Incremental Seismic Rehabilitation of School Buildings (K-12) - FEMA 395

Providing Protection to People and Buildings

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Overview

1. Introduction to the Incremental Seismic Rehabilitation Series

2. FEMA 395 – Incremental Seismic Rehabilitation of School Buildings (K-12) Part A

3. Thoughts on effective use of the tool
Introduction to Incremental Seismic Design Series

- Pioneered by FEMA and a Virginia Polytechnic Institute/Building Technology Inc. team in early 1990’s – (FEMA 318 – Existing School Buildings – Incremental Seismic Retrofit Opportunities)
- FEMA 395 Incremental Seismic Rehabilitation of School Buildings – June 2003 first in series with five additional manuals (Hospitals, Offices, Multifamily Apartment, Retail, Hotel and Motel buildings)
- FEMA 420 Engineering Guidelines – May 2009
- Part of the FEMA Risk Management Series
Incremental Seismic Rehabilitation of School Buildings

Contents

- Part A Critical Decisions for Earthquake Safety in Schools
- Part B Planning and Managing the Process for Earthquake Risk Reduction
- Part C Tools for Implementing Incremental Seismic Rehabilitation
How to Use the FEMA 395 Manual

- **Part A  Critical Decisions for Earthquake Safety in Schools**
  - Provides school district management with the necessary information to establish a **policy** of seismic risk reduction and **initiate** incremental seismic rehabilitation program
  - Superintendents, business managers, board members, principals and similar policy makers should read Part A

- **Part B  Planning/Managing Process for Earthquake Risk Reduction**
  - Provides information on initiation of a program of incremental seismic rehabilitation and how it can fit within ongoing facilities management process
  - District facilities, risk & financial management personnel should read Parts A + B

- **Part C  Tools for Implementing Incremental Seismic Rehabilitation**
  - Discusses opportunities for combining increments of seismic rehabilitation with other maintenance and capital improvement projects
  - District facilities managers should read Parts A + B + C

EERI School Seismic Safety Initiative – Webinar #1
Introduction

Schools, Risk, and Liability

School buildings need to be earthquake resistant:

- Provide safety for children and staff
- Maintain building operations
- Provide shelter-in-place and potential longer term community shelter needs
- Help communities minimize disruption to life
Introduction

*Schools, Risk, and Liability*

- School administrators face a wide array of risks:
  - Playground accidents – armed attacks
- Risk management driven by perceptions of danger:
  - Seatbelts in buses, crossing guards, flashing lights, reduced speeds
  - Cafeteria sanitary precautions
- Earthquake risk difficult to understand and evaluate:
  - Low-probability, high consequence
Introduction
Schools, Risk, and Liability

- Failure to address risk leaves school districts potentially liable for:
  - Injury and/or life loss
  - Financial losses
  - Disruption of services

- Risk insurance may protect from financial losses and liability but...
  - Not necessarily for disruption
  - Or injury and life-loss

- Only building rehabilitation can:
  - Reduce losses, deaths and injuries
  - Control liability and disruption
Part A – Critical Decisions for Earthquake Safety in Schools

For Superintendents, Business Managers, Board Members & Principals

“Earthquakes are one of the most serious natural hazards to which schools districts may be exposed....Therefore in spite of their rare occurrence, earthquake safety should be given full consideration in design and investment for risk management.”
A.1 Is There an Earthquake Hazard for Your Schools?

*Understanding Earthquake Risk*

\[
\text{Risk} = \text{Hazard} \times \text{Vulnerability}
\]

\[
\text{Risk} = \text{Earthquake} \times \text{Buildings}
\]
A.1 Is There an Earthquake Hazard for Your Schools?

*The Earthquake Hazard: Where, When, How Big*

Most earthquakes result from the movement of tectonic plates, and seismic hazard is strongly correlated to known faults.

- **RED** = high seismic hazard
- **YELLOW** = moderate seismic hazard
- **GREEN** = low seismic hazard
A.1 Is There an Earthquake Hazard for Your Schools?

*The Earthquake Hazard: Where, When, How Big*

- If your school district is located in a **RED** zone on the map:
  - Earthquakes are one of the most significant risks facing your facilities
  - Take *immediate* action - undertake a comprehensive vulnerability assessment
  - Identify and either *replace* or *rehabilitate* vulnerable existing buildings

- If your school district is located in a **YELLOW** zone on the map:
  - Probably of severe earthquake is sufficiently high to require consideration
  - Assign responsibility for vulnerability assessment
  - Identify vulnerable buildings and schedule them for replacement, rehabilitation, or change of use

- If your school district is located in a **GREEN** zone on the map:
  - Earthquakes are less likely, low cost mitigation strategies will help protect
  - Pay particular attention to school buildings used as shelters
A.2 Are Your School Buildings Safe?

- **What Happens to School Buildings in Earthquakes**
  - Fault rupture, ground shaking, liquefaction, landslides, tsunamis

- **Building Age and Earthquake Vulnerability**
  - Pre-1990’s construction
  - Pre-2000 IBC

- **Estimating Building Vulnerability**
  - FEMA 154 Rapid Visual Screening of Buildings for Potential Seismic Hazards

- **Other Earthquake Losses**
  - Building failures can be direct cause of:
    - Death and injury to students, teachers, staff
    - Destruction of contents and equipment
    - Disruption to delivery of services (education, shelter, etc.)
A.3 What Can Be Done to Reduce Earthquake Risk in Existing Vulnerable School Buildings?

Options for Seismic Risk Reduction

Do Nothing

No Cost
High Risk

Replace

High Cost
Low Risk

Rehabilitate

Loss of Use
High Cost

Single Stage

Incremental
Continuous Use
Low Cost

Estimating the Costs and Benefits of Seismic Rehabilitation

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A.4 Incremental Seismic Rehabilitation of Existing Schools

• **Approach**
  • *Series of discrete actions over period of several years*

• **Assessment of Deficiencies**
  • *Rank building inventory*
  • *Identify specific deficiencies*

• **Rehabilitation Strategy**
  • *Structural Priority*
  • *Use Priority*
  • *Integration*

• **Incremental Seismic Rehabilitation Plan**
  • *Includes all anticipated rehabilitation increments*

• **Recommended Action**
  • *Communicate importance of assessing buildings*
  • *Initiate a program of risk reduction*
  • *Consider incremental seismic rehabilitation*
Effective Use of FEMA 395 Incremental Seismic Rehabilitation Tool

1. Counter “Naysayers”
   • “It costs too much”
   • “It’s not in our budget”
   • “There’s no support for seismic rehabilitation work”

2. Design Community Endorsement
   • Knowledgeable about issue
   • Involved in design and risk decision making
   • At the table

3. Implications for EERI Schools Seismic Safety Initiative
   • Comprehensive tool for assessing vulnerability and affecting change
   • Convincing alternative to the “do nothing” mentality
QUESTIONS/COMMENTS?