Seismic Functional Recovery: A Shift in Code Philosophy

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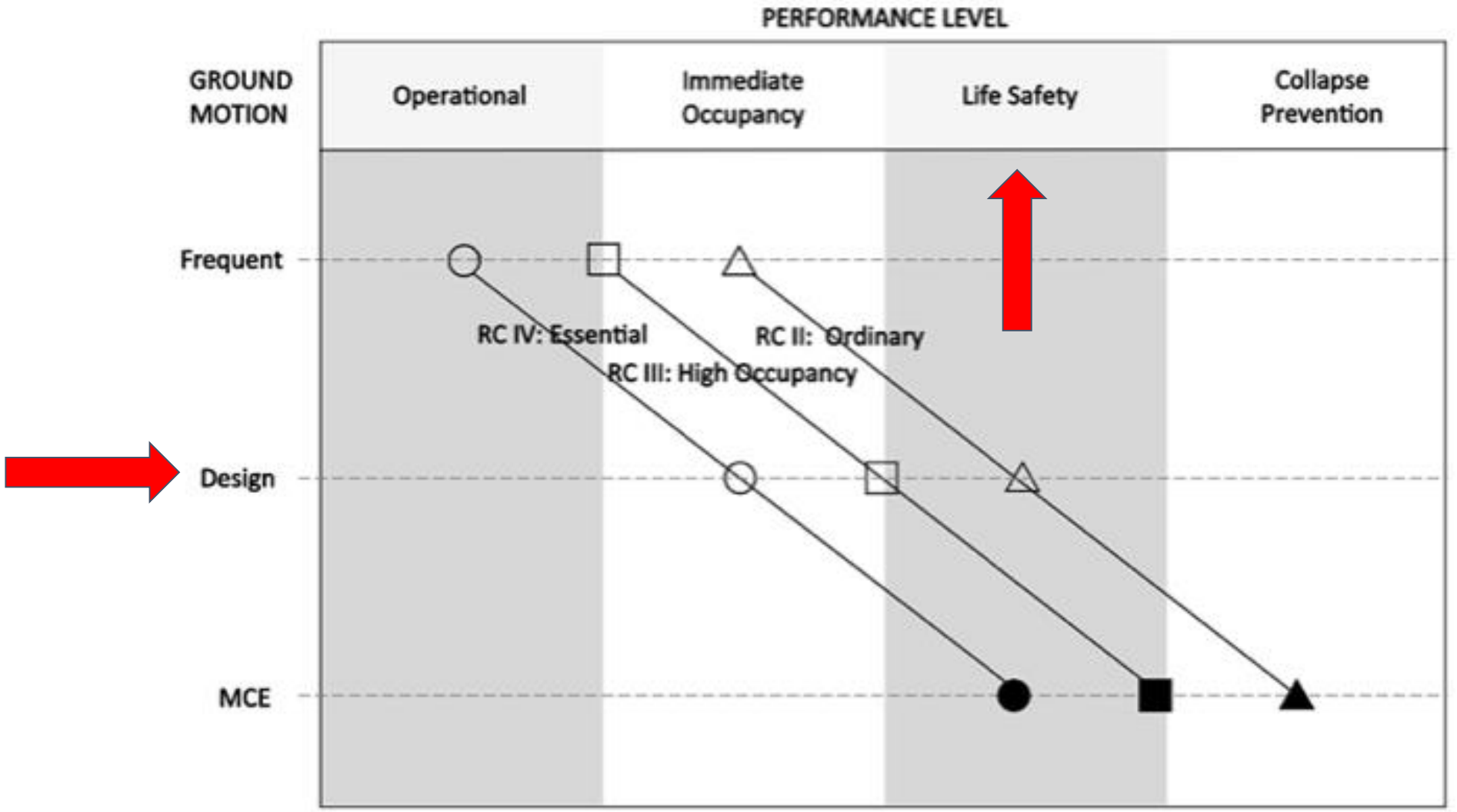
Session Agenda

1. Definitions and Justification for Functional Recovery
2. Key moments in the history of Functional Recovery
3. California Assembly Bill 1329
4. Additional Discussion
5. Closing Comments

What is the philosophy of the current code?



Why do we need to shift from Life Safety?

- Impact of Downtime on Communities
- Recommended by U.S. Congress

The public want and expect our Communities to be Resilient

S.1768 - National Earthquake Hazards Reduction Program Reauthorization Act of 2018

115th Congress (2017-2018)

LAW Hide Overview ✕

Sponsor:	Sen. Feinstein, Dianne [D-CA] (Introduced 09/06/2017)
Committees:	Senate - Commerce, Science, and Transportation | House - Science, Space, and Technology; Natural Resources; Transportation and Infrastructure
Committee Reports:	S. Rept. 115-336
Latest Action:	12/11/2018 Became Public Law No: 115-307. (TXT | PDF) (All Actions)

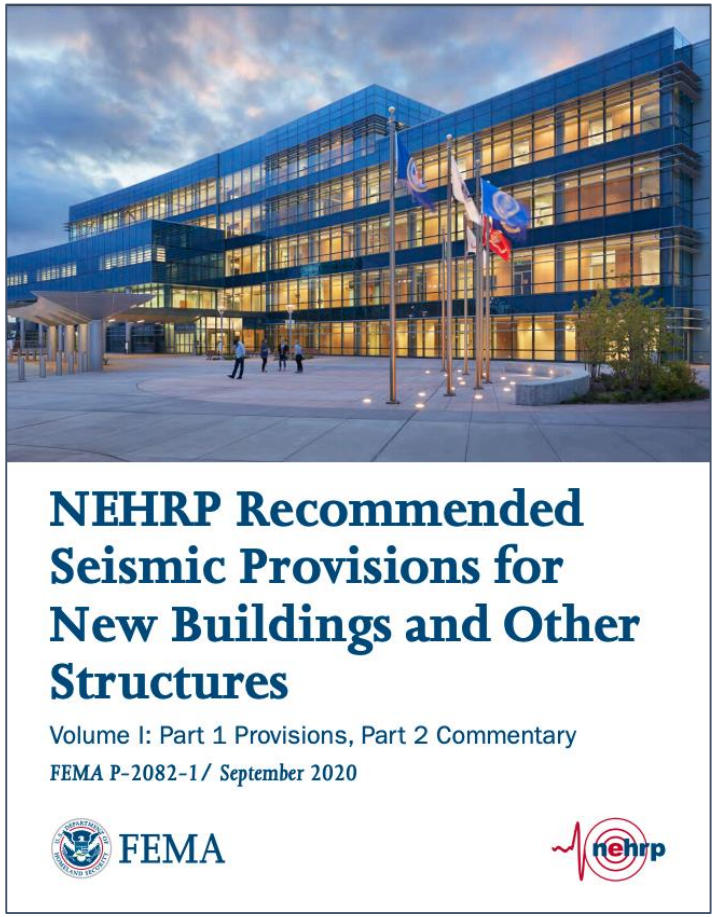
Tracker:

Introduced › Passed Senate › Passed House › To President › **Became Law**

What is NEHRP?

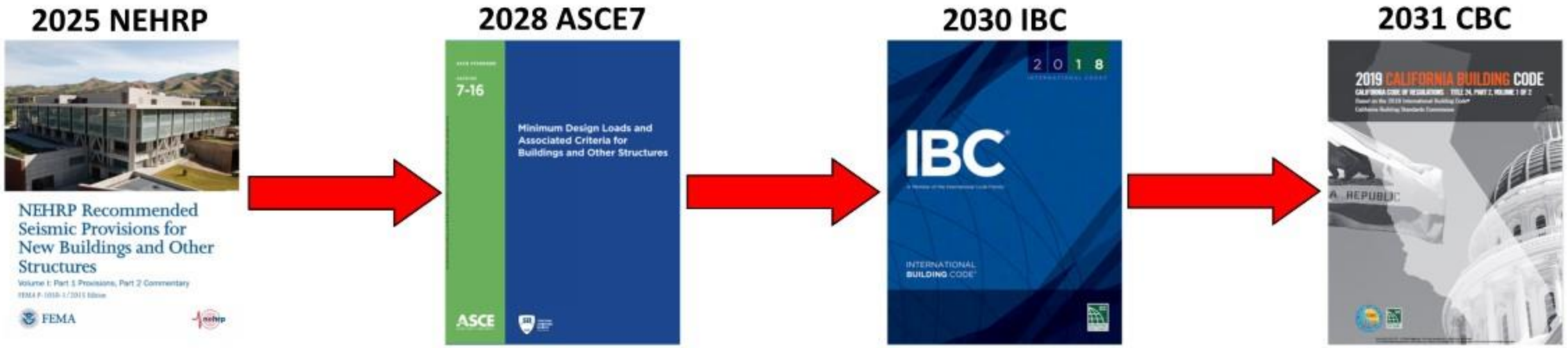
National **E**arthquake **H**azards **R**eduction **P**rogram

- coordinates work of four federal government agencies: NIST, FEMA, NSF and USGS
- by regular “reauthorization process” Congress directs these agencies and invests in earthquake risk reduction activities



NEHRP and its relation to Codes

- NEHRP Recommended Seismic Provisions
- National Seismic Hazard Maps



NEHRP Reauthorization 2018

Adds focus on community resilience:

"It is the purpose of the Congress in this chapter to reduce the risks of life and property from future earthquakes and increase the resilience of communities in the United States through the establishment and maintenance of an effective earthquake hazards reduction program."

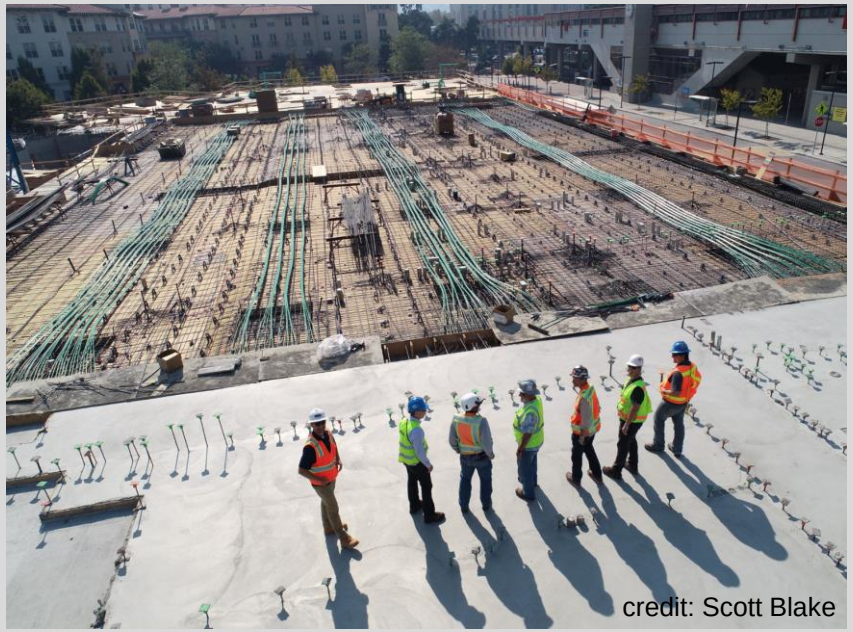
– 42 U.S. Code § 7702.Congressional statement of purpose

Requires functional recovery study:

NIST and FEMA to "jointly convene a committee of experts...to assess and recommend options for improving the built environment and critical infrastructure to reflect performance goals stated in terms of post-earthquake reoccupancy and functional recovery time."

– 42 U.S. Code § 7705b.Seismic standards

The missing link for Community Resilience



design, construction, retrofit of
individual buildings
and lifeline infrastructure systems

two new performance states:

Reoccupancy

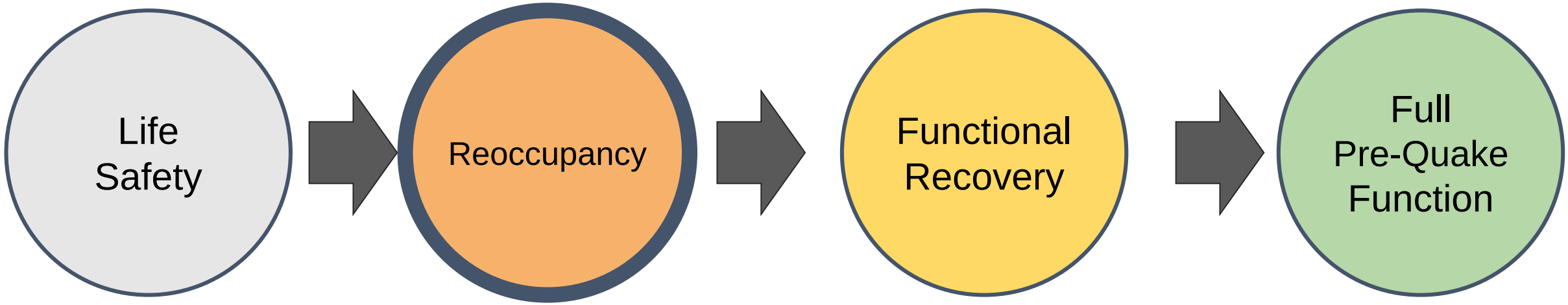
??? and

Functional Recovery

Resilient Community

has the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse seismic events. [S.1768]

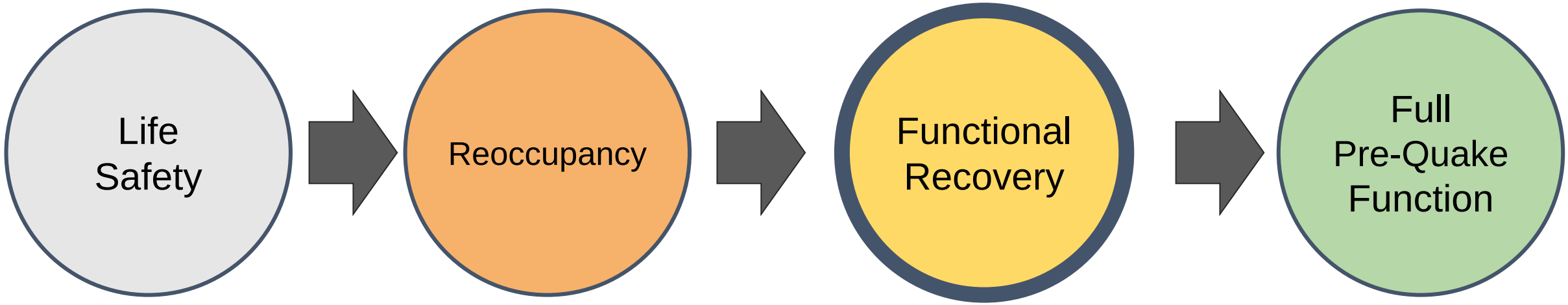
Reoccupancy



Reoccupancy is a post-earthquake performance state in which a building is maintained, or restored, to allow safe re-entry for the purposes of providing shelter or protecting building contents.

– FEMA P-2090/NIST SP-1254

Functional Recovery



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(, or the pre-earthquake service level of a lifeline infrastructure system).

– FEMA P-2090/NIST SP-1254

The importance of TIME

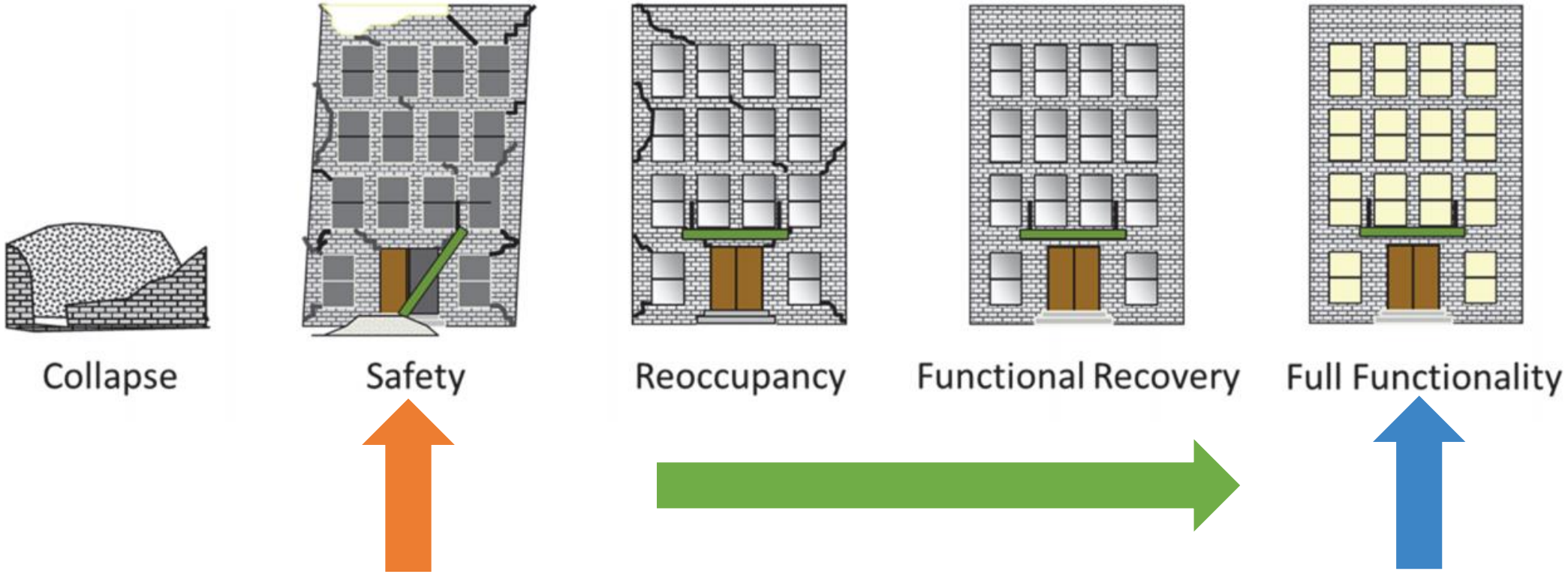


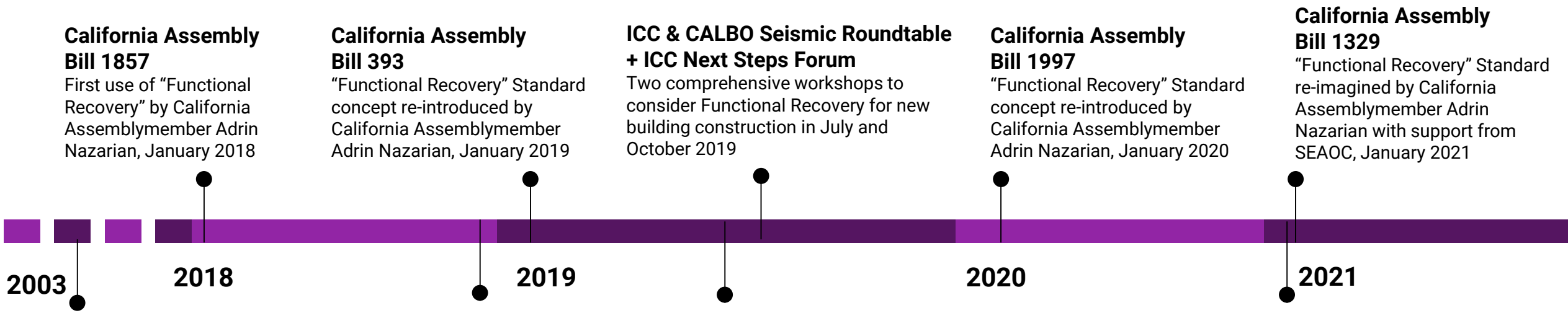
Image source: FEMA P-2090/NIST SP-1254

Question Break

Any questions so far?

Where did these concepts come from?

Many years of research, technical reports, and policy efforts



2003

Various research studies consider levels of functionality required for community resilience
Decades of research lay the groundwork for functional recovery concepts, notably: Bruneau, et al. in 2003, FEMA P-58 in 2012, and NIST Community Resilience Planning Guide for Buildings and Infrastructure Systems in 2016

2018

California Assembly Bill 1857
First use of "Functional Recovery" by California Assemblymember Adrin Nazarian, January 2018

2019

California Assembly Bill 393
"Functional Recovery" Standard concept re-introduced by California Assemblymember Adrin Nazarian, January 2019

NEHRP Reauthorization passes into Law by U.S. Congress
Adds Community Resilience and Functional Recovery to the NEHRP mandate, December 2018

ICC & CALBO Seismic Roundtable + ICC Next Steps Forum
Two comprehensive workshops to consider Functional Recovery for new building construction in July and October 2019

EERI Functional Recovery White Paper released
EERI releases conceptual framework with policy options to inform NIST/FEMA Functional Recovery Task Force that is just launching their study, August 2019.

2020

California Assembly Bill 1997
"Functional Recovery" Standard concept re-introduced by California Assemblymember Adrin Nazarian, January 2020

2021

California Assembly Bill 1329
"Functional Recovery" Standard re-imagined by California Assemblymember Adrin Nazarian with support from SEAOC, January 2021

FEMA/NIST Functional Recovery Report released
"Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time" FEMA P-2090/ NIST SP-1254 official released, January 2021

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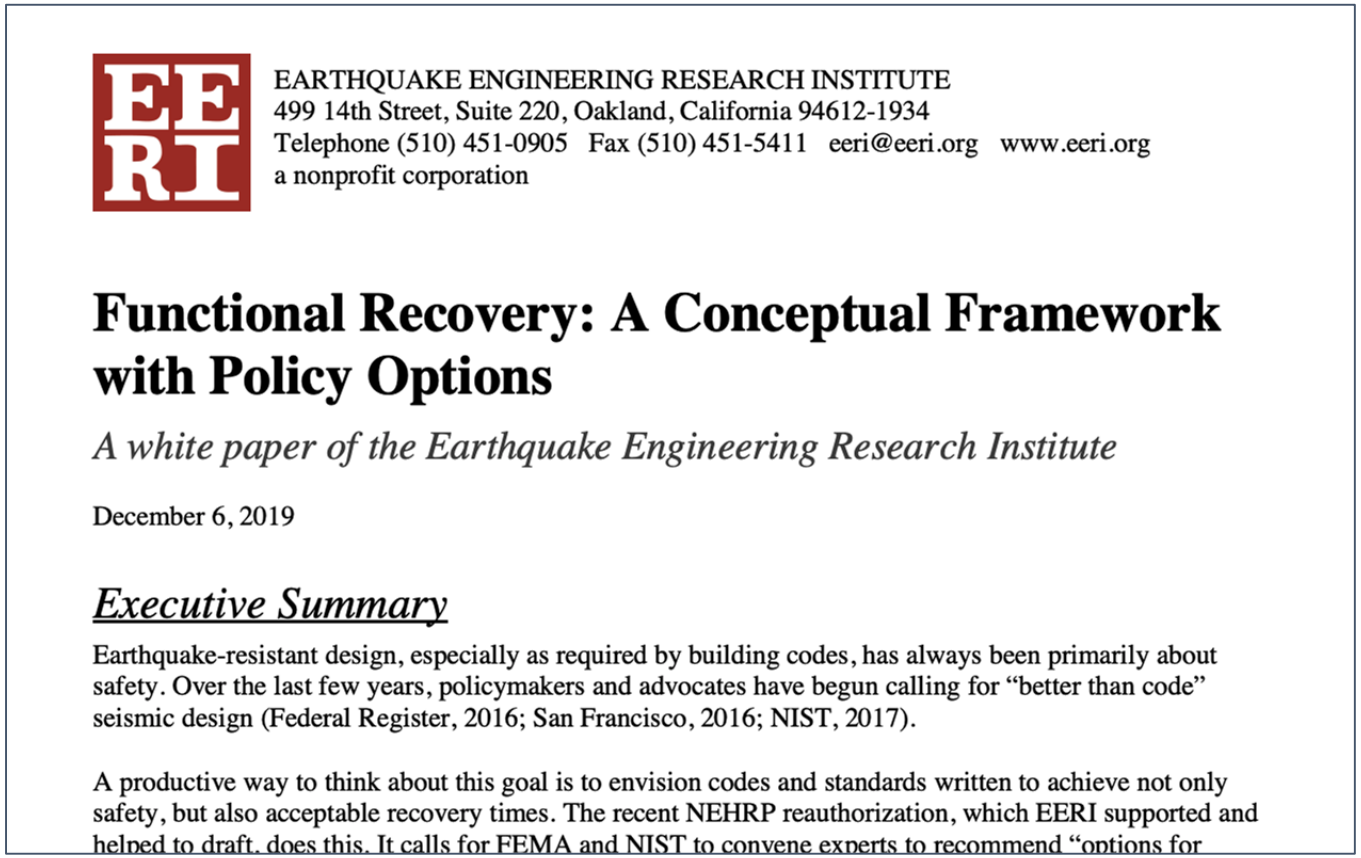
EERI White Paper



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Functional Recovery: A Conceptual Framework with Policy Options

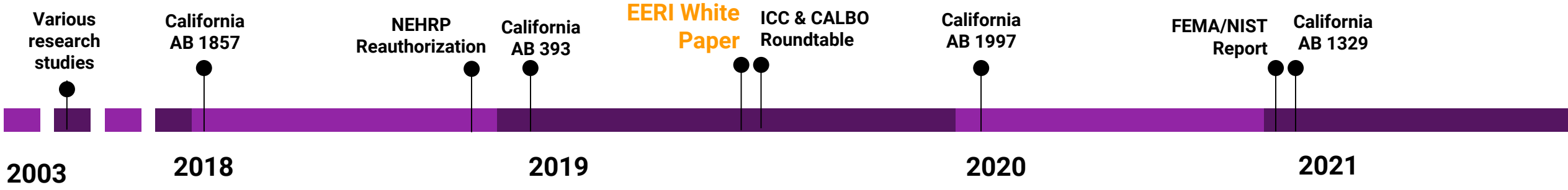
A white paper of the Earthquake Engineering Research Institute

December 6, 2019

Executive Summary

Earthquake-resistant design, especially as required by building codes, has always been primarily about safety. Over the last few years, policymakers and advocates have begun calling for "better than code" seismic design (Federal Register, 2016; San Francisco, 2016; NIST, 2017).

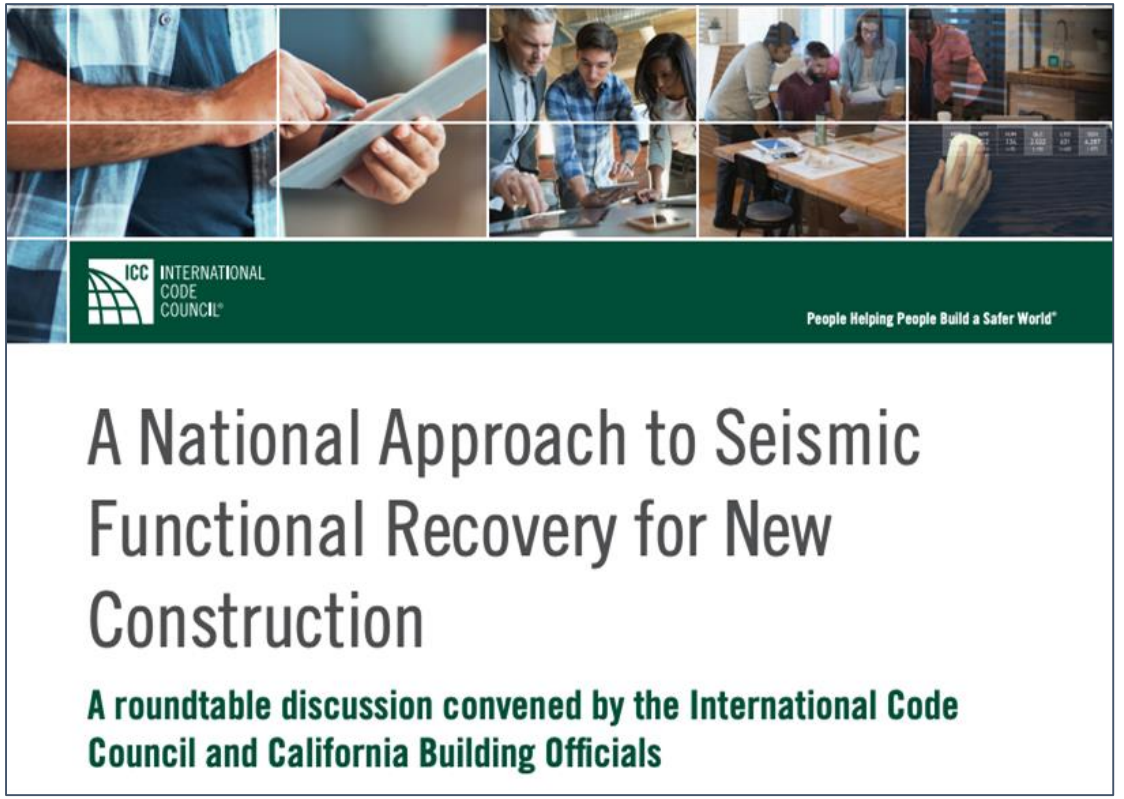
A productive way to think about this goal is to envision codes and standards written to achieve not only safety, but also acceptable recovery times. The recent NEHRP reauthorization, which EERI supported and helped to draft, does this. It calls for FEMA and NIST to convene experts to recommend "options for



Key Concepts: EERI White Paper

- Drafted definitions for buildings and lifelines
- Explored state of current practice
- Identified four **Issue Areas** for concurrent development:
  a. **Definitional – What needs to be functional?**
  b. **Policy – What is an *acceptable* time?**
  c. **Technical – What strategies/criteria will achieve functional recovery?**
  d. **Implementation – How will current practices need to change?**
- Identified four Functional Recovery Policy Options

Seismic Roundtable

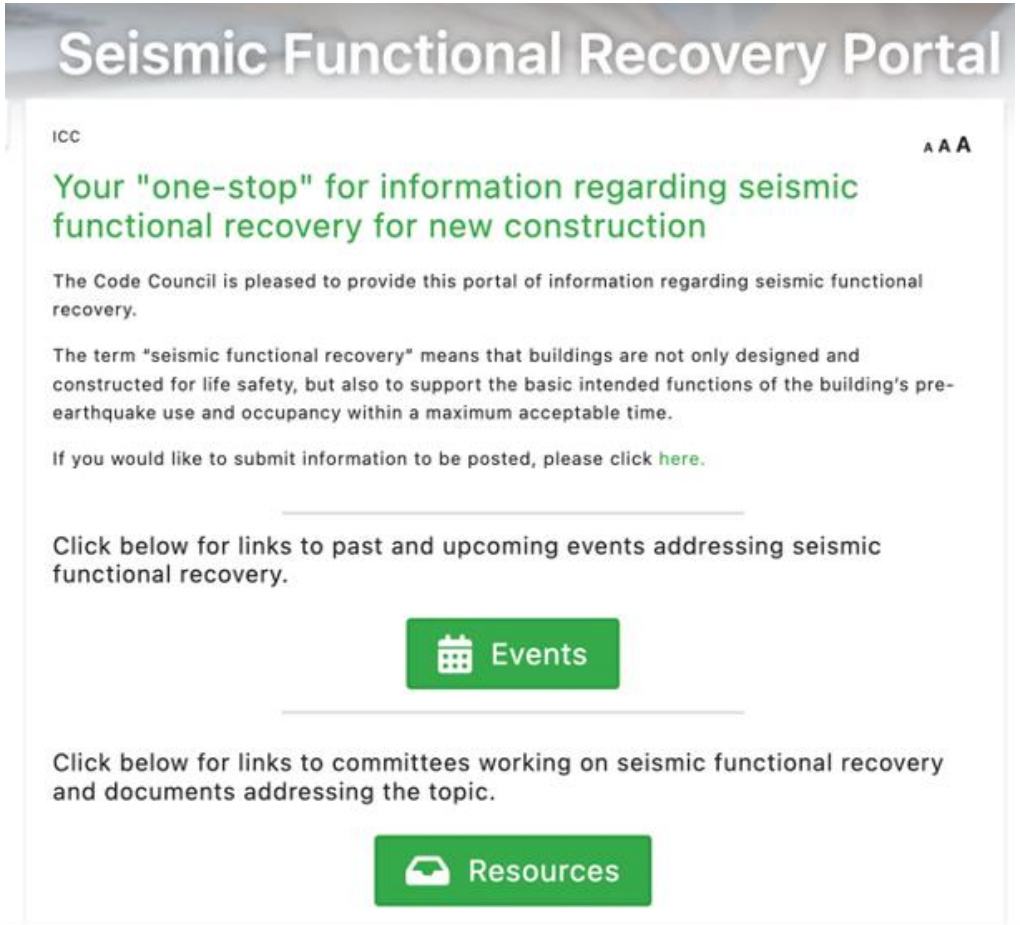


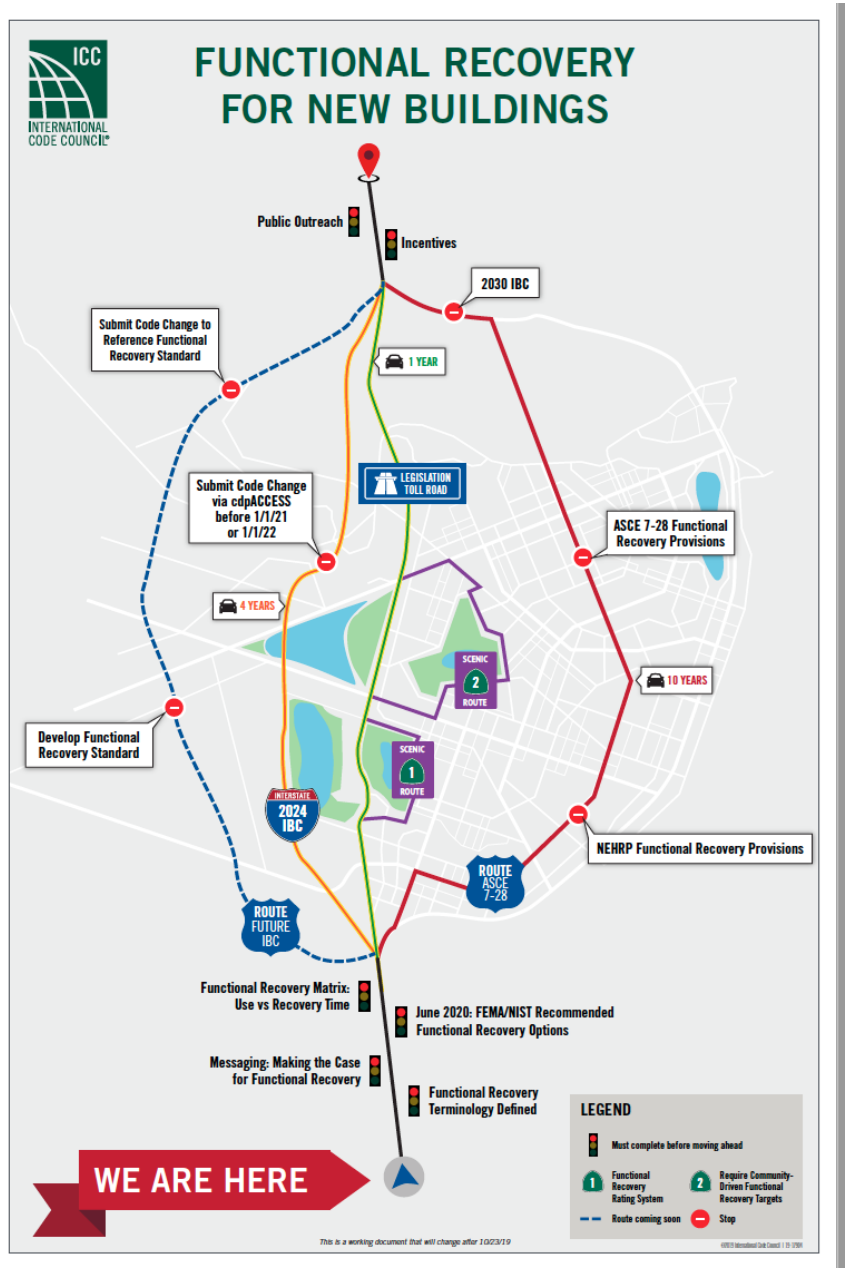
Various research studies
California AB 1857
NEHRP Reauthorization
California AB 393
EERI White Paper
ICC & CALBO Roundtable + ICC Forum
California AB 1997
FEMA/NIST Report
California AB 1329

2003
2018
2019
2020
2021

Next Steps Forum

ICC Annual Conference
Las Vegas, Oct 2019





FEMA / NIST Report

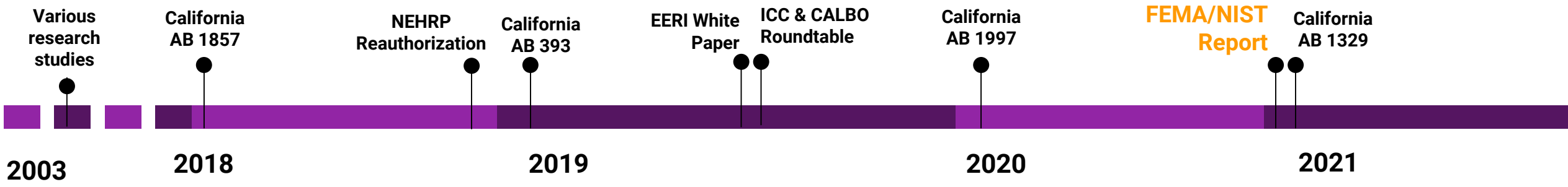
Recommended Options for Improving the Built Environment for Post-Earthquake Reoccupancy and Functional Recovery Time

FEMA P-2090/ NIST SP-1254 / January 2021

FEMA

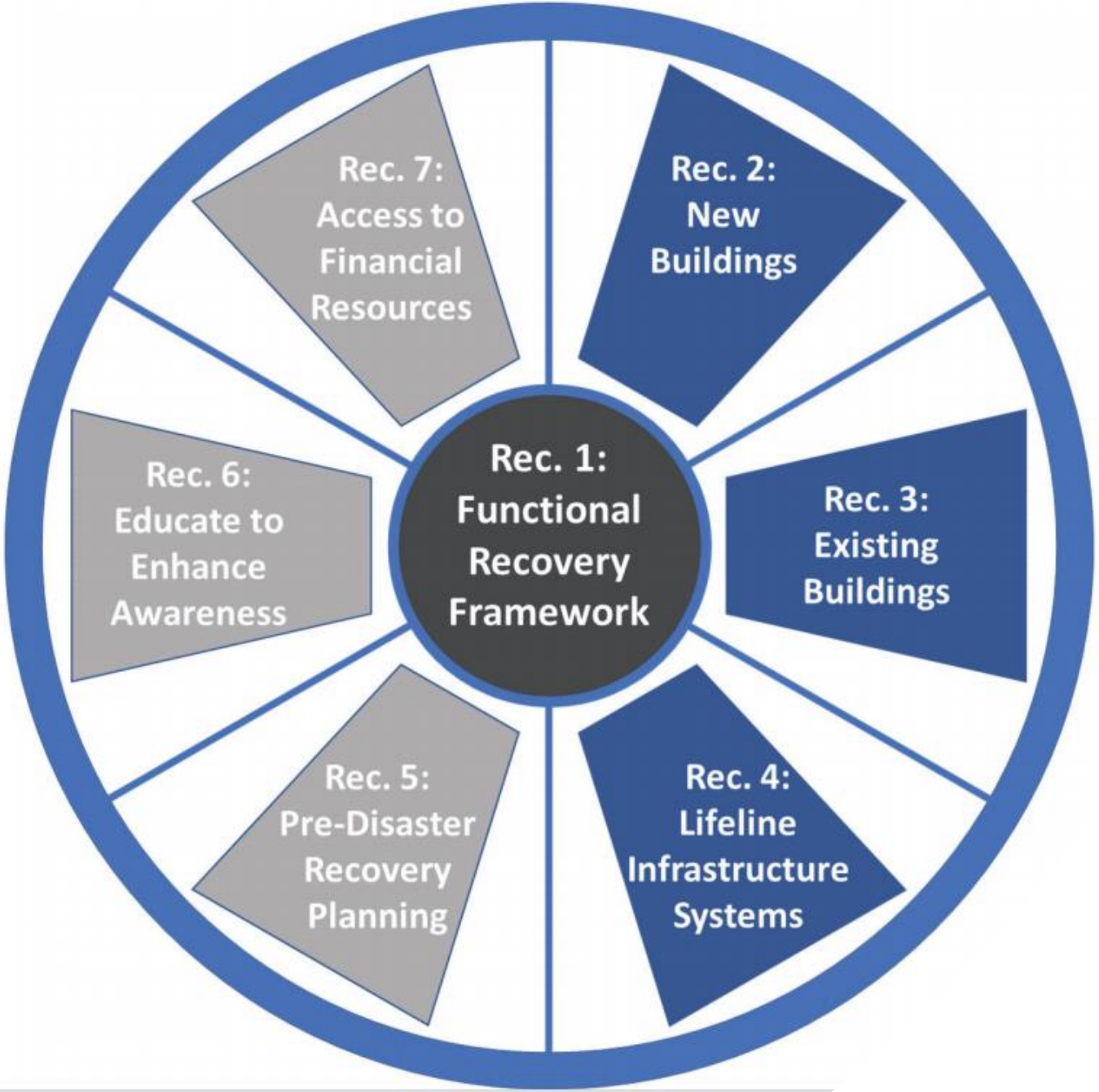
nehrp

NIST
National Institute of Standards and Technology



Key Concepts: FEMA/NIST Report

- Comprehensive development process by diverse Project Technical Panel with five stakeholder input workshops
- Provides clear definitions
- 7 main categories of recommendations with subtasks and alternatives
- Clear and pressing Call to Action:
  - “To protect U.S. communities and taxpayers against future losses on the scale of those …predicted in earthquake scenario studies, a change in building codes, building practices, and societal values is needed.”

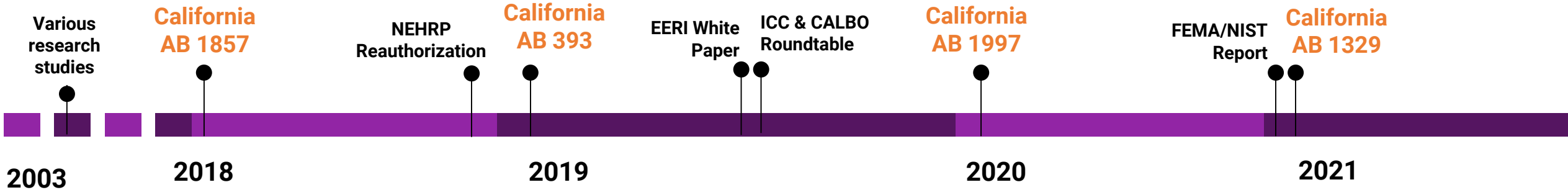


The Report: Recommendations

Community resilience and successful recovery after the next major earthquake will require collaborative and comprehensive planning involving all stakeholders and that work should begin now.

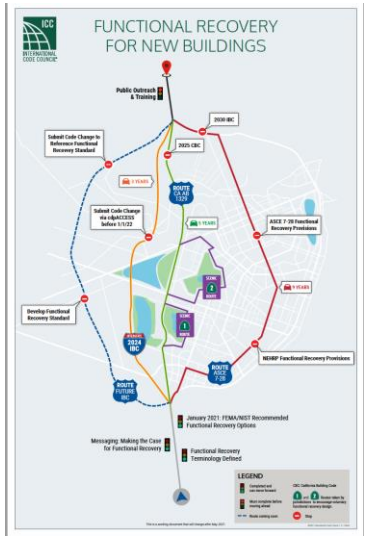
California Assembly Bill Evolution

- **Many iterations,** with continued improvements and revisions since 2018
- **Assembly Member Adrin Nazarian** is a **champion for seismic issues** and has welcomed input from **many technical experts and stakeholders**
- persistence has been necessary
  - *if plan A doesn't work there are 25 other letters in the alphabet!*



ICC Roadmap

updated May 2021



Question Break

Any questions so far?

California Assembly Bill 1329

- Active Legislation
- Introduced by:

  Adrin Nazarian
- Sponsored by:

  SEAOC
- Supported by:

AIA California

ACEC American Council of Engineering Companies California

EERI

ASCE American Society of Civil Engineers Region 9

U.S. Resiliency Council USRC

California Legislative Information

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AB-1329 Building codes: earthquakes: functional recovery standard. (2021-2022)

Text | Votes | History | Bill Analysis | Today's Law As Amended | Compare Versions | **Status** | Comments To Author

Senate:

Assembly: Int 1st Cmt 2nd Cmt

Bill Status	
Measure:	AB-1329
Lead Authors:	Nazarian (A)
Principal Coauthors:	-
Coauthors:	-
Topic:	Building codes: earthquakes: functional recovery standard.
31st Day in Print:	03/22/21
Title:	An act to amend Sections 18941 and 18941.5 of, and to add Section 18941.11 to, the Health and Safety (
House Location:	Assembly
Last Amended Date:	05/04/21
Committee Location:	Asm Appropriations
Committee Hearing Date:	05/12/21

What will AB 1329 do?

1. **Add functional recovery target to CA code**:

   It clarifies that our building code should support recovery as well as safety, to protect livelihoods as well as lives.

2. **Facilitate Local Amendment**:

   It allows cities and counties to amend the state code to address recovery as a local priority.

3. **Set minimum statewide requirements**:

   It charges the California Building Standards Commission (CBSC) to set minimum statewide requirements related to post-earthquake recovery.

What is meant by "functional recovery ~~standard~~ provisions in the context of this bill?

a set of **enforceable building code provisions and regulations** that provide specific design and construction requirements intended to result in a post-event performance state in which a **building's structural and nonstructural capacity are maintained or can be restored** to support the basic intended functions associated with the building's pre-event use and occupancy **within an acceptable time**, where the acceptable time might differ for various uses or occupancies.

What might functional recovery provisions look like, in the context of California's building codes?

1. **SIMPLE:** The simple approach takes maximum advantage of concepts, design strategies, and regulations already in place and familiar to the Commission and to the design and construction communities.

...or a intermediate blending of these two extremes...

2. **COMPREHENSIVE:** The comprehensive approach envisions an entirely new design standard based on recent and ongoing research and vetted by expert committees. It is estimated that this approach would take 10+ years

all cases expected to be a **prescriptive approach**
with structural and nonstructural considerations

What could the simple approach look like?

1. Rely on occupancies already defined in the CBC
2. Maintain current CBC design scope
3. Use the current design earthquake hazard
4. Presume recovery times for current CBC Risk Categories
5. Set recovery goals by stakeholder input & consensus judgment
6. Use Risk Category criteria as proxies for Functional Recovery criteria
7. Assign occupancies to higher Risk Category if quicker recovery needed
8. Implement within current design-review-build-inspect processes

Plain language simple, interim approach…

Where current code does not provide adequate recovery time - Consider assigning more occupancy types to Risk Category IV to get the best recovery times currently available for those buildings that are determined to be critical to recovery

Do we know how to design, review, build, and inspect for recovery?

YES!

We do this now for structures classified as Risk Category IV

Example:

Emergency Operations Centers,

Fire Stations,

etc.

What types of buildings and occupancies will this apply to?

To be determined...

Two key questions:

1. What recovery times do we want/need for which occupancies/services?
2. What design criteria will achieve these recovery time goals?

Examples: Grocery stores, pharmacies, etc.

Photos by NeONBRAND on Unsplash

What will be needed in different regions of the state to meet recovery provisions?

To be determined...

The timeframe for recovery is likely common statewide based upon occupancy,

but regions with higher hazard may require adjusted design criteria to meet performance targets where regions with lower hazard might meet performance goals using current code criteria.

Example: Central Valley vs. Coastal CA

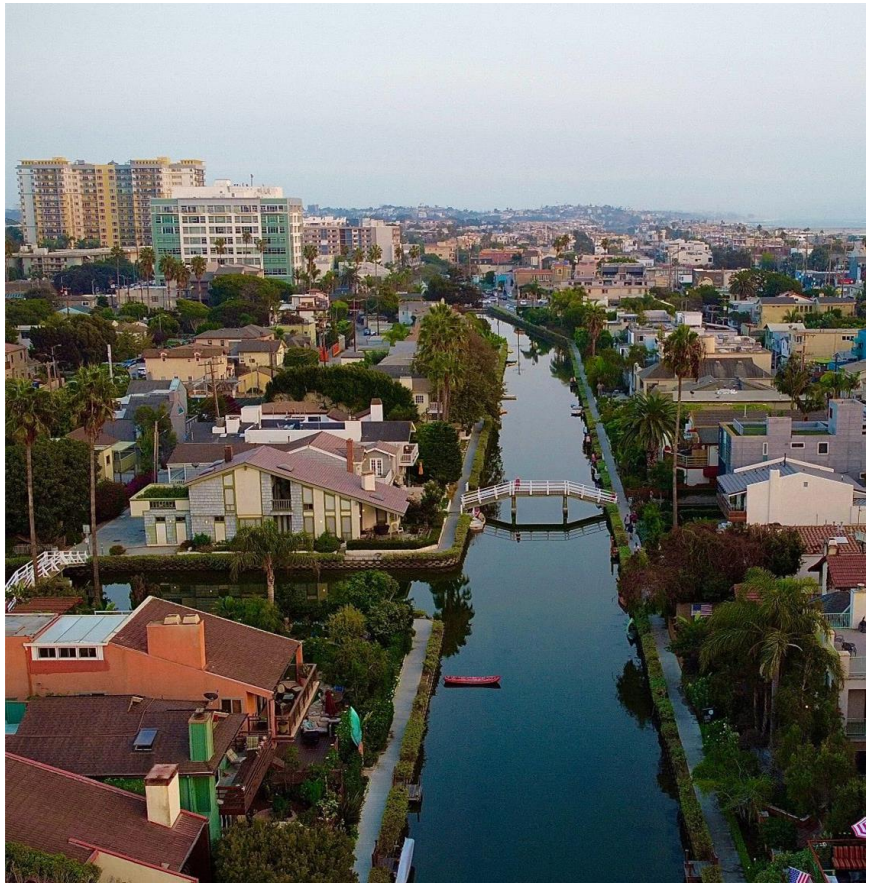

Photo by Adam Acosta on Unsplash

What about housing?

Will want to understand the performance difference (if any) between…

- California Building Code vs. California Residential Code
- Multi-family housing vs. 1-2 family dwellings

What is the timeline for development?

- **Fall 2021**: AB 1329 is chaptered.
- **Early 2022**: Commission determines methods of drafting and stakeholder consultation
- **Mid-2022**: Commission hires staff/consultants as needed.
- **Fall 2023 – early 2024**: Commission holds workshops on the functional recovery standard, as part of the 2024 Triennial Code Adoption Cycle
- **Mid-2024**: Commission publishes the proposed functional recovery standard as Express Terms and Initial Statement of Reasons, starting the public review process.
- **End of 2024:** Commission adopts and approves the functional recovery standard as amendments in the 2025 CBC and CRC.
- **July 2025**: The 2025 CBC and CRC are published with effective dates of January 1, 2026.

What resources will help us get there?

- **FEMA-NIST Report to Congress on Functional Recovery** discusses shortcomings of current code provisions in terms of recovery, the use of Risk Category IV as an interim approach to improve recovery time, and future development of functional recovery categories and associated design criteria
  - References FEMA P-58 reports for performance data
  - Supplemental studies being conducted by FEMA (ATC 138)
- **NIST Community Resilience Planning Guide** discusses what services are needed in what phase of recovery

What else can we do together?

- Collaborate between professionals and industry organizations
  - SEAOC, EERI, ICC, CALBO, AIA, Builders/Developers, etc.
- Seek to understand what our communities need for resilience
- Develop ways for buildings to be designed, reviewed, built, and inspected to achieve improved recovery time
- Supplement with fact sheets, design tools, review checklists, training and other resources to make implementation smooth

The opportunity is here and the time is now!

- California has more lives, more property, more investment, more innovation, and more community vitality at risk from earthquakes than any other state.

- Public expectations, federal prioritization, and political momentum within California (state and local jurisdictions) pushing for community resilience (and functional recovery).

- We know how to do better and have the resources to get us there. We achieve these goals by working together.

Discussion

Have more questions? Contact us!

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- **Heidi Tremayne**: heidi@eeri.org
- **Sharon Goei**: sgoei@ci.milpitas.ca.gov
- **Victor Cuevas**: victor.cuevas@lacity.org

Resources & Links

- California Assembly Bill 1329: https://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=202120220AB1329
- SEAOC AB 1329 Resources: www.seaoc.org or contact seaoc@seaoc.org
- FEMA P-2090/NIST SP-1254: https://www.fema.gov/sites/default/files/documents/fema_p-2090_nist_sp-1254_functional-recovery_01-01-2021.pdf
- ICC Seismic Functional Recovery Portal: https://www.iccsafe.org/advocacy/seismic-functional-recovery/
- EERI Functional Recovery White Paper, Dec 2019 https://eeri.org/images/policy/EERI-Functional-Recovery-Conceptual-Framework-White-Paper-201912.pdf
- ICC Paper *A National Approach to Seismic Functional Recovery for New Construction* http://media.iccsafe.org/2019_MarComm/Misc/19-17983_COMM_Seismic_RT_Report_FINAL_MIDrez.pdf
- NIST, 2016, Community Resilience Planning Guide for Buildings and Infrastructure Systems, Volume I & II, NIST Special Publication 1190, National Institute of Standards and Technology, Gaithersburg, Maryland.
- Bruneau, M., Chang, S.E., Eguchi, R.T., Lee, G.C., O'Rourke, T.D., Reinhorn, A.M., Shinozuka, M., Tierney, K., Wallace, W.A., and von Winterfeldt, D., 2003, "A Framework to Quantitatively Assess and Enhance the Seismic Resilience of Communities," Earthquake Spectra, Vol. 19, No. 4, pp. 733-752.