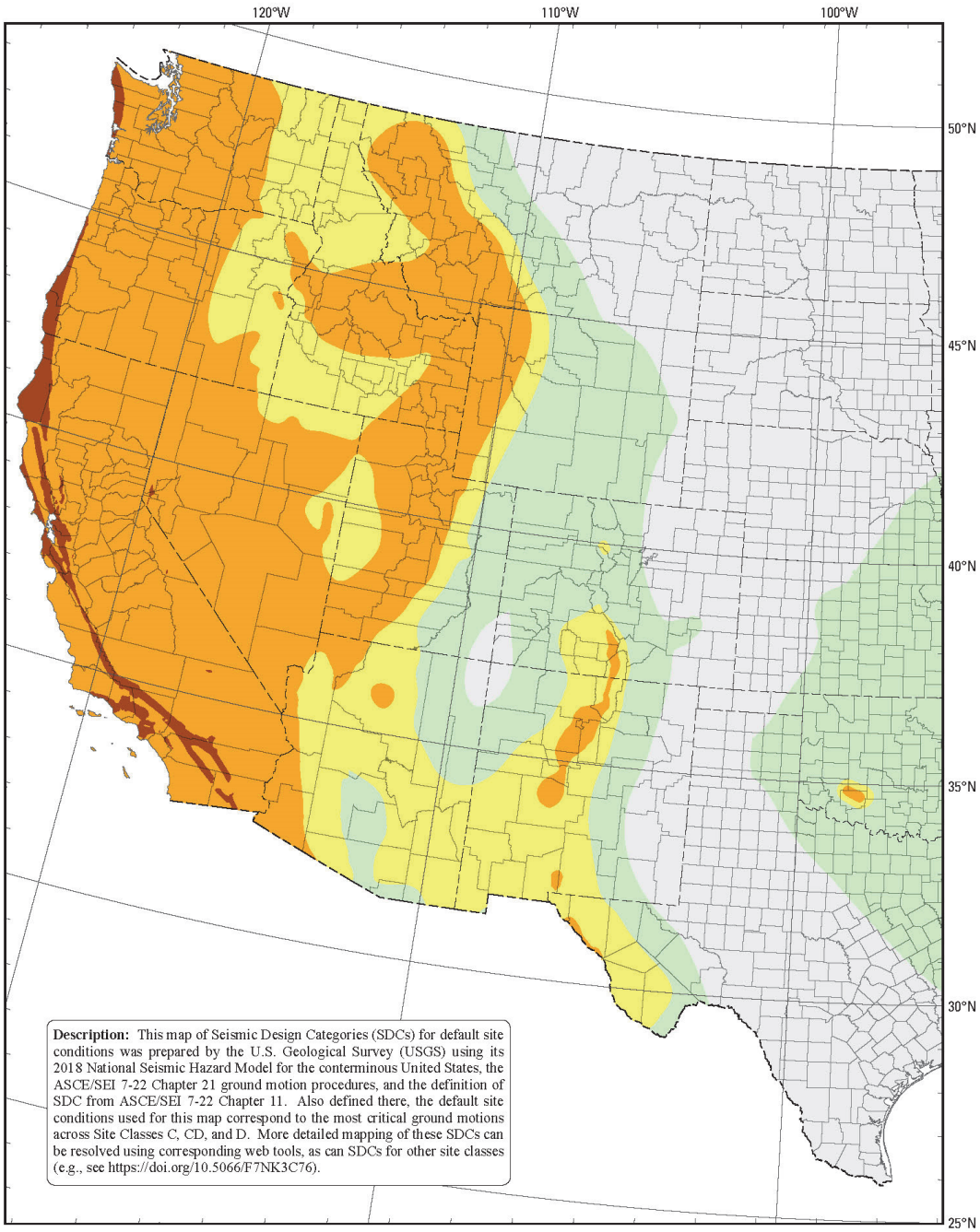


Figure C1.3-1(a). Map of Seismic Design Categories for Default Soil Conditions.

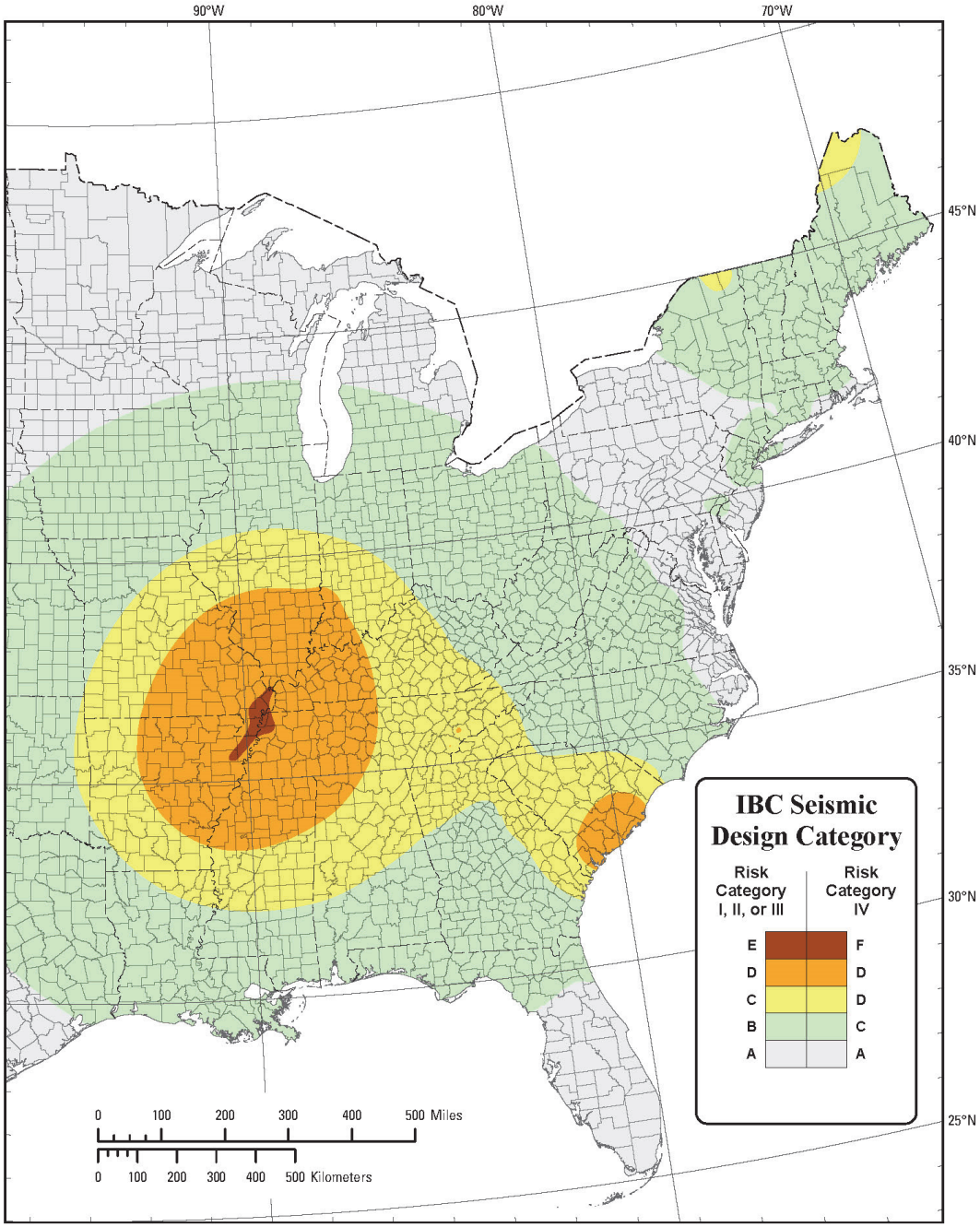
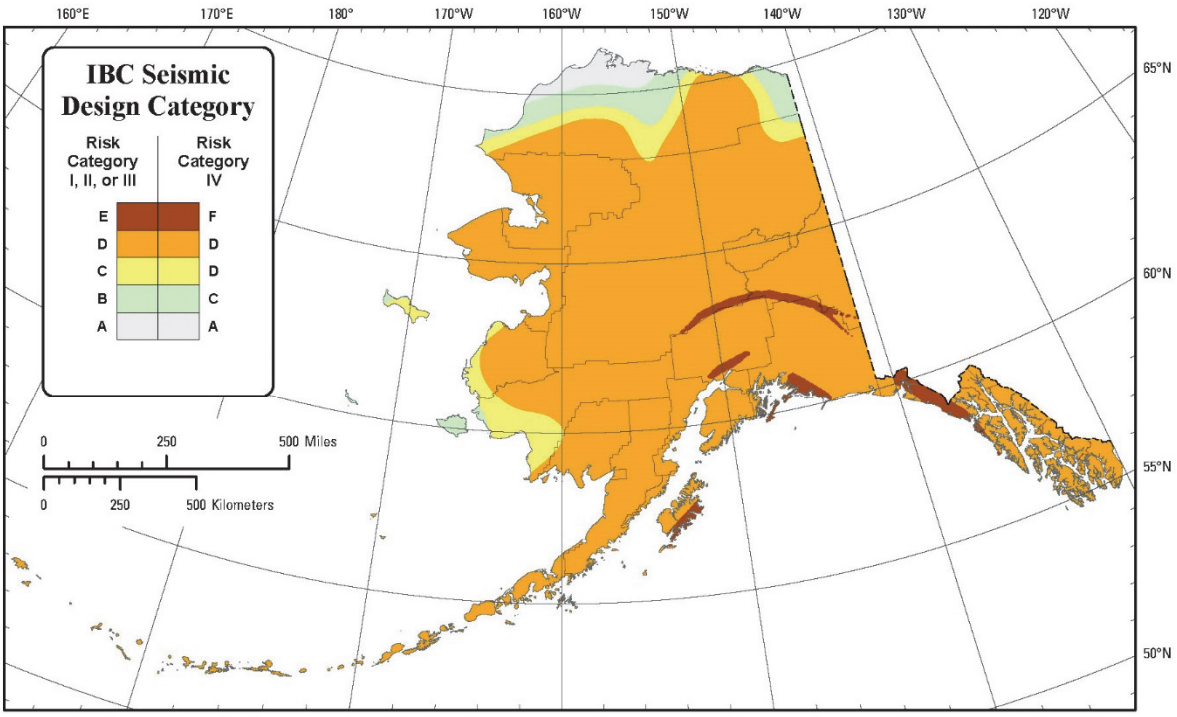


Figure C1.3-1(b). Map of Seismic Design Categories for Default Soil Conditions.



Description: This map of Seismic Design Categories (SDCs) for default site conditions was prepared by the U.S. Geological Survey (USGS) using its 2007 National Seismic Hazard Model for Alaska, the ASCE/SEI 7-22 Chapter 21 ground motion procedures, the FEMA P-2078 procedures for developing multi-period response spectra at non-conterminous U.S. sites, and the definition of SDC from ASCE/SEI 7-22 Chapter 11. Also defined there, the default site conditions used for this map correspond to the most critical ground motions across Site Classes C, CD, and D. More detailed mapping of these SDCs can be resolved using corresponding web tools, as can SDCs for other site classes (e.g., see https://doi.org/10.5066/F7NK3C76).

Figure C1.3-1(c). Map of Seismic Design Categories for Default Soil Conditions.

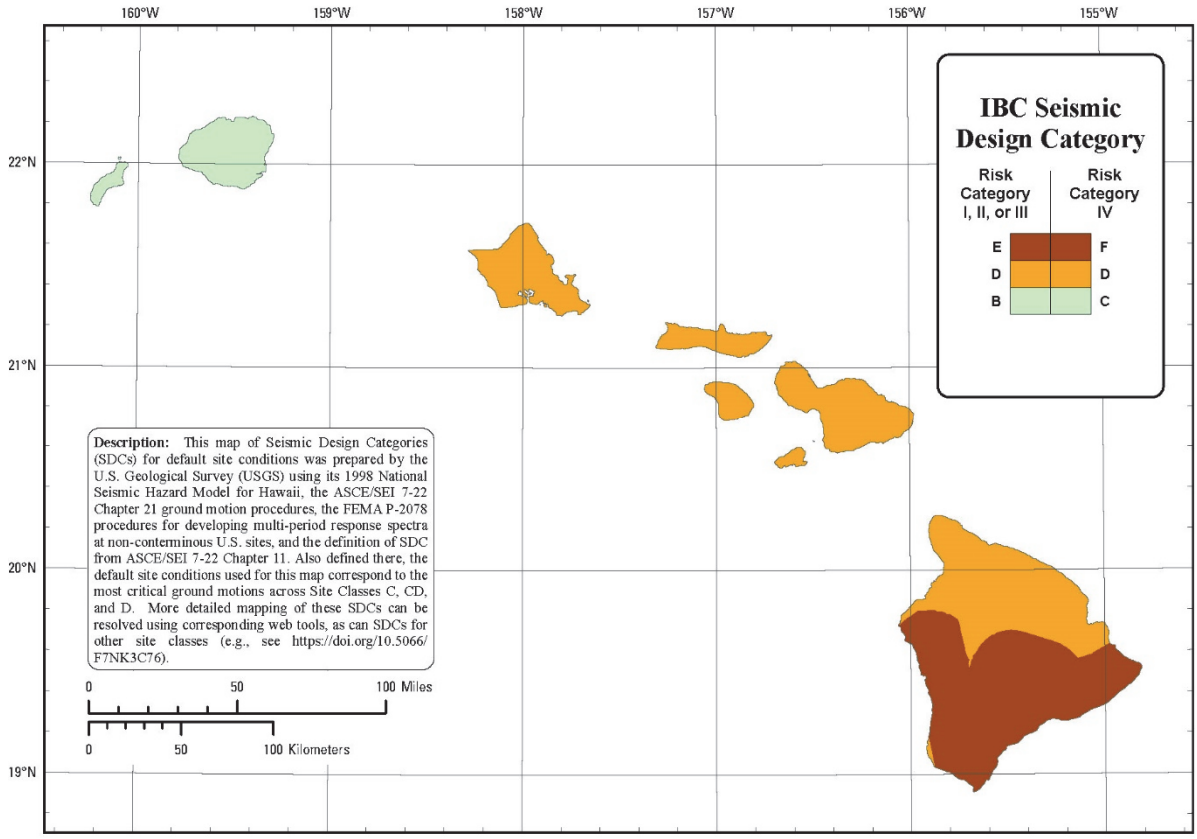
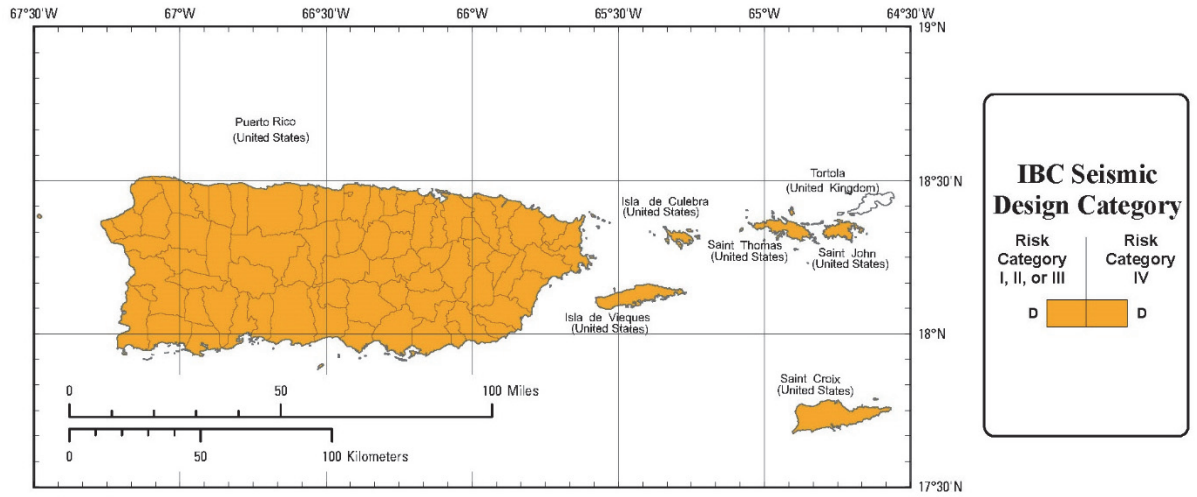


Figure C1.3-1(d). Map of Seismic Design Categories for Default Soil Conditions.



Description: This map of Seismic Design Categories (SDCs) for default site conditions was prepared by the U.S. Geological Survey (USGS) using its 2003 National Seismic Hazard Model for Puerto Rico and the U.S. Virgin Islands, the ASCE/SEI 7-22 Chapter 21 ground motion procedures, the FEMA P-2078 procedures for developing multi-period response spectra at non-conterminous U.S. sites, and the definition of SDC from ASCE/SEI 7-22 Chapter 11. Also defined there, the default site conditions used for this map correspond to the most critical ground motions across Site Classes C, CD, and D.

Figure C1.3-1(e). Map of Seismic Design Categories for Default Soil Conditions.

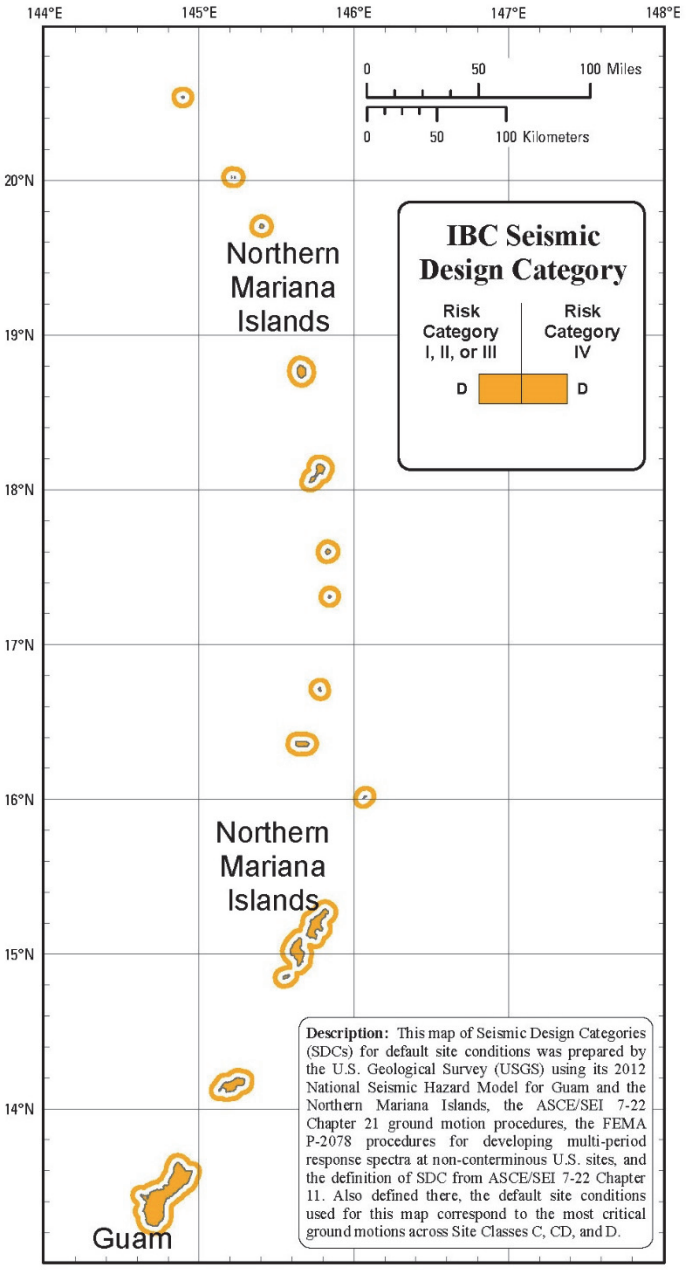
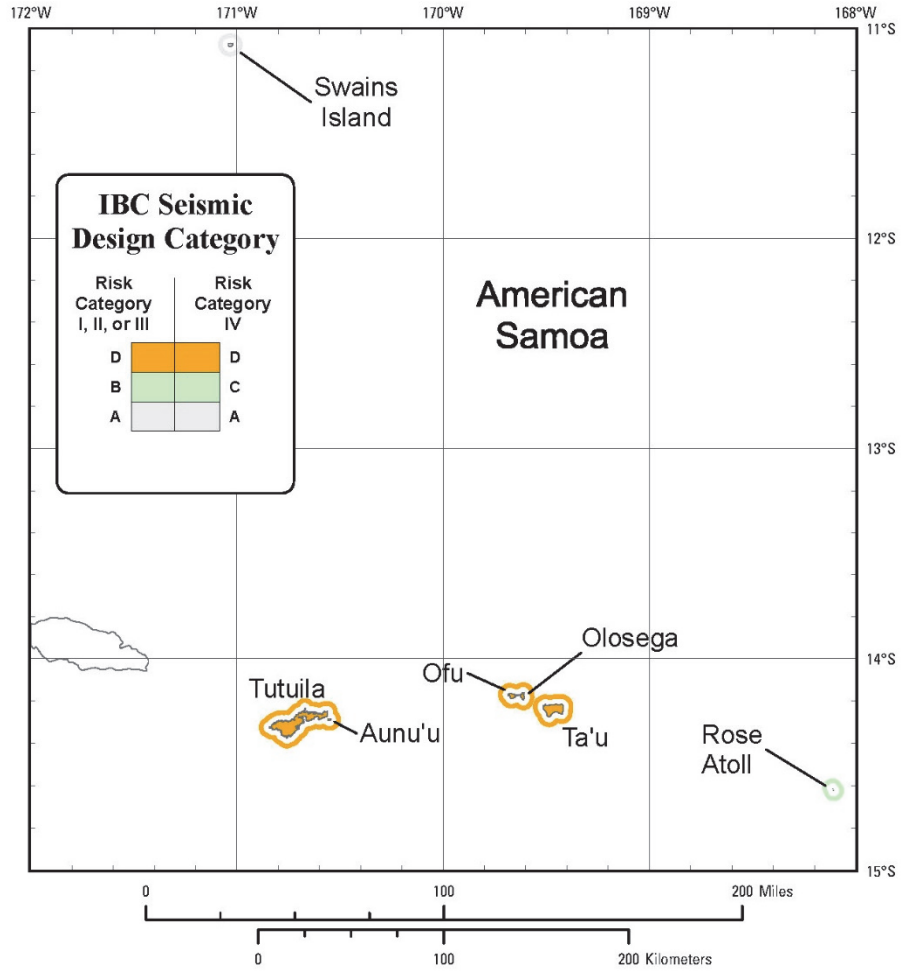


Figure C1.3-1(f). Map of Seismic Design Categories for Default Soil Conditions.



Description: This map of Seismic Design Categories (SDCs) for default site conditions was prepared by the U.S. Geological Survey (USGS) using its 2012 National Seismic Hazard Model for American Samoa, the ASCE/SEI 7-22 Chapter 21 ground motion procedures, the FEMA P-2078 procedures for developing multi-period response spectra at non-conterminous U.S. sites, and the definition of SDC from ASCE/SEI 7-22 Chapter 11. Also defined there, the default site conditions used for this map correspond to the most critical ground motions across Site Classes C, CD, and D.

Figure C1.3-1(g). Map of Seismic Design Categories for Default Soil Conditions.

- Item *c* provides an exception in areas of moderate seismic hazard where leased space meets a limiting requirement. This exemption does not to cover multiple leases of floor areas totaling over 10,000 ft^2 (930 m^2) in a single building.
- Item *d* provides an exception for some residential structures that are not under the purview of the IBC. The exemption applies regardless of the use of the building unless assigned to Risk Category IV and adds the more specific two-hour occupancy criterion.
- Item *e* exempts buildings assigned to Risk Category I that have incidental human occupancy.
- Item *f* exempts specific structural systems and building size that have shown acceptable performance in past earthquakes.

- Item *g* and *h* refer to short-term ownership or lease of space that may be necessary for surge space during renovation, for extra space during emergencies, or other uses totaling less than 5 years. Some federal agencies have internal guidance that simplifies other leasing requirements in such circumstances, and it would be logical to use the same criteria for seismic requirements.

In cases of changes of use or occupancy, occupancy-dependent exemptions should apply to the new use or occupancy based on the Risk Category assigned to the building in its new intended use or occupancy. In cases of building relocations, site-dependent exemptions should apply to the new building locations.

C1.4 Benchmark Buildings

A "benchmark building" is one that was designed and built, or retrofitted, in accordance with seismic provisions deemed suitable to the performance objective of interest. The determination of benchmark buildings, as described in Section 3.3 of ASCE/SEI 41 varies with building location, age, structural system, and governing building code. Benchmarking is for the buildings intended to satisfy the BPOE. An existing building designed prior to 2012 IBC evaluated to meet the BPON cannot be benchmarked. Further, benchmarking is only applicable for the same risk category (or occupancy factor) that the was assigned for the original design.

"Benchmarking" applies both to buildings that incorporated seismic provisions in their original design and those that have been seismically retrofitted. Benchmarking requires that the design was done in accordance with the benchmark code or standard in ASCE/SEI 41 and that there has been no significant alteration that would violate the assumptions of the benchmarking provisions.

Benchmarking addresses only the structural scope of work. Unless otherwise exempt, nonstructural components and geologic site hazards must still be considered, even for buildings shown as benchmarked in Section 3.3 of ASCE/SEI 41. Use of the benchmark building provisions must consider changes to site seismicity since original construction, be based on confirmation that the building was designed and constructed according to the appropriate code, as indicated in Section 3.3 of ASCE/SEI 41, and correlate available design documents with as-built conditions.

C1.5 Leased Buildings and Leased Space within a Building

This section applies to agencies that lease space in a non-federally owned building, whether the leasing agency occupies that space or not. This section also applies to an agency that leases space in their own building, or a building leased to them, to another agency through an occupancy agreement. Section 1.3, however, exempts small leased spaces in buildings and short-term leases.

Item *c* provides an exemption for potential nonstructural deficiencies outside the leased area because they are outside the agency's control, and when the agency will be replacing all the nonstructural components within the space being leased.

C1.6 Privately Owned Buildings on Federal Land

Privately owned existing buildings on federal land can include, for example, concessionaire buildings in national parks, school buildings on military bases, and buildings constructed and owned by private contractors with long-term exclusive relationships with federal agencies.

C1.7 Historic Buildings

Some building codes exempt historic buildings from triggered upgrades. Some allow flexibility in required performance, depending on the effect of retrofit on important historic features. In order to provide a consistent level of performance throughout the federal building stock, RP 10 does not make such a blanket exemption or permit flexibility in reducing the performance objective. In most cases, historic buildings are required to meet the same performance objectives as other buildings in the federal inventory. The intent of RP 10 is to provide essentially the same level of seismic performance as for non-historic buildings, without unreasonable impediment to the historic preservation process. However, alternative criteria may be appropriate, at the discretion of the agency acting as the code official. In some cases, it may be appropriate to retrofit a historic building to the Enhanced Safety Structural Performance Objective per ASCE/ SEI 41 to ensure that the architectural fabric survives an earthquake expected in the region.

Mitigation of seismic risks in historic buildings is a sensitive process that must balance the desired seismic performance with the need to protect the historical character and fabric of the building. Mitigation strategies developed specifically for historic buildings, such as those described in *Standards for the Treatment of Historic Properties and Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings* (Weeks and Grimmer 1995) should be evaluated.

Under the authority granted to it in Section 1.8, the agency may elect to permit the relaxation of the requirements of RP 10 for historic buildings when retrofit to the full requirements of RP 10 directly conflicts with preservation directives contained in *Standards for the Treatment of Historic Properties and Guidelines for Preserving, Rehabilitating, Restoring and Reconstructing Historic Buildings* (Weeks and Grimmer 1995). This should not, however, be taken as a permission to allow no mitigation to be done to the building, nor should it allow a building classified as an URE from not being mitigated.

C1.8 Additional Requirements

This section covers agency actions that are conducted in parallel to support a seismic evaluation in accordance with RP 10.

- Items *a* and *b* require that the agency be responsible for compliance with RP 10 and all reference standards. It is assumed that the agency will function in the manner which a local building department would. Therefore, wherever the reference standards cede decision responsibility to the "authority having jurisdiction" or "code official," it is intended that will be a duly authorized representative of the agency.
- Item *c* requires that the agency be responsible for assigning a Risk Category for the building under consideration. Even if a building is not assigned to Risk Category III or IV, the performance objectives in Chapter 2 for Risk Category II might not be adequate for the specific use or occupancy of the building depending on the mission of the agency. For such circumstances the agency may need to develop higher performance objectives than those in Chapter 2.
- Item *d* recognizes that each agency may have its own internal policies and procedures; it is up to each agency to cite RP 10 appropriately. Item *d* is also intended to enable efficient and acceptable use of "grandfathered" buildings previously evaluated or retrofitted. It is not the intent of RP 10 to rewrite federal agency procedures, but rather to set government-wide minimum standards. Once RP 10 is officially adopted for use, each agency should be able to demonstrate which of its existing or past programs meet or exceed the requirements of RP 10. For those programs that do not meet the requirements of RP 10, specific areas of potential deficiency should be identified and mitigated.
- Item *e* requires that quality control must not be overlooked in a seismic hazard mitigation project. All phases of a project, including evaluation and design and construction of a retrofit strategy must be monitored to be successful. Considerable engineering judgment is required to properly apply ASCE/SEI 41 or FEMA P-58. Reviews of evaluations for consistency, construction documents for adequacy, and construction itself for compliance with design drawings and construction standards are essential to maximize effectiveness of a project.
- Item *f* requires that an agency identifies which buildings in their inventory pose an Unacceptable Risk Exposure (URE). Past versions of this document used the term *Exceptionally High Risk* (EHR) but failed to qualify what the building is at high risk for. The ICSSC recommended in RP 5 that the following factors be considered in determining whether a building poses an EHR, presumably to the agency: seismicity of the building site, structural system, number of occupants, date of construction, number of stories, occupancy and use, square footage, structural irregularities, and importance of the building to the agency mission. However, none of these items pose a risk, individually or in any combination thereof. For example, a high occupancy multi-story building located in an area of high seismicity does not get automatically categorized as an EHR building, unless purposefully selected by an agency. RP 5 left the final determination of EHR buildings to the discretion of the agency, and definitions may vary from agency to agency. Seismic risks posed to an agency from damage given specific earthquake characteristics can only be determined after a building has been seismically evaluated. RP 10 is major update in that

it systematically categorizes a building as creating an URE to an agency after it has been evaluated and found to not comply with a selected performance objective.

C1.9 Qualifications of Evaluators, Designers, and Reviewers

Registered design professionals should be used to evaluate seismic risks for a specific building and to plan mitigation schemes. The engineering experience and qualifications of the individuals should match the scope and complexity of the assignment. The ICSSC recommends registration as a professional engineer to ensure that an individual possesses at least a familiarity with design and analysis of buildings for dynamic lateral loads. In addition, training and experience in seismic investigation should be required because ASCE/SEI 41 or FEMA P-58 uses concepts, terminology, and procedures different from those used for new building design.

Registered design professionals with a minimum amount of such background experience may be qualified for relatively small and simple buildings. Highly qualified individuals are recommended for complex buildings or for peer review. Their project experience should relate specifically to seismic investigations of structures.

A specialist in engineering geology or geotechnical engineering should be used for evaluation of foundation vulnerabilities and geologic site hazards.

C1.10 Items Not Addressed

Non-building structures can pose earthquake risks to safety and function just as building structures can. However, because RP 10 relies on ASCE/SEI 41 or FEMA P-58, which addresses only building structures, non-building structures must be addressed using other appropriate procedures and criteria. Similar non-building structures that are not "stand-alone" but rather are attached to a subject building (such as a roof-mounted tower or an adjacent pedestrian bridge) are within the scope of RP 10 and should be addressed as nonstructural components by applying engineering judgment and alternative criteria as appropriate.

Although there are obvious interactions between seismic hazards and other natural or man-made threats to buildings, a multi-hazard approach is beyond the scope of this document. However, before mitigation measures are taken for seismic deficiencies, it is good practice to consider other potential hazards.

As shown in Item *e* in Section 1.2.2, RP 10 triggers seismic evaluation and, possibly, mitigation when certain damage levels are reached. The intent of Section 1.10 is not to conflict with Section 1.2.2 but rather to clarify that RP 10 does not provide technical criteria for addressing material deterioration from such causes as corrosion, rot, fire charring, and termites. It is beyond the scope of RP 10 to address evaluation and mitigation criteria for damaged or deteriorated buildings, including those buildings damaged by earlier earthquakes. An agency assessing a damaged building

must investigate the condition of both the gravity load-resisting and seismic force-resisting elements to ensure that these elements and systems can perform dependably during an earthquake.

Human-induced earthquakes are not addressed in RP 10 because detailed seismic hazard maps are not included in the USGS seismic hazard model that produce the hazard maps for the United States. Further, this hazard is dependent on the activity, with the activity often having ended by the time its affects can be quantified in a hazard map. If an agency has a building located in a region that may be affected by a human-induced earthquake hazard, it is up to the agency's discretion on how to or if it should deal with that hazard.

Although seismic instrumentation of federal buildings is not addressed by RP 10, the ICSSC encourages agencies to instrument a number of buildings representative of their inventory to record building responses during seismic events. Such recordings are helpful to the ICSSC and to the profession in general in validating and, if needed, improving engineering standards to more accurately correlate engineering criteria with actual building performance.

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Chapter C2
Performance Objective

C2.0 Scope

The primary goal of RP 10 is to provide a methodology to gauge the severity of seismic risks posed to an agency and the public that may use the services provided in an agency building. The specified performance objectives in this Chapter are intended to outline the threshold for acceptable risk exposure. An agency may select or develop an enhanced performance objective if required.

Two seismic evaluation methods are presented in Chapter 3: deterministic using ASCE/SEI 41 or agency-approved equivalent and probabilistic using FEMA P-58 or agency-approved equivalent. It is the responsibility of the agency to determine which method is appropriate for the activity, which will depend on the seismic risks being evaluated, the level of risk accuracy needed, and how much behavioral data is available on the structural and nonstructural components.

C2.1 Minimum Performance Objective for Deterministic Seismic Evaluation

Use of ASCE/SEI 41 requires selection of a performance objective, which combines a desired structural and nonstructural performance level with a specified earthquake hazard intensity. RP 10 references two sets of performance objectives defined by ASCE/SEI 41.

- Basic Performance Objective Equivalent to New Building Standards (BPON) aims to match the performance expected of new buildings. However, the agency should keep in mind that ASCE/SEI 7 and referenced material-specific design standards are developed with a quantitative collapse performance and that an existing building designed and constructed without the same measures may have difficulty achieving this objective. In certain cases, the agency may wish to go beyond ASCE/SEI 41 or ASCE/SEI 7 and conduct a FEMA P695 (FEMA 2009) analysis to determine structural collapse compliance with the BPON.
- Basic Performance Objective for Existing Buildings (BPOE) allows a somewhat lower performance, as is traditional for certain triggered retrofits. The rationale for allowing "less than code" performance is related to the feasibility of achieving "code" level performance in existing buildings, as well as other project-specific benefit-cost considerations. The ASCE/SEI 41 commentary contains more background on the history and technical basis for the BPOE.

Both the BPOE and the BPON account for the different risk categories.

RP 8 also used two broad levels of performance. For evaluation, RP 8 effectively used BPOE-type objectives implicit in ASCE/SEI 31-03: *Seismic Evaluation and Retrofit of Existing Buildings*

(ASCE 2003). For retrofit, RP 8 effectively used BPON-type objectives defined as the Basic Safety Objective in ASCE/SEI 41-06: *Seismic Rehabilitation of Existing Buildings* (ASCE 2007). Thus, RP 8 allowed the lower objective for all evaluations and required the higher objective for all retrofits. The intent was to trigger retrofit only when a building failed even a low objective, but to do a full retrofit once retrofit was required. While there was precedent for this approach in federal and local mitigation programs, it had two problematic consequences. First, it meant that the scope of retrofit would often exceed the deficiencies found by the less conservative evaluation, making it difficult to budget a retrofit project based on evaluation findings. Second, it meant that triggered retrofit costs would often be disproportionate to the cost of the triggering alteration or repair project.

RP 10 takes a different approach that more closely matches that of the IEBC. Instead of using different objectives for evaluation and retrofit, Table 2-1 assigns the two broad sets of objectives, BPOE and BPON, by project type. Where retrofit becomes necessary, the retrofit objective matches the evaluation objective. As Table 2-1 shows, the lower BPOE objectives are allowed for repair projects and for moderate alterations, while the higher BPON objectives (which RP 8 required for all retrofits) are required for retrofits triggered by additions, changes of occupancy, relocations, purchased or donated buildings, and major alterations.

This approach is intended to result in fewer conflicts when agencies apply RP 10 together with the IEBC. The IEBC refers to BPON-type objectives as "International Building Code level seismic forces" and to BPOE-type objectives as "reduced International Building Code level seismic forces."

Given this new approach, together with a general intent to reflect the BPON-type retrofit objectives of RP 8, Table 2-1 represents a number of changes relative to RP 8 and variations from the IEBC, as follows.

In general, consistency between evaluation and retrofit objectives means that the BPON evaluation objectives are higher than in RP 8. The matching BPON retrofit objectives, however, remain the same. For two project types, repairs and alterations, the BPOE retrofit objectives are actually lower than in RP 8, reflecting a traditional concern for disproportionate retrofit costs.

RP 10 does not permit an agency to evaluate or retrofit to a performance objective less than what is provided in Table 2-1. However, an agency may elect to evaluate or retrofit to any performance objective greater than required in Table 2-1. Consideration of the effect of the loss of a building on the resilience of a local community or the nation should be considered and may lead to the selection of a higher performance objective than the minimum required per Table 2-1.

Some buildings may require performance levels for mission-critical requiring higher reliability of operational performance during and immediately after the specified earthquake than would typically be provided by the specified performance objective for even Risk Category IV buildings performance. Assignment of a mission-critical objective and specification of corresponding

evaluation and mitigation criteria are left to the discretion of each federal agency and are not addressed in RP 10.

C2.1.1 Basic Performance Objective Equivalent to New Building Performance

As shown in Table 2-2, compliance with BPON objectives requires work at two different earthquake hazard levels, BSE-1N and BSE-2N, defined in ASCE/SEI 41. As explained further in the commentary of ASCE/SEI 41, both hazard levels are considered necessary to reliably achieve new building equivalence in an existing building. The use of two hazard levels represents no change relative to the retrofit requirements in RP 8.

RP 10 uses risk categories in order to more closely align with the IBC and IEBC. RP 8 used the terms "safety-based objective" and "occupancy-based objective" to account for the same idea, that buildings serving different functions should have different performance expectations.

Table 2-2 shows that the defined objective includes consideration of nonstructural components at the lower hazard level. The IEBC, by contrast, does not trigger nonstructural evaluation or retrofit. RP 10 recognizes that nonstructural components can affect both building safety and post-earthquake functionality. For Risk Category I, II and III, the nonstructural performance objective calls for Position Retention with the BSE-1N hazard. While this is consistent with ASCE/SEI 41, the ICSSC recognizes that achieving Position Retention with existing components can sometimes cause disproportionate effort, disruption, or cost. Similarly, for Risk Category IV, the nonstructural performance objective calls for Operational performance. Since Operational performance requires a certain ruggedness typically demonstrated by component-specific testing, it is often impractical to prove existing components satisfy the criteria. Therefore, while the performance objectives remain as shown in Table 2-2, it is expected that agencies, acting as building officials, will need to implement these requirements with discretion and judgment, as allowed in Section 3.2.

Through the assignment of Risk Categories, the IBC and IEBC recognize that certain facilities must be usable almost immediately after an earthquake. Recognizing this need, ASCE/SEI 41 requires Immediate Occupancy in buildings assigned to Risk Category IV.

Performance objectives for Risk Category IV were called occupancy-based objectives in RP 8 (though Risk Category III could have been included in specific cases). Risk Category IV is generally appropriate for what building codes call "essential facilities." The definition of what is "essential" must be determined by each agency. The ICSSC recommends that the following facilities identified in Table 1604.5 of the IBC, among others, be designated as essential facilities:

- Fire, rescue, and police stations;
- Hospitals;
- Designated medical facilities having emergency treatment facilities;

- Designated emergency preparedness centers;

- Designated emergency operation centers;
- Designated emergency shelters;
- Power generating stations or other utilities required as emergency back-up facilities for other essential facilities;
- Emergency vehicle garages and emergency aircraft hangars;
- Designated communication centers;
- Aviation control towers and air traffic control centers;
- Structures containing certain quantities of toxic or explosive substances; and
- Water treatment facilities required to maintain water pressure for fire suppression.

There may be cases where a Risk Category III building needs to be seismically evaluated. These buildings were referred to in previous building codes as 'high occupancy' facilities.

FEMA E-74: *Reducing the Risks of Nonstructural Earthquake Damage–A Practical Guide* (FEMA 2012a), may be useful as an additional reference for scoping and prioritizing the protection of nonstructural components and contents for the Risk Category IV performance objectives.

C2.1.2 Basic Performance Objective for Existing Buildings

As noted in Section C2.2, RP 10 uses Risk Categories to account for distinctions between what RP 8 called a "safety-based objective" and an "occupancy-based objective."

There are two main differences between the BPOE and BPON objectives given in Section 2.2.

First, the BPOE objectives use different seismic hazard levels, BSE-1E and BSE-2E, defined in ASCE/SEI 41. BSE-1E and BSE-2E represent lower shaking intensities than BSE-1N and BSE-2N respectively. The lower intensities make the BPOE objectives less conservative than their BPON counterparts.

As explained further in the ASCE commentary, "reduced" earthquake loads were traditionally derived by applying a single factor, like 0.75, to the "full" loads used to design new buildings. RP 8, by referencing ASCE/SEI 31-03, implicitly took this traditional approach. RP 10, by referencing ASCE/SEI 41, defines the reduced loads in terms of different probabilities of exceedance.

Second, the BPOE nonstructural performance levels are less conservative. Where BPON requires Position Retention nonstructural performance for Risk Category I or Risk Category II, BPOE requires only Life Safety, and where BPON requires Operational performance for Risk Category IV, BPOE requires only Position Retention. These differences are consistent with traditional approaches that seek to avoid disproportionate additional cost where seismic mitigation is triggered by leases or by repair or moderate alteration projects (as shown in Table 2-1).

As discussed further in the ASCE/SEI 41 commentary, the difference between Life Safety and Position Retention nonstructural performance is largely about the scope of the mitigation, not the numerical criteria. For Life Safety nonstructural performance, only those components whose failure has led to serious injury or death in past earthquakes are within the scope. By contrast, Position Retention requires evaluation and mitigation of many nonstructural components whose failure may cost money or impede recovery but does not pose a common life safety hazard.

C2.2 Minimum Performance Objective for Probabilistic Seismic Evaluation

A major update in RP 10 is providing performance targets for use in a probabilistic seismic evaluation using FEMA P-58. RP 10 provides probability-based targets conditioned on the occurrence of ground shaking intensity for evaluation of collapse, loss of life, loss of function, and economic loss. These targets are assigned a risk level and RP 10 requires that all risk levels below the minimum target be evaluated. This means that if the agency target is economic loss (Risk Level 3), that the evaluation must also include functionality or loss of life (Risk Level 2) and collapse (Risk Level 1). If the agency target is only collapse, then no other risk level is required.

While the risk of loss of life or life-threatening injuries are captured in a structural collapse assessment, occupancy volume within a space is not explicitly addressed in this assessment. Therefore, including loss of life as a Risk Level 2 target allows a building that does not maintain occupancy on a daily basis (24 hour, 7 day a week) and a building that maintains a large daily work force to be evaluated accordingly to identify which risk governs the performance of the building. This target also assumes that 25% of occupancy volume is directly impacted within a collapsed area.

Similar to the performance objectives provided for a deterministic seismic evaluation, probability targets are prescribed for the various Risk Categories.

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Chapter C3
Evaluation Requirements

C3.0 Scope

Seismic evaluation and risk assessment of the evaluation results are two associated by distinctly different processes in the comprehension of agency exposure to seismic risks. Two seismic evaluation methods are presented in Chapter 3: deterministic using ASCE/SEI 41 or agency-approved equivalent and probabilistic using FEMA P-58 or agency-approved equivalent. A deterministic approach will require an implicit risk assessment whereas a probabilistic approach can explicitly include risk assessment.

C3.1 Deterministic Seismic Evaluation

As shown in Table 2-2 and Table 2-3, each performance objective involves two seismic hazard levels. In concept, both hazard levels must be evaluated to demonstrate performance compliance. This differs from RP 8, which allowed all evaluations to use only the one hazard level required by ASCE/SEI 31-03 (ASCE 2003).

The implicit risk assessment given in this section aligns with parameters used in practice. An agency can reduce these percentage values if required.

C3.1.1 Nonstructural Component Evaluation

While the nonstructural performance objectives specified in Chapter 2 are consistent with the intent of RP 8 and its predecessors and with the ASCE/SEI 41 standard, they do represent an increase in project scope relative to the IEBC. The ICSSC recognizes that nonstructural mitigation can sometimes involve disproportionate effort, disruption, and cost. This section clarifies that, for these reasons, each agency is allowed discretion in setting the nonstructural scope for a given project. The discretion is meant to be applied project-by-project, recognizing each project's specific circumstances; it is not intended that an agency would adopt a blanket policy modifying the performance objective set by RP 10.

Two cases are specifically noted, one in which the nonstructural scope might be reasonably reduced, and one in which it might be just as reasonably increased.

- Item *a* essentially allows an agency to reduce the desired nonstructural performance level, component by component, from Position Retention to Life Safety. Since the main difference between Position Retention and Life Safety is the number and type of components considered, the change of performance level represents a potentially substantial reduction in the scope of work.

Since the allowance only applies to Risk Category I or Risk Category II, and only to an initial objective involving Position Retention, it only affects projects with BPON objectives. The BPOE objectives already require only Life Safety nonstructural performance in Risk Category I or Risk Category II.

Examples of components that might be eligible for this scope reduction include panelized ceilings, certain light fixtures, piping, and some suspended mechanical equipment. ASCE/SEI 41 assumes that while damage to these components might render a building unusable, it would not make the building unsafe. Life Safety performance assumes that occupants will protect themselves during the earthquake ("drop, cover, and hold") and will be able to exit the building on their own through disturbed, but not blocked, egress routes. In addition, ASCE/SEI 41 Section 16.17 already allows even Life Safety provisions to be waived in parts of a building that are normally unoccupied. These assumptions and allowances might not be appropriate for buildings occupied by children or impaired persons, or in facilities where such components are especially numerous or densely configured. Therefore, to apply this allowance, the professional performing the assessment must visualize what is expected to happen for each potential nonstructural deficiency and make an appropriate judgment regarding the falling hazard and its effects on safety and egress. FEMA E-74: *Reducing the Risks of Nonstructural Earthquake Damage*, provides information on the relative risks posed by nonstructural elements, as well as appropriate mitigation techniques.

Item *a* does not apply to buildings assigned to Risk Category III because these buildings typically have assembly occupancy or vulnerable occupants and are expected to provide a heightened level of safety. In effect, the judgmental decisions allowed by RP 10 for Risk Category I or Risk Category II are being made by RP 10 for Risk Category III.

- Item *b* While it has been common practice to consider nonstructural performance only at the BSE-1E or BSE-1N hazard level, a major nonstructural falling hazard could have the same consequences as a partial structural collapse, so these items should also be evaluated and mitigated at the higher hazard level as well. This is especially the case where the lower hazard level is much smaller than the higher hazard, so that a component might pass an evaluation at the lower hazard while remaining especially vulnerable to a slightly larger earthquake.

C3.2 Probabilistic Seismic Evaluation

FEMA P-58 and its referenced procedures is a next generation performance-based seismic assessment methodology that can explicitly address risk assessment. The tool is as good as its input and the available behavioral data of the structural and nonstructural components in the building being evaluated. This type of analysis is generally reserved for high-end building structures; Risk Category III and IV buildings or Risk Category II buildings determined to be key for maintaining

some level of agency mission after an earthquake. An agency is strongly encouraged to seek expert structural engineering analysists (see Section 1.9 Design Professional) for conducting this type of evaluation.

The probability targets align with parameters used in practice. An agency can reduce these values if required.

C3.3 Designation of a Building After Seismic Evaluation

Since RP 4, the agencies have had to define buildings within their inventory as "exceptionally high risk" (EHR). However, this designation generally cannot be done until after a seismic evaluation and risk assessment. Predecessor versions of the *Standards* did not provide explicit guidance on when a seismic evaluation should be prioritized by an agency and left this to the agencies. RP 10 has taken the steps to provide guidance regarding when an agency should prioritize an evaluation, how to conduct an evaluation, and when the output of the evaluation results in a building posing an unacceptable risk to an agency. The term EHR has been replaced in RP 10 with the more physically meaningful term, Unacceptable Risk Exposure (URE).

Any building designated as URE must be recorded and provided to the person in charge of facility construction or programming for the agency to support their decision making. Seismic safety is a choice based on risk exposure. RP 10 is a tool to estimate the severity of seismic risk exposure. EO 13717 mandates the Federal Government to take proactive steps to enhance the resilience of buildings that are owned, leased, financed, or regulated by the Federal Government.

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Chapter C4
Mitigation Requirements

C4.0 Purpose

There are many actions that can be taken to mitigate the exposure to seismic risks posed to an agency from an existing building; implementing a retrofit strategy is most common.

C4.1 Seismic Evaluation of a Seismic Retrofit Strategy

A retrofitted building must satisfy the performance objective given in Chapter 2. For some buildings, the performance of the retrofitted building could extend beyond reducing safety risks. In some cases, the nature or extent of necessary retrofitting can be so extensive that abandonment or relocation is a cost-effective alternative. Generally, the performance objective for evaluating a retrofit strategy is chosen as the same used for the initial evaluation of the non-retrofitted building, but an agency can select an enhanced objective if needed.

Examples of retrofit strategies are discussed in the commentary to:

- ASCE/SEI 41-17 and its predecessor documents (including FEMA 274 and FEMA 356);
- FEMA 274, *NEHRP Commentary on the Guidelines for the Seismic Rehabilitation of Buildings* (FEMA 1997b);
- FEMA 351, *Recommended Seismic Evaluation and Upgrade Criteria for Existing Welded Steel Moment-Frame Buildings* (FEMA 2000a);
- FEMA 547, *Techniques for the Seismic Rehabilitation of Existing Buildings* (FEMA 2006); and
- FEMA P-807, *Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings with Weak First Stories* (FEMA 2012b).

Adding strength and stiffness by augmenting existing elements or introducing new elements is the most conventional strategy for improving seismic performance. Where the existing building is highly deficient relative to the performance objective, however, it may be impractical or uneconomical to add sufficient strength. Techniques that improve the drift capacity of components that are not part of the seismic force-resisting system (such as gravity load carrying columns in older concrete buildings) are available for use alone or in conjunction with lateral system strengthening. In addition, configuration irregularities can be eliminated, damping can be added, or all or part of the building can be seismically isolated to reduce displacement demand.

Design of the retrofit strategy is in accordance with ASCE/SEI 41 and its referenced standards depending on the type of retrofit (*e.g.*, component addition/replacement or base isolation), construction material, and agency policies.

C4.2 Phased Retrofitting to meet a Performance Objective

Owing to space restrictions, budgets, and other factors, it may be necessary to complete a mitigation project in several phases, sometimes spanning several years. This practice is acceptable as long as the partial retrofitting measures do not reduce the performance level of the existing structure at any time (except temporarily during actual construction), and the retrofit has a reasonable plan for completion in a timely manner. The overall schedule of the complete retrofit will depend on the nature and size of the project, but as a general rule, the ICSSC recommends that a reasonable overall duration for all phases should not exceed five years.

Phased retrofits, if not carefully planned, can exacerbate existing structural irregularities. For example, a phased retrofit might be appropriate in a multi-story building where tenants are temporarily relocated while work is being done on their floor. In this case, the retrofit work should usually proceed from lower floors to the top of the building, to avoid creating a soft or weak story irregularity if upper stories are stiffened or strengthened first. Similarly, strengthening one side or wing of a building during a single phase could create a torsional irregularity between phases.

C4.3 Nonstructural Retrofit Scope

As discussed in Section C3.1.1, RP 10 allows some agency discretion in setting the scope of nonstructural mitigation.

Where Operational performance is required, ASCE/SEI 41 and ASCE/SEI 7 provide some requirements involving larger anchorage and bracing forces and certification of component ruggedness. Certification is normally done through analysis or physical testing of the components. While those requirements are intended to meet the Operational nonstructural performance level, they might not be sufficient for cases where the component must function during an earthquake. In these cases, more specific criteria may need to be developed. Further guidance on nonstructural performance and mitigation of nonstructural hazards can be found in FEMA E-74.

References

ASCE, 2003, *Seismic Evaluation and Retrofit of Existing Buildings*, ASCE/SEI 41-03, American Society of Civil Engineers, Reston, Virginia.

ASCE, 2007, *Seismic Rehabilitation of Existing Buildings*, ASCE/SEI 41-06, American Society of Civil Engineers, Reston, Virginia.

ASCE, 2011, *Minimum Design Loads and for Buildings and Other Structures*, ASCE/SEI 7-10, American Society of Civil Engineers, Reston, Virginia.

ASCE, 2014, *Seismic Evaluation and Retrofit of Existing Buildings*, ASCE/SEI 41-13, American Society of Civil Engineers, Reston, Virginia.

ASCE, 2017, *Seismic Evaluation and Retrofit of Existing Buildings*, ASCE/SEI 41-17, American Society of Civil Engineers, Reston, Virginia.

ASCE, 2016, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, ASCE/SEI 7-16, American Society of Civil Engineers, Reston, Virginia.

FEMA 1992, *NEHRP Handbook for the Seismic Evaluation of Existing Buildings*, FEMA 178, prepared by the Building Seismic Safety Council for the Federal Emergency Management Agency, Washington, D.C.

FEMA, 1997a, *NEHRP Guidelines for the Seismic Rehabilitation of Buildings,* FEMA 273, prepared by the Applied Technology Council for the Building Seismic Safety Council with funding from the Federal Emergency Management Agency, Washington, D.C.

FEMA, 1997b, *NEHRP Commentary on the Guidelines for the Seismic Rehabilitation of Buildings,* FEMA 274, prepared by the Applied Technology Council for the Building Seismic Safety Council with funding from the Federal Emergency Management Agency, Washington, D.C.

FEMA 1998, *Handbook for the Seismic Evaluation of Buildings*, FEMA 310, prepared by the American Society of Civil Engineers for the Federal Emergency Management Agency, Washington, D.C.

FEMA, 2000a, *Recommended Seismic Evaluation and Upgrade Criteria for Existing Welded Steel Moment-Frame Buildings*, FEMA 351, prepared by the SAC Joint Venture Partnership for the Federal Emergency Management Agency, Washington, D.C.

FEMA, 2000b, *Prestandard and Commentary for the Seismic Rehabilitation of Buildings*, FEMA 356, prepared by the American Society of Civil Engineers for the Federal Emergency Management Agency, Washington, D.C.

FEMA, 2006, *Techniques for the Seismic Rehabilitation of Existing Buildings*, FEMA 547, prepared by Rutherford & Chekene Consulting Engineers under contract with National Institute of Standards and Technology for the Federal Emergency Management Agency, Washington, D.C.

FEMA, 2012a, *Reducing the Risks of Nonstructural Earthquake Damage – A Practical Guide*, FEMA E-74, prepared by the Applied Technology Council for the Federal Emergency Management Agency, Washington, D.C.

FEMA, 2012b, *Seismic Evaluation and Retrofit of Multi-Unit Wood-Frame Buildings with Weak First Stories*, FEMA P-807, prepared by the Applied Technology Council for the Federal Emergency Management Agency, Washington, D.C.

FEMA, 2012a P-50, Volumes 1-7, *Simplified Seismic Assessment of Detached, Single-Family, Wood-Frame Dwellings*

FEMA 2012b E-74: *Reducing the Risks of Nonstructural Earthquake Damage—a Practical Guide*

FEMA P-154, *Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook* (FEMA 2015);

FEMA 2018 P-58, *Seismic Performance Assessment of Buildings*

ICC, 2018a, *International Building Code*, International Code Council, Washington, D.C.

ICC, 2018b, *International Existing Building Code*, International Code Council, Washington, D.C.

ICC, 2018c, *International Residential Code*, International Code Council, Washington, D.C.

ICSSC, 1994, *Standards of Seismic Safety for Existing Federally Owned or Leased Buildings and Commentary*, RP 4, NISTIR 5382, Gaithersburg, Maryland.

ICSSC, 1995, *ICSSC Guidance on Implementing Executive Order 12941 on Seismic Safety of Existing Federally Owned or Leased Buildings*, RP 5, NISTIR 5734, Gaithersburg, Maryland.

ICSSC, 2002, *Standards of Seismic Safety for Existing Federally Owned or Leased Buildings and Commentary*, RP 6, NISTIR 6762, Gaithersburg, Maryland.

ICSSC, 2011, *Standards of Seismic Safety for Existing Federally Owned or Leased Buildings and Commentary*, RP 8, GCR 11-917-12, Gaithersburg, Maryland.

Weeks, K.D. and Grimmer, A.E., 1995, *The Secretary of the Interior's Standards for the Treatment of Historic Properties with Guidelines for Preserving, Rehabilitating, Restoring & Reconstructing Historic Buildings*, U.S. Department of the Interior, Washington, DC.

Appendix A
History of the *Standards*

History of *Standards of Seismic Safety for Existing Federally Owned and Leased Buildings*

Public Law 101-614[1] mandated the Interagency Committee on Seismic Safety in Construction (ICSSC), a function of the National Earthquake Hazards Reduction Program (NEHRP), to develop standards for assessing and enhancing the seismic safety of existing buildings constructed for or leased by the Federal Government, which were designed and constructed without adequate seismic design and construction standards. The ICSSC issued the first edition of *Standards of Seismic Safety for Existing Federally Owned or Leased Buildings* (or *Standards*) in 1994 as ICSSC Recommended Practice (RP) 4, published as NISTIR 5382 (NIST 1994). Subsequently, Executive Order 12941[2]: *Seismic Safety of Existing Federally Owned or Leased Buildings* adopted the *Standards* as the minimum level acceptable for use by federal agencies in assessing the seismic safety of their owned and leased buildings and in mitigating unacceptable seismic risks in those buildings.

RP 4 was based on FEMA 178: *NEHRP Handbook for the Seismic Evaluation of Existing Buildings* (FEMA 1992), which established criteria for evaluating buildings to a performance level of Substantial Life Safety. FEMA 178 was updated as FEMA 310: *Handbook for the Seismic Evaluation of Buildings, A Prestandard* (FEMA 1998).

In 1997, FEMA 273: *NEHRP Guidelines for the Seismic Rehabilitation of Buildings* (FEMA 1997a), and FEMA 274: *Commentary on the NEHRP Guidelines for the Seismic Rehabilitation of Buildings* (FEMA 1997b) were published. FEMA 273 was updated in 2000 as FEMA 356: *Prestandard and Commentary for the Seismic Rehabilitation of Buildings* (FEMA 2000b).

RP 4 was updated in 2002 as ICSSC RP 6 and published as NISTIR 6762 (NIST 2002). RP 6 referenced FEMA 310 and FEMA 356.

In 2003, FEMA 310 was converted to a standard and published by the Structural Engineering Institute (SEI) of the American Society of Civil Engineers (ASCE) as ASCE/SEI 31-03 (ASCE 2003). In 2006, FEMA 356 was similarly converted to an ASCE standard and published as ASCE/SEI 41-06 (ASCE 2007).

While FEMA 178 addressed the risk to loss of life and life-threatening injuries, ASCE/SEI 31-03 and ASCE/SEI 41-06 (and their predecessors FEMA 310 and FEMA 356) included procedures

[1] P.L. 101-614: *National Earthquake Hazards Reduction Program Reauthorization Act of 1990*. 104 Stat. 3231; 16 Nov. 1990.
[2] United States, Executive Office of the President [William Clinton]. Executive order 12941: *Seismic Safety of Existing Federally Owned or Leased Buildings*. 1 Dec. 1994. Federal Register, Vol. 59, No. 232, 5 Dec. 1994.

for evaluation and rehabilitation of buildings for Life Safety and Immediate Occupancy performance levels.

RP 6 was updated in 2011 as RP 8 and published as NIST GCR 11-917-12 (NIST 2011). RP 8 referenced ASCE/SEI 31-03 and ASCE/SEI 41-06 and prescribed minimum performance levels. RP 8 also utilized the Seismic Design Categories defined in ASCE/SEI 7-10: *Minimum Design Loads for Buildings and Other Structures* (ASCE 2010) to assign seismic performance requirements and define seismic hazard levels in various regions of the United States.

ASCE/SEI 31-03 and ASCE/SEI 41-06 were combined into a single ASCE standard in 2013 as ASCE/SEI 41-13: *Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 2013). ASCE/SEI 41-13 maintained the three-tiered evaluation approach of ASCE/SEI 31-03 as well as the broader performance objectives and analytical procedures of ASCE/SEI 41-06. ASCE/SEI 41-13 was updated in 2017 as ASCE/SEI 41-17: *Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 2017). The next update will be ASCE/SEI 41-23: *Seismic Evaluation and Retrofit of Existing Buildings* (ASCE 2023).

RP 8 was adopted by Executive Order (EO) 13717[3]: *Establishing a Federal Earthquake Risk Management Standard*. EO 13717 establishes seismic requirements for new and existing buildings that will be constructed, altered, leased, financed, or regulated by the Federal Government. EO 13717 requires that agencies whose activities are covered by the order adopt the *Standards* as the minimum level acceptable for managing the earthquake risks in their existing building portfolio or leased space. The EO further requires the ICSSC to review and update the *Standards* as needed to comply with the order at the maximum interval of every 6 years. EO 13717 rescinds EO 12941.

In 2016, an effort was initiated to update RP 8 as RP 10. To support EO 13717, RP 10 would reference the 2018 editions of the International Building Code, International Existing Building Code, and the International Residential Code, as well as ASCE/SEI 41-17 and ASCE/SEI 7-16. These codes and standards provide the bases for defining performance objectives, evaluation procedures, and, where necessary, retrofit criteria.

[3] United States, Executive Office of the President [Barack Obama]. Executive order 13717: *Establishing a Federal Earthquake Risk Management Standard.* 2 Feb. 2016. Federal Register, Vol. 81, No. 24, 5 Feb. 2016.

Appendix B
Cross Reference between RP 8 and RP 10

Table B-1 provides a high-level cross reference between RP 8 and RP 10.

Table B-1. Cross Reference Between RP 8 and RP 10

Recommended Practice 8		Recommended Practice 10	
1.0	Intent and Reference Standards	1.0	Scope and Referenced Codes and Standards
1.1	Performance Objectives	2.0	(Performance Objective) Scope
1.2	Items Not Included in the *Standards*	1.10	Items Not Included in Recommended Practice 10
1.3	Exemptions	1.3	Exemptions
1.3.1	Benchmark Buildings	1.4	Benchmark Buildings
1.3.2	Leased Buildings	1.5	Leased Space within a Building
1.3.3	Privately Owned Buildings on Federal Land	1.6	Privately Owned Buildings on Federal Land
2.0	(Application of the *Standards*) Scope	1.0	Scope and Referenced Codes and Standards
2.1	Situations Requiring Evaluation and Potential Mitigation	1.2	Circumstances Initiating a Seismic Evaluation
2.2	Compliance	1.1	Performance Compliance
2.3	Qualifications of Evaluators, Designers, and Reviewers	1.9	Qualifications of Evaluators, Designers, and Reviewers
2.4	Additional Requirements	1.8	Additional Requirements
3.0	(Evaluation) Scope	3.0	(Evaluation Requirements) Purpose
3.1	Evaluation Requirements	3.0	(Evaluation Requirements) Purpose
3.2	Nonstructural Evaluation Final Assessment	3.1.1	Nonstructural Component Evaluation
4.0	(Mitigation) Scope	4.0	(Mitigation Requirements) Purpose
4.1	(Mitigation) Requirements	4.1	Seismic Evaluation of a Seismic Retrofit Strategy
4.2	Minimum Standards and Scope for Mitigation	4.1	Seismic Evaluation of a Seismic Retrofit Strategy
4.3	Incremental/Partial Retrofitting	4.2	Phased Retrofitting to meet a Performance Objective
4.4	Strategies for Mitigation	4.0	(Mitigation Requirements) Purpose

Recommended Practice 8		Recommended Practice 10	
4.4.1	Local Modification of Components	-	Removed from RP 10
4.4.2	Removal or Lessening of Existing Irregularities	-	Removed from RP 10
4.4.3	Nontraditional Mitigation Methods	-	Removed from RP 10
4.4.4	Mitigation of Nonstructural Mechanical and Electrical Equipment	4.3	Nonstructural Retrofit Scope
4.5	Historic Buildings	1.7	Historic Buildings

Appendix C
RP 10 Workflow Examples

This appendix provides a workflow example for both the mandatory evaluation process and the voluntary evaluation process.

Mandatory Evaluation Process Workflow using RP 10

Agency Z has an inventory of existing buildings with locations throughout the nation. The agency has decided to modify Building X (e.g., change of occupancy, construct an addition, alteration, repair, etc.), or it has been designated as an URE by the agency (see §1.8, Item *f*), and programming is initiated.

Step 1: Gather relevant design and construction data for the as-built building at the time of programming (i.e., unmodified) and its *modified* version after work is completed, including seismic hazard data for the building site. The *modified* version does not include seismic retrofits required based on a seismic evaluation (Step 4).

Step 2: Check §1.1 to determine if the *modified* building complies with the minimum seismic performance objective for the applicable Risk Category.

I. Determine if building satisfies Condition A (§1.2.1):
   a. Cond. A is Satisfied → go to II and check Cond. B.
   b. Cond. A is Not Satisfied → seismic evaluation is required, skip II (Cond. B), go to Step 3.

II. Determine if building satisfies Condition B (§1.2.2), including its exceptions:
   a. Cond. B is Satisfied → performance of building is deemed to comply with RP 10. Agency designates building as an ARE. *END PROCESS*
   b. Cond. B is Not Satisfied → seismic evaluation is required, go to Step 3.

Step 3: Check §1.3 to determine if *modified* building is exempt from a seismic evaluation.

a. Exempt → performance of building is deemed to comply with RP 10. Agency designates building as an ARE. *END PROCESS*

b. Not Exempt → performance of building is deemed to not comply with RP 10. Agency programs seismic evaluation of building in accordance with Chapters 2 and 3, go to Step 4.

Step 4: Does *modified* building satisfy the risk assessment in Chapter 3 based on the target performance objective selected in Chapter 2 for the seismic evaluation conducted?

a. Risk Assessment is Satisfied → agency designates building as an ARE. *END PROCESS*
b. Risk Assessment is Not Satisfied → agency designates building as a URE, a record of the URE designation shall be provided to the person in charge of facility construction or programming for the agency in accordance with §3.3, seismic risk(s) shall be mitigated in accordance with Chapter 4. Depending on mitigation strategy, repeat Step 4 for the *retrofitted modified* building until risk assessment is satisfied.

Step 5: Repeat Steps 1 through 4 as programming requires for other buildings in inventory.

Voluntary Evaluation Process Workflow using RP 10

Agency Z has an inventory of existing buildings with locations throughout the nation. The agency has decided to screen a set of their inventory to determine what buildings may pose an unacceptable seismic risk(s). This set can be composed of one building, a subset of the inventory, or the complete inventory. Follow Steps 1 through 6 for each building in the set. If any building is being modified or has been designated as an URE by the agency, then it shall follow the mandatory evaluation process.

Step 1: Gather relevant design and construction data for the as-built building at the time of screening, including seismic hazard data for each building site.

Step 2: Check §1.1 to determine if building complies with the minimum seismic performance objective for the applicable Risk Category.

I. Determine if building satisfies Condition A (§1.2.1):
    a. Cond. A is satisfied by default since no modifications or designation will trigger a mandatory seismic evaluation → go to II and check Cond. B.
II. Determine if building satisfies Condition B (§1.2.2), including its exceptions:
    a. Cond. B is Satisfied → performance of building is deemed to comply with RP 10. Agency designates building as an ARE. *END PROCESS*
    b. Cond. B is Not Satisfied → seismic screening is required, go to Step 3.

Step 3: Check §1.3 to determine if building is exempt from a seismic evaluation.

a. Exempt → performance of building is deemed to comply with RP 10. Agency designates building as an ARE. *END PROCESS*
b. Not Exempt → seismic screening is required, go to Step 4.

Step 4: Does building satisfy the agency-developed, or adopted, screening process (see §1.2.2) based on a screening performance target? The performance target shall be based on a target

performance level in Chapter 2, recommendations in §1.2.2 adopted by the agency, or an agency-defined target.

a. Screening Target is Satisfied → performance of building is deemed to comply with RP 10. Agency designates building as an ARE. *END PROCESS*
b. Screening Target is Not Satisfied → performance of building is deemed to not comply with RP 10. Agency programs seismic evaluation of building in accordance with Chapters 2 and 3, go to Step 5.

Step 5: Does building satisfy the risk assessment in Chapter 3 based on the target performance objective selected in Chapter 2 for the seismic evaluation conducted?

a. Risk Assessment is Satisfied → agency designates building as an ARE. *END PROCESS*
b. Risk Assessment is Not Satisfied → agency designates building as a URE, a record of the URE designation shall be provided to the person in charge of facility construction or programming for the agency in accordance with §3.3, seismic risk(s) shall be mitigated in accordance with Chapter 4. Depending on mitigation strategy, repeat Step 5 for the *retrofitted* building until risk assessment is satisfied.

Step 6: Repeat Steps 1 through 5 for each building in set.

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Appendix D
Participating ICSSC Agencies

Interagency Committee on Seismic Safety in Construction (ICSSC)

INCLUDE FULL LIST OF AGENCIES AND SUBSIDARIES WHEN READY

Architect of the Capitol

Bonneville Power Administration

Bureau of Reclamation

Department of Energy

Department of State

Department of the Air Force

Department of Veterans Affairs

Federal Aviation Administration

Federal Bureau of Prisons

Federal Emergency Management Agency

General Services Administration

Los Alamos National Laboratory

National Aeronautics and Space Administration

National Institute of Standards and Technology

National Park Service

Naval Facilities Engineering Command

Tennessee Valley Authority

U.S. Army Corps of Engineers

U.S. Department of Agriculture

U.S. Geological Survey