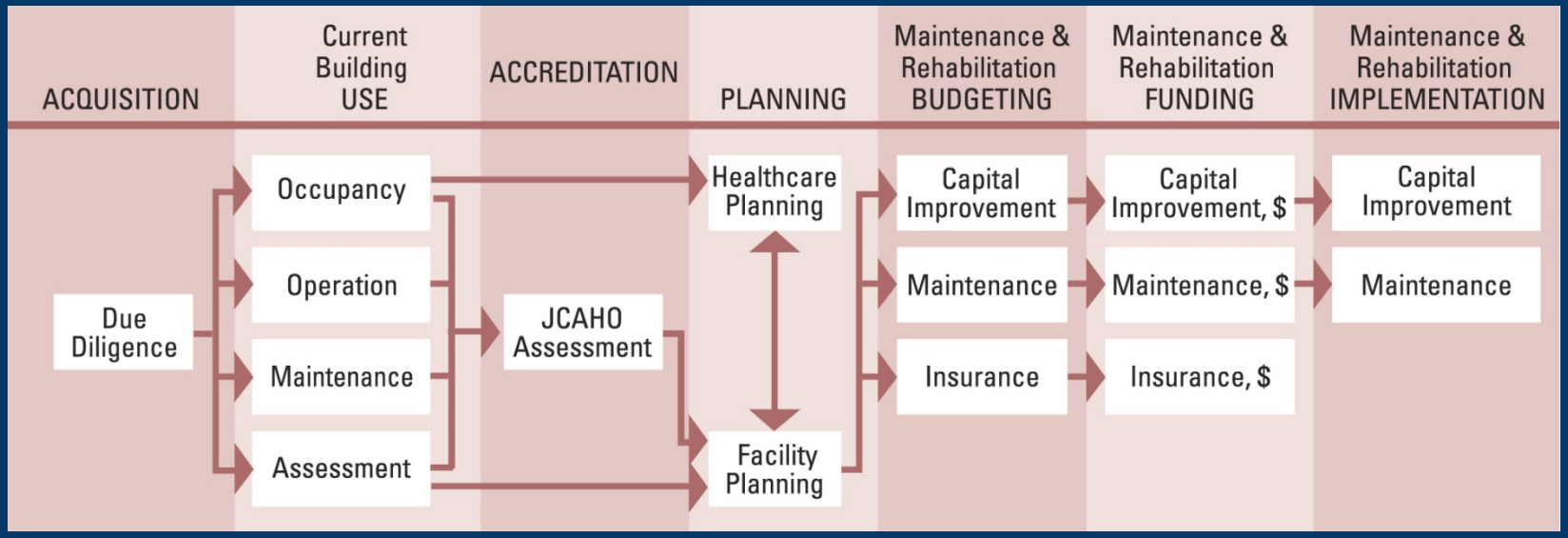
Earthquake Mitigation for Hospitals: Workshop

Part 7 - Planning and Managing the Process

Planning and Managing the Process of Seismic Risk Reduction

- Planning for earthquake risk reduction requires a coordinated and integrated effort by facility managers, risk managers, and financial managers.

Planning and Managing the Process of Seismic Risk Reduction



Acquisition

Hospital buildings and their professional staffs are often acquired as part of a single transaction. The **due diligence** process that precedes an acquisition is intended to identify and quantify all the liabilities or potential liabilities related to the asset being acquired.

Use

The use phase of facility management includes:

- Occupancy: healthcare delivery and support
- Operation: facility support
- Maintenance: enable Occupancy and Operation to continue over time
- Assessment: facility survey and inspection

Accreditation

The accreditation phase of facility management consists of a variety of evaluation and inspection activities.

Planning

The planning phase consists of projecting and forecasting future needs in two separated but related areas:

- Healthcare planning
- Facility planning

Budgeting

The budgeting phase consists of the projection of future financial resources required to meet future needs in three areas relevant to facility management:

- Capital
- Maintenance
- Insurance

Funding

The funding phase consists of obtaining the financial resources to meet hospital needs. The funding of hospital capital, maintenance, and insurance budgets can come from various sources:

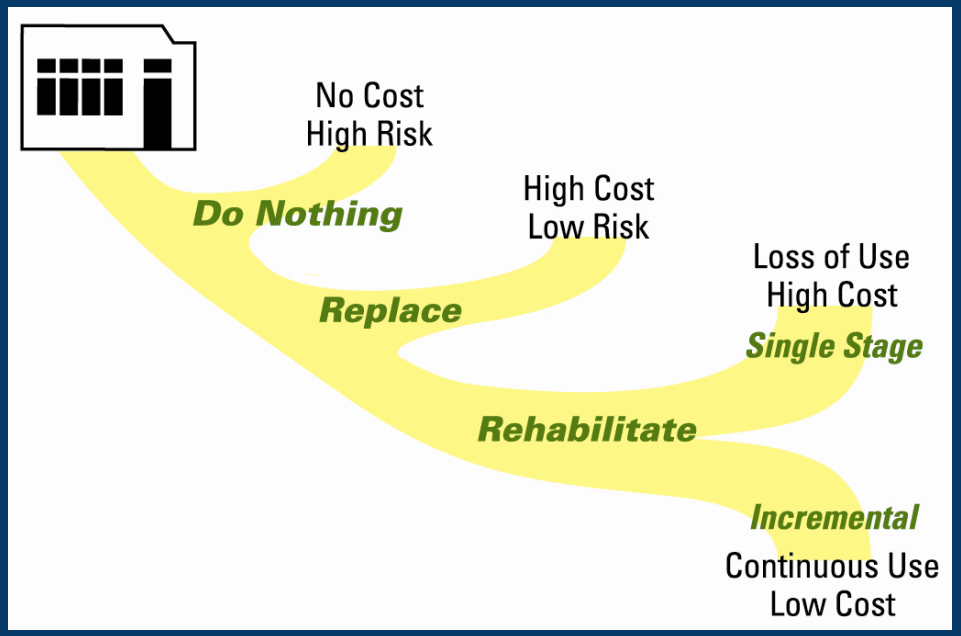
- Revenue
- Bonds
- Grants
- Interest income
- Taxation

Implementation

The implementation phase includes design and construction in four categories of projects:

- New building construction
- Building acquisition
- Capital improvement
- Maintenance

Overview of Seismic Risk Reduction



Planning and Managing the Process of Seismic Risk Reduction

- 10 specific activities can be added to the facility management process to implement an incremental seismic rehabilitation program.
- 9 additional activities can be added to further reduce seismic risk.
- There are two ways to start reducing seismic risk. *EQ drills, contents mitigation*

Elements of an Incremental Seismic Rehabilitation Program

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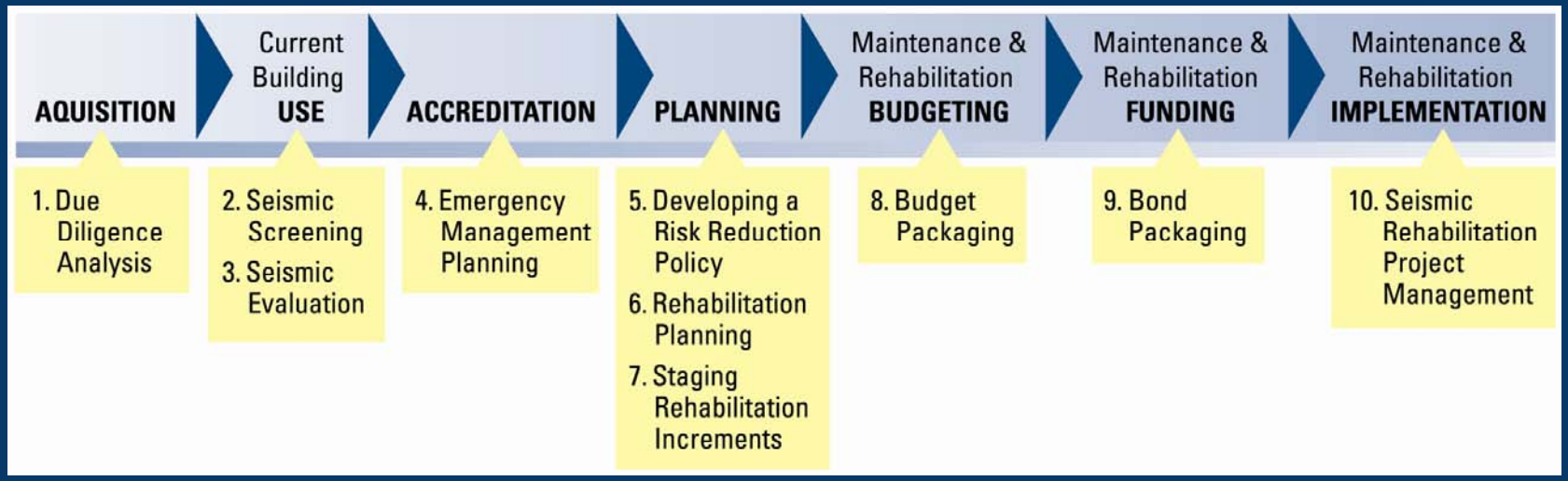
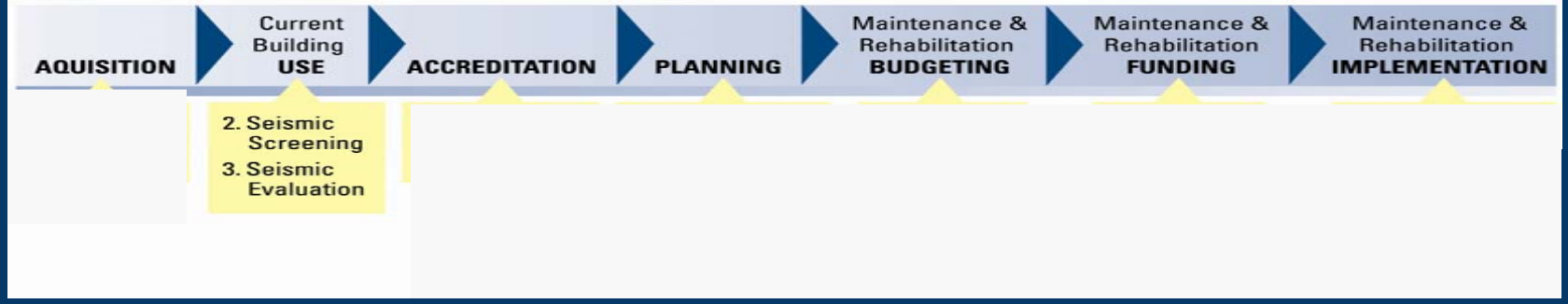


1. Due Diligence Analysis

Due diligence should include a probabilistic analysis of potential earthquake risks:

- Building stability
- Site stability
- Building damageability
- Building content damageability
- Business interruption

Resource: ASTM E 2026

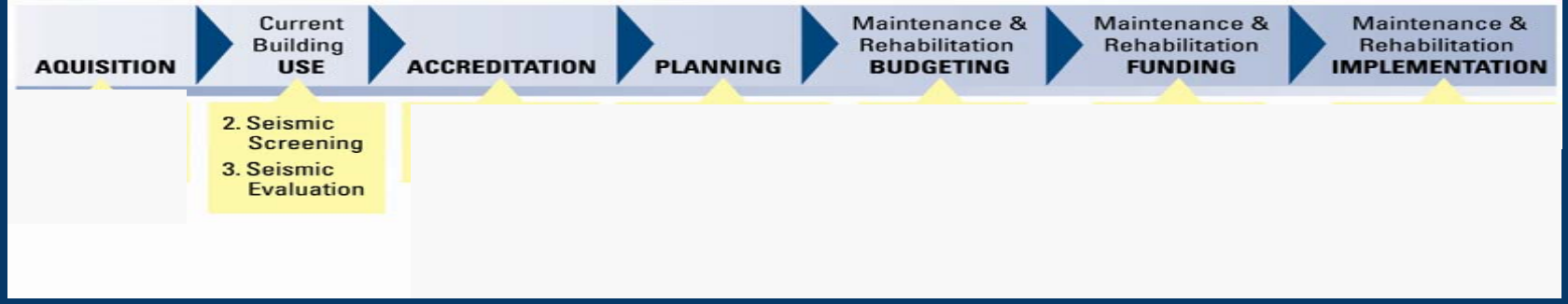


2. Seismic Screening

Seismic screening of a healthcare organization's building inventory can be incorporated into other building assessment activities:

- Determine building structure type
- Relative vulnerability score of each building

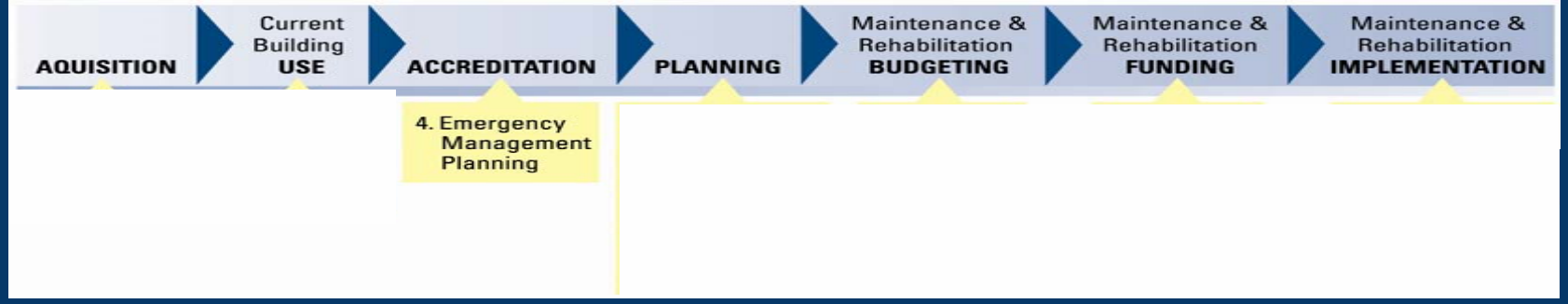
Resource: FEMA 154



3. Seismic Evaluation

Seismic evaluation is an engineering analysis of individual healthcare buildings that have been screened as relatively more vulnerable.

Resource: ASCE 31 (based on FEMA 310)



4. Emergency Management Planning

Emergency management planning is required by JCAHO Environment of Care standards. Seismic screening and evaluation can support and enhance demonstration of compliance with JCAHO standards EC.1.4 and EC.2.4

Resource: ASHE, *Hazard Vulnerability Analysis*

5. Developing a Risk Reduction Policy

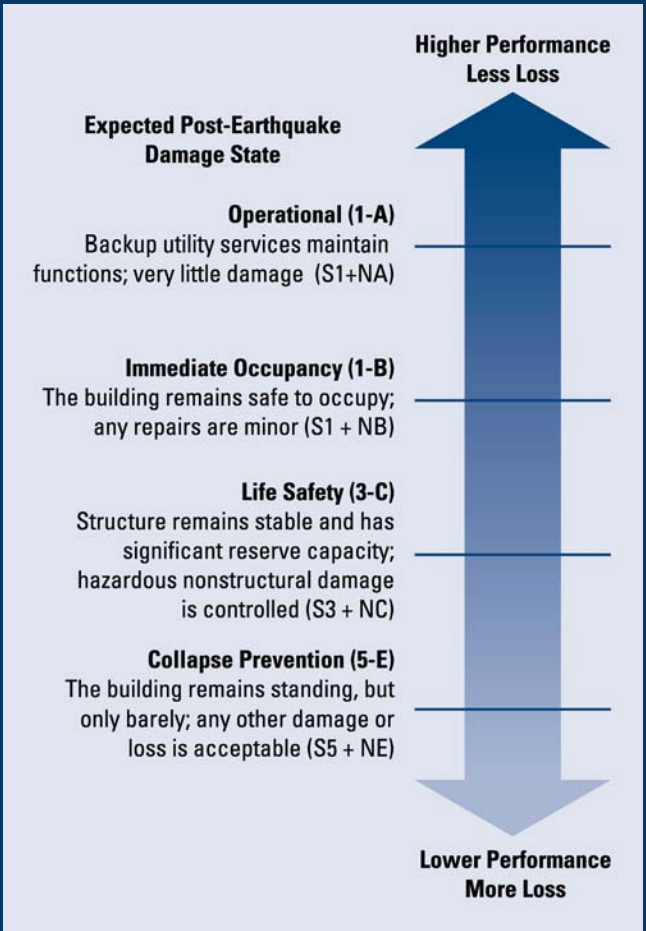
- The Board of Directors should adopt a policy statement supporting seismic risk reduction.
- Such a policy should, at a minimum, establish seismic performance objectives for the healthcare organization's various buildings.

6. Seismic Rehabilitation Planning

- Establish seismic target performance levels
- Prioritize rehabilitation opportunities (“worst first”)
- Define rehabilitation increments
- Integrate with other planned rehabilitation work

Resource: ASCE 41 (based on FEMA 356)

Target Performance Levels



Target Performance Levels

Target Building Performance Levels

Lower Performance
More Loss

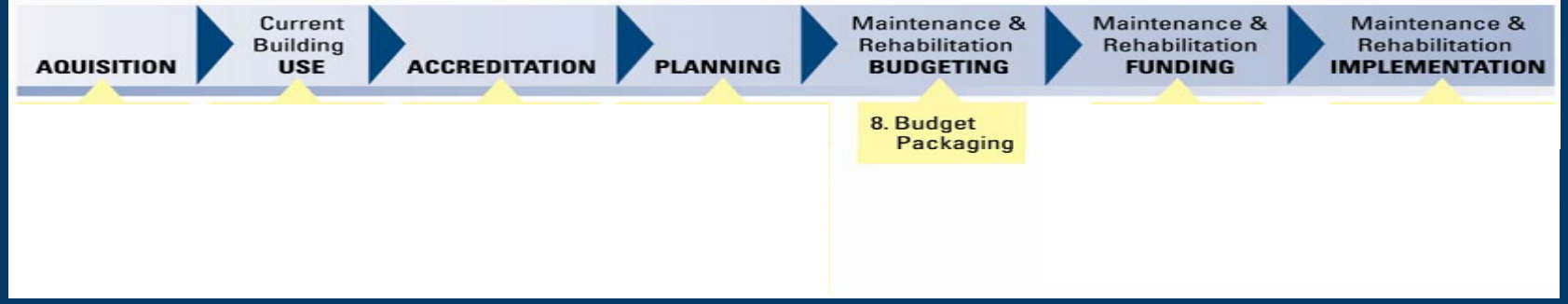
Higher Performance
Less Loss

	Collapse Pervention Level (5-E)	Life Safety Level (3-C)	Immediate Occupancy Level (1-B)	Operational Level (1-A)
Overall Damage	Severe	Moderate	Light	Very Light
General	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.
Nonstructural Components	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.	Negligble damage occurs. Power and other utilities are available, possibly from standby sources.
Comparison with performance intended for buildings designed under the *NEHRP Provisions* for the Design Earthquake	Significantly more damage and greater risk.	Somewhat more damage and slightly higher risk.	Less damage and lower risk.	Much less damage and lower risk.

7. Staging Seismic Rehabilitation Increments

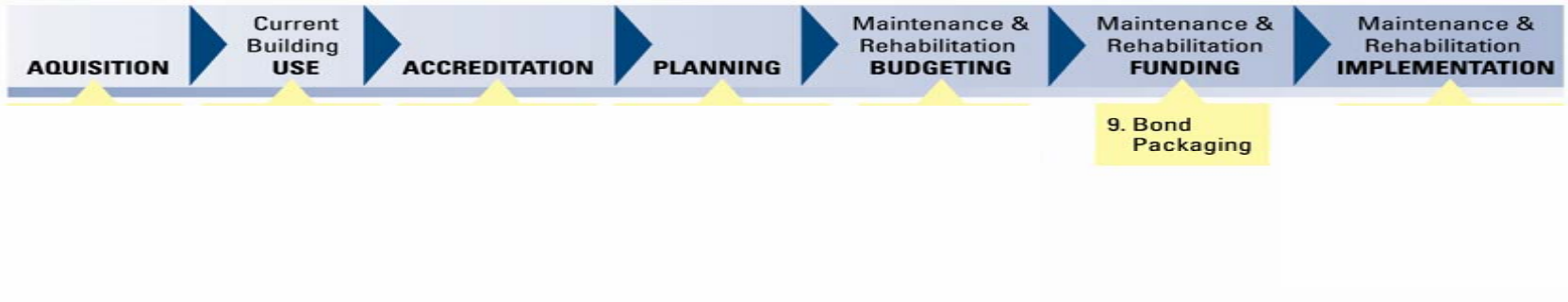
Incremental seismic rehabilitation affords great flexibility in the sequence and timing of actions:

- Get started as soon as possible
- Even if completion takes 10-20 years, most of the risk reduction benefit is realized
- There is a wide margin of options and it is possible to increase the vulnerability for a limited period.



8. Budget Packaging

- Carefully plan how to present the incremental seismic rehabilitation budgets, given political and financial realities and Medicare's depreciation schedules
- It is unlikely that healthcare organizations outside California can raise funds for a seismic rehab program for all their buildings
- It may be necessary to package seismic rehabilitation with other work to get it funded



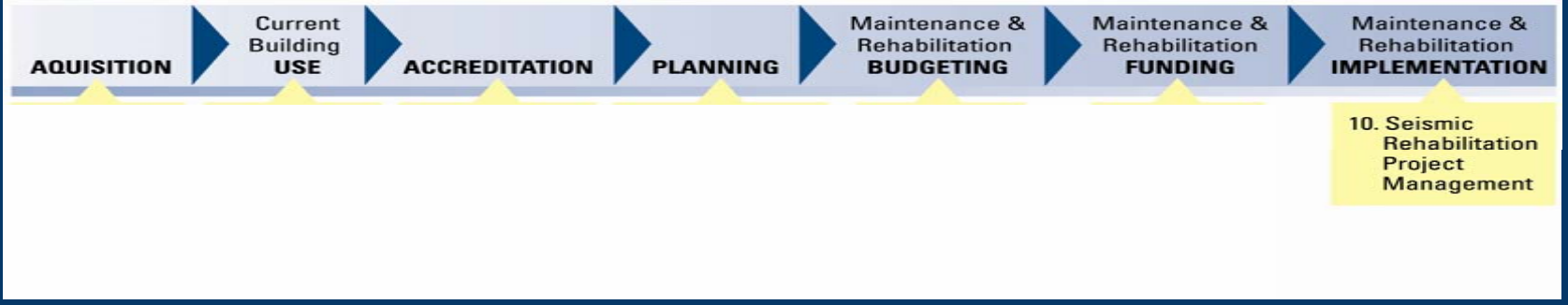
9. Bond Packaging

Bond financing is one of five financing mechanisms for seismic rehabilitation. It is important to ensure that bond-financed incremental seismic rehabilitation does not include categories of work precluded by law or regulation.

Bond Financing

Experience with bond-financed incremental seismic rehabilitation has been limited to school districts. Most extensive is that of Seattle Public Schools. Seattle's experience may be of interest to some healthcare organizations. Two types of bonds were used, based on state law:

- Capital Levy Bonds (smaller projects)
- Capital Improvement Bonds (larger projects)

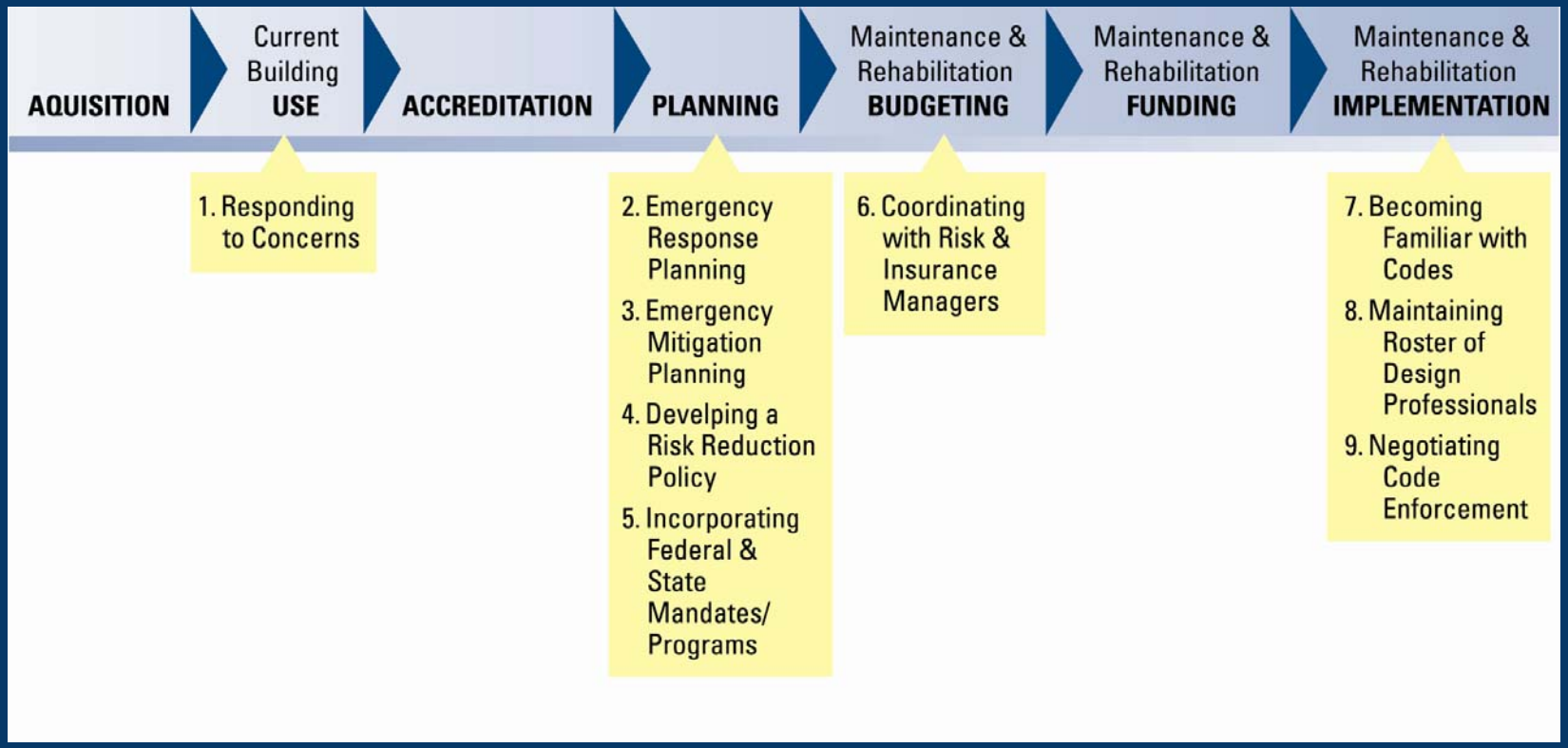


10. Seismic Rehabilitation Project Management

For incremental seismic rehabilitation:

- Brief or train design professionals preparing the bid documents on the rationale behind the rehabilitation measures
- Continuity of Operations
- Ensure continuity of documentation
- Conduct a pre-bid conference

Additional Opportunities for Seismic Risk Reduction



Additional Opportunities for Seismic Risk Reduction

1. Responding to Occupant Concerns
   - Track staff and patient concerns related to earthquake vulnerability, as a source of influence
2. Emergency Mngmt./Response Planning
   - Establish a liaison with emergency management agencies and volunteer organizations
3. Emergency Mngmt./Mitigation Planning
   - Incorporate hospital building seismic mitigation into the state mitigation plan

Additional Opportunities for Seismic Risk Reduction

4. Developing a Risk Reduction Policy
   - The Board of Directors should adopt a policy statement supporting seismic risk reduction.
5. Incorporating Federal & State Mandates
   - Become familiar with applicable requirements imposed on hospitals by federal and state programs
6. Coordinating with Risk & Insurance Managers
   - Establish coordination between facility management and risk management functions in the organization

Additional Opportunities for Seismic Risk Reduction

7. Becoming Familiar with Applicable Codes
   - Become familiar with any code-imposed seismic rehabilitation requirements. Code triggers may occur in “normal” remodeling projects.
8. Establishing and Maintaining a Roster of Design Professionals & Contractors
9. Negotiating Code Enforcement
   - Negotiate with code enforcement authorities an optimization of life safety and risk reduction when undertaking seismic rehabilitation

Additional Components of an Earthquake Safety Program

1. Building Contents Mitigation
   - Fastening laboratory equipment
   - Anchoring file cabinets, storage shelves, and other large furnishings
   - Restraining objects on shelves
   - Securing the storage of hazardous materials

Resource: FEMA E-74

Additional Components of an Earthquake Safety Program

2. Earthquake Drills
   - Influx of patients and casualties
   - Building damage

FEMA and Other Resources for Seismic Rehabilitation

- FEMA 396, Incremental Seismic Rehabilitation of Hospital Buildings
- ASTM E 2026, *Standard Guide for the Seismic Risk Assessment of Buildings*
- FEMA 154, *Rapid Visual Screening of Buildings for Potential Seismic Hazards: A Handbook, Second Edition*
- ASCE 31, *Seismic Evaluation of Existing Buildings*
- ASHE Management Monograph #055920, *Hazard Vulnerability Analysis*
- ASCE 41, *Seismic Rehabilitation of Buildings*
- FEMA E-74, *Reducing the Risks of Nonstructural Earthquake Damage; A Practical Guide*
- FEMA 547 Techniques for Seismic Rehabilitation

Questions?