

**FISH AND WILDLIFE SERVICE  
ENGINEERING AND CONSTRUCTION**

**Engineering and Construction**

**Part 363 Seismic Safety**

**Chapter 1 Seismic Safety Policy, Objectives, and Responsibilities**

**363 FW 1**

**1.1 What is the purpose of the Seismic Safety Program?** To preserve the life safety of Service employees and the public during a major earthquake.

**1.2 What are the authorities of the Seismic Safety Program?**

**A.** Executive Order 12941, Seismic Safety of Existing Federally Owned or Leased Buildings (1994).

**B.** Executive Order 12699, Seismic Safety of Federal and Federally Assisted or Regulated New Building Construction (1990).

**C.** Public Law 101-614, National Earthquake Hazards Reduction Program (NEHRP) Reauthorization Act (1990).

**D.** Earthquake Hazards Reduction Act of 1977 (42 U.S.C. 7701).

**1.3 What are the objectives of the program?**

**A.** To preserve the life safety of employees and the visiting public.

**B.** To protect the Federal investment in buildings and human resources.

**C.** To fulfill the requirements of Executive Order 12941, which requires the Service to identify and mitigate Service-owned buildings that are not capable of providing minimum life safety performance during a major earthquake.

**1.4 Who is responsible for the Seismic Safety Program?**

**A.** The Department of Interior Seismic Safety Program is responsible for:

**(1)** Overall coordination of the Interior Seismic Safety Program Team which is comprised of individual bureau Seismic Safety Coordinators.

**(2)** Reporting on the Program to the Federal Emergency Management Agency (FEMA).

**B.** The **Chief, Division of Engineering** is responsible for:

**(1)** Rehabilitation of "Exceptionally High Risk" (EHR) buildings located in high seismic zones (per 8/6/99 memorandum from the Director to Regional Directors, Regions 1 - 7).

**(2)** Overall policy and administration of the program for the Service.

**(3)** Appointing a National Seismic Safety Coordinator for the Service.

**C.** The **National Seismic Safety Coordinator** is responsible for:

**(1)** Following the Implementation Plan and reporting requirements of the Department of Interior's Seismic Safety Program in carrying out the requirements of Executive Order 12941.

**(2)** Managing the Program's national building inventory database, which includes the screening, classification, evaluation, and mitigation of Service-owned buildings.

**(3)** The mitigation of EHR buildings located in high seismic zones and other seismic projects as requested by Regional Offices.

**(4)** Tracking the progress of all seismic mitigation activity for the Service and reporting to the Department of the Interior.

**(5)** Providing program information, assistance, and training to Regional Offices.

**D. Regional Directors** are responsible for program compliance in each Region, which includes the mitigation of EHR buildings located in moderate and low seismic zones.

**E. Regional Engineers** are responsible for:

**(1)** Rehabilitation of EHR buildings located in moderate and low seismic zones (per 8/6/99 memorandum from the Director to Regional Directors, Regions 1 - 7).

**(2)** Seismic Safety Program compliance within their respective Regions.

**(3)** Appointing a Seismic Safety Regional Coordinator to assist the Service's National Seismic Safety Coordinator.

**F. Regional Seismic Safety Coordinators** are responsible for:

**(1)** Performing Rapid Visual Screening inspections within their respective Region.

**(2)** Obtaining field station cooperation in completing Seismic Safety Questionnaires, which are used for collecting information on individual Service-owned buildings.

**(3)** Reporting building occupancy and use changes to the Service's National Seismic Safety Coordinator in

**FISH AND WILDLIFE SERVICE  
ENGINEERING AND CONSTRUCTION**

accordance with [Exhibit 1](#) (Seismic Policy: 5 Triggers to Check), which could result in the reevaluation of building seismic classifications.

(4) Reporting seismic mitigation actions to the Service's Seismic Safety Coordinator.

**G.** Field stations are responsible for:

(1) Completing Seismic Safety Questionnaires and Questionnaire updates on individual Service-owned buildings. A building's classification is based on answers from the Questionnaire, so changes in those answers may affect its seismic classification. Questionnaire updates may be made electronically on the Seismic Safety Program's electronic database (<http://efmis.fws.gov/>).

(2) Identifying one seismic user per field station with edit rights and access to the Seismic Safety Program's electronic database on the Engineering Facilities Management Information System (EFMIS).

**1.5 What are the definitions of seismic terms used in this chapter?**

**A. Earthquake.** A sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. Strong earthquakes, with magnitudes of 5 to 6, can topple a poorly constructed building in 60 seconds.

**B. Essential.** Designation given to buildings that must remain functional after an earthquake such as hospitals, fire and police stations, communication centers, etc. We may also designate an "essential" building that must remain functional after an earthquake in order to maintain critical Service operations. Essential buildings are typically evaluated to the "Immediate Occupancy" performance level, instead of "Life Safety."

**C. Exemption criteria.** Used by the Seismic Safety Program to screen and classify buildings as follows:

(1) "Exempt classification" is given to a building that has met at least one of the program's exemption criteria and is exempt from any further program requirements.

(2) "Non-Exempt classification" is given to a building that did not meet any of the program's exemption criteria which prompts further program action to look for seismic risk.

**D. Geotechnical site hazard deficiencies.** Local site conditions outside or under a building that can lead to structural damage and threaten life safety during an earthquake such as: surface fault rupture, soil liquefaction, differential compaction, landslide, and flooding. Large foundation settlement or lateral spreading beneath

buildings due to soil liquefaction can severely damage structures.

**E. Life safety.** Standard performance level for the seismic rehabilitation of a building that will retain enough structural integrity during a major earthquake to allow safe egress by building occupants. Life safety provides a level of assurance that risk to loss of life is kept to minimal levels.

**F. Liquefaction.** A process in which loose, granular soils below the ground water table temporarily lose strength and act as a fluid during strong earthquake shaking. When shaken strongly, unconsolidated sandy deposits that are saturated with water can liquify and form a slurry. Liquefaction has been the cause of considerable damage to buildings during earthquakes.

**G. Mitigation.** An action taken in response to seismic deficiencies or findings to ensure public safety, health, and welfare. Examples of mitigation actions are rehabilitation, building replacement, changing the use of a building, reducing the number of occupants, demolition, or abandonment.

**H. Nonstructural deficiencies.** Seismic problems with the nonstructural elements of a building such as its architectural, mechanical, electrical, and plumbing components that can fall and harm occupants during an earthquake. Nonstructural seismic deficiencies generally consist of unsecured bookcases or gas water heaters that can pose hazards to life safety under certain circumstances.

**I. Rapid visual screening (RVS) inspection.** Quick and low cost evaluation tool to initially evaluate the danger of building collapse due to earthquakes. Low RVS scores indicate that a building requires further seismic evaluation.

**J. Seismic building inventory.** A compilation of all Service-owned buildings in the Seismic Safety Program's electronic database complete with screening, evaluation, and mitigation results.

**K. Seismic classification.** The screening result of dividing up an inventory of buildings into either "Exempt" or "Non-Exempt" classifications. (Refer to subparagraph C above for more information.)

**L. Seismic deficiency.** A finding as a result of a seismic evaluation by a professional seismic engineer. Deficiencies can be structural, nonstructural, or geotechnical site hazards.

**M. Seismic performance level.** The design intended post-earthquake condition of a building for seismic rehabilitation. In order from highest to lowest performance level, the levels are: Operational, Immediate Occupancy,

**FISH AND WILDLIFE SERVICE  
ENGINEERING AND CONSTRUCTION**

**Engineering and Construction**

**Part 363 Seismic Safety**

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**363 FW 1**

Life Safety, and Collapse Prevention. (Refer to subparagraph E for "Life safety.")

**N. Seismic Safety Questionnaire.** A one-page question and answer form on Service-owned buildings used to collect information and screen individual buildings. Answers are used to place individual buildings into seismic classification categories. Questionnaires are available on the Seismic Safety module of the Engineering Facilities Management Information System or EFMIS.

**O. Seismic zone.** Seismic zones, such as high, moderate, or low, are used when describing groups of buildings in our building inventory. A seismic zone is a region on a map for which a common areal rate of seismicity was once used for the purpose of calculating probabilistic ground motions. However, new ground motion and soil maps are now in use which are more accurate for specific building locations and now make the term "seismic zone" obsolete when designing for rehabilitation.

**P. Structural deficiencies.** Seismic problems with structural elements of a building such as its lateral force resisting system, its structural framing, floor and roof diaphragm construction, basement, or foundation system.

**1.6 On which buildings does the Seismic Safety Program focus?** The program focuses on existing, Service-owned buildings that may not have been built to conform to seismic provisions of current building codes. If the Service owns a building but leases it to others, the Service is still responsible for seismic safety of that building.

**1.7 What about buildings leased by the Service and owned by others?** We should not enter into new leases or renew leases of buildings without checking for seismic safety compliance per the RP4 *Standards of Seismic Safety for Existing Federally Owned or Leased Buildings and Commentary*. Seismic compliance, which includes a certification of seismic safety by the building owner, is required for building leases which meet either of these criteria: 1) Leased space less than (<) 10,000 S.F. and located in high seismic zones, or 2) Leased space greater than (>) 10,000 S.F. and located in any seismic zone (low, moderate, or high). Leased buildings are exempt from the RP4 requirement if both of the following apply: the leased space is less than 10,000 square feet (930 square meters) and located in NEHRP map areas 1 - 4 (low and moderate seismic zones).

**1.8 What about seismic safety of recently constructed buildings?** Buildings designed after 1/5/90, are exempt from further Seismic Safety Program action because they are assumed to have been designed with seismic building code provisions.

**1.9 What are the program's reporting requirements to FEMA?**

**A.** The Department of Interior issues Annual Reports on the Seismic Safety Program's activities.

**B.** FEMA will periodically report on the progress of the National Earthquake Hazards Reduction Program activities by the Interior Seismic Safety Program Team to the President and to Congress.

**C.** A rehabilitation report entitled "Towards Earthquake Resistant Federal Buildings" was submitted to Congress. A summary of seismically deficient buildings, costs required to rehabilitate those buildings and a cost-effective seismic rehabilitation plan are included in the report. The rehabilitation plan details a 30-year, \$728 million (FY1999 dollars) rehabilitation program to mitigate the highest seismic risks in the Department of Interior.

**1.10 Does this program require annual seismic inspections?** No. Annual inspections of existing buildings are not required because only certain buildings undergo Rapid Visual Screening inspections. If there are no changes in the use or occupancy of a building, then there is no need to reevaluate or inspect a particular building. If there are changes that affect the seismic classification of a building, further evaluation and inspection may be necessary.

**1.11 How does the Seismic Safety Program work?**

Governmentwide program guidelines established by FEMA, in conjunction with standards developed by the Interagency Committee on Seismic Safety in Construction, are followed. The program identifies Service-owned buildings with seismic deficiencies that must be mitigated as required by public law. Existing buildings are screened, classified, and inspected to determine if further seismic evaluation is required.

**1.12 How was the building inventory for the program developed?** It began by using data on Service-owned buildings from the Real Property Database, Division of Realty. Other fields were added to the database as required for reporting purposes to FEMA.

**1.13 How are individual buildings screened in the program?** Seismic Safety Questionnaire forms were sent to field stations to collect information on individual buildings. Questionnaire answers were used to screen each building according to program guidelines developed by FEMA. Seismic screening determines further program actions based on a building's classification into "Exempt" or "Non-Exempt" categories. A list of the program's exemption criteria can be found on the Seismic Safety website (<http://sii.fws.gov/r9eng/seismic.htm>).

**1.14 Can a building's seismic classification change?**

Yes, a change in a building's occupancy or use may change a building's seismic classification. A building's classification is based on answers from the Seismic Safety Questionnaire, so changes in those answers may affect its seismic classification. Seismic users can report such changes on the Seismic Safety Program's electronic database (<http://efmis.fws.gov/>).

**1.15 When does a building need to be reclassified?**

A. There are five reasons or "triggers" ([Exhibit 1](#)) for reevaluating seismic risks, which would cause a building to be reclassified or screened again. Any of the five changes identified below must be reported to the Service's National Seismic Safety Coordinator:

(1) A change in the building's function occurs that results in a significant increase in the building's level of use, importance, or occupancy.

(2) A project is planned that will significantly extend the building's useful life through alterations or repairs that total more than 50 percent of the replacement value of the facility.

(3) The building or part of the building has been significantly damaged by fire, wind, earthquake, or other causes (if structural degradation of the building's vertical or lateral load-carrying systems).

(4) The building is deemed by the Service to be at "Exceptionally High Risk" to occupants or to the public.

(5) The building is added to the Federal inventory through purchase or donation.

**1.16 What happens after the initial screening process?**

A. "Exempt" buildings, which have met at least one of the Seismic Safety Program's exemption criteria, are dropped from further program consideration.

B. "Non-Exempt" buildings require further program action to look for seismic risk. Each Non-Exempt building is given a Rapid Visual Screening (RVS) inspection and may need further structural engineering evaluation and mitigation.

**1.17 What is an RVS inspection?** An RVS inspection is a quick and easy, one-page form that uses numeric scores to indicate the probability of the building sustaining life-threatening damage should a severe earthquake occur. A high RVS score indicates that the building is at low seismic risk based on its structural system, age, condition, and other building modifiers that impact structural performance

during earthquakes. A low score means that a building requires additional study by a professional engineer experienced in seismic design to determine if seismic risk exists. Trained RVS inspectors perform these inspections, including engineers from Regional Engineering Offices.

**1.18 Are buildings assigned seismic conditions?**

A. Yes, seismic condition descriptions based on RVS inspection scores are used to describe buildings, similar to condition descriptions of the Service's Maintenance Management System. "Non-Exempt" buildings with RVS scores greater than 4.0 are "Good Condition," scores between 4.0 and 2.6 are "Fair Condition," and scores less than 2.6 are "Poor Condition." "Exempt" buildings are also described as "Good Condition."

B. Further structural evaluation is required on all "Fair" and "Poor" seismic condition descriptions to identify specific seismic deficiencies and to determine mitigation strategies.

**1.19 What are "Exceptionally High Risk" or EHR buildings?** RVS inspection scores less than 4.0 were used to designate buildings located in high and moderate seismic zones as "Exceptionally High Risk" buildings and are prime candidates for further structural evaluation. EHR designations for buildings located in low seismic zones have yet to be determined, but will probably be defined in a similar fashion.

**1.20 What is a structural evaluation?** A structural evaluation is a preliminary study conducted by a professional seismic engineer to identify structural, nonstructural, and geotechnical site hazard deficiencies. The purpose of the study is to determine if a building has any seismic deficiencies. It is not meant to be used as a final rehabilitation design. The FEMA 310 guide, *Handbook for the Seismic Evaluation of Buildings - A Prestandard*, is used for this study.

**1.21 What are the Service's obligations to correct seismic deficiencies?**

A. Once seismic deficiencies have been identified, the Service is required under Executive Order 12941 to mitigate unacceptable seismic risks. Unacceptable seismic risks are those buildings with seismic deficiencies identified by the Service to be at "Exceptionally High Risk."

(1) Structural deficiencies will be addressed through a seismic rehabilitation program.

(2) Nonstructural deficiencies, which typically consist of low cost corrections such as securing bookcases and gas water heaters to walls, will be addressed using Service maintenance staff when possible.

**FISH AND WILDLIFE SERVICE  
ENGINEERING AND CONSTRUCTION**

**1.22 How will rehabilitation projects be funded?**

**A.** Division of Engineering: Seismic rehabilitation projects located in high seismic zones will be funded out of the Service's Construction Appropriation.

**B.** Regional Offices: Seismic rehabilitation projects located in moderate and low seismic zones will be funded out of the Construction Appropriation or Maintenance Management System.

**1.23 How will EHR buildings requiring mitigation be prioritized?**

**A.** "Exceptionally High Risk" buildings are ranked in priority order by the Department for all bureaus in order to be consistent in the development of seismic rehabilitation rankings. The annualized-loss-of-life ranking methodology used by the Department takes into account risk assessment tools and innovative building earthquake behavior prediction techniques.

**B.** Rehabilitation projects, in general, will be selected from these rankings in order of priority, beginning with the highest. Maintenance projects or other building improvements may also prompt seismic rehabilitation selections.

**(1)** Rehabilitation priority rankings of 78 EHR buildings located in high seismic zones have been identified.

**(2)** Rehabilitation priority rankings of 95 EHR buildings located in moderate seismic zones have been identified.

**(3)** Rehabilitation priority rankings for buildings located in low seismic zones have not yet been issued.

**1.24 Are there different choices for seismic mitigation?**

Yes, rehabilitation is only one of several mitigation options available to the Service. Mitigation choices for buildings with seismic deficiencies include: abandon, demolish, rehabilitate, change the use of the building, or reduce the number of occupants. Many factors must be considered before making this decision. Consider the age, life expectancy, condition, and historical significance of the building; the cost of the seismic mitigation along with the cost of other, nonseismic building improvements; the impact on occupants or building functions; and long-term plans for the building. When the cost of rehabilitation approaches the cost of replacement, it may be time to consider a new building.

**1.25 What if rehabilitating an older building is not cost effective?**

If the mitigation solution is for building replacement instead of rehabilitation, the design and construction of the new building is the responsibility of the

Regional Engineering Office. This applies to buildings located in any seismic zone.

**1.26 If rehabilitation is chosen, which design guideline must be followed?**

Seismic rehabilitation designs will follow the FEMA 273/274 *NEHRP Guidelines for the Seismic Rehabilitation of Buildings* as mandated by Service policy on May 10, 1999. FEMA 273/274 is the only guideline currently available for the seismic rehabilitation of existing buildings and it shall be used by the Service for rehabilitation design and construction.

**1.27 What is the most common level of building strength to design for?**

**A.** The level of building strength for rehabilitation design is called its seismic performance level. The most common seismic performance level is for "Life Safety." The "Life Safety" performance level assumes that people will be able to exit safely after a major earthquake but the building will often be left in an unreparable state.

**B.** Performance levels greater than "Life Safety" may be used when a building has been designated as either "essential" or "historic."

**C.** Performance level choices should be made at the start of a rehabilitation design.

**1.28 What are the time frames for mitigating "Exceptionally High Risk" buildings?**

**A.** FEMA's Report to Congress has proposed a 30-year mitigation time frame which targets a completion date of 2030. Further time frame direction may come from the Department.

**B.** The Service has already started seismic mitigation activities on buildings located in high seismic zones. Buildings located in moderate seismic zones will be next, followed by low seismic zone buildings in order of priority and allocation of resources.

**1.29 Are there Indefinite Quantity Contractors available to do seismic evaluations and rehabilitation designs?**

Yes, there are structural engineering firms with offices around the country that are available for seismic evaluations and rehabilitation designs. These firms are familiar with both the FEMA 310 and FEMA 273 guidelines and have extensive seismic mitigation experience. Contact the Service National Seismic National Safety Coordinator for more information.

**1.30 Where can I find out more about the program and my Service-owned buildings?**

A. The National Seismic Safety Coordinator has developed a Nationwide electronic database that is available to certain Regional and field station users of the Engineering Facilities Management Information System (EFMIS). Building records along with useful Program information is easily accessible at: <http://efmis.fws.gov/>.

(1) Regional and field station database users have edit rights in order to update Seismic Safety Questionnaires, add buildings to their inventory, or ask for building reevaluations per use or occupancy changes.

(2) Regional Seismic Safety Coordinators have edit rights, also, to enter RVS inspection scores.

(3) Other Service employees have read-only rights.

### 1.31 What about seismic design of new buildings?

A. We will design new buildings to conform to the seismic requirements found in the 2000 International Building Code (IBC) or the FEMA 302/303 Provisions, if the 2000 IBC has not been adopted by a State or local jurisdiction.

(1) The Interagency Committee on Seismic Safety in Construction has recommended the use of building codes that are substantially equivalent to FEMA 302/303, which is the *1997 Edition of the National Earthquake Hazards Reduction Program (NEHRP) Recommended Provisions for Seismic Regulations for New Buildings and Other Structures*. The 1997 NEHRP Provisions have been incorporated into the new International Building Code, 2000 Edition. Those jurisdictions that have not adopted the 2000 IBC should use FEMA 302/303, since some building codes may not be substantially equivalent to, or exceed, the 1997 NEHRP Provisions.

(2) The 1997 NEHRP Provisions include over 150 design criteria changes, including:

(a) New spectral response seismic design maps reflecting seismic hazard maps recently completed by the U.S. Geological Survey. These are more accurate than the old seismic zone classifications such as high, moderate, and low.

(b) Improved design procedures for high-seismic, near-source (known earthquake fault) areas.

(c) The steel structure design chapter addresses the welded steel moment resisting frame problems highlighted by the Northridge earthquake.