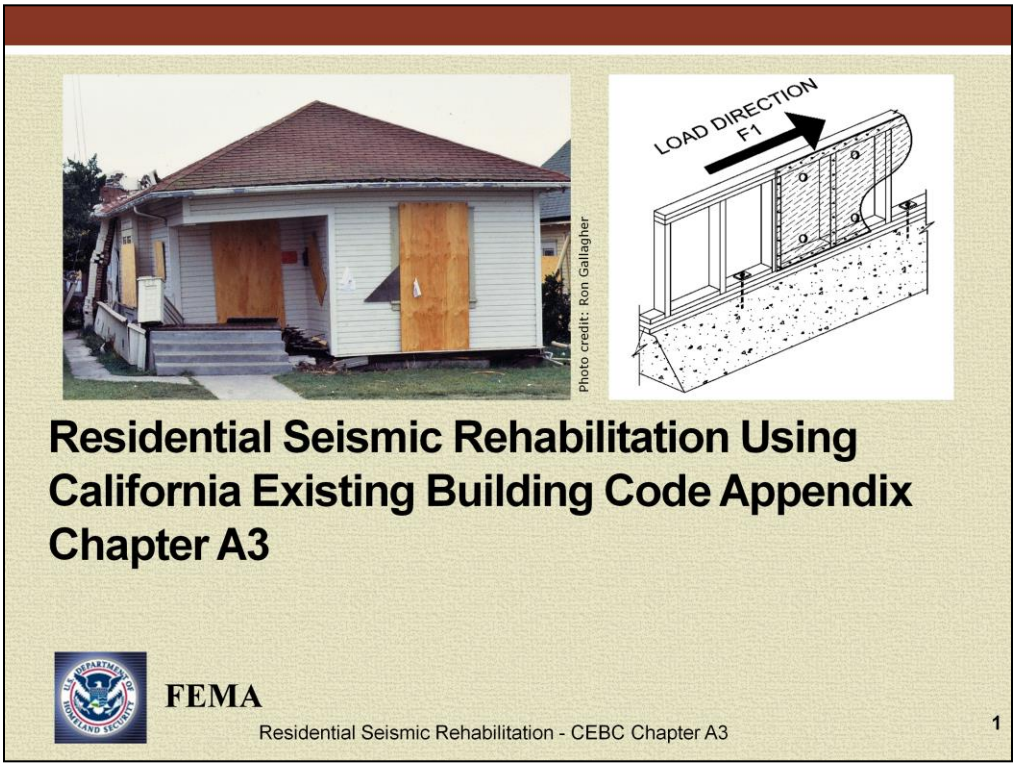
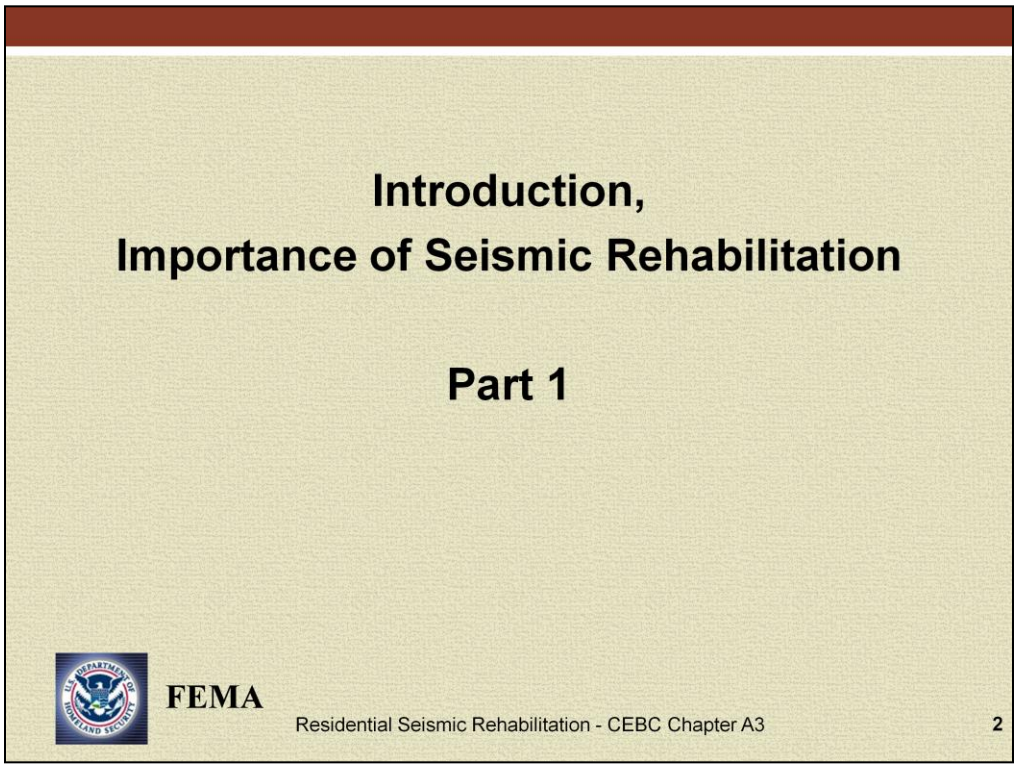
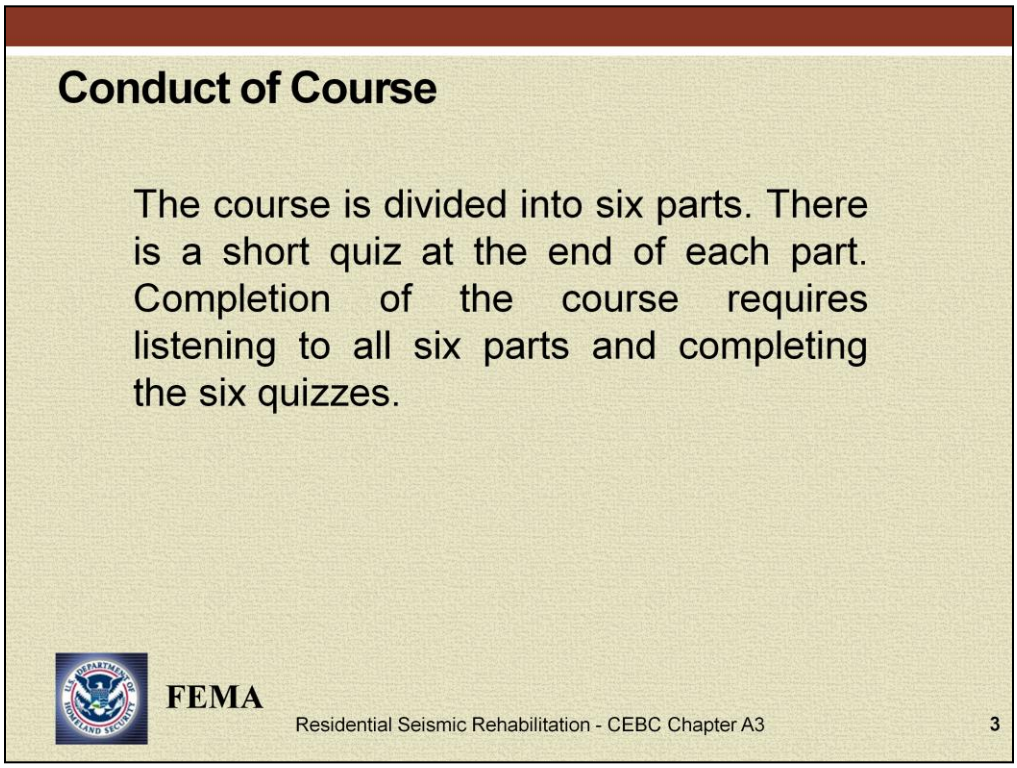


This training has been developed from FEMA P-593, funded by the Federal Emergency Management Agency (FEMA), and developed by the Applied Technology Council (ATC).

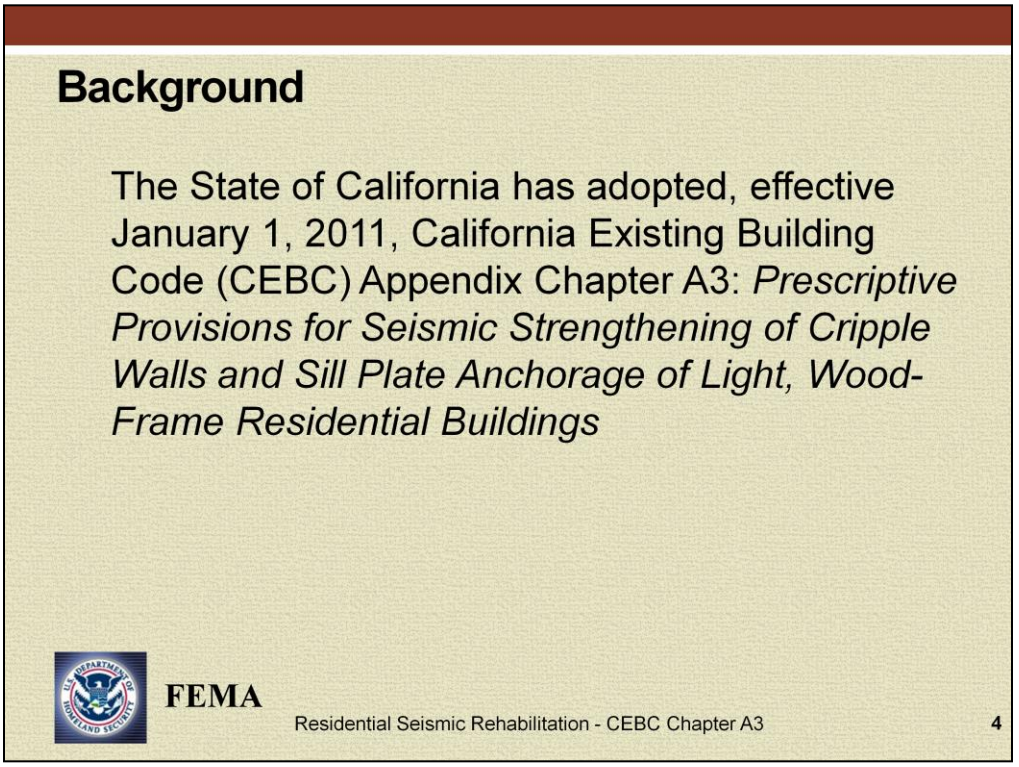
This version of the training has been modified for use in California, and in particular for the use of California Existing Building Code (CEBC) Chapter A3, as published in the CEBC 2010 Edition.



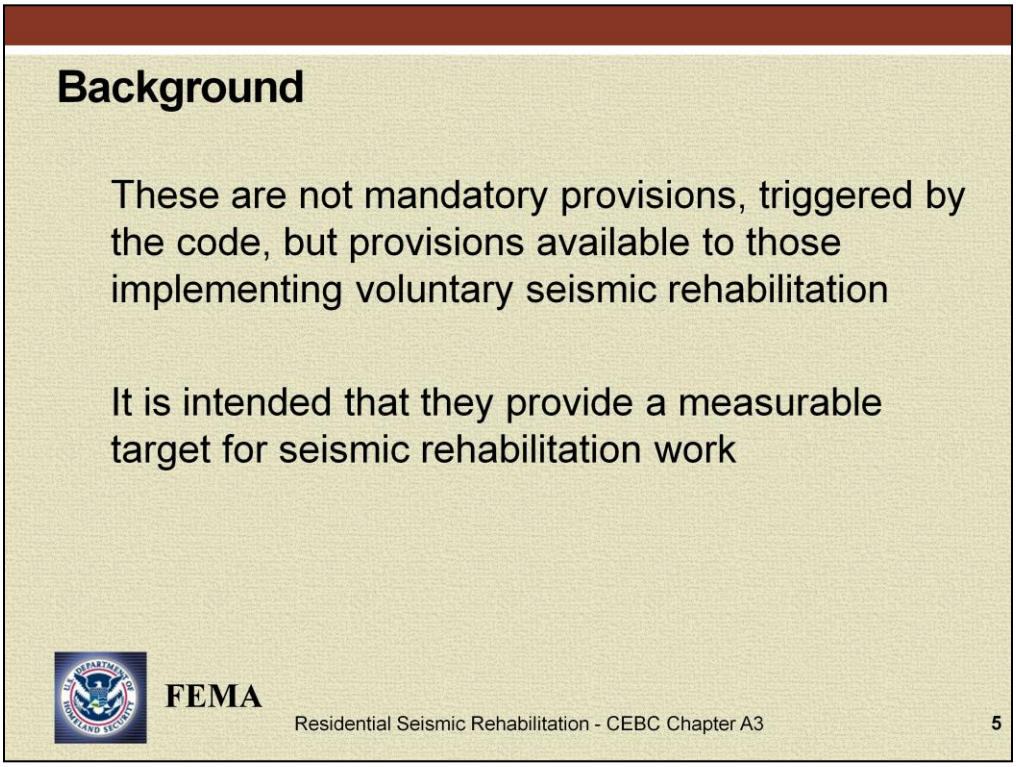
The importance of Seismic Rehabilitation.



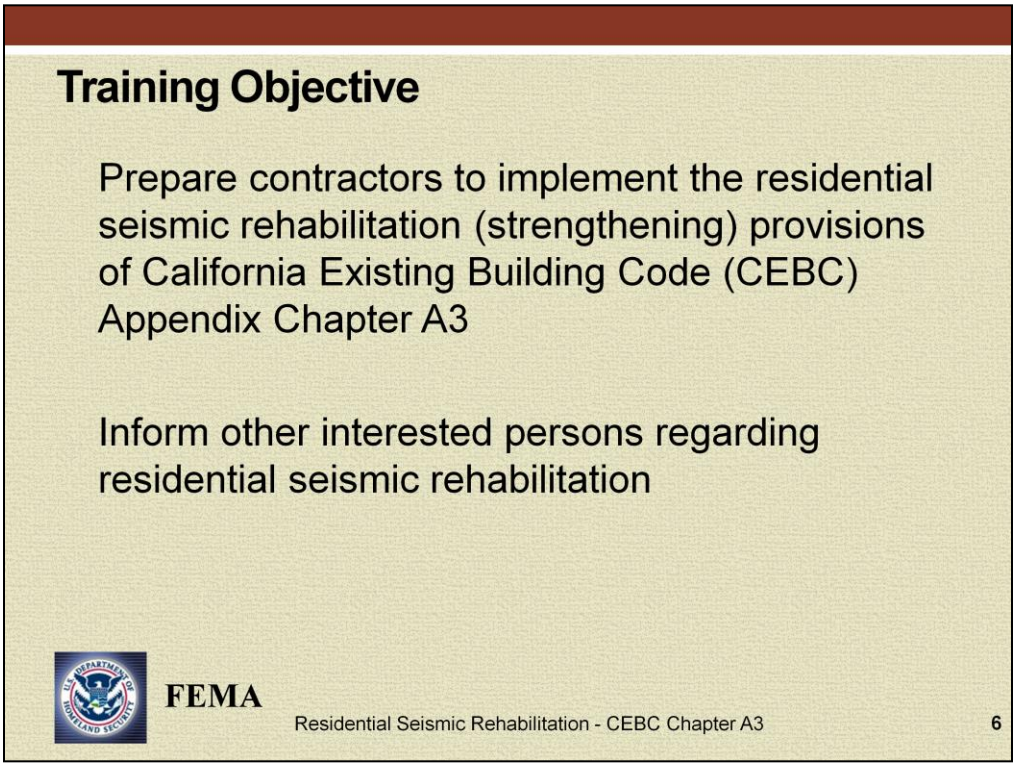
The course is divided into six parts. There is a short quiz at the end of each part. Completion of the course requires listening to all six parts and completing the six quizzes.



The State of California has adopted, effective January 1, 2011, California Existing Building Code (CEBC) Appendix Chapter A3: *Prescriptive Provisions for Seismic Strengthening of Cripple Walls and Sill Plate Anchorage of Light, Wood-Frame Residential Buildings*



These are not mandatory provisions, triggered by the code, but provisions available to those implementing voluntary seismic rehabilitation. It is intended that they provide a measurable target for seismic rehabilitation work



A primary objective of this training is to prepare contractors to implement the residential seismic rehabilitation provisions of CEBC Appendix Chapter A3.

Another objective is to inform persons potentially involved in residential rehabilitation, including architects, engineers, and building officials.

Training Scope

Focus: One- to four-family wood-frame dwellings

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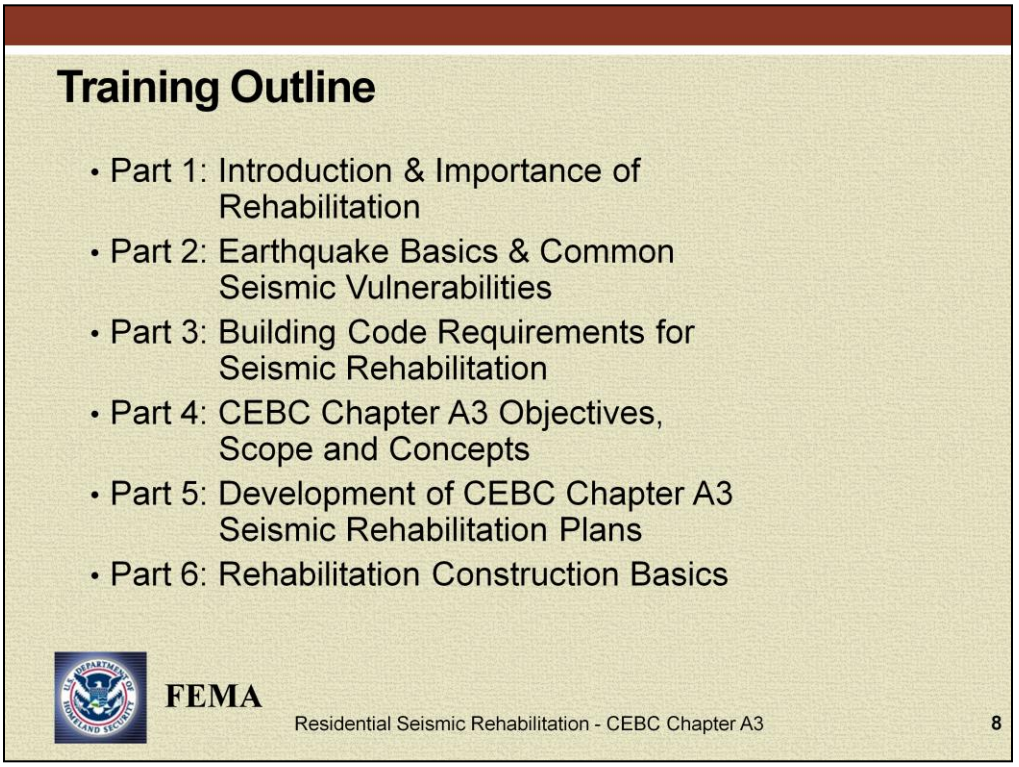
This training focuses on the behavior and types of seismic vulnerabilities that can be seen in one- to four-family detached dwellings.

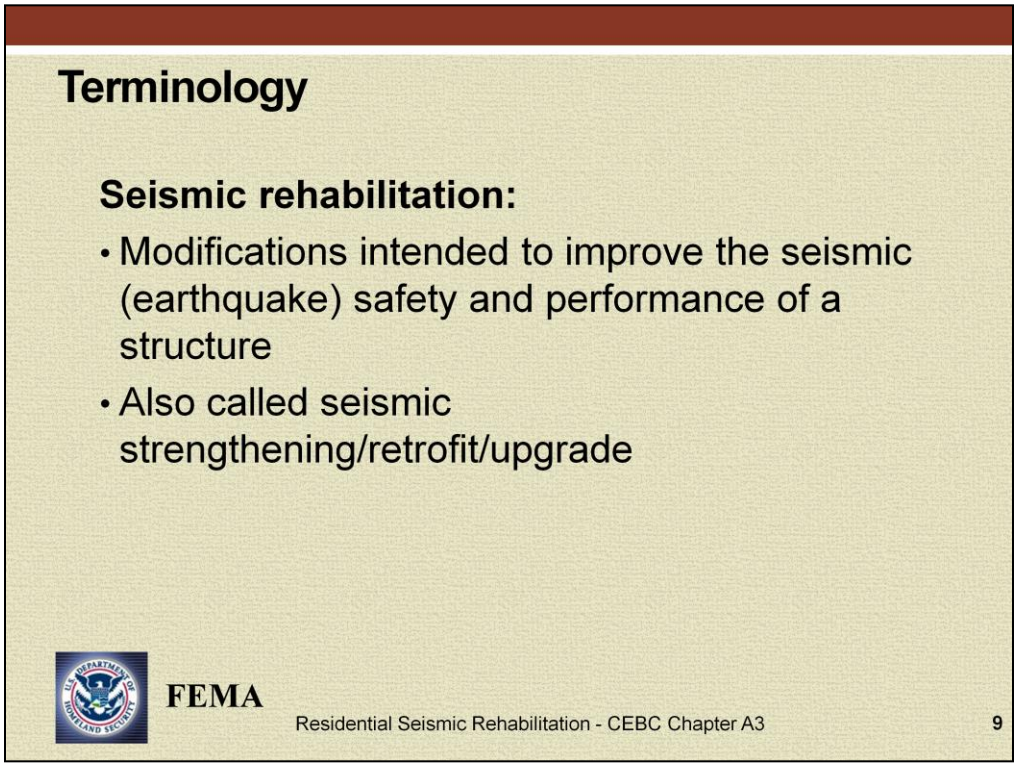
Some of these vulnerabilities can also be found in multi-family dwellings and in other wood-frame buildings. The basic concepts of seismic rehabilitation apply to these other buildings, too, but the details of code requirements and implementation may differ, due to the increased building complexity. A design professional is required for seismic rehabilitation of wood-frame multi-family dwellings and commercial buildings, due to increased building complexity.



Parts 1& 2 of this course will cover information on the importance of rehabilitation, basic information on earthquake effects on dwellings and description of seismic vulnerabilities commonly seen in dwellings. It is hoped that this will inform the contractor and aid the contractor in communication of this information to homeowners.

Part 3 will cover building code requirements applicable to either voluntary or mandatory seismic rehabilitation.

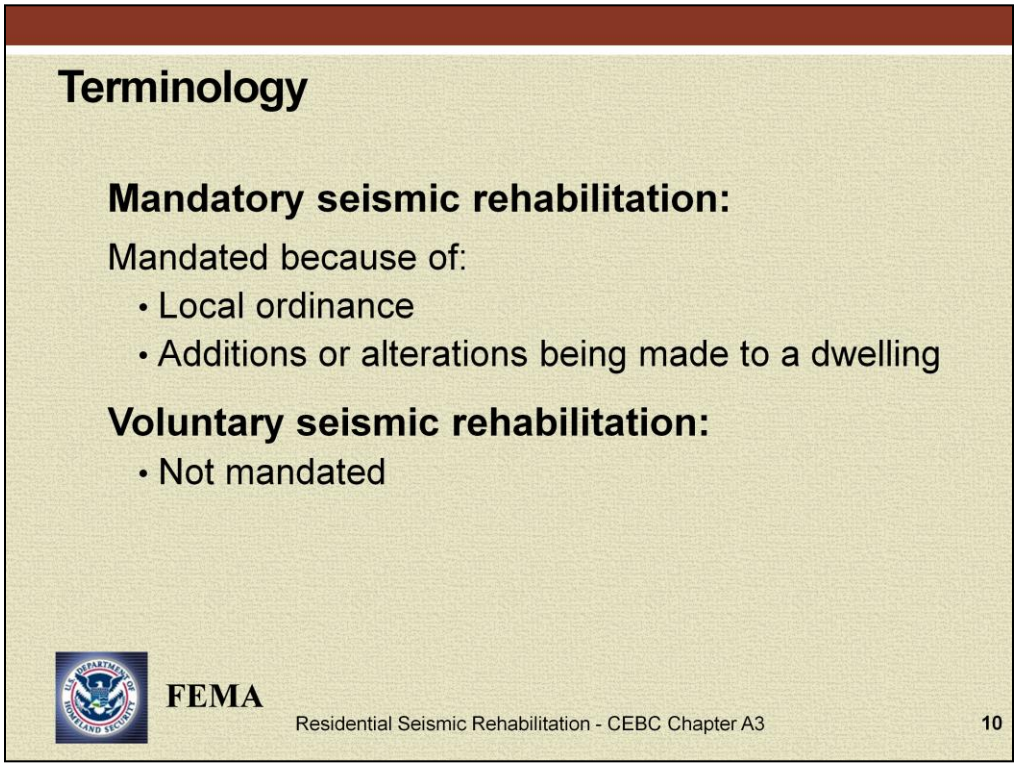
Parts 4 through 6 will cover implementation of CEBC Chapter A3 provisions including scope and concepts, development of rehabilitation plans, and basics of rehabilitation construction.



It is useful to define a series of terms that will be used throughout this presentation.

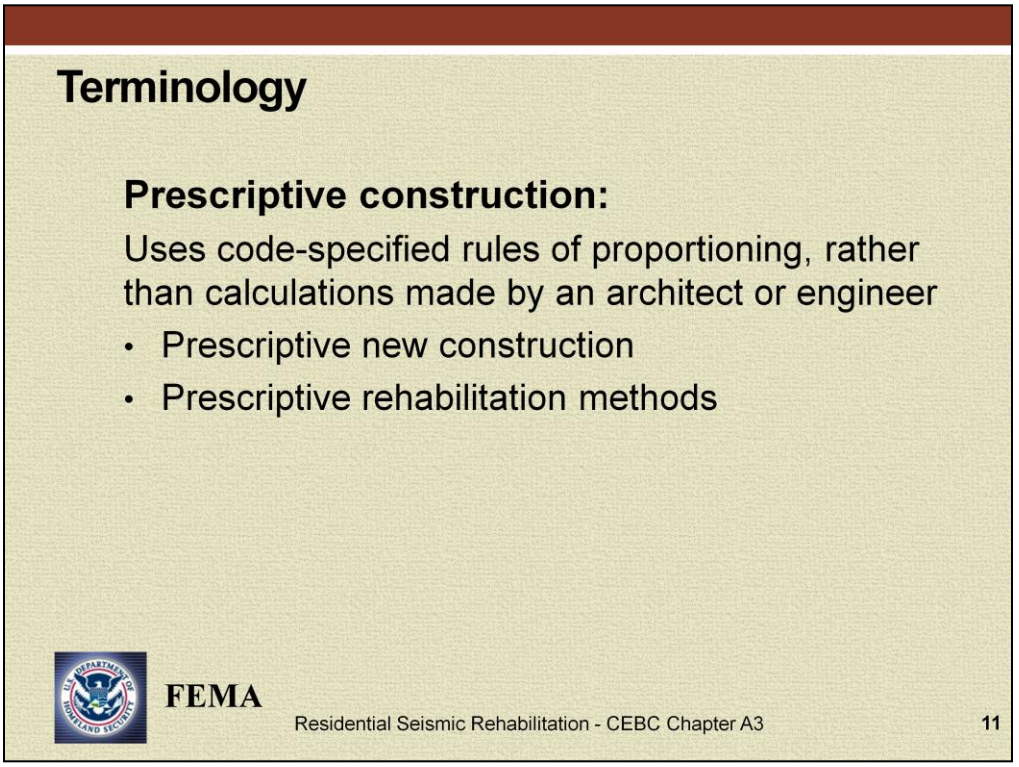
The term “seismic rehabilitation” will be used in this presentation to describe modifications to dwellings, which are intended to improve the safety and performance of a dwelling during an earthquake.

Other commonly used terms are “seismic strengthening,” “seismic retrofit” and “seismic upgrade.” In common usage, all of these terms mean the same thing.



Seismic rehabilitation is sometimes mandated, because of a local ordinance or because an addition or alteration to a dwelling triggers seismic rehabilitation requirements of the building code. When this is the case, it is likely that both the type and the minimum required extent of rehabilitation work to be done will be defined.

Any seismic rehabilitation work that is not specifically triggered by building codes or local ordinances is classified as a voluntary seismic rehabilitation. Homeowners generally have significant flexibility in selecting the type and extent of work to be done for voluntary seismic rehabilitation, with the primary restriction that work performed should not make the dwelling more vulnerable to earthquake damage.



Two primary approaches are available for design:

-*Prescriptive construction* uses rules of proportioning that are published in codes or design standards.

-*Engineered construction* uses calculations of demand, or load, and capacity as a basis for design.

The terms “prescriptive” and “engineered” construction apply both to new construction and to seismic rehabilitation work.

CEBC Chapter A3 is a prescriptive rehabilitation method; for dwellings that fall within the described scope, involvement of an engineer or architect is generally not required.

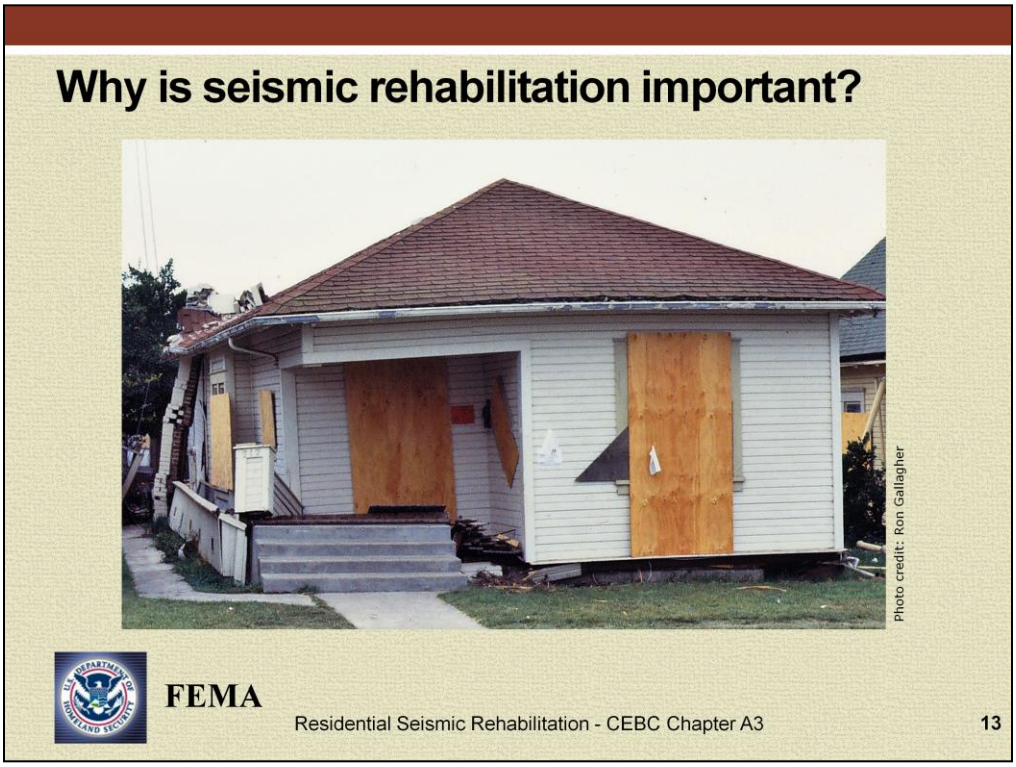
Seismic rehabilitation is important, because a modest investment made prior to an earthquake can have a large payoff after an earthquake, including:

-Increased safety for occupants, when vulnerable configurations are present

-Reduced structural damage although some damage must be expected

-Increased likelihood of the dwelling being habitable after an earthquake, so that occupants do not have to seek emergency shelter

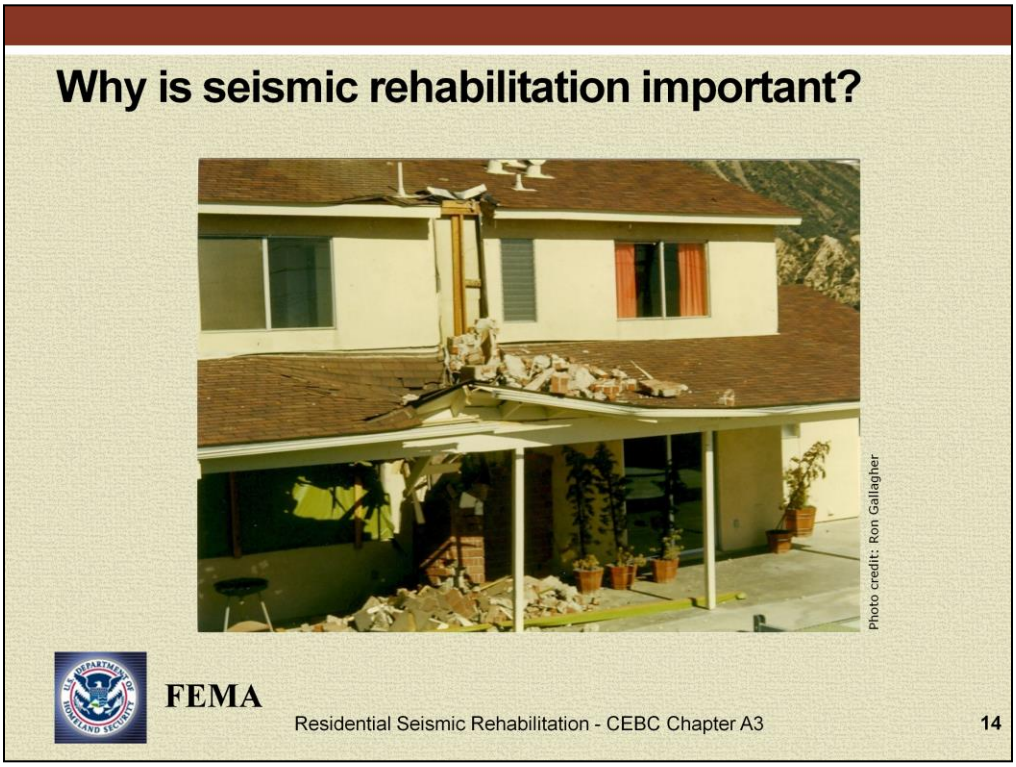
-In high seismic areas, rehabilitation may also increase home resale value



This dwelling's cripple walls collapsed, allowing the dwelling to fall off its foundations. This hazard can be reduced.

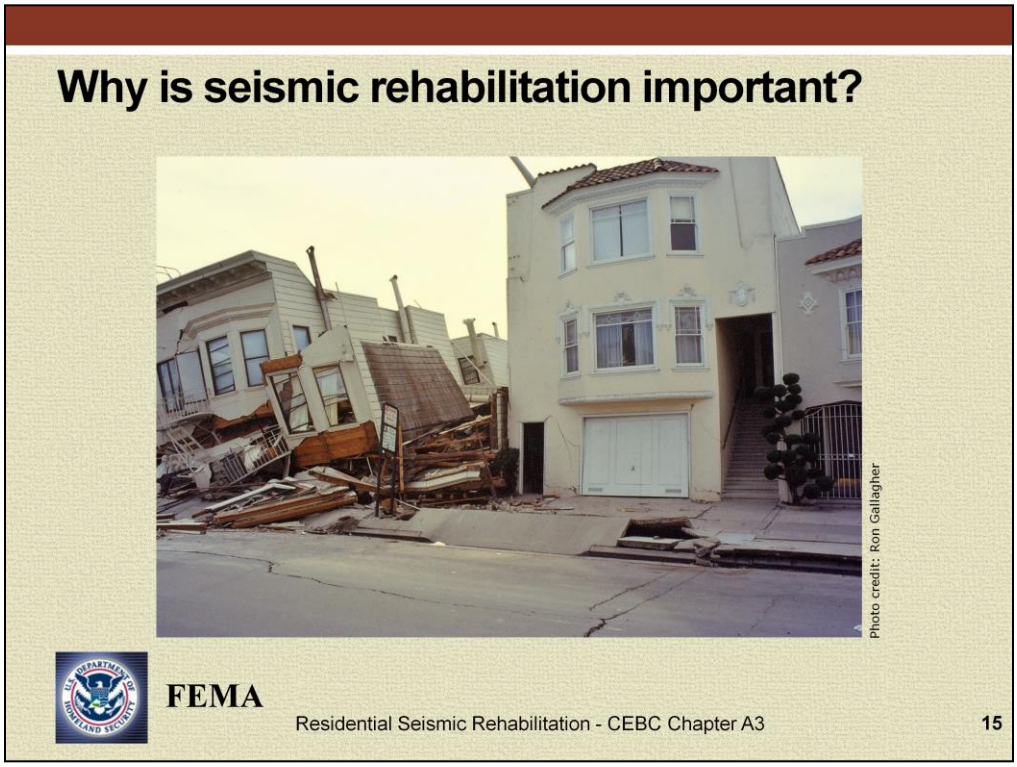
A cripple wall is a short wall that rests on the foundation and supports the floor and exterior walls. If the cripple wall is not braced, it can shift during an earthquake. When this occurs, there is a greater likelihood that the structure will be severely damaged and that you and others will be injured.

Photo credit: Ron Gallagher



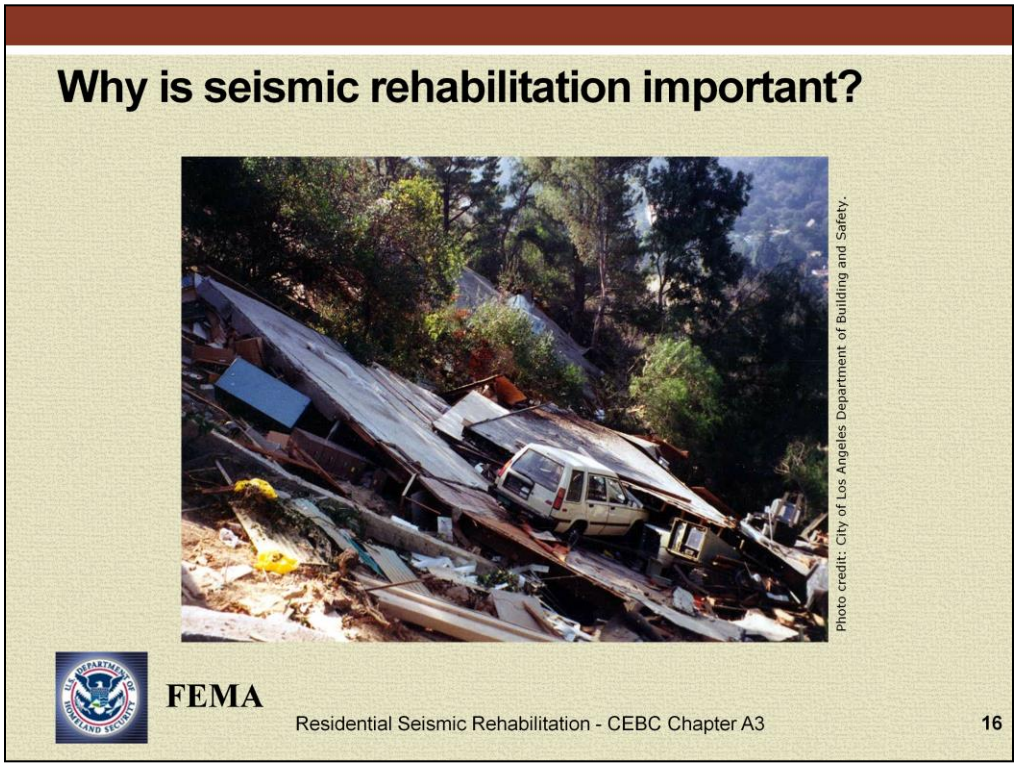
This chimney collapse broke through the porch roof. This earthquake hazard can be reduced.

Photo credit: Ron Gallagher



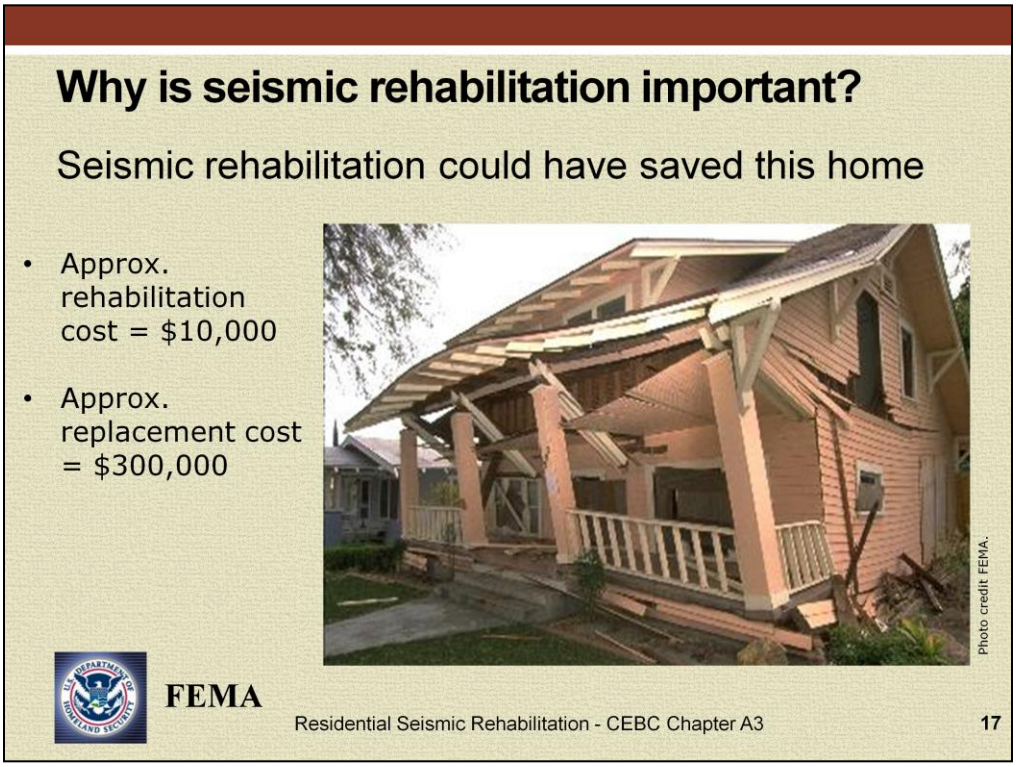
This open-front dwelling collapsed in the 1989 Loma Prieta earthquake, in part because it did not have any bracing walls at the building front. This hazard can be reduced.

Photo credit: Ron Gallagher



This hillside dwelling collapsed during the 1994 Northridge Earthquake. This hazard can be reduced.

Photo credit: City of Los Angeles Department of Building and Safety.



As a specific illustration of the benefits of seismic rehabilitation:

-In this photo, the main house had a cripple wall collapse, while the porch floor did not. Because the house roof and gable end walls were supported on both the porch and the main building, very significant damage occurred. This house would likely require demolition and reconstruction, at an estimated cost of $300,000, while rehabilitation is estimated as costing approximately $10,000. (The cost estimates are in 2009 dollars.)

-The home is not habitable in the condition shown, but it might have been habitable, post-earthquake, if seismic rehabilitation had been performed.

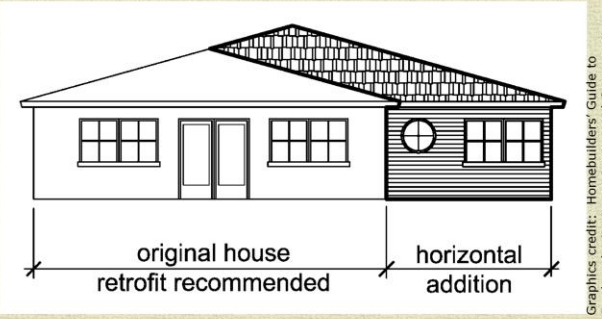
-While not all examples of earthquake damage will be this extreme, the cost ratios of reconstruction to rehabilitation are generally high in areas of high seismic hazard.

-Rehabilitation may reduce likelihood of injury to occupants.

Photo credit FEMA.

When should seismic rehabilitation work be done?

- Anytime, as a stand-alone project
- During remodel, addition, or renovation



Graphics credit: Homebuilders' Guide to Earthquake Resistant Design and Construction (FEMA 232)

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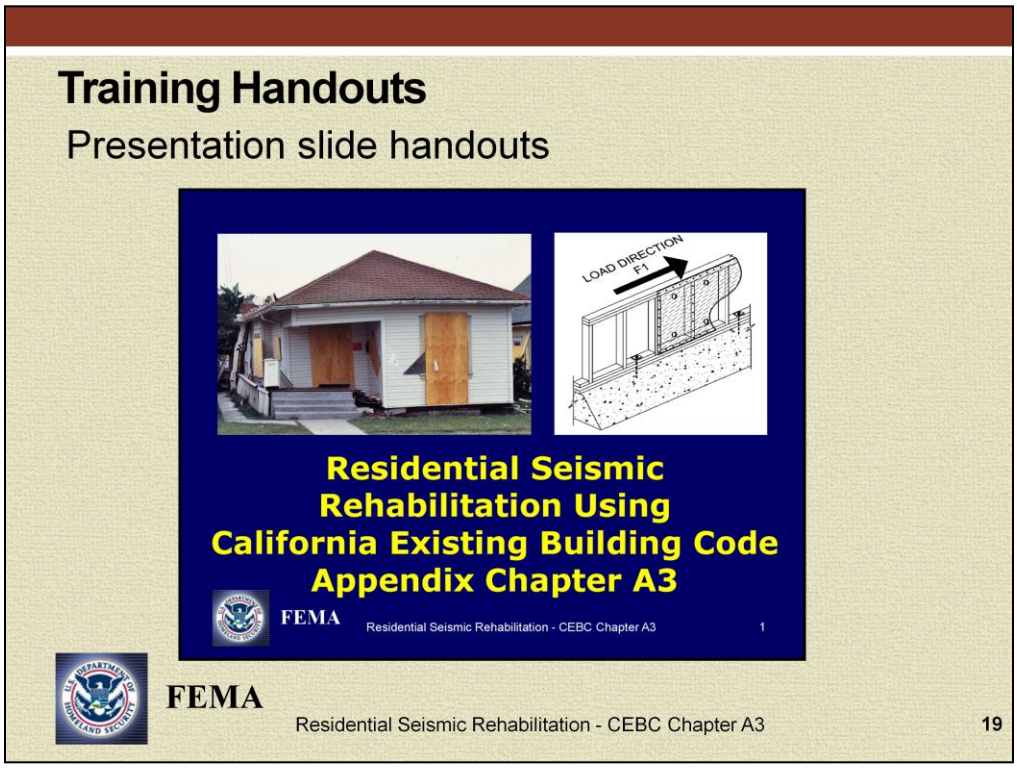
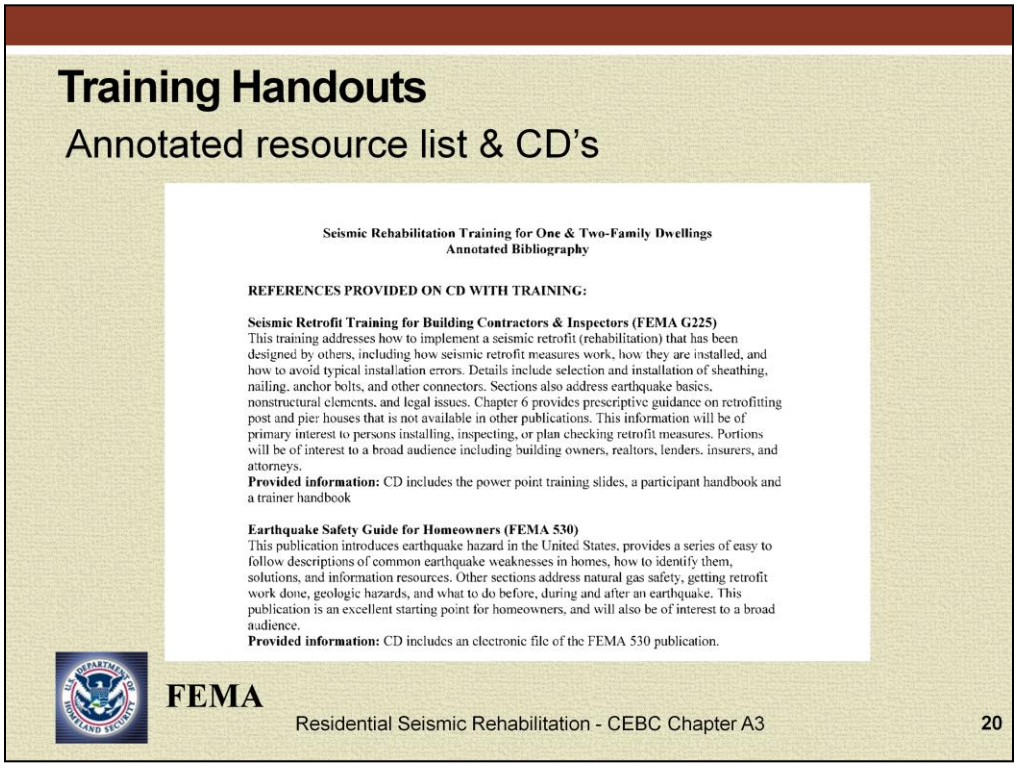
Seismic rehabilitation can always be undertaken as a stand-alone project. Any time is a good time to improve seismic safety.

Seismic rehabilitation should be encouraged as part of addition or alteration projects. Each year homeowners invest a significant amount of money in remodels and additions, and they significantly extend the useful life of their houses through that investment. Seismic rehabilitation can be a small part of the overall construction project, can use the same contractor, and can help to protect the investment that is being made in the dwelling. Seismic rehabilitation work done within the livable space is more likely to be possible during remodel/addition/renovation work. Also, mandatory building code requirements may apply. (Part 4 of this training will discuss code requirements.)

Graphics credit: Homebuilders' Guide to Earthquake Resistant Design and Construction (FEMA 232)



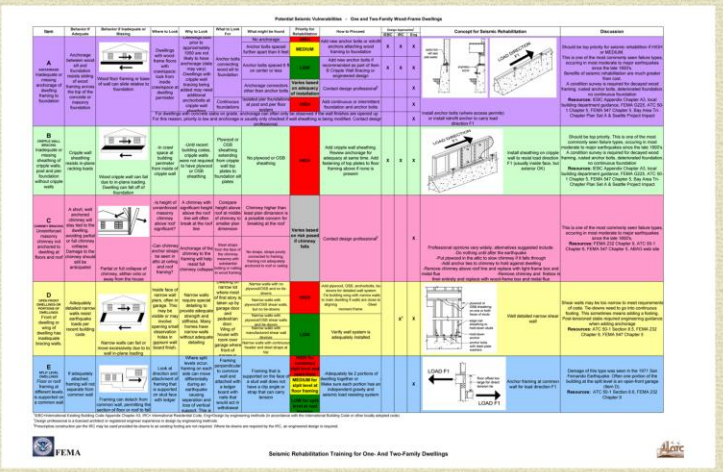
PDF files of this course are available for download. For these files and additional seismic rehabilitation information, see the "Additional Information" page. This information includes:



FEMA publications available for download from their website. One useful document is FEMA 232, The Homebuilders' Guide to Earthquake Resistant Design and Construction.

Training Handouts

Potential Seismic Vulnerabilities card



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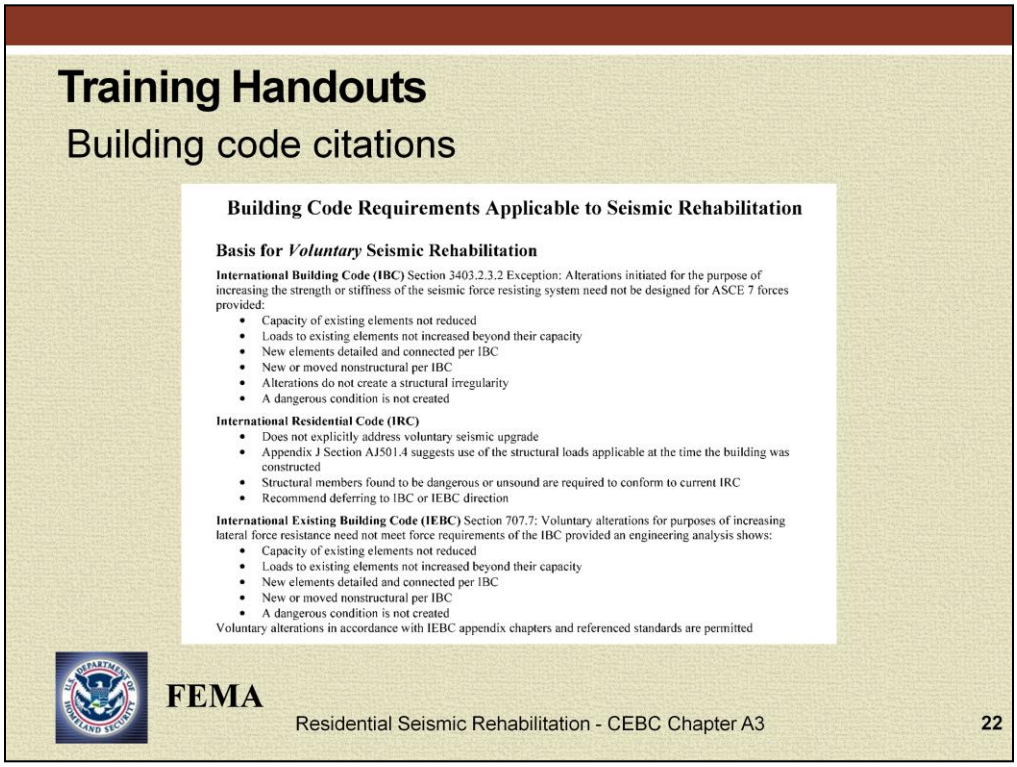
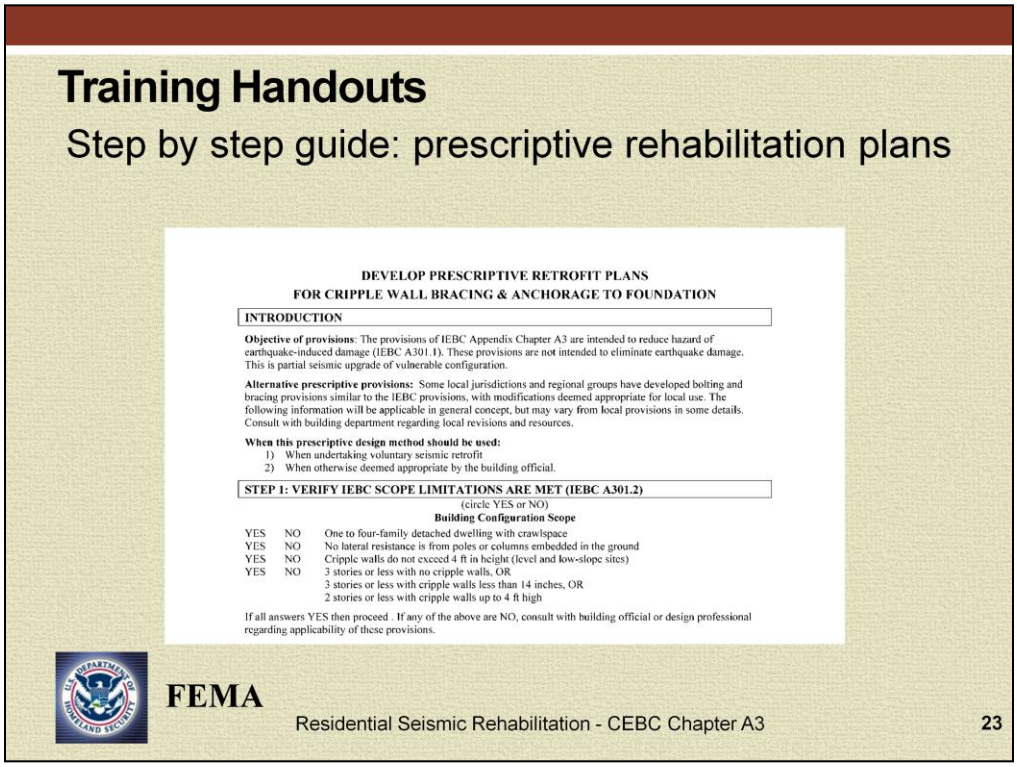
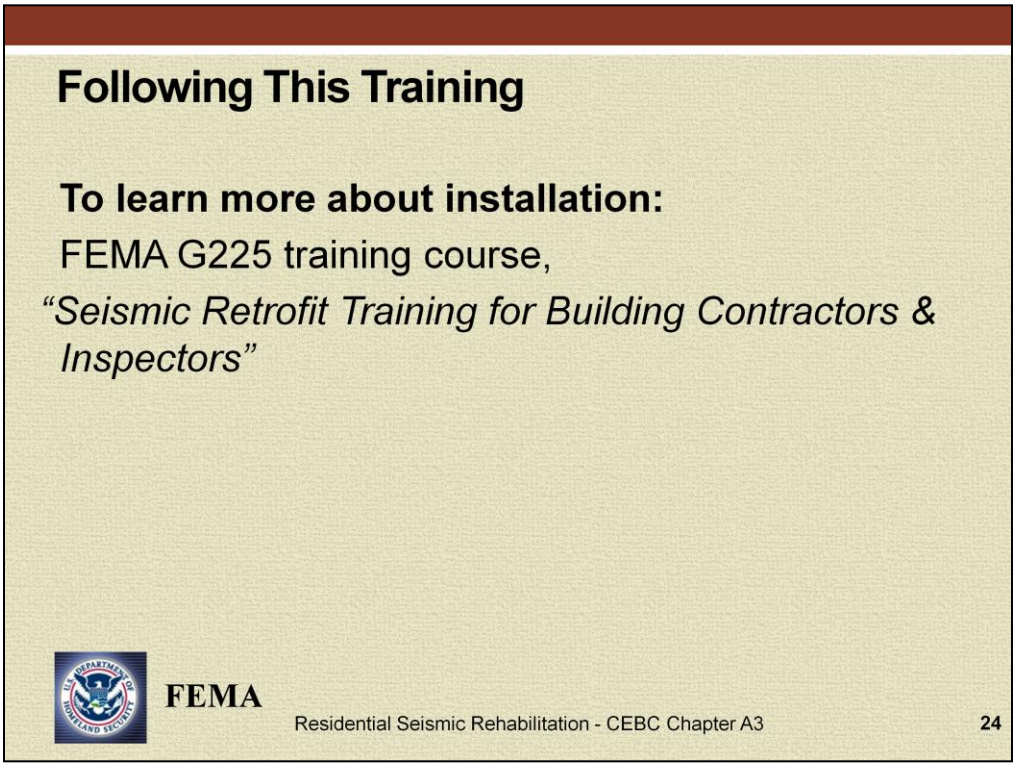
A picture card summarizing seismic vulnerabilities.



A list of applicable building code citations.



A step by step procedure for how to use IEBC prescriptive provisions for anchorage and cripple wall bracing.

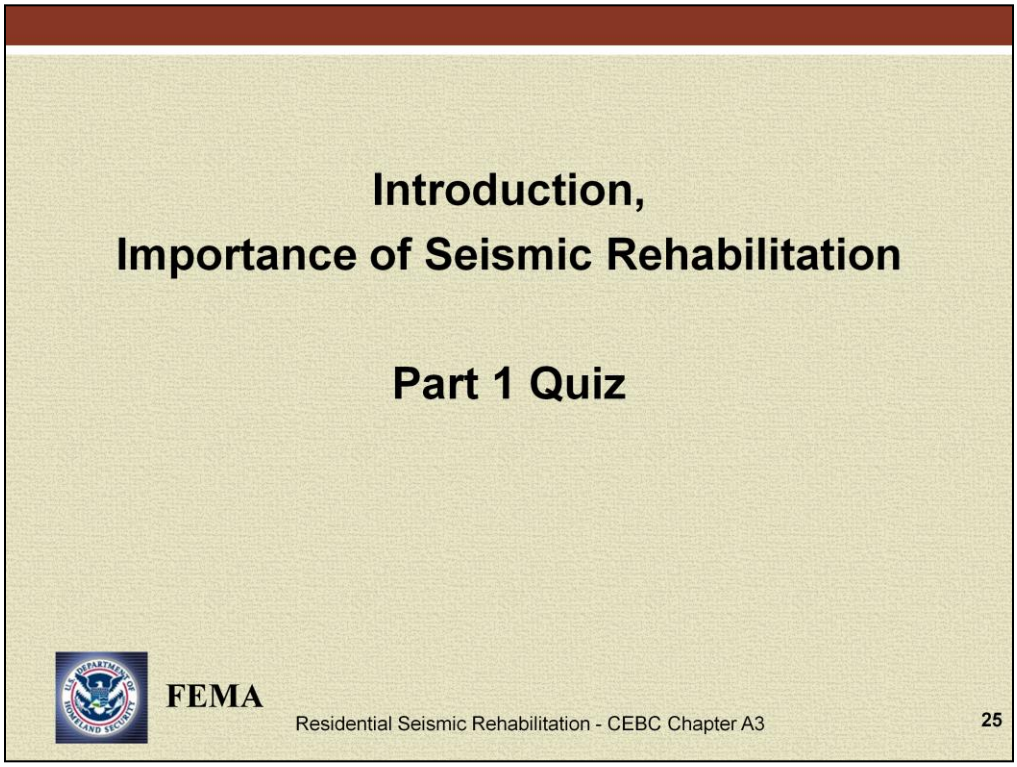


Anyone who is interested in the nuts and bolts of seismic rehabilitation installation may also want to take the FEMA G225 training course, "Seismic Retrofit Training For Building Contractors & Inspectors."

That course addresses installation details of:

- Shear wall construction (sheathing, nails, etc.)
- Shear wall connections (anchor bolts, etc.)
- Post & pier foundation rehabilitation

Portions of the FEMA G225 training are incorporated into Part 6 of this training.



You have completed part 1 of the education module.
Contractor's please return to the contractor dashboard to take a short quiz.