

**For Facility Managers,  
Risk Managers, &  
Financial Managers**

**Part**

# **Planning and Managing the Process for Earthquake Risk Reduction in Existing Multifamily Buildings**

## **Introduction**

*Part B of this manual is written specifically for a multifamily building owner's facility managers, risk managers, and financial managers concerned with the seismic safety of their buildings. Senior management may have requested you, the manager, to make a recommendation to address seismic safety in multifamily buildings or may have made the decision to address it, or there may already be a seismic safety program in place. Part B describes when and how specific activities that will accomplish the goal of seismic risk reduction can be introduced into an ongoing multifamily facility management process, regardless of how simple or sophisticated that process is. Part B also provides the framework and outline that can be used by the facility managers, risk managers, and financial managers in developing and communicating their recommendations to senior management.*

*An incremental seismic rehabilitation program is one of several seismic risk reduction strategies that can be implemented in multifamily buildings. It can be implemented separately or in combination with other seismic risk reduction actions. If you determine that such a program is appropriate for your*

*organization, the planning and implementation of incremental seismic rehabilitation should be integrated into the facility management processes and integrated with other seismic risk reduction actions that will complement it or support it.*

## In Brief

■ Planning for earthquake risk reduction in multifamily buildings requires a coordinated and integrated effort by facility managers, risk managers, and financial managers.

### Facility Managers

## **B.1 Integrating the Efforts of Facility Management, Risk Management, and Financial Management**

Preparing an analysis of a multifamily building owner's earthquake risk reduction needs, and planning and managing such a process, benefits from an integrated effort by the organization's facility managers, risk managers, and financial managers, or by the administrators charged with those respective responsibilities. Such an integrated effort may be a departure from current practices, but collaboration is the key to improving safety cost-effectively and with a minimum of disruption.

**Facility managers** currently carry out their planning activities by considering the parameters of rental markets, area demographics, and the physical condition and projected useful life of the existing multifamily buildings. Often they consider pressing social issues such as physical security and accessibility. Some of these issues become federal or local government mandates, such as asbestos and lead abatement, energy conservation, or accessibility compliance. Sometimes facility managers consider the risks to multifamily buildings from natural disasters such as earthquakes or windstorms.

### Risk Managers

**Risk managers**, relatively recent additions to many multifamily owners' organizations, carry out their planning activities by considering three aspects: risk identification, risk reduction, and risk transfer. The latter generally involves the purchase of insurance. Currently, multifamily building owner risks are classified into two broad areas: employee risk, and facility and environmental risk. Rarely do risk managers consider the risks to multifamily buildings and their occupants from natural disasters. Rather, they tend to assume that the latter risks are addressed by building codes and similar regulations.

### Financial Managers

**Financial managers** currently deal with facilities by controlling and managing maintenance budgets, capital improvement budgets, and insurance budgets. The facility managers and risk managers present the demands on these budgets to the financial managers, but rarely are the potential tradeoffs among these budgets considered. The costs and benefits of various options of facility risk management are rarely explicitly addressed.

Addressing the problem of earthquake risk reduction requires establishing active communication among the three management functions and coordinating activities into an integrated planning and management effort. Facility and risk managers will have to consider facility risk, and financial managers will have to consider the cost and benefits of various options for managing facility risk. Specific recommendations on implementing such an effort are provided in the following sections.

## B.2 Integrating Incremental Seismic Rehabilitation into the Facility Management Process

### B.2.1 A Model of the Facility Management Process for Existing Multifamily Buildings

The typical facility management process for existing multifamily buildings consists of seven phases of activities: Acquisition, Redevelopment, Current Building Use, Planning, Maintenance & Rehabilitation Budgeting, Maintenance & Rehabilitation Funding, and Maintenance & Rehabilitation Implementation. Each phase consists of a distinct set of activities as follows:

**Acquisition:** due diligence

**Redevelopment:** capital improvement

**Current Use:** facility occupancy, facility operation, facility maintenance, and facility assessment

**Planning:** strategic planning and facility planning

**Budgeting:** capital budgeting, maintenance budgeting, and insurance budgeting

**Funding:** financing of capital, maintenance, and insurance budgets

**Implementation:** capital improvement and maintenance

This process is sequential, progressing from acquisition through implementation of rehabilitation in any given building. An owner who has a large inventory of buildings is likely to have ongoing activities in all of these phases in different buildings. The process is illustrated in the following diagram. Appendix I to this manual, Additional Information on Multifamily Building Facility Management, contains a discussion of the specific phases and the activities therein for owners seeking further detail on the facility management process. This is a generalized model subject to local variation.



### B.2.2 Elements of an Incremental Seismic Rehabilitation Program

The following ten activities are essential elements of an incremental seismic rehabilitation program for multifamily buildings, and can be added to the facility management process by facility, risk, and financial managers who implement such a program:

#### B.2.2.1 Due Diligence Analysis

In regions of high and moderate seismicity, due diligence should include a probabilistic analysis of potential earthquake risks. Such an analysis considers damage from earthquakes of all levels of intensity, and will provide information on seismic vulnerabilities in the building. If the building is acquired, the due diligence analysis will provide information for the initiation of a full seismic assessment. Probabilistic analysis, because of its detail and scope, will be more expensive than more simplistic Probable Maximum Loss (PML) analysis.

### In Brief

Ten specific activities can be added to the current facility management process to implement an incremental seismic rehabilitation program.

#### Incremental Seismic Rehabilitation

##### Element 1 Due Diligence Analysis

Incremental Seismic Rehabilitation

Element 2  
Initial Integration Opportunities

Incremental Seismic Rehabilitation

Element 3  
Seismic Screening

Initial Multifamily Facility Manager/  
Risk Manager Screening of Seismic Concerns

B.2.2.2 Initial Integration Opportunities

Even if seismic rehabilitation is not among the capital improvements being undertaken in the redevelopment phase, and even though seismic screening and evaluation may not have taken place prior to the determination of redevelopment phase capital improvements, there may be some seismic rehabilitation increments that can be identified with minimal evaluation and analysis (for example, parapet and gable bracing or anchoring of mechanical equipment). Depending on the nature of these increments, it may be possible to integrate them with specific capital improvements being undertaken in this phase. Part C, Section C.2 should be used to identify such integration opportunities.

B.2.2.3 Seismic Screening

Following building acquisition and initial redevelopment, seismic screening of the owner’s multifamily building inventory is the first step of the incremental seismic rehabilitation process. Seismic screening procedures can be incorporated into other facility assessment activities. Begin with a determination of the status of the archival records. If building plans are available, a document review for the determination of building structure types is the first step in seismic screening. The following chart can be used to obtain an overall view of seismic concerns based on the seismic hazard map in Part A.

Level of Seismic Concern by Typical Building Type	Level of Seismic Concern by Building Location*		
	Green	Yellow	Red
Wood Frame		Low	High
Steel Frame		Low	High
Concrete Frame	Very Low	Medium	Very High
Unreinforced Masonry	Low	High	Very High

Patterned after recommendations developed by Dr. Charles Scawthorn for the California Seismic Safety Commission’s *Earthquake Risk Management: A Toolkit for Decision Makers*.

\* Locations refer to the seismic hazard map in Part A, Section A.1.

The Federal Emergency Management Agency (FEMA) has developed FEMA 154, *Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook, Second Edition*,<sup>1</sup> as guidance for seismic screening of an inventory of buildings. It describes a technique for identifying the relatively more vulnerable buildings in a large inventory so that they can be addressed in more detail.

The FEMA 154 publication is nationally applicable and addresses all building types. In some cases, the screening will suggest specific seismic rehabilitation opportunities that do not require additional engineering and risk analyses.

The incorporation of seismic screening into ongoing facility assessment activities requires assigning the screening to the appropriate inspectors. If

<sup>1</sup> To order this and other FEMA publications, you may write to FEMA, PO Box 2012, Jessup, MD 20794-2012; or you may call 800-480-2520, Monday – Friday, 8:00 a.m. – 5:00 p.m., eastern time; or you may fax your request to 301-362-5335.

inspections are periodically carried out in the owner's multifamily buildings for other purposes, such as life safety, insurance, occupational health and safety, or hazardous materials identification, it may be possible to assign the seismic screening to the same inspectors with some additional training. Alternatively, the seismic screening can be assigned to a consulting architect or engineer.

#### B.2.2.4 *Seismic Evaluation*

Seismic evaluation is an engineering analysis of individual multifamily buildings. It usually follows the seismic screening, when the buildings identified as relatively more vulnerable are subjected to a more detailed analysis. However, in some cases, such as when the owner's building inventory is small, seismic evaluation of individual buildings may be the first step of the incremental seismic rehabilitation process.

Guidance for seismic evaluation of buildings is contained in standard ASCE 31<sup>2</sup>, *Seismic Evaluation of Existing Buildings*, which is based on FEMA 310, *Handbook for the Seismic Evaluation of Existing Buildings—A Prestandard*. The standard provides engineering guidance on how to evaluate categories of buildings in order to identify deficiencies and determine effective rehabilitation measures.

Seismic evaluation can be done by the owner's professional staff or by a consulting engineer.

#### B.2.2.5 *Developing a Risk Reduction Policy*

Convince the board of directors to adopt a clear policy statement supporting seismic risk reduction. Such a policy should, at a minimum, establish seismic performance objectives for the owner's multifamily buildings. Seismic performance objectives define the target performance of a building following an earthquake of a specified intensity. The policy and objectives should be developed and documented as part of the seismic rehabilitation planning process.

#### B.2.2.6 *Seismic Rehabilitation Planning for Specific Buildings*

FEMA has developed engineering guidance to plan seismic rehabilitation for specific buildings, including FEMA 356, *Prestandard and Commentary for the Seismic Rehabilitation of Buildings*, which includes specific techniques for analyzing and designing effective seismic rehabilitation. The planning task entails four specific facility planning subtasks:

1. **Establish seismic target performance levels:** With cooperation between central management and local facility management, establish the performance level desired in each of the owner's multifamily buildings following an earthquake. Performance levels used in FEMA 356 are, in declining level of protection:
  - Operational
  - Immediate Occupancy
  - Life Safety
  - Collapse Prevention

<sup>2</sup> ASCE 31 can be obtained from the American Society of Civil Engineers at 1-800-548-2723.

#### *Incremental Seismic Rehabilitation*

##### *Element 4 Seismic Evaluation*

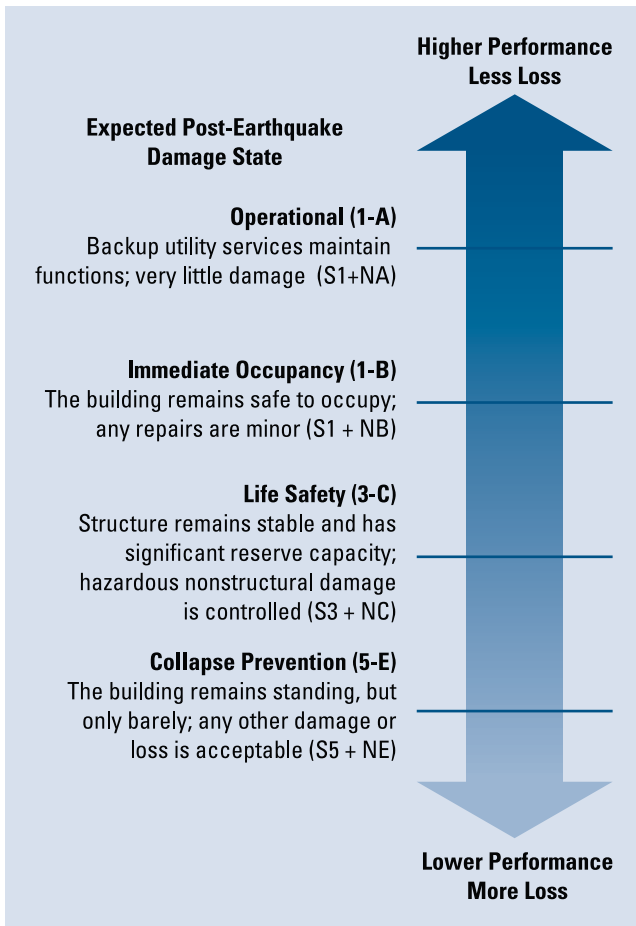
#### *Incremental Seismic Rehabilitation*

##### *Element 5 Developing a Risk Reduction Policy*

#### *Incremental Seismic Rehabilitation*

##### *Element 6 Seismic Rehabilitation Planning for Specific Buildings*

## Target Building Performance Levels and Ranges



Adapted from FEMA 356, Figure C1-2

This is an expansion of the two performance levels—immediate occupancy and life safety—included in ASCE 31, *Seismic Evaluation of Existing Buildings*.

The figures adapted from FEMA 356 on this and the following page demonstrate the use of these performance levels. Reasonable objectives and expectations should be considered for moderate, severe, and rare great earthquakes.

**2. Prioritize rehabilitation opportunities:** Carry out additional engineering and risk analysis in order to prioritize the seismic rehabilitation opportunities identified in the seismic evaluation in terms of risk reduction. ASCE 31 and FEMA 356 include lists of seismic rehabilitation measures as a function of common building types. Priorities for these measures are established in terms of respective contribution to the overall earthquake resistance of the structure.

Apply a “worst first” approach. Attend to heavily used sections of the most vulnerable buildings housing the greatest number of occupants, as well as to areas housing critical functions and equipment. For example, higher priorities may be given to rehabilitation of areas that will facilitate the evacuation of the building in an earthquake, such as lobbies, corridors, stairs, and exits.

**3. Define increments:** Break down the specific seismic rehabilitation opportunities into discrete incremental rehabilitation measures that make sense in engineering and construction terms. When establishing increments, consider scheduling to minimize the disruption to normal multifamily building operations. Increments that can be accomplished during tenant turnover seem to make the most sense.

**4. Integrate with other rehabilitation work:** Link each incremental rehabilitation measure with other related facility maintenance or capital improvement work. The related work classifications may differ from one building owner to another, but will fall into the following generic categories:

- Building envelope improvements
- Interior space reconfiguration
- Life safety and accessibility improvements
- Refinishing and hazardous materials removal
- Building systems additions, replacements, and repairs
- Additions to existing buildings

## Damage Control and Building Performance Levels

Target Building Performance Levels				
Lower Performance More Loss		Higher Performance Less Loss		
Overall Damage	Collapse Prevention Level (5-E)	Life Safety Level (3-C)	Immediate Occupancy Level (1-B)	Operational Level (1-A)
	Severe	Moderate	Light	Very Light
<b>General</b>	Little residual stiffness and strength, but load-bearing columns and walls function. Large permanent drifts. Some exits blocked. Infills and unbraced parapets failed or at incipient failure. Building is near collapse.	Some residual strength and stiffness left in all stories. Gravity-load-bearing elements function. No out-of-plane failure of walls or tipping of parapets. Some permanent drift. Damage to partitions. Building may be beyond economical repair	No permanent drift. Structure substantially retains original strength and stiffness. Minor cracking of facades, partitions, and ceilings as well as structural elements. Elevators can be restarted. Fire protection operable.	No permanent drift. Structure substantially retains original strength and stiffness. Minor cracking of facades, partitions, and ceilings as well as structural elements. All systems important to normal operations are functional.
<b>Nonstructural Components</b>	Extensive damage.	Falling hazards mitigated but many architectural, mechanical, and electrical systems are damaged	Equipment and contents are generally secure, but may not be operable due to mechanical failure or lack of utilities.	Negligible damage occurs. Power and other utilities are available, possibly from standby sources.
<b>Comparison with performance intended for buildings designed under the NEHRP Provisions for the Design Earthquake</b>	Significantly more damage and greater risk.	Somewhat more damage and slightly higher risk.	Less damage and lower risk.	Much less damage and lower risk.

Adapted from FEMA 356, Table C1-2

Opportunities for project integration are listed in Part C, Section C.2 of this manual. Some examples of the opportunities you can use to link projects are: when accessing concealed areas, when removing finishes and exposing structural elements, when performing work in a common location, when sharing scaffolding and construction equipment, and when sharing contractors and work force.

The four subtasks described above form an iterative process. The definition and related cost estimation of increments, as well as the integration with other maintenance and capital improvement projects (subtasks 3 and 4), may lead to a revision of target performance levels (subtask 1) or to specific analysis carried out as part of subtask 2.

### B.2.2.7 Staging Seismic Rehabilitation Increments

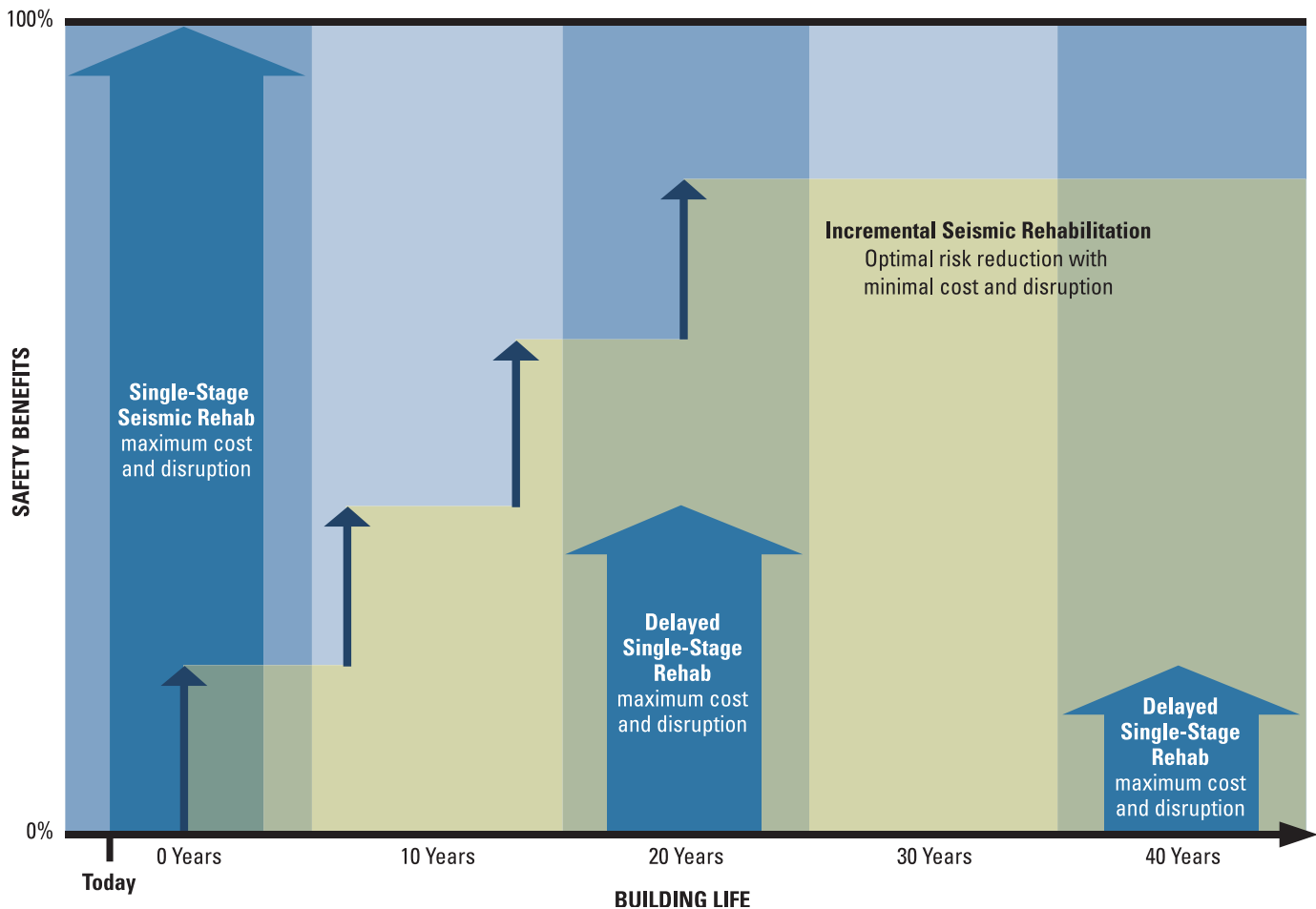
Determine the number and scope of incremental stages that will be undertaken and the length of time over which the entire rehabilitation strategy will be implemented.

#### Incremental Seismic Rehabilitation

#### Element 7 Staging Seismic Rehabilitation Increments

Estimates of seismic damage can be quantified in terms of percentage of building value damaged. Annual seismic damage is calculated as the probable damage that can result in any year from all possible earthquakes. The benefits of seismic rehabilitation are quantified as the reduction in annual seismic damage resulting from specific rehabilitation actions (also quantified in terms of percentage of building value). A generalized life-cycle benefit analysis shows that incremental approaches can return a substantial portion of the expected benefits of single-stage seismic rehabilitation carried out now.

The schematic diagram below illustrates such a life-cycle benefit analysis. The three wide arrows represent the benefits of single-stage rehabilitation occurring at three points in time: now, in 20 years, and in 40 years. Clearly, the largest benefit derives from a single-stage rehabilitation done now, and it is designated as 100%. The benefits of single-stage rehabilitation done in the future must be discounted and expressed as some percentage lower than 100%, as represented by the decreased arrows. The stepped portion of the diagram represents incremental rehabilitation starting soon, and completed in four increments over 20 years. The benefits of the future increments must also be discounted, and the benefit of the completed incremental rehabilitation is therefore expressed as a percentage lower than 100%, but higher than the single-stage rehabilitation in year 20. Reducing the overall duration of the incremental rehabilitation will increase its benefit, and extending the duration will decrease it.





Incremental seismic rehabilitation affords great flexibility in the sequence and timing of actions when the following precautions are kept in mind:

- It is important to get started as soon as possible. Any early reduction of risk will provide benefit over the remaining life of the building. Delaying action extends risk exposure. The incremental approach can be more effective than a delayed, single-stage rehabilitation, as long as one gets started soon.
- Even if the completion of the incremental program takes 10 or 20 years, most of the risk reduction benefit is realized.
- There is a wide margin of error. For example, you may unintentionally increase the probability of damage in the first few years due to an initial rehabilitation increment that inadvertently makes the building more vulnerable to damage, and still realize the benefit of risk reduction if you complete the incremental rehabilitation over a reasonable period.

#### *B.2.2.8 Budget Packaging*

The facility, risk, and financial managers should carefully plan how to present the incremental seismic rehabilitation budgets to maximize the probability of their being approved, given the financial realities of the owner organization.

The facility capital improvements and maintenance budget proposals, generated both locally at the building and centrally at owner headquarters, are results of the facility planning process. The budget, however, is also a vehicle for establishing funding priorities through a board decision, a bond issue, or other process. It is unlikely for most multifamily building owners in the United States to be able to raise funds for a comprehensive seismic rehabilitation program of all their buildings. While the incremental rehabilitation approach appears to be a viable alternative, in some organizations it may be necessary to “package” incremental seismic rehabilitation with other work in order to get it funded.

In regions of moderate seismicity and low seismic awareness (parts of New York and New England, for example), it may be useful to concentrate on rehabilitation measures that also reduce the risk of loss due to other natural or man-made forces, such as high winds or terrorist attack. Such a multi-hazard approach will help justify mitigation investments.

For those parts of the country where the understanding of earthquake risk is limited, it may be necessary and appropriate to combine seismic rehabilitation costs with normal maintenance budgets.

#### *B.2.2.9 Bond Packaging*

Since a bond issue is one of the four financing mechanisms for seismic rehabilitation (in addition to revenue, equity, and commercial credit), you must ensure that bond-financed incremental seismic rehabilitation does not include categories of work precluded by law or regulation.

#### *B.2.2.10 Seismic Rehabilitation Project Management*

The implementation of the selected incremental seismic rehabilitation measures in combination with other building work may require added attention to project design and bid packaging.

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*Incremental Seismic Rehabilitation*

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*Element 8*  
**Budget Packaging**

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*Incremental Seismic Rehabilitation*

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*Element 9*  
**Bond Packaging**

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*Incremental Seismic Rehabilitation*

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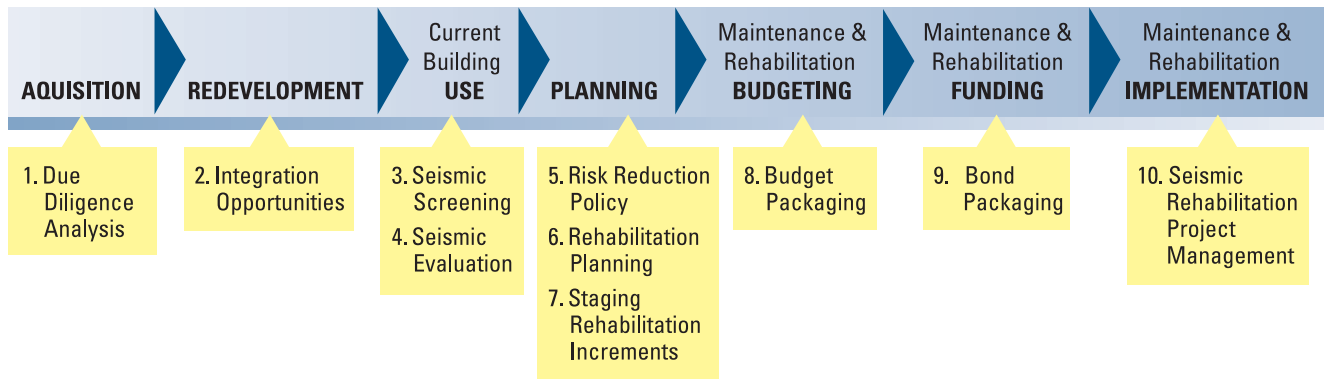
*Element 10*  
**Seismic Rehabilitation Project Management**

- Fully brief or train in-house architects/engineers or outside consultants preparing the bid documents on the rationale behind the rehabilitation measures, in order to assure that the seismic risk reduction objectives are achieved.
- Assure the continuity of building documentation from the analysis and design through construction and as-built drawings.
- Conduct a pre-bid conference to fully explain the seismic risk reduction objectives and the rationale for their selection to all prospective bidders.

Federal and state mandates and programs represent opportunities for seismic rehabilitation. Externally, federal and state programs may establish requirements affecting the implementation phase that have implications for multifamily buildings (e.g., Fair Housing Act and Occupational Safety and Health Administration [OSHA] requirements).

**B.2.3 Integration into the Multifamily Facility Management Process**

The following diagram illustrates the integration of the 10 elements discussed in the preceding sections (B.2.2.1 through B.2.2.10) into the multifamily facility management process. The elements are shown in the phase of the management process in which they are most likely to be implemented.



**In Brief**

■ Ten additional activities can be added to the facility management process to further reduce seismic risk.

**B.3 Opportunities for Seismic Risk Reduction in Support of Integrating Incremental Seismic Rehabilitation into the Facility Management Process**

The following ten opportunities for seismic risk reduction will support the integration of an incremental seismic rehabilitation program:

1. Responding to Occupant Concerns
2. Emergency Management/Response Planning (establishing liaison)
3. Emergency Management/Mitigation Planning (establishing liaison)
4. Developing a Risk Reduction Policy
5. Incorporating Federal and State Mandates and Programs
6. Coordinating with Risk and Insurance Managers

- 7. Coordinating with Lenders
- 8. Becoming Familiar with Applicable Codes
- 9. Establishing and Maintaining a Roster of Design Professionals
- 10. Negotiating Code Enforcement

These opportunities are created by internal and external factors that typically influence the multifamily facility management process. Internal factors are generated within the owner’s organization. External factors are imposed on organizations by outside pressures, such as the government, insurance regulations and practices, or financial climate. The following factors may influence each respective phase:

**Acquisition:** external market conditions, lenders and insurers, and internal risk management

**Redevelopment:** external market conditions, lenders and insurers, and internal marketing and architectural policies

**Current Use:** external federal and state programs, and internal occupant concerns

**Planning:** internal board policies, and external insurance carriers and brokers, and government mandates

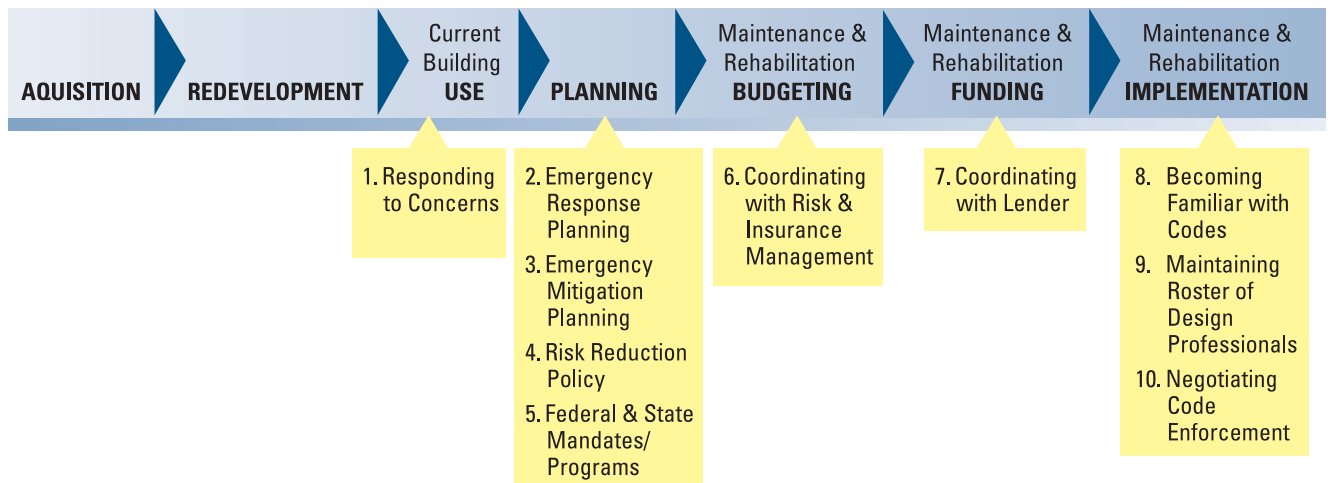
**Budgeting:** external government fiscal regulations and lender requirements, and internal budgetary constraints and risk management

**Funding:** external economic conditions and bond financing regulations

**Implementation:** external federal and state mandates and programs, codes and code enforcement

Appendix I to this manual, Additional Information on Multifamily Building Facility Management, contains a discussion of the specific phases and the related internal and external influences for those seeking more information on the facility management process.

The following diagram illustrates the integration of these opportunities into the multifamily facility management process. The opportunities are shown in the phase of the management process in which they are most likely to be implemented. Each opportunity is discussed in detail in the following sections (B.3.1 through B.3.10).



### ***B.3.1 Responding to Occupant Concerns***

Track all tenant and staff concerns that relate to earthquake vulnerability, and make sure they are understood and considered in the **planning** phase.

Be alert to tenant concerns, especially as they affect leasing. They can be a source of considerable influence on risk managers as well as potentially significant pressure on the facility management process. Occupant concerns may become the vehicle for channeling internal pressures of all kinds, including policies adopted by the board, into capital improvements and maintenance actions.

### ***B.3.2 Emergency Management/Response Planning***

Establish a liaison with emergency management agencies and volunteer agencies, such as the Red Cross.

Become familiar with the role of the owner's multifamily buildings in the local emergency response plans. If it is a significant role, become active in the emergency planning process. Define the role in specific detail, assigning specific functions to specific facilities. The role of specific multifamily buildings in the local emergency response plans should affect seismic performance objectives and the priority of specific seismic rehabilitation measures. Therefore, there should be full coordination between the owner's emergency planning and facility planning functions.

### ***B.3.3 Emergency Management/Mitigation Planning***

Establish a liaison with emergency management mitigation planners at the state and local levels.

Endeavor to incorporate the multifamily building earthquake mitigation into the state's mitigation plan, and to recognize the owner's incremental seismic rehabilitation measures as elements of the mitigation plan.

Federal resources and funds are available to small business owners following a presidentially declared disaster for the support of disaster recovery and mitigation planning activities in the form of Small Business Administration (SBA) loans. Multifamily building owners who qualify should make every effort to obtain these resources.

### ***B.3.4 Developing a Risk Reduction Policy***

Convince the board of directors to adopt a clear policy statement supporting seismic risk reduction. Such a policy should, at a minimum, establish seismic performance objectives for the owner's buildings. Seismic performance objectives define the target performance of a building following an earthquake of a specified intensity. The policy and objectives should be developed and documented as part of the seismic rehabilitation planning process.

### ***B.3.5 Incorporating Federal and State Mandates and Programs***

Become familiar with the seismic rehabilitation requirements imposed on multifamily buildings by federal and state programs, currently or under discussion for the future, and take them into account in planning activities.

Currently there are no seismic rehabilitation mandates or implications in any federal or state programs related to existing multifamily buildings with the exception of California.

### ***B.3.6 Coordinating with Risk and Insurance Managers***

Establish coordination between the facility management and risk management functions in the multifamily building owner's organization.

The owner's risk and insurance managers may have a direct or indirect role in the planning and budgeting phases of the facility management process with regard to decisions related to insurance as well as other budget categories.

In areas of seismic risk, the risk of building loss or damage, the risk of occupant death or injury, and the risk of the owner's liability must all be assessed. The owner's risk manager should be fully informed on the individual building or project approaches to seismic risk reduction and should be a participant in the planning process. Insurance carriers are more than willing, when asked, to provide building owners with Loss Control and Prevention Reports that include recommendations for loss prevention. If seismic risk is covered by the owner's insurance carrier, it may be possible to negotiate a rate reduction, deductible reduction, or increased maximum benefit. On the other hand, the insurer may require some seismic rehabilitation as a condition of coverage.

Formal risk management is a relatively recent addition to the management structure of many multifamily building owners, and for large owners with nationwide portfolios, it is usually placed at central headquarters. Facility management is a local function that takes place at a particular building, or regionally, for a group of buildings. In this case, there is a need to establish effective communication lines between central organization staff and local facility managers. Risk managers may develop checklists, questionnaires, or other planning tools to be used by facility managers in planning for seismic risk reduction.

### ***B.3.7 Coordinating with Lenders***

Become familiar with the requirements likely to be imposed by lenders on your capital improvement program. Some lenders may waive or reduce their requirement for seismic insurance if certain seismic improvements are included in your program.

### ***B.3.8 Becoming Familiar with Applicable Codes***

Become familiar with the seismic rehabilitation requirements imposed in your building inventory's jurisdictions by building codes or other codes and ordinances, currently or under discussion for the future such as rehabilitation codes, and take them into account in planning activities.

### ***B.3.9 Establishing and Maintaining a Roster of Design Professionals***

Develop and maintain a roster of architects, engineers, and other consultants with expertise in the fields of seismic assessment of buildings, seismic design, and risk analysis to quickly make use of their specialized expertise when needed. Such qualified professionals can be identified with the assistance of professional societies such as the American Society of Civil Engineers, the American Institute of Architects, or the Earthquake Engineering Research Institute.

## In Brief

- Two additional components of an earthquake safety program can be initiated.

### **B.3.10 Negotiating Code Enforcement**

Discuss the owner's planned incremental seismic rehabilitation actions with the applicable code enforcement authorities.

Building codes impose requirements on the implementation phase in cases of repair, alteration, or addition to existing buildings. These requirements may be enforced by a state or local agency. Such requirements can add costs to a project and jeopardize feasibility if not taken into account.

Although additions must comply with building code seismic requirements, few codes mandate seismic rehabilitation in repair and alteration projects. Incremental seismic rehabilitation is consistent with most building code requirements applicable to existing buildings.

If applicable, negotiate with code enforcement authorities an optimization of life safety and risk reduction when undertaking seismic rehabilitation. Some code enforcement agencies negotiate required life safety and other improvements with owners of existing buildings who undertake voluntary building rehabilitation. Such negotiations attempt to strike a compromise between safety, feasibility, and affordability.

## **B.4 Additional Components of a Comprehensive Earthquake Safety Program**

In addition to integrating an incremental seismic rehabilitation program into the multifamily facility management process and integrating opportunities to support and implement such a program, there are additional activities that can become part of a comprehensive earthquake safety program for multifamily buildings. These activities can be implemented at any time.

### **B.4.1 Building Contents Mitigation**

Communicate with maintenance staff and tenants to initiate housekeeping or maintenance measures to reduce or eliminate risks from earthquake damage to equipment, furnishings, and unsecured objects in buildings. Work may include such tasks as:

- Anchoring bookcases, file cabinets, storage shelves, and other large furnishings.
- Restraining objects on shelves
- Securing the storage of hazardous materials such as chemicals

FEMA has developed materials that contain information on contents mitigation. These include FEMA 74, *Reducing the Risk of Nonstructural Earthquake Damage: A Practical Guide*, and FEMA 241, *Identification and Reduction of Nonstructural Earthquake Hazards in Schools*. (While the latter is addressed primarily to schools, it is equally applicable to other facility types.)

### **B.4.2 Earthquake Drills**

Introduce earthquake drills and appropriate earthquake preparedness materials into the regular multifamily building emergency preparedness program. Knowing what to do and where to go in an emergency can be critical to life safety in earthquakes.

## B.5 Preparing a Plan for the CEO and the Board

This section provides guidance to multifamily facility managers, risk managers, and financial managers when preparing a proposal for a seismic safety program in response to top management's request.

The owner's facility, risk, and financial managers should prepare a proposal for a seismic risk reduction program. This proposal should be based on an analysis of each of the elements of an incremental seismic rehabilitation program (B.2.2), opportunities for seismic risk reduction (B.3), and additional components (B.4) as discussed above. The proposal should include the following elements:

- A discussion of each recommendation in Part B from the perspective of the owner's current facility management, risk management, and financial management practices. This may take the form of a comprehensive rewriting of Part B.
- A specific plan and recommendation for initiating the first two steps following building acquisition and redevelopment, **Seismic Screening** and **Seismic Evaluation**. The plan should include a budget and schedule of activities.
- A request for the budget for these first steps.

If the necessary resources are available to the facility manager, perform a rapid visual screening, as outlined in B.2.2.3, prior to preparing the program proposal. Then, expand the proposal based on the known inventory of potentially vulnerable buildings as determined in the screening process.

If the owner has a current 5-year capital improvement plan or its equivalent, add the following details to the proposal discussed above:

- Identify existing buildings currently included for rehabilitation in the current 5-year plan.
- Perform a preliminary review of their seismic vulnerabilities, as outlined in B.2.2.3.
- Using Part C of this manual, identify potential seismic rehabilitation increments that could be integrated with the rehabilitation program.
- Add a FEMA 356, *Prestandard and Commentary for the Seismic Rehabilitation of Buildings*, seismic rehabilitation design task to the rehabilitation projects.

### In Brief

- There are three options to propose a seismic safety program.

### **Summary of Part B**

- Planning for earthquake risk reduction in multifamily buildings requires a coordinated and integrated effort by facility managers, risk managers, and financial managers.
- Ten specific activities can be added to the current facility management process to implement an incremental seismic rehabilitation program:
  1. Due Diligence Analysis
  2. Initial Integration Opportunities
  3. Seismic Screening
  4. Seismic Evaluation
  5. Developing a Risk Reduction Policy
  6. Seismic Rehabilitation Planning for Specific Buildings
  7. Staging Seismic Rehabilitation Increments
  8. Budget Packaging
  9. Bond Packaging
  10. Seismic Rehabilitation Project Management
- Ten additional activities can be added to the facility management process to further reduce seismic risk.
- Two additional components of an earthquake safety program can be initiated.
- There are three options to propose a seismic safety program.

### **Recommended Actions**

1. Prepare an analysis of your buildings using Part B of this manual as a guide.
2. Based on this analysis, prepare a seismic risk reduction plan for top management that includes the costs and benefits of such a plan.
3. Adopt a comprehensive earthquake safety program and begin to implement incremental seismic rehabilitation in your buildings.