

# Resilient Design Coalition Introductory Webinar (+ Functional Recovery Building Code Development Background)

**Dr. Curt B. Haselton, PhD, PE**

*Co-Founder and CEO @ Haselton Baker Risk Group (SP3)*

*Professor @ California State University, Chico*

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*Resilient Design Coalition Introductory Webinar*

*February 18, 2025*

- All phone lines are muted to start (can open line and video at end for questions)
- Questions are highly encourage
- Handouts will be available – presentation slides
- Webinar will be recorded and video will be distributed



## ■ Questions:

- Zoom allows verbal questions at the end (so we can actually interact more), so please feel free to use that feature.
- You can type in questions as we go and we can discuss them at the end of the webinar.
- For further questions, or for feedback on forward development, please contact Allison at the SP3 office and she can connect you with the right person ([allison@hbrisk.com](mailto:allison@hbrisk.com)).



- 1) Overview of the Resilient Design Movement over past ~25 yrs.  
**[Curt Haselton]**
- 2) Background on development of new Functional Recovery building code requirements over the past ~3 years (Building Seismic Safety Council Functional Recovery Task Committee)  
**[Reid Zimmerman]**
- 3) Introduction to the Resilient Design Coalition  
(which builds on the foundation laid by the BSSC FRTC)  
**[Curt Haselton]**
- 4) Dedicated Time for Q&A (~15-20+ minutes)

# The Resilient Design Movement

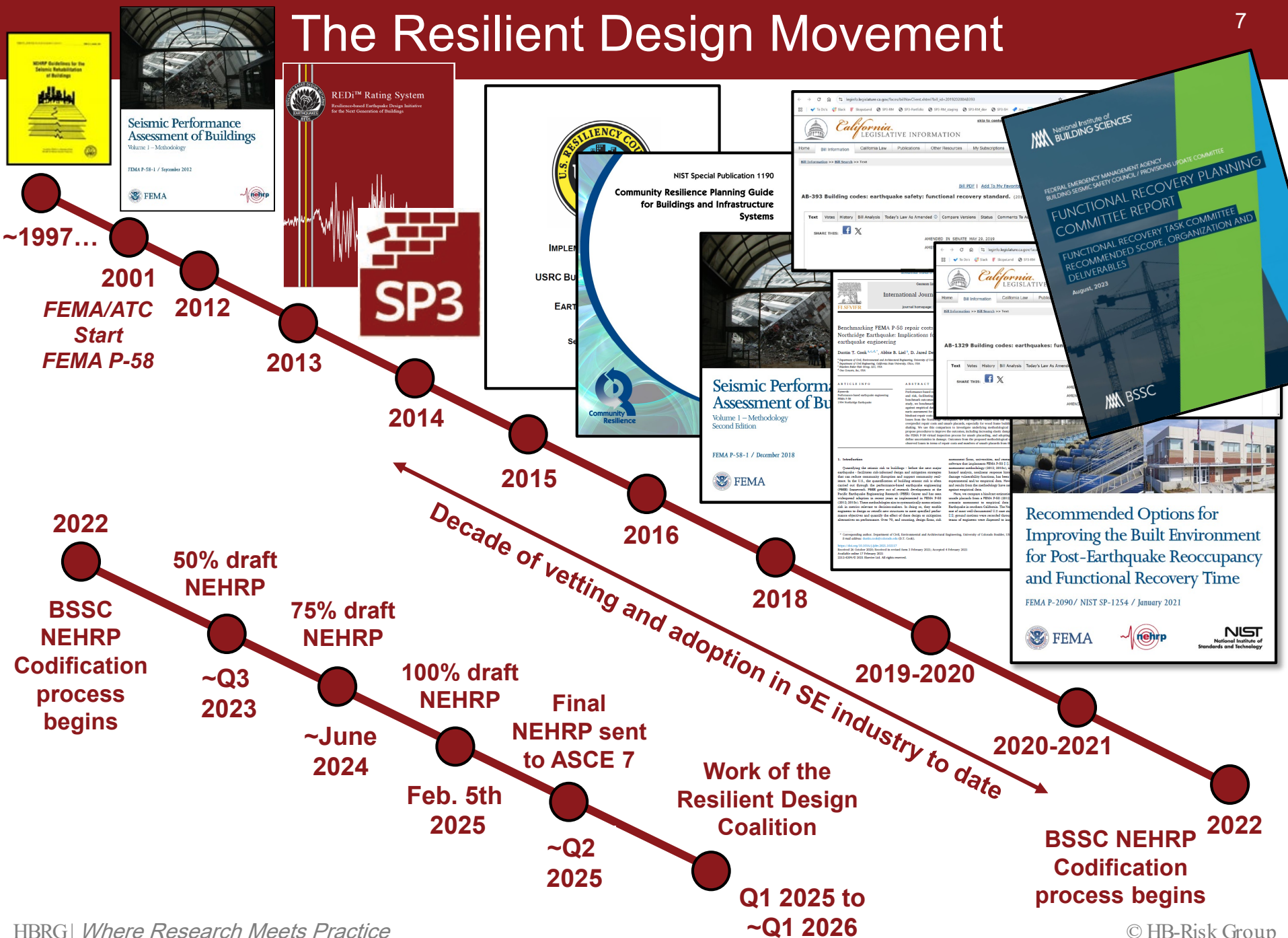


# The Resilient Design Movement

- Over the past decade, FEMA P-58 resilient design and risk assessment methods have been broadly adopted by the majority of seismic-focused structural engineering companies.



# The Resilient Design Movement



## Bottom-Up Push for Resilient Design:

- Visionary structural engineers are leading by doing this electively on projects (provide value to clients, differentiate themselves in marketplace).
- Typical design goals of resilient design projects:
  - ✓ **Time:** Reduce time for building to regain function (business disruption); aiming for function in “days to weeks”.
  - ✓ **Cost:** Reduce damage and needed repair costs; aiming for  $\sim < 5\%$  repair cost.
- These elective/visionary projects have been a critical component of the Resilient Design Movement, showing us that:
  - ✓ Resilient design is feasible in SE practice (at the rapid pace of a design office).
  - ✓ Resilient design is cost effective,  $\sim 0\text{-}2\%$  cost (Gen1, excluding more QA/QC).
- The learning from these projects has also informed the BSSC functional recovery building code efforts (showing how prescriptive requirements can be created).

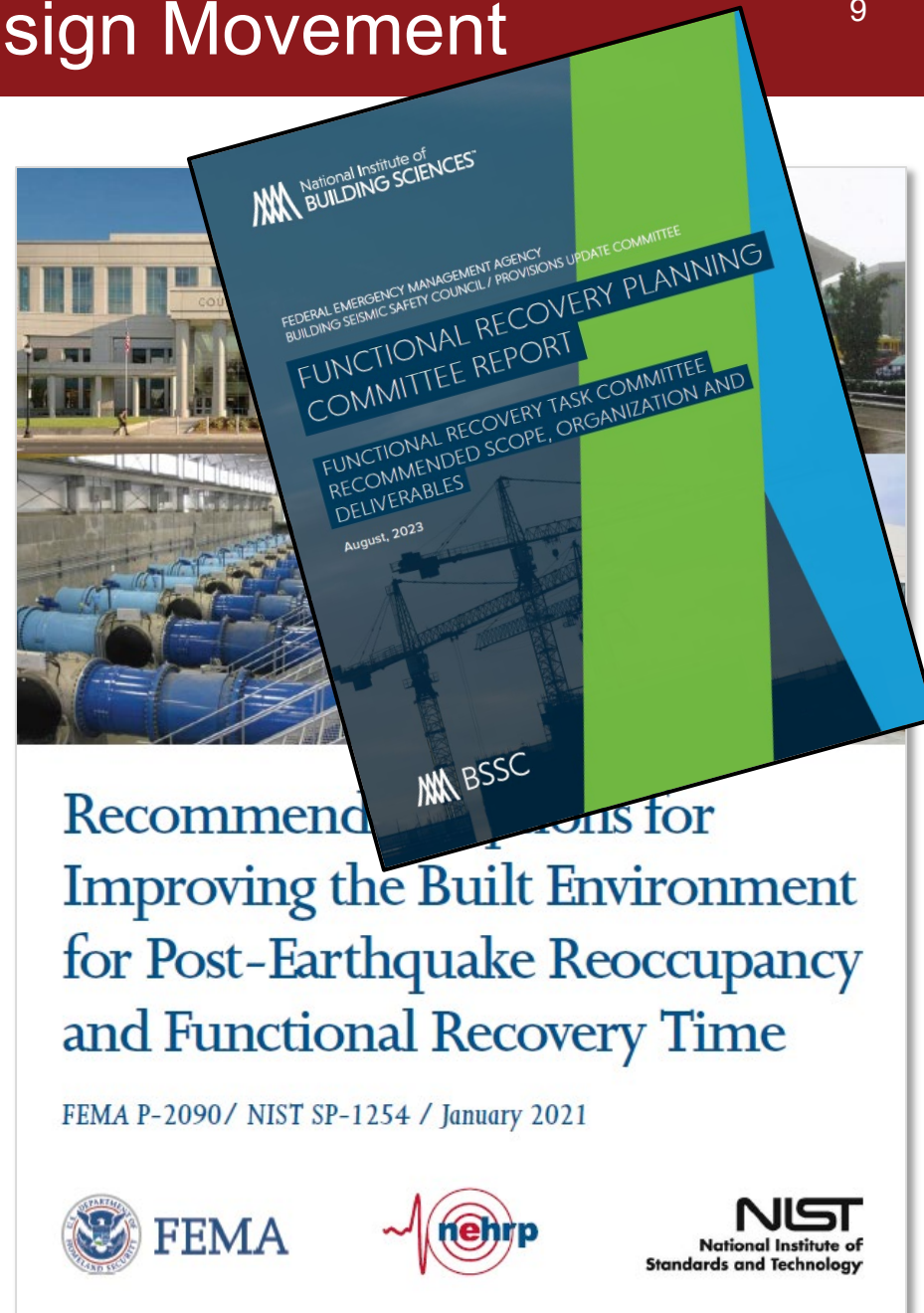
# The Resilient Design Movement

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## Top-Down Push for Resilient Design:

- **Federal:** NEHRP Reauthorization with mandate to look at building function, NIST Immediate Occupancy report, NIST/FEMA Functional Recovery report.

*“**Functional recovery** is a post-earthquake performance state in which a building or lifeline infrastructure system is maintained, or restored, to safely and adequately support the **basic intended functions** associated with the pre-earthquake use or occupancy of a building...”*



- 2) Background on the development of new Functional Recovery building code requirements over the past ~3 years (Building Seismic Safety Council Functional Recovery Task Committee)  
**[Reid Zimmerman]**





# Functional Recovery Requirements for the NEHRP Provisions and ASCE 7

Resilient Design Coalition – Introduction, Overview and Q&A  
February 18, 2025

Reid Zimmerman  
Technical Director | KPFF Consulting Engineers  
[reid.zimmerman@kpff.com](mailto:reid.zimmerman@kpff.com)



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Building Seismic  
Safety Council

# Functional Recovery Task Committee(s)



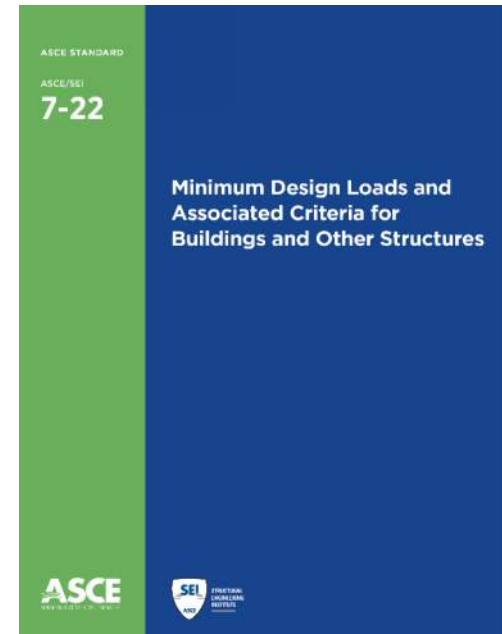
*Functional Recovery Task Committee*

*Functional Recovery Task Committee*



## NEHRP Recommended Seismic Provisions for New Buildings and Other Structures

Volume I: Part 1 Provisions, Part 2 Commentary  
FEMA P-2082-1 / September 2020



# Outline of Appendix

**Section A.1 General**

**Section A.2 Definitions**

**Section A.3 Symbols**

**Section A.4 Basic Intended Function**

Section A.5 Functional Recovery Category

Section A.6 Seismic Ground Motion Values

**Section A.7 Geologic Hazards**

Section A.8 Analysis and Design of Structural Systems for Buildings

Section A.9 Analysis and Design of Structural Systems for Non-Building Structures

Section A.10 Analysis and Design Criteria of Nonstructural Systems

Section A.11 Seismic Certification Requirements for Components and Equipment

Section A.12 Documentation and Review

Section A.13 Observation

Section A.14 Quality Assurance

Section A.15 Post-Earthquake Functional Recovery Plan

Section A.16 Emergency Systems

**Section A.17 Explicit Functional Recovery Assessment Procedures**

**Section A.18 Consensus Standards**

|  |                     |
|--|---------------------|
|  | Categories          |
|  | Ground Motions      |
|  | Structural          |
|  | Nonstructural       |
|  | Associated Criteria |



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# Functional Recovery Definitions

Section A.1 General

**Section A.2 Definitions**

Section A.3 Symbols

Section A.4 Basic Intended Function

Section A.5 Functional Recovery Category

Section A.6 Seismic Ground Motion Values

Section A.7 Geologic Hazards

Section A.8 ... Structural Systems for Buildings

Section A.9 ... Structural Systems for Non-Building Structures

Section A.10 ... Nonstructural Systems

Section A.11 Seismic Certification Requirements ...

Section A.12 Documentation and Review

Section A.13 Observation

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Section A.18 Consensus Standards



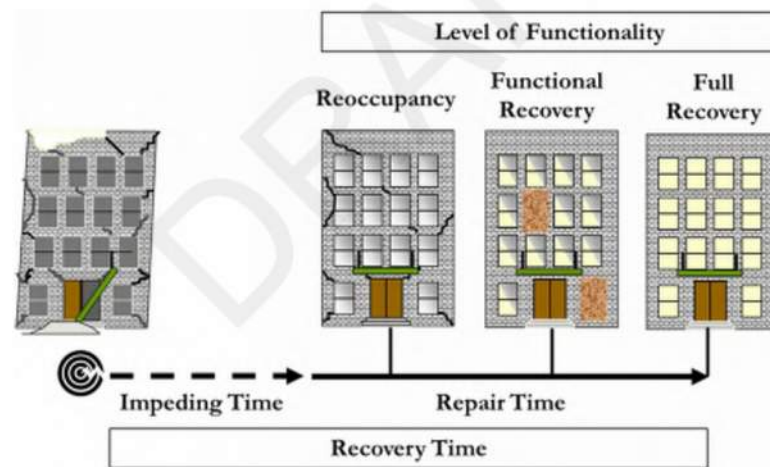
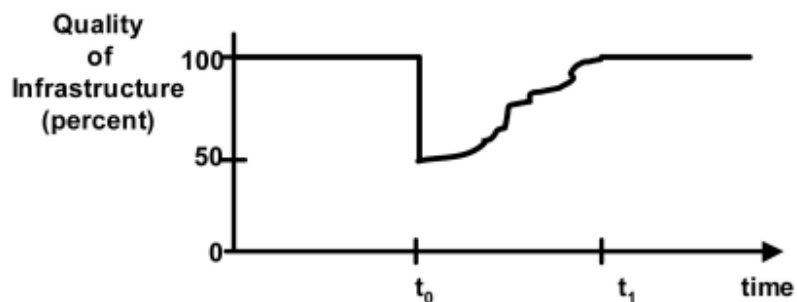
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## Functional Recovery Definitions

**FUNCTIONAL RECOVERY:** The post-earthquake *recovery state* in which a *structure* is maintained, or restored, to safely and adequately support the *basic intended function* associated with its pre-earthquake use or occupancy.

**BASIC INTENDED FUNCTION:** A designated subset of the activity or range of activities for which the *structure* is intended, as indicated by its occupancy classification(s) and use designation(s).



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Bottom left figure from Bruneau et al. (2003)

# Functional Recovery Categories

Section A.1 General

Section A.2 Definitions

Section A.3 Symbols

Section A.4 Basic Intended Function

| Use or Occupancy of Buildings and Structures                                                                                                                                                                                                                                                                                                                                                                                                                                             | Risk Category |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|
| Buildings and other structures that represent low risk to human life in the event of failure                                                                                                                                                                                                                                                                                                                                                                                             | I             |
| All buildings and other structures except those listed in Risk Categories I, III, and IV                                                                                                                                                                                                                                                                                                                                                                                                 | II            |
| Buildings and other structures, the failure of which could pose a substantial risk to human life                                                                                                                                                                                                                                                                                                                                                                                         | III           |
| Buildings and other structures not included in Risk Category IV, with potential to cause a substantial economic impact and/or mass disruption of day-to-day civilian life in the event of failure                                                                                                                                                                                                                                                                                        |               |
| Buildings and other structures not included in Risk Category IV (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, hazardous waste, or explosives) containing toxic or explosive substances where the quantity of the material exceeds a threshold quantity established by the Authority Having Jurisdiction and is sufficient to pose a threat to the public if released* |               |
| Buildings and other structures designated as Essential Facilities                                                                                                                                                                                                                                                                                                                                                                                                                        | IV            |
| Buildings and other structures, the failure of which could pose a substantial hazard to the community                                                                                                                                                                                                                                                                                                                                                                                    |               |
| Buildings and other structures (including, but not limited to, facilities that manufacture, process, handle, store, use, or dispose of such substances as hazardous fuels, hazardous chemicals, or hazardous waste) containing sufficient quantities of highly toxic substances where the quantity of the material exceeds a threshold quantity established by the Authority Having Jurisdiction and is sufficient to pose a threat to the public if released*                           |               |
| Buildings and other structures required to maintain the functionality of other Risk Category IV structures                                                                                                                                                                                                                                                                                                                                                                               |               |

Section A.13 Observation

Section A.14 Quality Assurance

Section A.15 Post-Earthquake Functional Recovery Plan

Section A.16 Emergency Systems

Section A.17 Explicit Functional Recovery Assessment Procedures

Section A.18 Consensus Standards

**Table A.5-1 Functional Recovery Category for Structures for Earthquake Loads**

| Functional Recovery Category | Contribution of Structure to Community Resilience                                                                                                                                              |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A                            | Structures with a basic intended function that the community relies on for immediate post-earthquake safety and survival.                                                                      |
| B                            | Structures with a basic intended function that supports urgent and basic human survival needs and prevents the escalation of adverse disaster consequences.                                    |
| C                            | Structures with a basic intended function that supports routine self- and group-preservation, and sustains short- and long-term economic, educational, and governance activities and services. |
| D                            | Structures with a basic intended function that enhances a community's general well-being and expedites the return to normalcy.                                                                 |
| E                            | Structures not assigned to FRC A, B, C, or D.                                                                                                                                                  |



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# Functional Recovery Categories

Section A.1 General

Section A.2 Definitions

Section A.3 Symbols

Section A.4 Basic Intended Function

Section A.5 Functional Recovery Categories

| Risk Category | Conditional Probability of Failure Caused<br>by the $MCE_R$ Shaking Hazard (%) |
|---------------|--------------------------------------------------------------------------------|
| I and II      | 10                                                                             |
| III           | 5                                                                              |
| IV            | 2.5                                                                            |

Section A.12 Documentation and Review

Section A.13 Observation

Section A.14 Quality Assurance

Section A.15 Post-Earthquake Functional Recovery Plan

Section A.16 Emergency Systems

Section A.17 Explicit Functional Recovery Assessment Procedures

Section A.18 Consensus Standards

| Functional<br>Recovery Category | Target Functional Recovery Time |                     |
|---------------------------------|---------------------------------|---------------------|
|                                 | General Expectation             | Acceptance Criteria |
| A                               | Immediate                       | 0 hours             |
| B                               | Within a few days               | 72 hours            |
| C                               | Within a couple of months       | 2 months            |
| D                               | Within half a year              | 6 months            |

with 25% conditional probability of exceedance



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# Functional Recovery Earthquake

Section A.1 General

Section A.2 Definitions

Section A.3 Symbols

Section A.4 Basic Intended Function

Section A.5 Functional Recovery Category

**Section A.6 Seismic Ground Motion Values**

Section A.7 Geologic Hazards

Section A.8 ... Structural Systems for Buildings

Section A.9 ... Structural Systems for Non-Building Structures

Section A.10 ... Nonstructural Systems

Section A.11 Seismic Certification Requirements ...

Section A.12 Documentation and Review

Section A.13 Observation

Section A.14 Quality Assurance

Section A.15 Post-Earthquake Functional Recovery Plan

Section A.16 Emergency Systems

Section A.17 Explicit Functional Recovery Assessment Procedure

Section A.18 Consensus Standards

## FRE<sub>R</sub> versus DE Comparison

34 sites; default site conditions

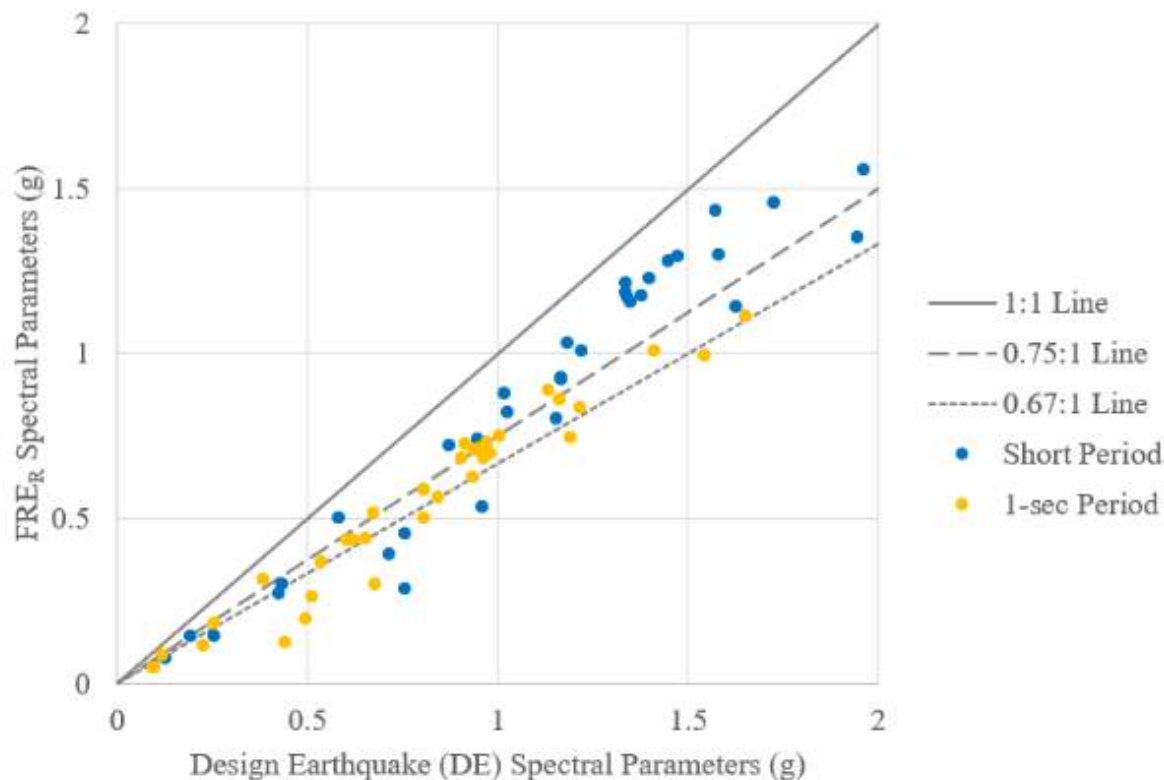


Table courtesy of Dustin Cook



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# Explicit versus Prescriptive Path

- Section A.1 General
- Section A.2 Definitions
- Section A.3 Symbols
- Section A.4 Basic Intended Function
- Section A.5 Functional Recovery Category
- Section A.6 Seismic Ground Motion Values
- Section A.7 Geologic Hazards
- Section A.8 ... Structural Systems for Buildings
- Section A.9 ... Structural Systems for Non-Building Structures
- Section A.10 ... Nonstructural Systems
- Section A.11 Seismic Certification Requirements ...
- Section A.12 Documentation and Review
- Section A.13 Observation
- Section A.14 Quality Assurance
- Section A.15 Post-Earthquake Functional Recovery Plan
- Section A.16 Emergency Systems
- Section A.17 Explicit Functional Recovery Assessment Procedures
- Section A.18 Consensus Standards

Table 24.1-1. Applicability Requirements

| Description                                                                                                                             | Section |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                                                                                                                         | 24.1    | 24.2 | 24.3 | 24.4 | 24.5 | 24.6 | 24.7 | 24.8 | 24.9 | 24.10 | 24.11 | 24.12 | 24.13 | 24.14 | 24.15 | 24.16 | 24.17 | 24.18 |
| <b>Buildings</b>                                                                                                                        |         |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |
| <u>Buildings assigned to Functional Recovery Category A meeting the limitations of Section 24.1.5.1</u>                                 | X       | X    | X    | X    | X    | X    | X    | X    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Buildings assigned to Functional Recovery Category B</u>                                                                             | X       | X    | X    | X    | X    | X    | X    | X    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Buildings assigned to Functional Recovery Category C or D</u>                                                                        | X       | X    | X    | X    | X    | X    | X    | X    | -    | X     | X     | X     | X     | X     | -     | -     | -     | X     |
| <u>Seismically isolated buildings assigned to Functional Recovery Category A or B</u>                                                   | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Seismically isolated buildings assigned to Functional Recovery Category C</u>                                                        | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | -     | -     | -     | X     |
| <u>Any building</u>                                                                                                                     | X       | X    | X    | X    | X    | X    | X    | -    | -    | -     | X     | X     | X     | X     | X     | X     | X     | X     |
| <b>Nonbuilding Structures</b>                                                                                                           |         |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |
| <u>Nonbuilding structures assigned to Functional Recovery Category B designated as Risk Category IV</u>                                 | X       | X    | X    | X    | X    | X    | X    | -    | X    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Nonbuilding structures assigned to Functional Recovery Category B designated as other than Risk Category IV</u>                      | X       | X    | X    | X    | X    | X    | X    | -    | X    | X     | X     | X     | X     | X     | X     | -     | -     | X     |
| <u>Seismically isolated nonbuilding structures assigned to Functional Recovery Category B designated as Risk Category IV</u>            | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Seismically isolated nonbuilding structures assigned to Functional Recovery Category B designated as other than Risk Category IV</u> | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | X     | -     | -     | X     |

X indicates section is required; - indicates section is not required



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# Explicit Assessment Procedure

Section A.1 General

Section A.2 Definitions

Section A.3 Symbols

Section A.4 Basic Intended Function

Section A.5 Functional Recovery Category

Section A.6 Seismic Ground Motion Values

Section A.7 Geologic Hazards

Section A.8 ... Structural Systems for Buildings

Section A.9 ... Structural Systems for Non-Building Structures

Section A.10 ... Nonstructural Systems

Section A.11 Seismic Certification Requirements ...

Section A.12 Documentation and Review

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Section A.14 Quality Assurance

Section A.15 Post-Earthquake Functional Recovery Plan

Section A.16 Emergency Systems

**Section A.17 Explicit Functional Recovery Assessment Procedures**

Section A.18 Consensus Standards

Table 24.1-1. Applicability Requirements

| Description                                                                                                                      | Section |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |
|----------------------------------------------------------------------------------------------------------------------------------|---------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                                                                                                                  | 24.1    | 24.2 | 24.3 | 24.4 | 24.5 | 24.6 | 24.7 | 24.8 | 24.9 | 24.10 | 24.11 | 24.12 | 24.13 | 24.14 | 24.15 | 24.16 | 24.17 | 24.18 |
| <b>Buildings</b>                                                                                                                 |         |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |
| Buildings assigned to Functional Recovery Category A meeting the limitations of Section 24.1.5.1                                 | X       | X    | X    | X    | X    | X    | X    | X    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| Buildings assigned to Functional Recovery Category B                                                                             | X       | X    | X    | X    | X    | X    | X    | X    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| Buildings assigned to Functional Recovery Category C or D                                                                        | X       | X    | X    | X    | X    | X    | X    | X    | -    | X     | X     | X     | X     | X     | -     | -     | -     | X     |
| Seismically isolated buildings assigned to Functional Recovery Category A or B                                                   | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| Seismically isolated buildings assigned to Functional Recovery Category C                                                        | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | -     | -     | -     | X     |
| Any building                                                                                                                     | X       | X    | X    | X    | X    | X    | X    | -    | -    | -     | X     | X     | X     | X     | X     | X     | X     | X     |
| <b>Nonbuilding Structures</b>                                                                                                    |         |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |
| Nonbuilding structures assigned to Functional Recovery Category B designated as Risk Category IV                                 | X       | X    | X    | X    | X    | X    | X    | -    | X    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| Nonbuilding structures assigned to Functional Recovery Category B designated as other than Risk Category IV                      | X       | X    | X    | X    | X    | X    | X    | -    | X    | X     | X     | X     | X     | X     | X     | -     | -     | X     |
| Seismically isolated nonbuilding structures assigned to Functional Recovery Category B designated as Risk Category IV            | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| Seismically isolated nonbuilding structures assigned to Functional Recovery Category B designated as other than Risk Category IV | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | X     | -     | -     | X     |

X indicates section is required; - indicates section is not required

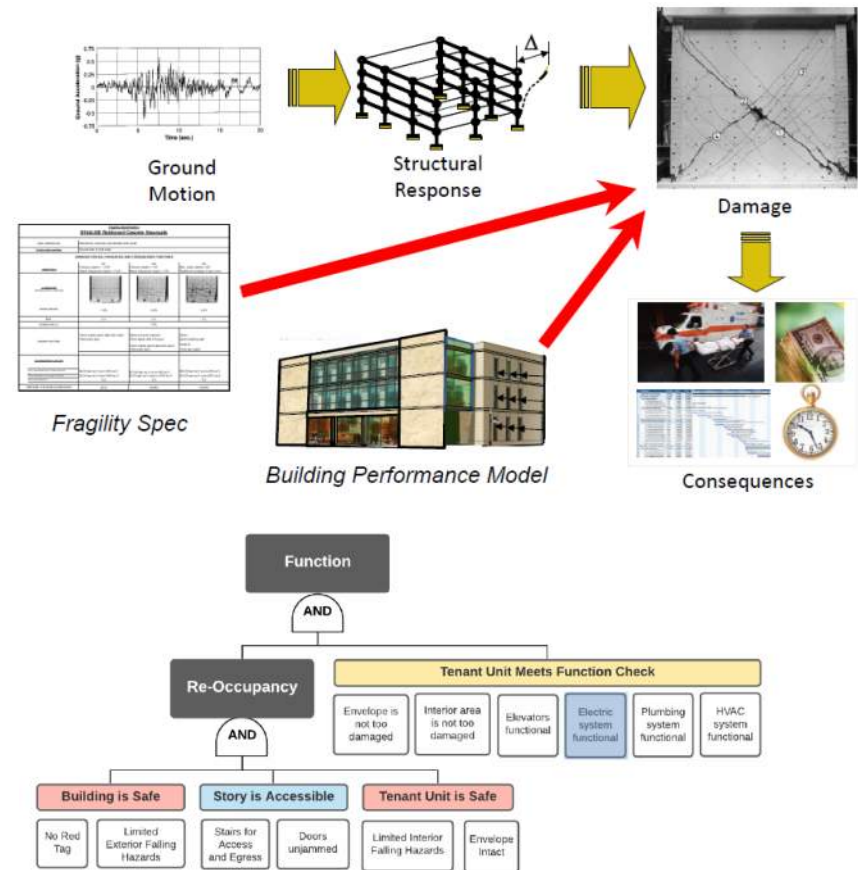


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# Explicit Assessment Procedure

- Section A.1 General
- Section A.2 Definitions
- Section A.3 Symbols
- Section A.4 Basic Intended Function
- Section A.5 Functional Recovery Category
- Section A.6 Seismic Ground Motion Values
- Section A.7 Geologic Hazards
- Section A.8 ... Structural Systems for Buildings
- Section A.9 ... Structural Systems for Non-Building Structures
- Section A.10 ... Nonstructural Systems
- Section A.11 Seismic Certification Requirements ...
- Section A.12 Documentation and Review
- Section A.13 Observation
- Section A.14 Quality Assurance
- Section A.15 Post-Earthquake Functional Recovery Plan
- Section A.16 Emergency Systems
- Section A.17 Explicit Functional Recovery Assessment Procedures**
- Section A.18 Consensus Standards



(courtesy of A. Liel, D. Cook)

Graphics courtesy of Jon Heintz



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# Prescriptive Design Procedure

Section A.1 General

Section A.2 Definitions

Section A.3 Symbols

Section A.4 Basic Intended Function

Section A.5 Functional Recovery Category

Section A.6 Seismic Ground Motion Values

Section A.7 Geologic Hazards

**Section A.8 ... Structural Systems for Buildings**

Section A.9 ... Structural Systems for Non-Building Structures

**Section A.10 ... Nonstructural Systems**

Section A.11 Seismic Certification Requirements ...

Section A.12 Documentation and Review

Section A.13 Observation

Section A.14 Quality Assurance

Section A.15 Post-Earthquake Functional Recovery Plan

Section A.16 Emergency Systems

Section A.17 Explicit Functional Recovery Assessment Procedures

Section A.18 Consensus Standards

Table 24.1-1. Applicability Requirements

| Description                                                                                                                             | Section |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |
|-----------------------------------------------------------------------------------------------------------------------------------------|---------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                                                                                                                         | 24.1    | 24.2 | 24.3 | 24.4 | 24.5 | 24.6 | 24.7 | 24.8 | 24.9 | 24.10 | 24.11 | 24.12 | 24.13 | 24.14 | 24.15 | 24.16 | 24.17 | 24.18 |
| <b>Buildings</b>                                                                                                                        |         |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |
| <u>Buildings assigned to Functional Recovery Category A meeting the limitations of Section 24.1.5.1</u>                                 | X       | X    | X    | X    | X    | X    | X    | X    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Buildings assigned to Functional Recovery Category B</u>                                                                             | X       | X    | X    | X    | X    | X    | X    | X    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Buildings assigned to Functional Recovery Category C or D</u>                                                                        | X       | X    | X    | X    | X    | X    | X    | X    | -    | X     | X     | X     | X     | X     | -     | -     | -     | X     |
| <u>Seismically isolated buildings assigned to Functional Recovery Category A or B</u>                                                   | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Seismically isolated buildings assigned to Functional Recovery Category C</u>                                                        | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | -     | -     | -     | X     |
| <u>Any building</u>                                                                                                                     | X       | X    | X    | X    | X    | X    | X    | -    | -    | -     | X     | X     | X     | X     | X     | X     | X     | X     |
| <b>Nonbuilding Structures</b>                                                                                                           |         |      |      |      |      |      |      |      |      |       |       |       |       |       |       |       |       |       |
| <u>Nonbuilding structures assigned to Functional Recovery Category B designated as Risk Category IV</u>                                 | X       | X    | X    | X    | X    | X    | X    | -    | X    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Nonbuilding structures assigned to Functional Recovery Category B designated as other than Risk Category IV</u>                      | X       | X    | X    | X    | X    | X    | X    | -    | X    | X     | X     | X     | X     | X     | X     | -     | -     | X     |
| <u>Seismically isolated nonbuilding structures assigned to Functional Recovery Category B designated as Risk Category IV</u>            | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | X     | X     | -     | X     |
| <u>Seismically isolated nonbuilding structures assigned to Functional Recovery Category B designated as other than Risk Category IV</u> | X       | X    | X    | X    | X    | X    | X    | -    | -    | X     | X     | X     | X     | X     | X     | -     | -     | X     |

X indicates section is required; - indicates section is not required



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# Analysis and Design for Structural Systems

Section A.1 General

Section A.2 Definitions

Section A.3 Symbols

Section A.4 Basic Intended Function

Section A.5 Functional Recovery Category

Section A.6 Seismic Ground Motion Values

Section A.7 Geologic Hazards

**Section A.8 ... Structural Systems for Buildings**

Section A.9 ... Structural Systems for Non-Building Structures

Section A.10 ... Nonstructural Systems

Section A.11 Seismic Certification Requirements ...

Section A.12 Documentation and Review

Section A.13 Observation

Section A.14 Quality Assurance

Section A.15 Post-Earthquake Functional Recovery Plan

Section A.16 Emergency Systems

Section A.17 Explicit Functional Recovery Assessment Procedures

Section A.18 Consensus Standards

Perform a separate analysis and design to ASCE 7 Chapter 12 except:

| Instead of                                                              | Use                                                             |
|-------------------------------------------------------------------------|-----------------------------------------------------------------|
| Design Earthquake = $\frac{2}{3} \times MCE_R$                          | Functional Recovery Earthquake = $FRE_R$                        |
| Response Modification Coefficient divided by Importance Factor, $R/I_e$ | Functional Recovery Response Modification Coefficient, $R_{fr}$ |
| Allowable Story Drift, $\Delta_a$                                       | Functional Recovery Allowable Story Drift, $\Delta_{afr}$       |

\* and a few other things

$$C_s = \frac{S_a}{\left(\frac{R}{I_e}\right)} \quad R_{fr} \leq R$$

$$\Delta_a = 0.020h_{sx} \quad \Delta_{afr} \leq \Delta_a$$



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# Analysis and Design for Structural Systems

| Seismic Force-Resisting System                                                                                            | ASCE 7 Section Where<br>Detailing Requirements<br>Are Specified | Response<br>Modification<br>Coefficient, R <sup>a</sup> |                                                                                                                           |                      |
|---------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|----------------------|
| <b>A. BEARING WALL SYSTEMS</b>                                                                                            |                                                                 |                                                         |                                                                                                                           |                      |
| 1. Special reinforced concrete shear walls <sup>a,b</sup>                                                                 | 14.2                                                            | 5                                                       |                                                                                                                           |                      |
| 2. Reinforced concrete ductile coupled walls <sup>c</sup>                                                                 | 14.2                                                            | 8                                                       |                                                                                                                           |                      |
| 3. Ordinary reinforced concrete shear walls <sup>d</sup>                                                                  | 14.2                                                            | 4                                                       |                                                                                                                           |                      |
| 4. Detached plain concrete shear walls <sup>d</sup>                                                                       | 14.2                                                            | 2                                                       |                                                                                                                           |                      |
| 5. Ordinary plain concrete shear walls <sup>d</sup>                                                                       | 14.2                                                            | 1½                                                      |                                                                                                                           |                      |
| 6. Intermediate precast shear walls <sup>d</sup>                                                                          | 14.2                                                            | 4                                                       |                                                                                                                           |                      |
| 7. Ordinary precast shear walls <sup>d</sup>                                                                              | 14.2                                                            | 3                                                       |                                                                                                                           |                      |
| 8. Special reinforced masonry shear walls                                                                                 | 14.4                                                            | 5                                                       | 18. Intermediate reinforced masonry shear walls                                                                           | 14.4 4               |
| 9. Intermediate reinforced masonry shear walls                                                                            | 14.4                                                            | 3½                                                      | 19. Ordinary reinforced masonry shear walls                                                                               | 14.4 2               |
| 10. Ordinary reinforced masonry shear walls                                                                               | 14.4                                                            | 2                                                       | 20. Detached plain masonry shear walls                                                                                    | 14.4 2               |
| 11. Detached plain masonry shear walls                                                                                    | 14.4                                                            | 2                                                       | 21. Ordinary plain masonry shear walls                                                                                    | 14.4 1½              |
| 12. Ordinary plain masonry shear walls                                                                                    | 14.4                                                            | 1½                                                      | 22. Precast masonry shear walls                                                                                           | 14.4 1½              |
| 13. Precast masonry shear walls                                                                                           | 14.4                                                            | 1½                                                      | 23. Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance                              | 14.5 7               |
| 14. Ordinary reinforced AAC masonry shear walls                                                                           | 14.4                                                            | 2                                                       | 24. Light-frame (cold-formed) steel walls sheathed with wood structural panels rated for shear resistance or steel sheets | 14.1 7               |
| 15. Ordinary plain AAC masonry shear walls                                                                                | 14.4                                                            | 1½                                                      | 25. Steel framing—special concentrically braced frames                                                                    | 14.1 and 14.5 2½     |
| 16. Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance or steel sheets              | 14.1                                                            | 1½                                                      | 26. Steel framing—ordinary concentrically braced frames                                                                   | 14.1 8               |
| 17. Light-frame (cold-formed) steel walls sheathed with wood structural panels rated for shear resistance or steel sheets | 14.1                                                            | 1½                                                      | 27. Steel special plate shear walls                                                                                       | 14.1 7               |
| 18. Light-frame walls with shear panels of all other materials                                                            | 14.1 and 14.5                                                   | 2                                                       | 28. Steel and concrete coupled composite frame shear walls                                                                | 14.3 8               |
| 19. Light-frame (cold-formed) steel walls with shear panels of all other materials                                        | 14.1 and 14.5                                                   | 2                                                       | 29. Steel and concrete coupled composite frame shear walls                                                                | 14.1 and 12.2.5.5 8  |
| 20. Cross-laminated timber shear walls                                                                                    | 14.1                                                            | 4                                                       | 30. Steel special plate shear walls                                                                                       | 14.1 7               |
| 21. Cross-laminated timber shear walls with shear resistance provided by high-aspect-ratio panels only                    | 14.1                                                            | 4                                                       | 31. Steel and concrete composite special moment frames <sup>a</sup>                                                       | 12.2.5.7 and 14.1 4½ |
| <b>B. BUILDING FRAME SYSTEMS</b>                                                                                          |                                                                 |                                                         |                                                                                                                           |                      |
| 1. Steel eccentrically braced frames                                                                                      | 14.1                                                            | 7                                                       | 2. Steel special concentrically braced frames                                                                             | 14.1 7               |
| 2. Steel special concentrically braced frames                                                                             | 14.1                                                            | 7                                                       | 3. Steel ordinary concentrically braced frames                                                                            | 12.2.5.6 and 14.1 3½ |
| 3. Steel ordinary concentrically braced frames                                                                            | 14.1                                                            | 7                                                       | 4. Steel intermediate moment frames                                                                                       | 12.2.5.7 and 14.1 4½ |
| 4. Special reinforced concrete shear walls <sup>a,b</sup>                                                                 | 14.2                                                            | 6                                                       | 5. Steel ordinary moment frames                                                                                           | 12.2.5.6 and 14.1 3½ |
| 5. Reinforced concrete ductile coupled walls <sup>c</sup>                                                                 | 14.2                                                            | 8                                                       | 6. Ordinary reinforced concrete moment frames                                                                             | 14.2 3               |
| 6. Ordinary reinforced concrete shear walls <sup>d</sup>                                                                  | 14.2                                                            | 5                                                       | 7. Steel and concrete composite special moment frames                                                                     | 12.2.5.5 and 14.3 8  |
| 7. Detached plain concrete shear walls <sup>d</sup>                                                                       | 14.2 and 14.2.2.7                                               | 2                                                       | 8. Steel and concrete composite intermediate moment frames                                                                | 14.3 5               |
| 8. Ordinary plain concrete shear walls <sup>d</sup>                                                                       | 14.2                                                            | 1½                                                      | 9. Steel and concrete composite partially restrained moment frames                                                        | 14.3 6               |
| 9. Intermediate precast shear walls <sup>d</sup>                                                                          | 14.2                                                            | 5                                                       | 10. Steel and concrete composite ordinary moment frames                                                                   | 14.3 3               |
| 10. Ordinary precast shear walls <sup>d</sup>                                                                             | 14.2                                                            | 4                                                       | 11. Cold-formed steel—special bolted moment frames <sup>a</sup>                                                           | 14.1 3½              |
| 11. Steel and concrete composite eccentrically braced frames                                                              | 14.3                                                            | 8                                                       |                                                                                                                           |                      |
| 12. Steel and concrete composite special concentrically braced frames                                                     | 14.3                                                            | 5                                                       |                                                                                                                           |                      |
| 13. Steel and concrete composite ordinary braced frames                                                                   | 14.3                                                            | 3                                                       |                                                                                                                           |                      |
| 14. Steel and concrete composite plate shear walls                                                                        | 14.3                                                            | 6½                                                      |                                                                                                                           |                      |
| 15. Steel and concrete composite special shear walls                                                                      | 14.3                                                            | 6                                                       |                                                                                                                           |                      |
| 16. Steel and concrete composite ordinary shear walls                                                                     | 14.3                                                            | 5                                                       |                                                                                                                           |                      |
| 17. Special reinforced masonry shear walls                                                                                | 14.4                                                            | 3½                                                      |                                                                                                                           |                      |

Not possible to map all ~90 seismic systems in Chapter 12 for functional recovery.



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## Analysis and Design for Structural Systems

| Seismic Force-Resisting System                                                           | R <sub>e</sub> and Δ <sub>as</sub> by Functional Recovery Category |                              |
|------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------|
|                                                                                          | A, B and C                                                         | D                            |
| <b>BEARING WALL SYSTEMS</b>                                                              |                                                                    |                              |
| Special reinforced concrete shear walls                                                  | 3.5<br>0.01h <sub>st</sub>                                         | 4<br>0.0125h <sub>st</sub>   |
| Reinforced concrete ductile coupled walls                                                | 4<br>0.01h <sub>st</sub>                                           | 5<br>0.0125h <sub>st</sub>   |
| Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance | 3<br>0.01h <sub>st</sub>                                           | 3.5<br>0.0125h <sub>st</sub> |
| <b>MOMENT-RESISTING FRAME SYSTEMS</b>                                                    |                                                                    |                              |
| Steel special moment frames                                                              | 5.5<br>0.01h <sub>st</sub>                                         | 6.5<br>0.015h <sub>st</sub>  |
| Special reinforced concrete moment frames                                                | 4<br>0.0075h <sub>st</sub>                                         | 5<br>0.0075h <sub>st</sub>   |

| Seismic Force-Resisting System                                                           | R <sub>e</sub> and Δ <sub>as</sub> by Functional Recovery Category |                              |
|------------------------------------------------------------------------------------------|--------------------------------------------------------------------|------------------------------|
|                                                                                          | A, B and C                                                         | D                            |
| <b>BUILDING FRAME SYSTEMS</b>                                                            |                                                                    |                              |
| Special reinforced concrete shear walls                                                  | 4<br>0.01h <sub>st</sub>                                           | 5<br>0.0125h <sub>st</sub>   |
| Reinforced concrete ductile coupled walls                                                | 4<br>0.01h <sub>st</sub>                                           | 5<br>0.0125h <sub>st</sub>   |
| Light-frame (wood) walls sheathed with wood structural panels rated for shear resistance | 3<br>0.01h <sub>st</sub>                                           | 3.5<br>0.0125h <sub>st</sub> |
| Steel buckling-restrained braced frames, non-moment-resisting beam-column connections    | 5<br>0.01h <sub>st</sub>                                           | 5<br>0.01h <sub>st</sub>     |
| Steel buckling-restrained braced frames, moment-resisting beam-column connections        | 5.5<br>0.01h <sub>st</sub>                                         | 6.5<br>0.0125h <sub>st</sub> |

**Primary Goal of the Resilient Design Coalition:**  
**Quantify R<sub>fr</sub> and Δ<sub>af</sub> for as many additional building structural systems as possible.**



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# Analysis and Design for Nonstructural Systems

Perform a separate analysis and design to ASCE 7 Chapter 13 except:

| Functional Recovery Category | Seismic Functional Recovery Component Importance Factor, $I_{pfr}$ |
|------------------------------|--------------------------------------------------------------------|
| A and B                      | 1.75                                                               |
| C                            | 1.5                                                                |
| D                            | 1.25                                                               |

| Instead of                                 | Use                                                                |
|--------------------------------------------|--------------------------------------------------------------------|
| Design Earthquake = $2/3 \times MCE_R$     | Functional Recovery Earthquake = $FRE_R$                           |
| Seismic Component Importance Factor, $I_p$ | Functional Recovery Seismic Component Importance Factor, $I_{pfr}$ |

\* and a few other things

$$F_p = 0.4 S_{DS} \overset{I_{pfr}}{\cancel{I_p}} W_p \left[ \frac{H_f}{R_\mu} \right] \left[ \frac{C_{AR}}{R_{po}} \right]$$

$$D_{pl} = D_p \overset{I_{pfr}}{\cancel{I_e}}$$



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# Seismic Certification

Section A.1 General

Section A.2 Definitions

Section A.3 Symbols

Section A.4 Basic Intended Function

Section A.5 Functional Recovery Category

Section A.6 Seismic Ground Motion Values

Section A.7 Geologic Hazards

Section A.8 ... Structural Systems for Buildings

Section A.9 ... Structural Systems for Non-Building Structures

Section A.10 ... Nonstructural Systems

**Section A.11 Seismic Certification Requirements ...**

Section A.12 Documentation and Review

Section A.13 Observation

Section A.14 Quality Assurance

Section A.15 Post-Earthquake Functional Recovery Plan

Section A.16 Emergency Systems

Section A.17 Explicit Functional Recovery Assessment Procedures

Section A.18 Consensus Standards

**A.11.2 Seismic Certification Methods** Components and equipment shall be seismically certified by one of the following methods, except that active parts or energized components shall be certified exclusively on the basis of shake-table testing:

1. Shake-table testing in accordance with Section 13.2.6. Where shake-table testing is used to seismically certify equipment, the connection of equipment to the structure shall be similar to the connection used in the shake-table test.
2. Experience data in accordance with Section 13.2.7
3. For nonactive components only, analysis for the forces determined in accordance with Section 13.3 as modified by Section A.10. The values of  $C_{AR}$  and  $R_{po}$  shall be taken for the equipment of which the component is part.

| Equipment or Component                                    | Table A.11-1. Seismic Certification Floor Acceleration Threshold                       |      |
|-----------------------------------------------------------|----------------------------------------------------------------------------------------|------|
|                                                           | Seismic Certification Floor Acceleration Threshold (g) by Functional Recovery Category |      |
|                                                           | C                                                                                      | D    |
| <b>MECHANICAL</b>                                         |                                                                                        |      |
| Chillers, including associated evaporators and condensers | 0.35                                                                                   | 0.4  |
| Cooling Towers                                            | 0.6                                                                                    | 0.65 |
| Compressors                                               | 0.55                                                                                   | 0.65 |
| HVAC Fans                                                 | 0.9                                                                                    | 1.0  |

|                                         |      |      |
|-----------------------------------------|------|------|
| Variable/Constant                       | 0.75 | 0.85 |
| Air Volume Boxes                        |      |      |
| Air Handling Units                      | 0.45 | 0.55 |
| Control Panels                          | 1.1  | 1.3  |
| Other Mechanical Equipment              | 0.35 | 0.4  |
| <b>ELECTRICAL</b>                       |      |      |
| Transformers                            | 1.0  | 1.2  |
| Motor Control Centers                   | 1.0  | 1.1  |
| Low Voltage Switchgear and Switchboards | 0.95 | 1.05 |
| Distribution Panels                     | 1.2  | 1.3  |
| Battery Racks                           | 1.1  | 1.2  |
| Battery Chargers                        | 0.8  | 0.95 |
| Generators                              | 0.95 | 1.05 |
| Other Electrical Equipment              | 0.8  | 0.95 |
| <b>INTERIOR</b>                         |      |      |
| Independent Pendant Lighting            | 0.6  | 0.65 |



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## Associated Criteria

Section A.1 General

Section A.2 Definitions

Section A.3 Symbols

Section A.4 Basic Intended Function

Section A.5 Functional Recovery Category

Section A.6 Seismic Ground Motion Values

Section A.7 Geologic Hazards

Section A.8 ... Structural Systems for Buildings

Section A.9 ... Structural Systems for Non-Building Structures

Section A.10 ... Nonstructural Systems

Section A.11 Seismic Certification Requirements ...

**Section A.12 Documentation and Review**

**Section A.13 Observation**

**Section A.14 Quality Assurance**

**Section A.15 Post-Earthquake Functional Recovery Plan (Functional Recovery Category A and B only)**

**Section A.16 Emergency Systems (Functional Recovery Category A only)**

Section A.17 Explicit Functional Recovery Assessment Procedures

Section A.18 Consensus Standards



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# Summary

Section A.1 General

Section A.2 Definitions

Section A.3 Symbols

Section A.4 Basic Intended Function

Section A.5 Functional Recovery Category

Section A.6 Seismic Ground Motion Values

Section A.7 Geologic Hazards

Section A.8 Analysis and Design of Structural Systems for Buildings

Section A.9 Analysis and Design of Structural Systems for Non-Building Structures

Section A.10 Analysis and Design Criteria of Nonstructural Systems

Section A.11 Seismic Certification Requirements for Components and Equipment

Section A.12 Documentation and Review

Section A.13 Observation

Section A.14 Quality Assurance

Section A.15 Post-Earthquake Functional Recovery Plan

Section A.16 Emergency Systems

Section A.17 Explicit Functional Recovery Assessment Procedures

Section A.18 Consensus Standards

|  |                     |
|--|---------------------|
|  | Categories          |
|  | Ground Motions      |
|  | Structural          |
|  | Nonstructural       |
|  | Associated Criteria |



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## Work In-Progress Disclaimer

Work on the 2026 NEHRP Recommended Seismic Provisions is ongoing.

The final content of the proposals for the 2026 NEHRP Recommended Seismic Provisions will depend on the technical and policy deliberations of the Task Committee and the PUC.

All proposals will be balloted through the consensus review process, and any concepts discussed herein are subject to change depending on further development of proposals and deliberations during balloting.

This work is being done under an ongoing FEMA architect - engineer contract.  
Final results, conclusions, and recommendations are still pending.



**FEMA**



# Thank you

Reid Zimmerman  
Technical Director | KPFF Consulting Engineers  
[reid.zimmerman@kpff.com](mailto:reid.zimmerman@kpff.com)



- 1) Overview of the Resilient Design Movement over past ~25 yrs.  
**[Curt Haselton]**
- 2) Background on the development of new Functional Recovery building code requirements over the past ~3 years (Building Seismic Safety Council Functional Recovery Task Committee)  
**[Reid Zimmerman]**
- 3) Introduction to the Resilient Design Coalition  
(which will build on the foundation laid by the BSSC FRTC)  
**[Curt Haselton]**
- 4) Dedicated Time for Q&A (~15-20+ minutes)

## ■ BSSC FRTC Work and Progress:

- The FRTC has worked on a volunteer basis for nearly three years.
- This has resulted in a complete chapter/appendix (in ballot now).
- However, at the August 2024 PUC meeting, it was clear that the PUC desired a more complete set of structural systems in the new Rfr table (beyond the capacity of the volunteer effort).
- We have a ~1 year window of opportunity to further impact this code cycle.

## ■ The Idea:

- Can we find win-win support to expand work beyond the volunteer FRTC effort? (i.e. refill the gas tank)
- We found this win-win by working with structural system supporters to qualify more structural systems.

- The Resilient Design Coalition Supporters to date:

- Charles Pankow Foundation – anchor supporter with full matching funds (\$230k to date for Phase I)
- Resilient structural system supporters



CHARLES PANKOW  
FOUNDATION  
Building Innovation through Research

- Supported Structural Systems To Date  
(all are non-proprietary):

- SpeedCore
- Precast hybrid moment frame
- Steel damped moment frame
- Steel buckling-restrained braced frame (qualification report, possible refinement)
- Wood light-frame (possible refinement)
- Tilt-up (rigid-wall flexible-diaphragm)



Smarter.  
Stronger.  
Steel.



CLARK  
PACIFIC



taylor devices inc.



COREBRACE  
SUPERIOR SEISMIC PERFORMANCE



CHARLES PANKOW  
FOUNDATION  
Building Innovation through Research

- Additional Possible Systems (many in active discussion):
  - Mass Timber Rocking walls (proposal to US Forest Service Wood Innov. Grant)
  - Base isolated buildings
  - RC Walls: Ductile coupled, coupled, uncoupled
  - Masonry: Rigid-wall flexible-diaphragm in masonry, other masonry building types
  - Additional steel SMF (e.g. SidePlate, Yield-Link Moment Connection, DuraFuse)
  - Additional steel braced frames (SCBF, Yield-Link Brace Connection)
  - More complete support for wood light-frame, including general WLF and resilient design solutions for wood light-frame (e.g. Hardy Frame, Hardy Shear Wall, Strong-Wall, and Yield-Link Moment Connection in wood)
  - Others? Any suggestions?

- **Task 1:** Develop the standard FEMA P58 pre-qualification methodology. ***[DONE!]***
- **Task 2:** Edit and refine the pre-qualification process, based on PUC feedback, and iterate until it is approved.
- **Task 3:** Secure as many co-funders as possible for structural system resilient design evaluation studies. ***[in progress]***
- **Task 4:** Finalize the technical project team. ***[DONE!]***
- **Task 5:** Finalize the Technical Advisory Committee responsible for independent technical review. ***[in progress]***
- **Task 6:** Evaluate as many structural systems as possible, and do the research needed to clearly support design requirements for each system. ***[in progress]***
- **Task 7:** Document research results in technical report(s), and likely also journal papers and conference papers.
- **Task 8:** Create proposals to the BSSC PUC for the resilient design requirements for each structural system, and iterate with PUC during voting/revisions process.
- **Task 9:** Throughout project, do frequent webinars to disseminate research results.

## ■ Detailed Timeline (with webinars throughout):

- **Dec/January:** Launched/started work (and structural system evaluations are currently in-progress)
- **Jan. 23<sup>rd</sup>:** PUC leadership coordination/planning meeting
- **Feb. 5<sup>th</sup>:** Coalition presentation to the Provisions Update Committee (for feedback)
- **Feb. 5<sup>th</sup>:** Submit expanded Section A.8 structural system quantification procedure.
- **~Feb. 21<sup>st</sup>:** Coalition Work Plan to Provisions Update Committee for formal comment.
- **Feb/March:** Finalizing support for additional structural systems.
- **March 31<sup>st</sup>:** Preliminary evaluation reports done for some structural systems.
- **April 23-25 PUC Meeting:** Provide working update
- **June 16<sup>th</sup> (ballot date):** System proposals Cohort #1 (proposal for new/modified line in Rfr table, full supporting report; note that some preliminary reports are due by March 31<sup>st</sup>)
- **August 26-29 PUC Meeting:** Provide working update
- **Sept 22<sup>nd</sup> (ballot date):** Clean-up ballots from June, and likely Cohort #2 of system proposals.
- **December PUC Meeting:** Provide working update
- **Jan 5<sup>th</sup> 2026 (ballot date):** Final ballot for this cycle (probably just clean-up, likely not a Cohort #3)
- **Early 2026 PUC Meeting:** Wrap things up for this code cycle (if not before)!

- Summary of Primary Coalition Deliverables:
  - 1) Structural system quantification/qualification procedure.
  - 2) BSSC code proposals for new structural systems (line items in Rfr table).
  - 3) Supporting evaluation reports documenting underlying evaluations.
  - 4) Education and outreach (webinars, publications).

- Keep Coalition work separate from FRTC (at request of PUC Leadership).
- Be sure Coalition work does not delay the FRTC work (e.g. current ballot).
- Separate roles and steps:
  - 1) **FRTC:** Produce a complete Appendix A, currently in ballot, and this train of work continues separately from the Coalition start-up.
  - 2) **Coalition:** Evaluate more structural systems and provide targeted ballots to add/refine line items in the Rfr table of Appendix A.

**“Tiger Team”:** *A small technical team tasked with addressing a specific complex problem over a short period of time.*



## ■ Funded Resilient Design Coalition “Tiger Team”:

- University of British Columbia: Carlos Molina-Hutt, Kristen Blowes (PhD student, soon post-doc), Huy Pham (newly added post-doc from UC Berkeley)
- KPFF: Reid Zimmerman
- HBRG: Curt Haselton, Ed Almeter, Dave Welch, Jared DeBock
- Many in-kind contributors and supporters (may try to enumerate and recognize in the future)
- Reviewers: External/independent reviewers (TBD and to be invited shortly)



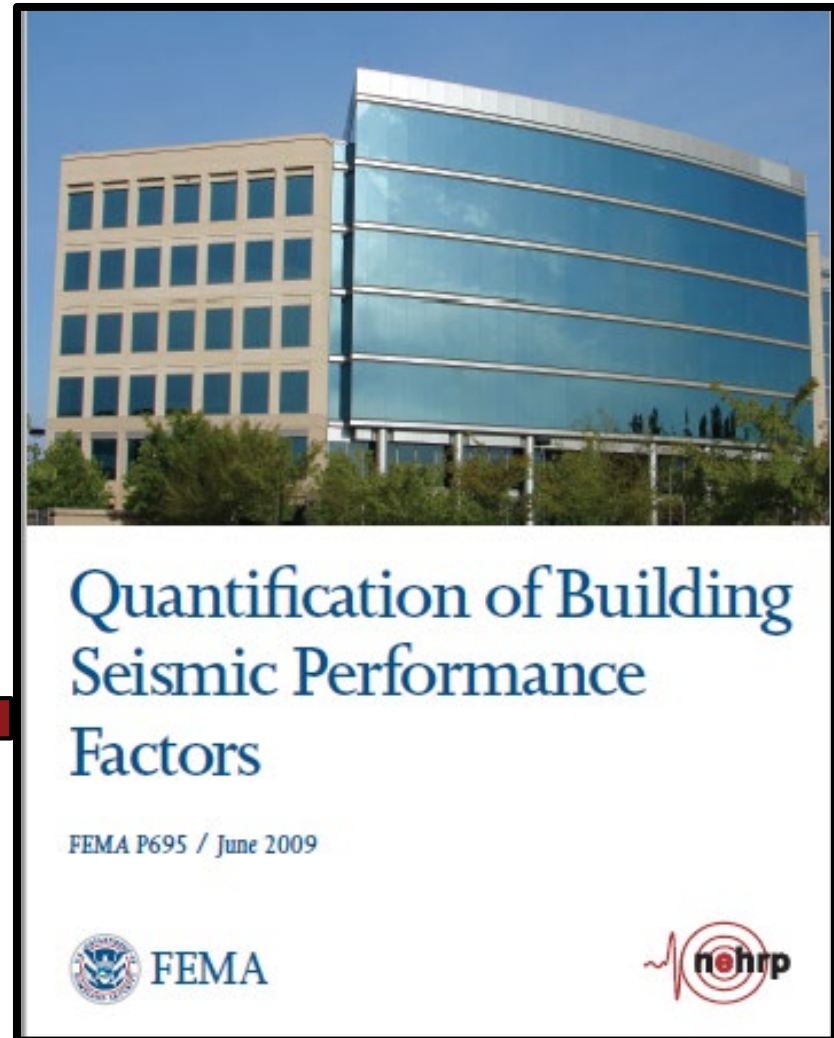
## Review of Code Development Process for Safety (current):

Table 1.3-2 Target Reliability (Conditional Probability of Failure)  
for Structural Stability Caused by Earthquake

| Risk Category | Conditional Probability of<br>Failure Caused by the $MCE_R$<br>Shaking Hazard (%) |
|---------------|-----------------------------------------------------------------------------------|
| I & II        | 10                                                                                |
| III           | 5                                                                                 |
| IV            | 2.5                                                                               |

Lots of Analysis Runs  
for Lots of Design Cases

Prescriptive Design  
Requirements for the Code



## Similar use of FEMA P-58 for Functional Recovery Provisions:

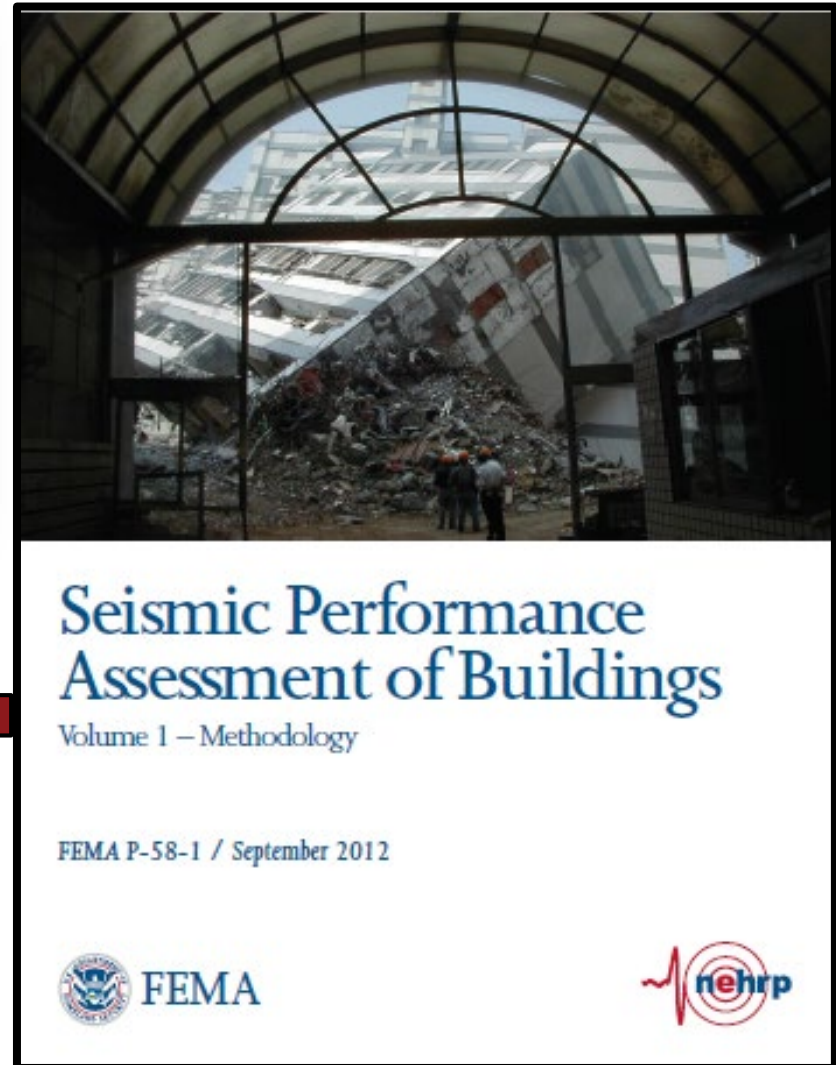
Table 24.1-1. Target Functional Recovery Time

| Functional Recovery Category | Target Functional Recovery Time |                     |
|------------------------------|---------------------------------|---------------------|
|                              | General Expectation             | Acceptance Criteria |
| A                            | Immediate                       | 0 hours             |
| B                            | Within a few days               | 72 hours            |
| C                            | Within a couple of months       | 2 months            |
| D                            | Within half a year              | 6 months            |

AWS

Lots of Analysis Runs  
for Lots of Design Cases

Prescriptive Design  
Requirements for the Code



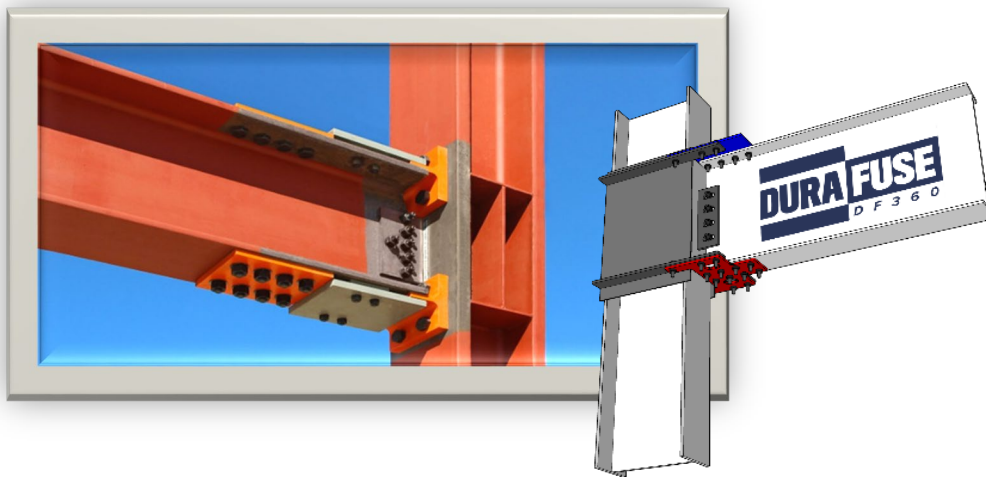


## Current ASCE7 Safety Design

$R = 8$   
Drift Limit  
= 2%

## New Design for Quick Functional Recovery

$R = ??$   
Drift Limit  
= ??

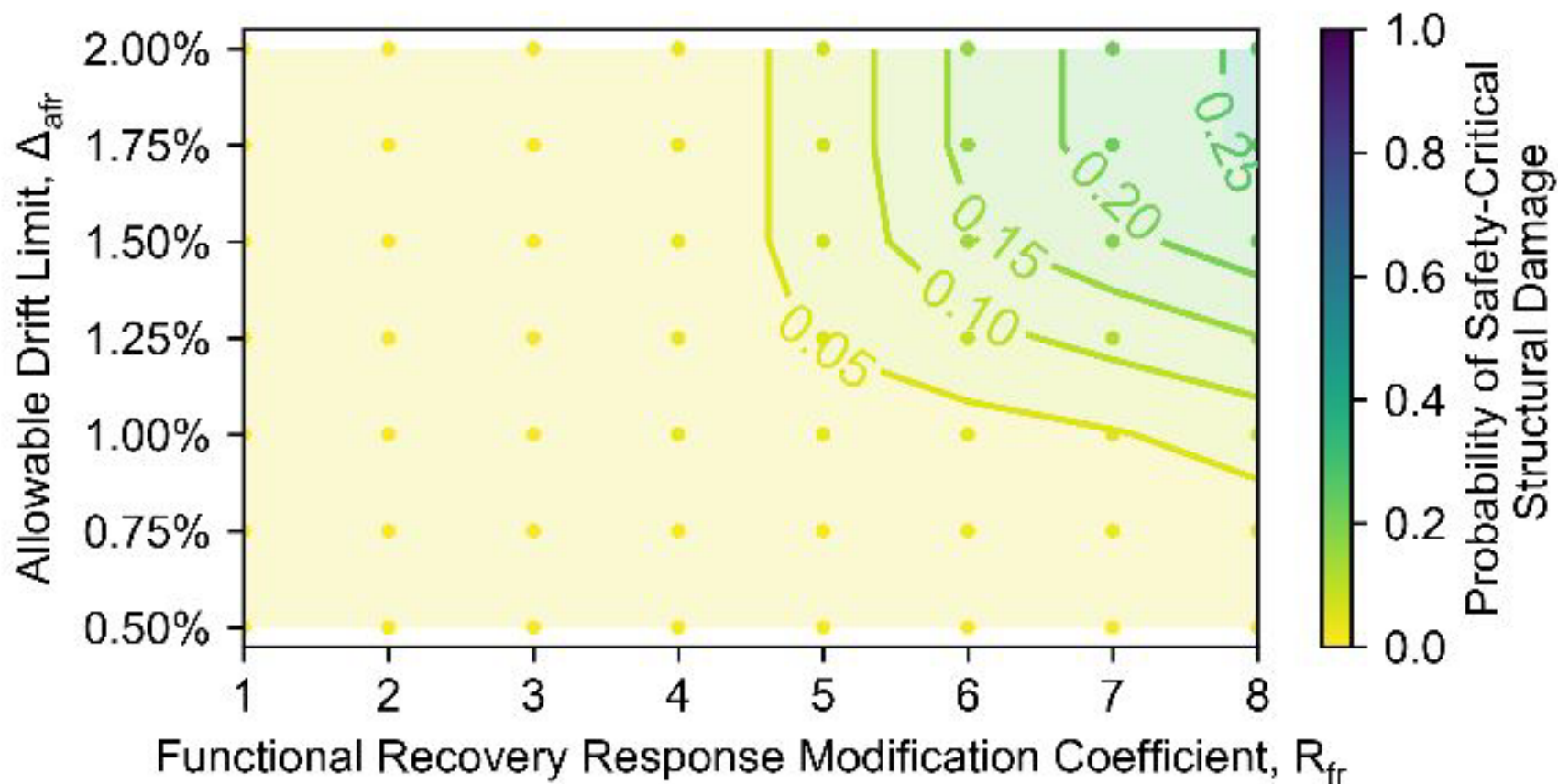


$R = 8$   
Drift Limit  
= 2%

$R = ??$   
Drift Limit  
= ??

# Process for Qualifying a Structural System

24



- Education and Outreach is an important aspect for us in the work of the Resilient Design Coalition.
- We are creating our webinar plans/schedule now (with many envisioned topics), and we ask for your input on what you would like to hear more about!
- Next Webinar:
  - Title: Structural and Nonstructural Design Requirements for Functional Recovery Performance as part of the 2026 NEHRP Provisions.
  - Carlos Molina-Hutt, PhD, University of British Columbia
  - Tentatively, next Tuesday February 25<sup>th</sup> 1:00-2:15pm PST (to be confirmed and announced shortly)



- 1) Overview of the Resilient Design Movement over past ~25 yrs.  
**[Curt Haselton]**
- 2) Background on the development of new Functional Recovery building code requirements over the past ~3 years (Building Seismic Safety Council Functional Recovery Task Committee)  
**[Reid Zimmerman]**
- 3) Introduction to the Resilient Design Coalition  
(which will build on the foundation laid by the BSSC FRTC)  
**[Curt Haselton]**
- 4) Dedicated Time for Q&A (~15-20+ minutes)



- Thank you for your time!
- Time for questions! With Zoom, we can do:
  - verbal questions (so we can actually interact more!),
  - or questions typed in.
- For further questions, or to provide feedback, please contact Allison at the SP3 office and she can connect you with the right person ([allison@hbrisk.com](mailto:allison@hbrisk.com)).

Curt Haselton: [curt@hbrisk.com](mailto:curt@hbrisk.com), Direct: (530) 514-8980

[www.sp3risk.com](http://www.sp3risk.com)