Advancing Flood-Resilient Standards, Design, and Construction

September 12, 2023

FEMA

John Ingargiola, Lead Physical Scientist – FEMA Resilience

Our Floodprone Nation- Getting Worse!

3.5 million miles of streams rivers and coastlines in the United States (1.2 million miles mapped)

8.7 million properties at risk from flooding in SFHA (per FEMA)

Annual flood losses roughly doubling per decade - now $20+ billion/yr.

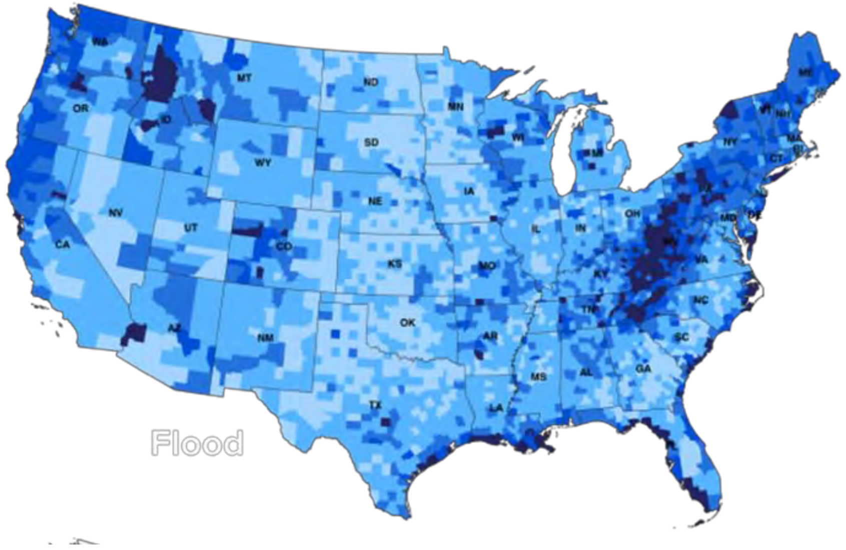
Photo Credit: Caltrans

Our Floodprone Nation – Getting Worse!

From First Street Foundation:

17.7 million properties similar risk from flooding in SFHA + non-mapped + pluvial areas (per First Street Foundation)

New precipitation model shows 1-in-100 year flooding can now be expected every 8 years in some areas



Changing Market Conditions

Catastrophe & Flood › Private flood insurers seize market growth amid NFIP pricing challenges

Private flood insurers seize market growth amid NFIP pricing challenges

Market up 24% from 2016 to 2022, according to new report

Rise of the Climate Rating Agencies

Government and the private sector rely increasingly on risk-m... that claim they can zero in on exposure to climate change.

BY LEE HARRIS APRIL 12, 2023

2.3k

The Washington Post + Follow

Home insurers cut natural disasters from policies as climate risks grow

Story by Jacob Bogage • 2d

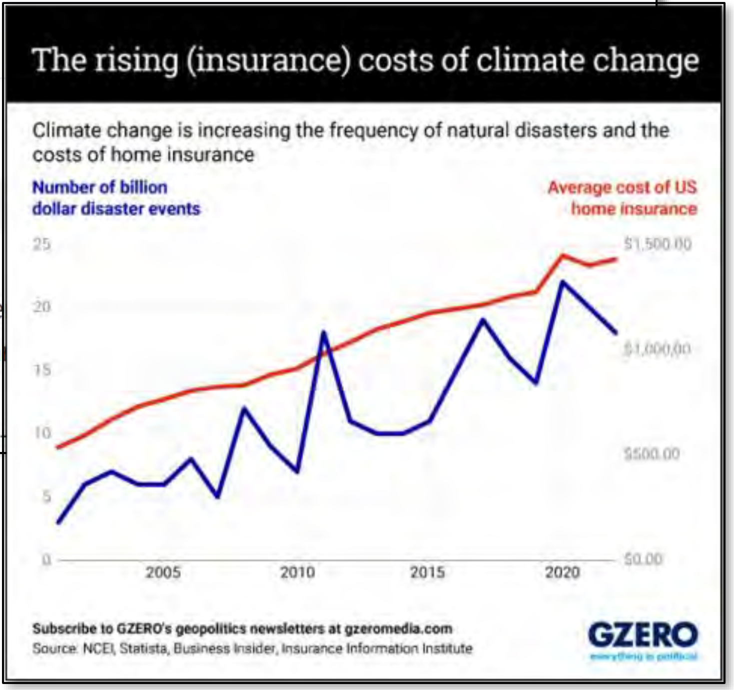
MARKETS TODAY ···

DJI ▼ -0.33% INX ▼ -0.16%

EXPERTS BLOG

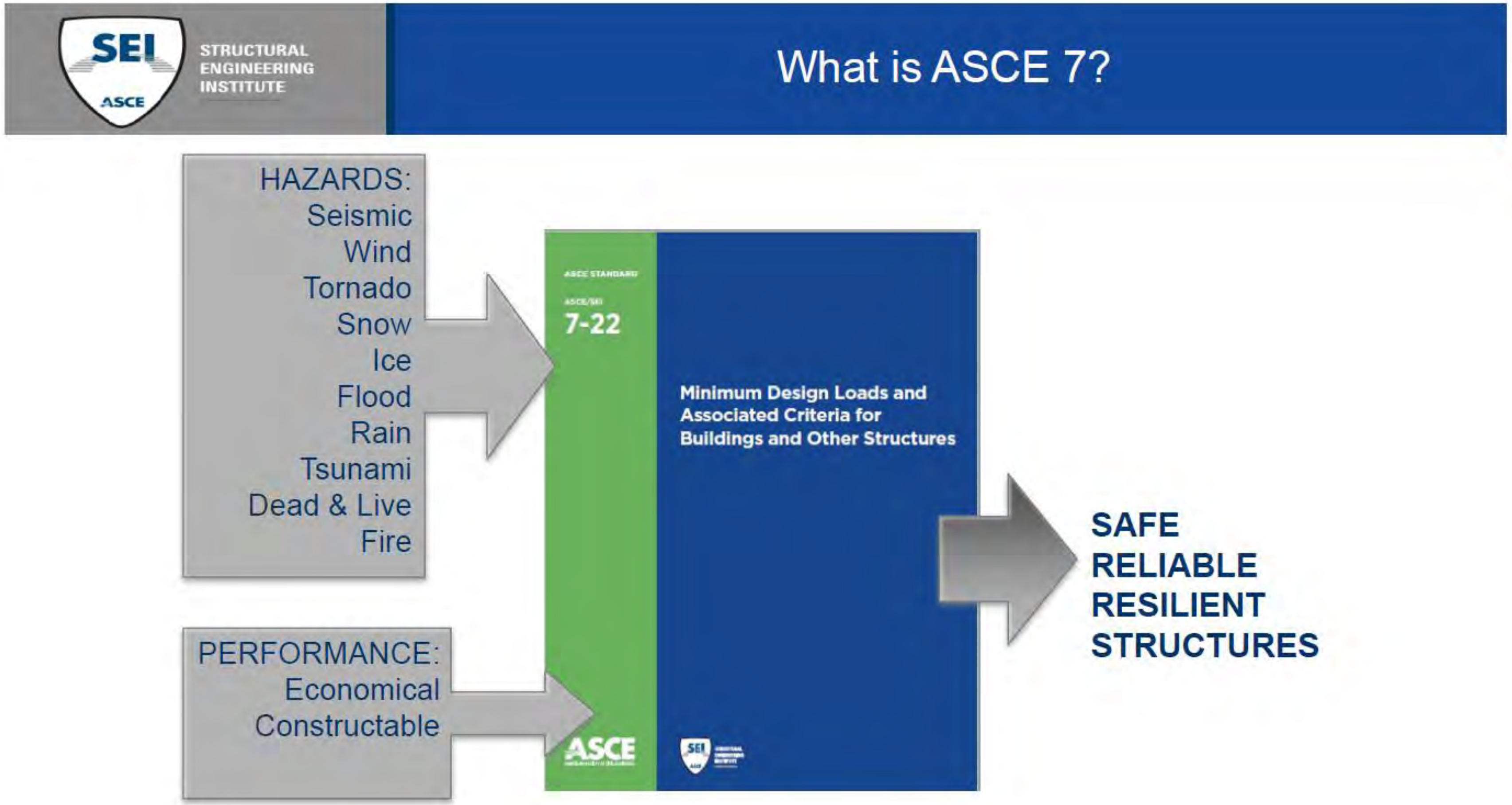
Why Investors Can't Avoid Climate Risk by Divesting

JEAN ROGERS: The topic of divestment often comes up in conversations about how to mitigate climate change. But these discussions often miss an important point: Climate risk is real and embedded across a portfolio, and as such, investors cannot diversify away from climate risk by divesting.



Flood Protection in Current Building Codes

What level of flood protection is addressed in current building codes?



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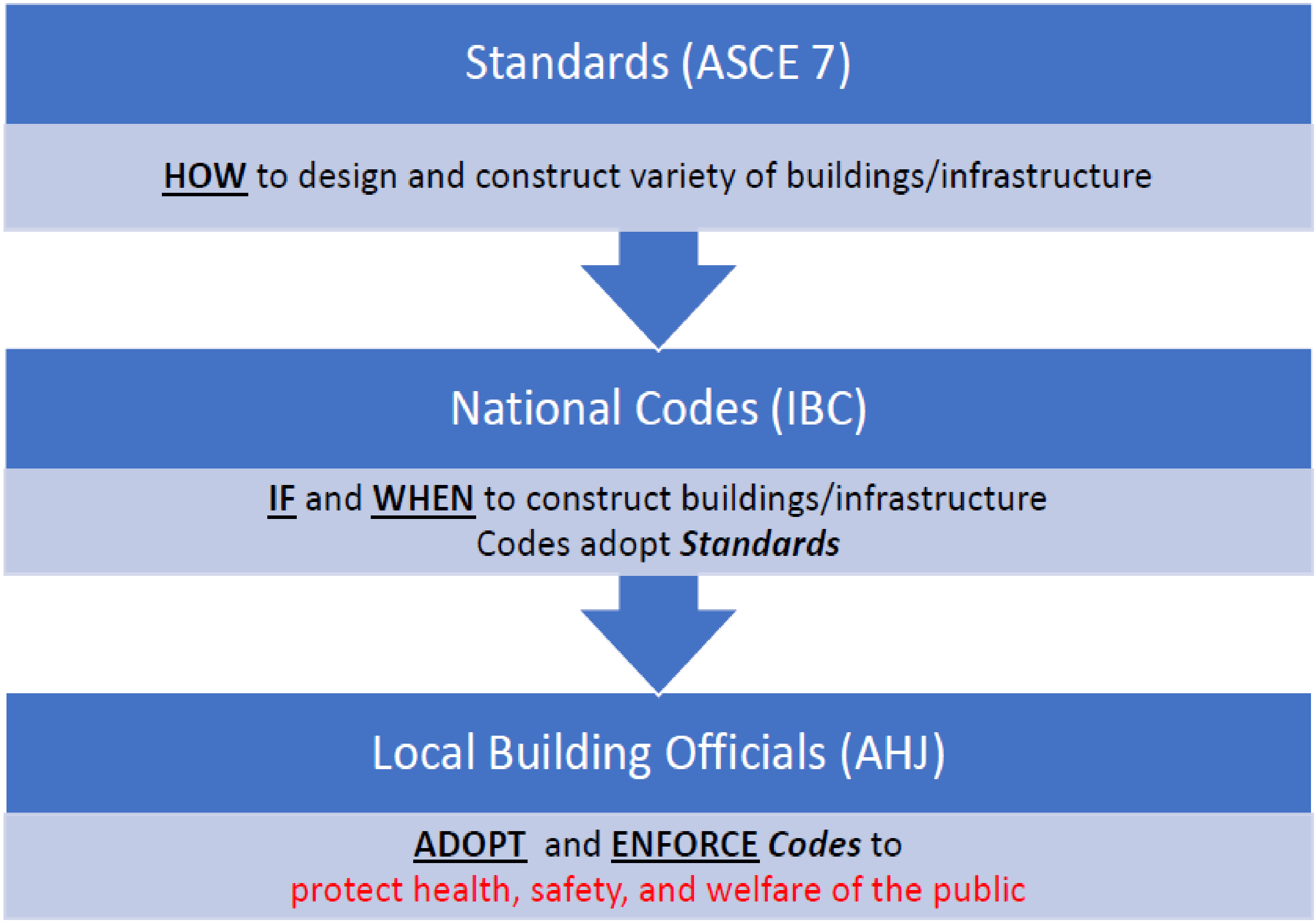


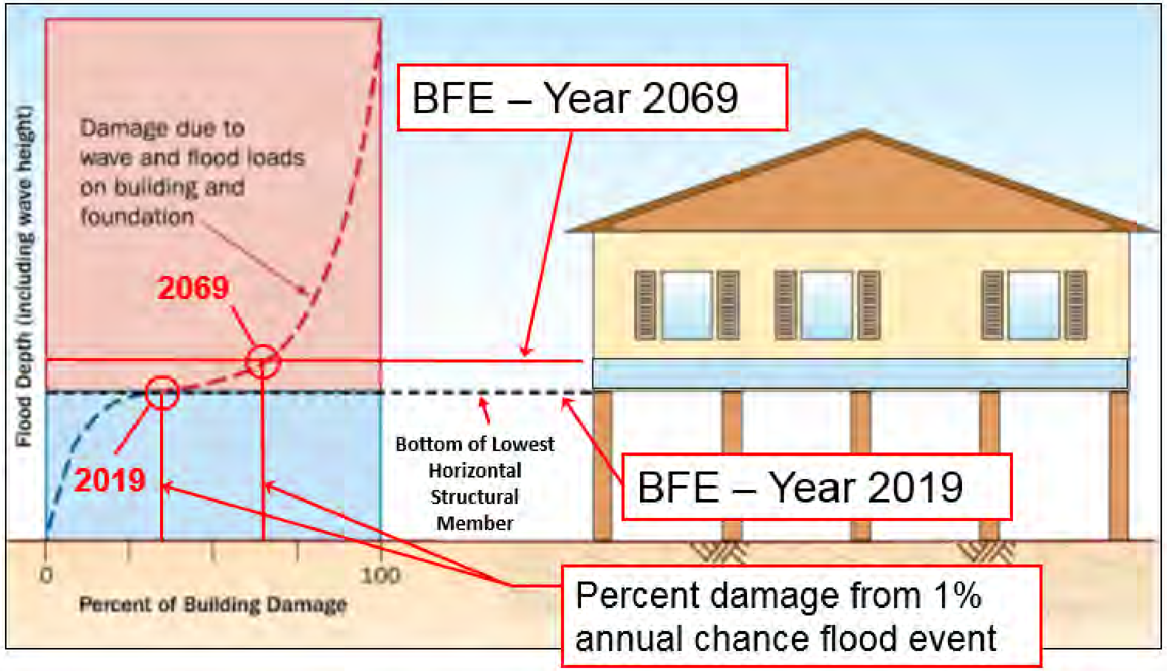
FEMA

What level of flood protection is addressed in current building codes?

International Building Code (Since 2006 uses ASCE 24)	
Flood Design Class[1]	Minimum Flood Elevation (Zone A)
1, 2, and 3*	BFE + 1 foot or DFE, whichever is higher
4	BFE + 2 feet or DFE, or the 500-year, whichever is higher

Damage from a 1% annual chance flood over the next 50 years could increase from 30% to 60%.

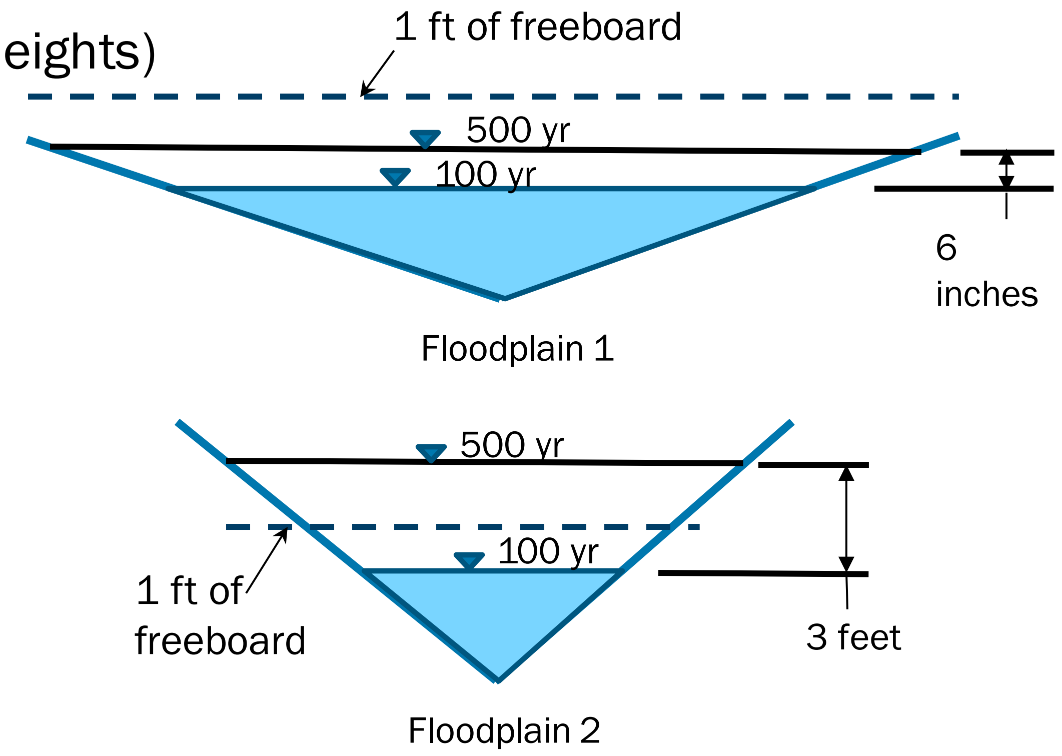
For a building value of $150k that's a $45k increase in building damage alone.



An example of increases in flood damage over time due to changes in flood conditions.

Moving towards higher minimum return periods or risk-based consensus standard

- Freeboard provides **varying levels of protection** within the floodplain
- Freeboard could provide protection to the **1,000-year flood or just over the 100-year flood** depending on the area
- A Return Period based approach is **more consistent protection**
- Calculations should **reflect flood heights** as well as **other changing factors** (e.g., velocity or wave heights)



Riverine Example

- **Useful life of the building** – it's longer than the mortgage
  - Non-Residential Expected Service Life* 51.6 – 87.2 years
  - Residential Expected Service Life** 61 years

We need to incorporate Future Conditions into Flood Design

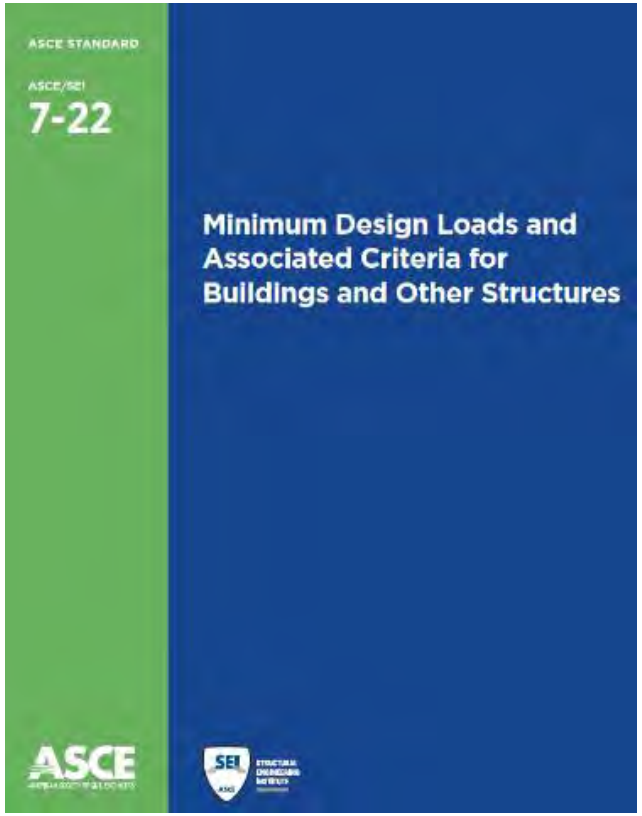
- Understand **impact of increased/future flood conditions**
  - Sea Level Rise
  - Coastal Erosion
  - Subsidence
  - Increased Development/ Increased Runoff
  - Increase or Changes in Precipitation Rates
- **Interpret flood data** and **approximate** a future flood protection level
- Explain to clients the **potential increase in flood risk** and how incorporating increased flood protection serves the clients interests
- Incorporate the future conditions into the **minimum elevation** and **flood load** calculations

Project Lifespan becomes a key factor

What Just Happened?

ASCE 7-22 Supplement 2 Minimum Design Loads & Criteria for Buildings and Structures – FREE DOWNLOAD @ ascelibrary.org Published May 25, 2023

- Rewrites Chapter 5 Flood Loads - as a Supplement to ASCE 7-22
- Changes the approach of determining flood loads from an Allowable Stress Design (ASD) to a Strength Design or Load Resistance Factor Design (LRFD)
- Makes flood consistent with minimum consensus wind and seismic design standards that have higher return periods
- Changes to:
  - Minimum Design Requirements (uses formulas & risk-based scaling factors)
  - Hydrostatic / Hydrodynamic Loads (velocity, scour, design stillwater elevation)
  - Wave Loads
  - Debris Loads
  - Flood Load Cases / Load Combinations / Stability Checks



ASCE 7 Flood Supplement - Updated Design Flood Relates to Risk Category

- Risk Categories similar to Flood Design Class in ASCE 24
- Applies to all buildings and structures in the delineated 500-year floodplain (horizontal extent)
- Sea Level Rise is included. The minimum rate of relative sea level change shall be the historic rate of rise over 50-year period rather than projected future rise.
  - Does not prohibit considering increased rise
  - Sea-Level Change Curve Calculator (army.mil)
- The **Relative Sea Level Rise** during the project lifecycle of the structure shall be added to **the design stillwater flood elevation** and then wave heights calculated to derive a design flood elevation
- **Erosion** calculated for **50-year minimum** project lifecycle

ASCE 7-22 FS Risk Categories and Design Mean Recurrence Intervals

Design Requirements apply to buildings in the 500-yr floodplain where designated

Calculation of higher MRI is based on ratios (C_{MRI}) applied to the 100-year stillwater flood depth*

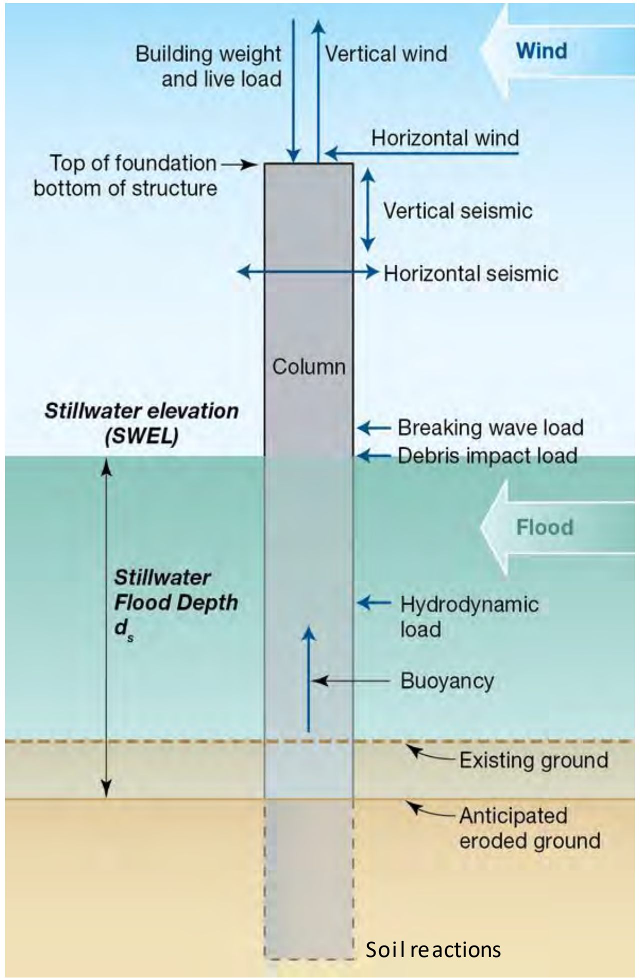
Risk Category	MRI (year)	Annual Exceedance Probability (AEP)	C_{MRI} Gulf of Mexico Coastal Sites[1]	C_{MRI} All Other Coastal Sites[1]	C_{MRI} Great Lakes Sites[2]	C_{MRI} Riverine Sites
I	100	1.00%	1.00	1.00	1.00	1.00
II	500	0.20%	1.35	1.25	1.15	1.35
III	750	0.13%	1.45	1.35	1.20	1.45
IV	1,000	0.10%	1.50	1.40	1.25	1.50

1 Gulf Coast site scale factors are for coastlines of TX, LA, MS, AL and FL west of 80.75 deg W. All other coastlines taken as Other.
2 If flood loading is being considered on other lakes, the scale factors for riverine sites shall be used.

$SWEL_{MRI} = C_{MRI}(SWEL_{100} - Z_{datum}) + Z_{datum}$ **Equation 1** [ASCE 7-22-S3 Eq. 5.3-2]

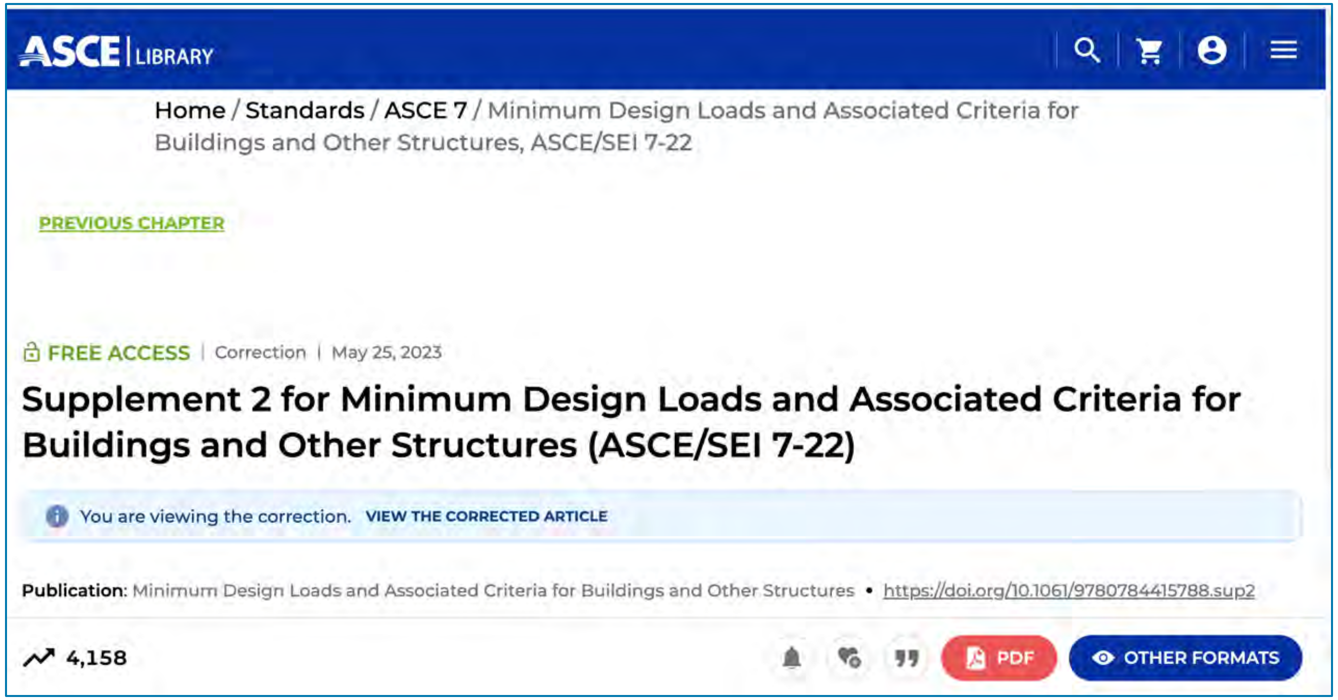
ASCE 7-22 FS Flood Elevation Calcs

- Calculation of stillwater flood depth (d_f)
  - $d_f = (SWEL_{MRI} - G_e) + \Delta_{SLR}$
- Stillwater flood depth is used in the calculation of:
  - Hydrostatic loads
  - Determination of floodwater velocity
  - Determination of hydrodynamic loads
  - May be applicable for wave height calculation
  - Wave load calculations
  - Debris impact calculations for certain building types



ASCE 7 Flood Supplement –Chapter 5

https://ascelibrary.org/doi/10.1061/9780784415788.sup2



- Supplement 2 approved by ASCE, published as part of ASCE 22 May 23, 2022
- Available for free online

Existing
(ASCE 7-22)

5.1 General
5.2 Definitions
5.3 Design Requirements
5.3.1 Design Loads
5.3.2 Erosion and Scour
5.3.3 Loads on Breakaway Walls
5.4 Loads During Flooding
5.4.1 Load Basis
5.4.2 Hydrostatic Loads
5.4.3 Hydrodynamic Loads
5.4.4 Wave Loads
5.4.4.1 Breaking Wave Loads on Vertical Piles or Columns
5.4.4.2 Breaking Wave Loads on Vertical Walls
5.4.4.3 Breaking Wave Loads on Non-Vertical Walls
5.4.4.4 Breaking Wave Loads from Obliquely Incident Waves
5.4.4.5 Impact Loads
5.5 Consensus Standards and Other Affiliated Criteria

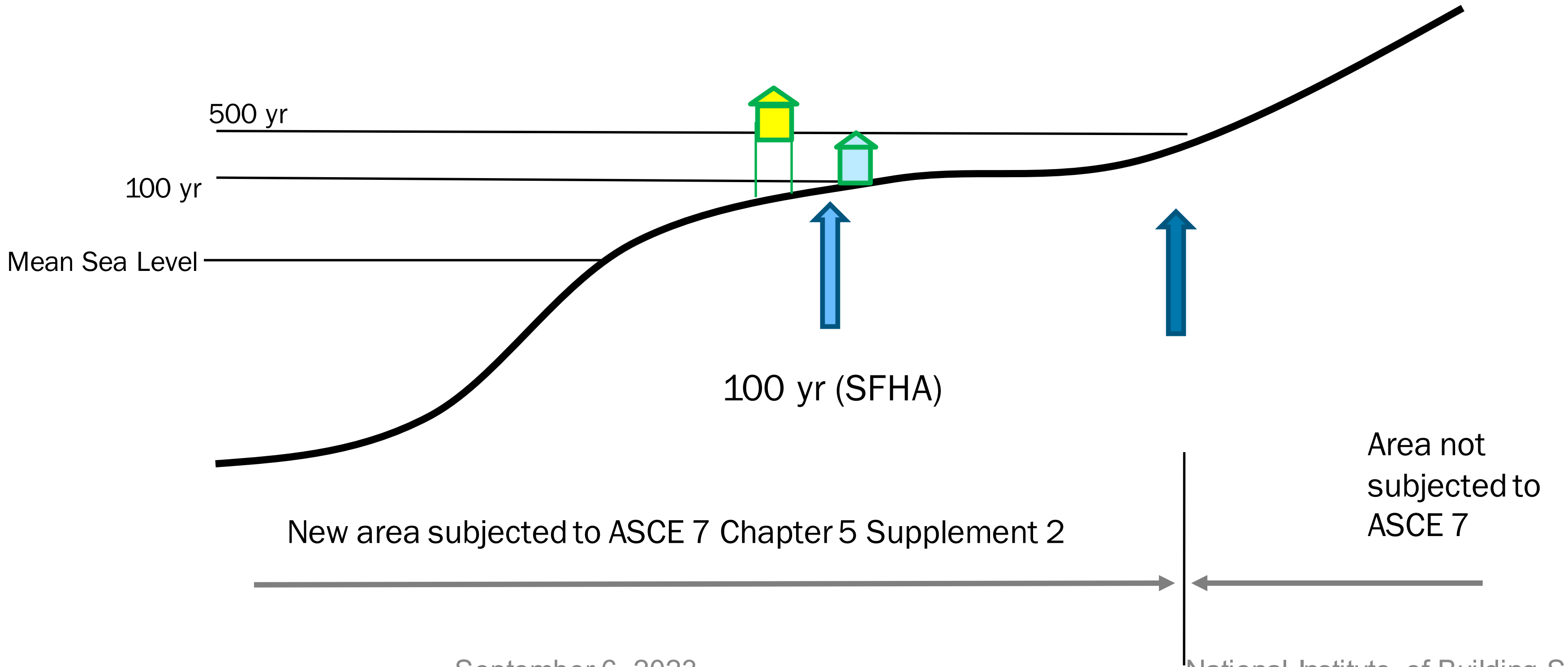
Changes
(ASCE 7-22 Supplement 2)

5.1 **General**
5.2 **Definitions** and Symbols
5.2.1 Definitions
5.2.2 Symbols
5.3 Design Requirements
5.3.1 Flood Hazard Area
5.3.2 Design Loads
5.3.3 Design Stillwater Flood Depth
5.3.3.1 Stillwater Elevation Determination When Data Not Available Beyond the 100-year Flood
5.3.4 Effects of Relative Sea Level Change
5.3.5 Erosion
5.3.6 Flood Velocity
5.3.6.1 Flood Velocity in Coastal Areas
5.3.6.2 Flood Velocity in Riverine Areas
5.3.7 Wave Effects
5.3.7.1 Wave Height
5.3.7.2 Wave Period and Wavelength
5.3.8 Scour
5.3.8.1 Scour at Walls
5.3.8.1.1. Scour at Walls Due to Nonbreaking Waves
5.3.8.1.2. Scour at Walls Due to Breaking Waves
5.3.8.2 Scour at Vertical Piles and Columns
5.3.9 Debris
5.3.9.1 Debris Impact
5.3.9.1.1. Debris Impact Objects
5.3.9.1.2. Site Hazard Assessment for Localized Marine Debris. Shipping Containers, Ships, Small Vessels, and Barges
5.3.9.1.3. Extraordinary Debris Impact Loading
5.3.9.2 Debris Damming
5.3.10 Loads on Breakaway Walls
5.3.11 Site-Specific Studies
5.3.12 Performance Based Design

5.4 Loads During Flooding
5.4.1 Load Basis
5.4.2 Hydrostatic Loads
5.4.2.1 Vertical Hydrostatic Force
5.4.2.2 Lateral Hydrostatic Force
5.4.2.3 Seepage
5.4.3 Hydrodynamic Loads
5.4.4 Wave Loads
5.4.4.1 Wave Loads on Vertical Piles or Columns
5.4.4.1.1. Non-breaking Wave Loads on Vertical Piles or Columns
5.4.4.1.2. Breaking Wave Loads on Vertical Piles or Columns
5.4.4.2 Lateral Wave Loads on Walls
5.4.4.2.1. Lateral Non-Breaking Wave Loads on Non-elevated Vertical Walls
5.4.4.2.2. Lateral Breaking Wave Loads on Non-elevated Vertical Walls
5.4.4.2.3. Lateral Breaking Wave Loads on Non-Vertical Walls
5.4.4.2.4. Lateral Breaking Wave Loads from Obliquely Incident Waves
5.4.4.2.5. Lateral Wave Loads on Walls of Elevated Walls
5.4.4.3 Wave Uplift Forces on Elevated Structures and Non-Elevated Structures with Overhangs
5.4.5 Debris Impact Loads
5.4.5.1 Debris Impact Load Determination
5.4.5.1.1. Simplified Debris Impact Load for Passenger Vehicles or Small Vessels
5.4.5.1.2. Elastic Debris Impact Loads
5.4.5.1.3. Alternate Methods of Debris Impact Analysis
5.4.5.2 Debris Types and Properties
5.4.5.3 Extraordinary Debris Impact
5.4.5.4 Debris Impact Load Redistribution
5.5 Flood Load Cases
5.5.1 Stability for Global Uplift
5.5.2 Stability for Global Sliding
5.6 **Consensus Standards and Other Affiliated Criteria**

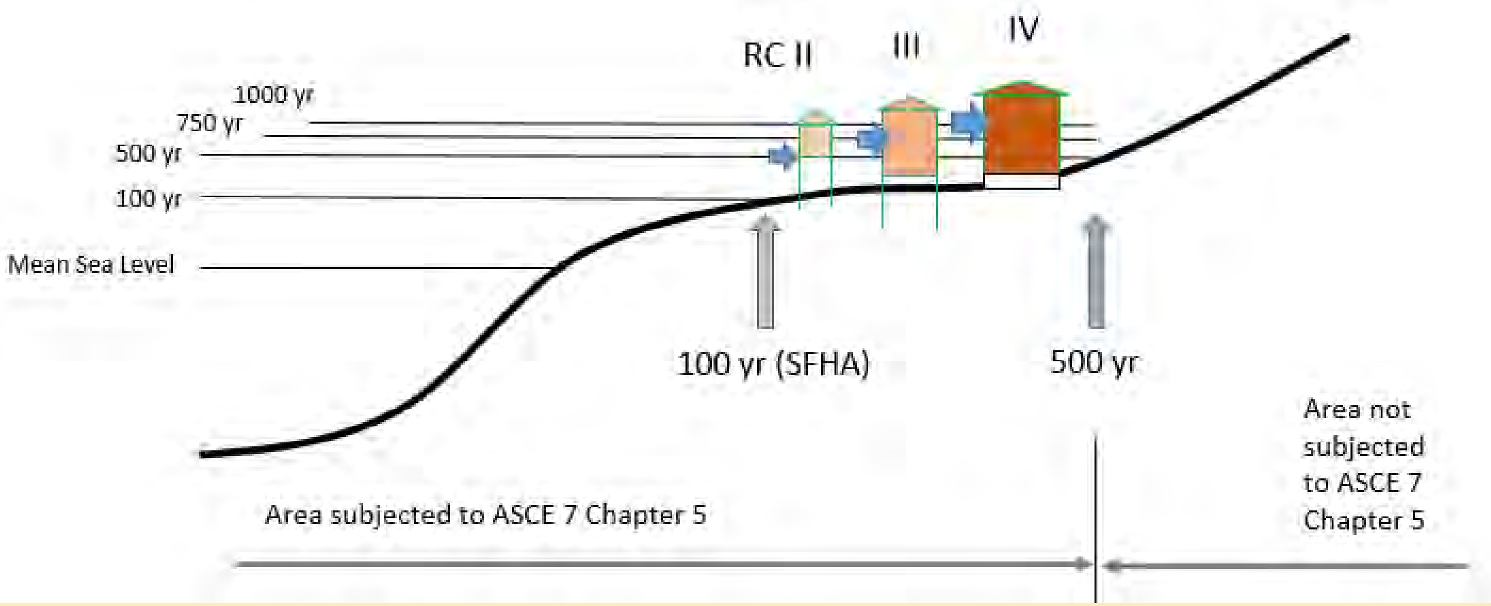
Chapter 5 Revisions (Supplement 2)

Increase the flood hazard **area** from 100-year to 500-year for all RC II, III, and IV structures



Chapter 5 Revisions (Supplement 2)

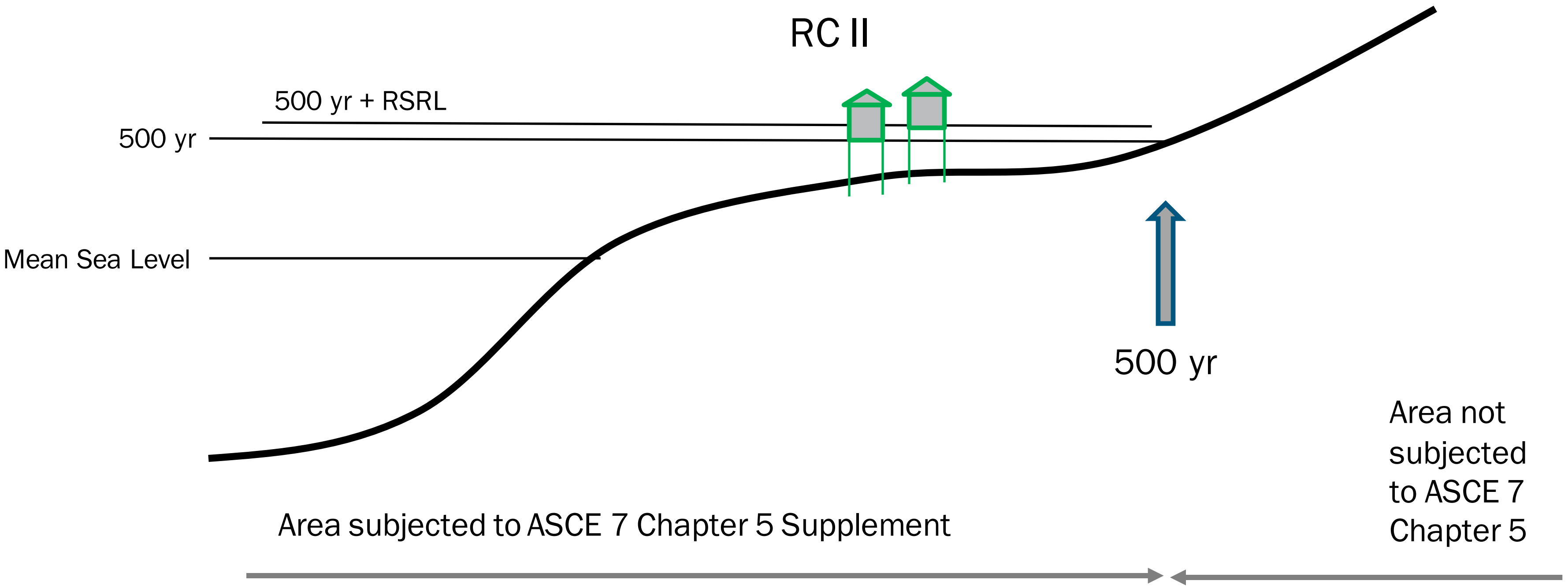
- Incorporate a risk-based approach where flood hazard is tied to structure risk category
  RC I 100-year RC II 500-year RC III 750-year RC IV 1000-year



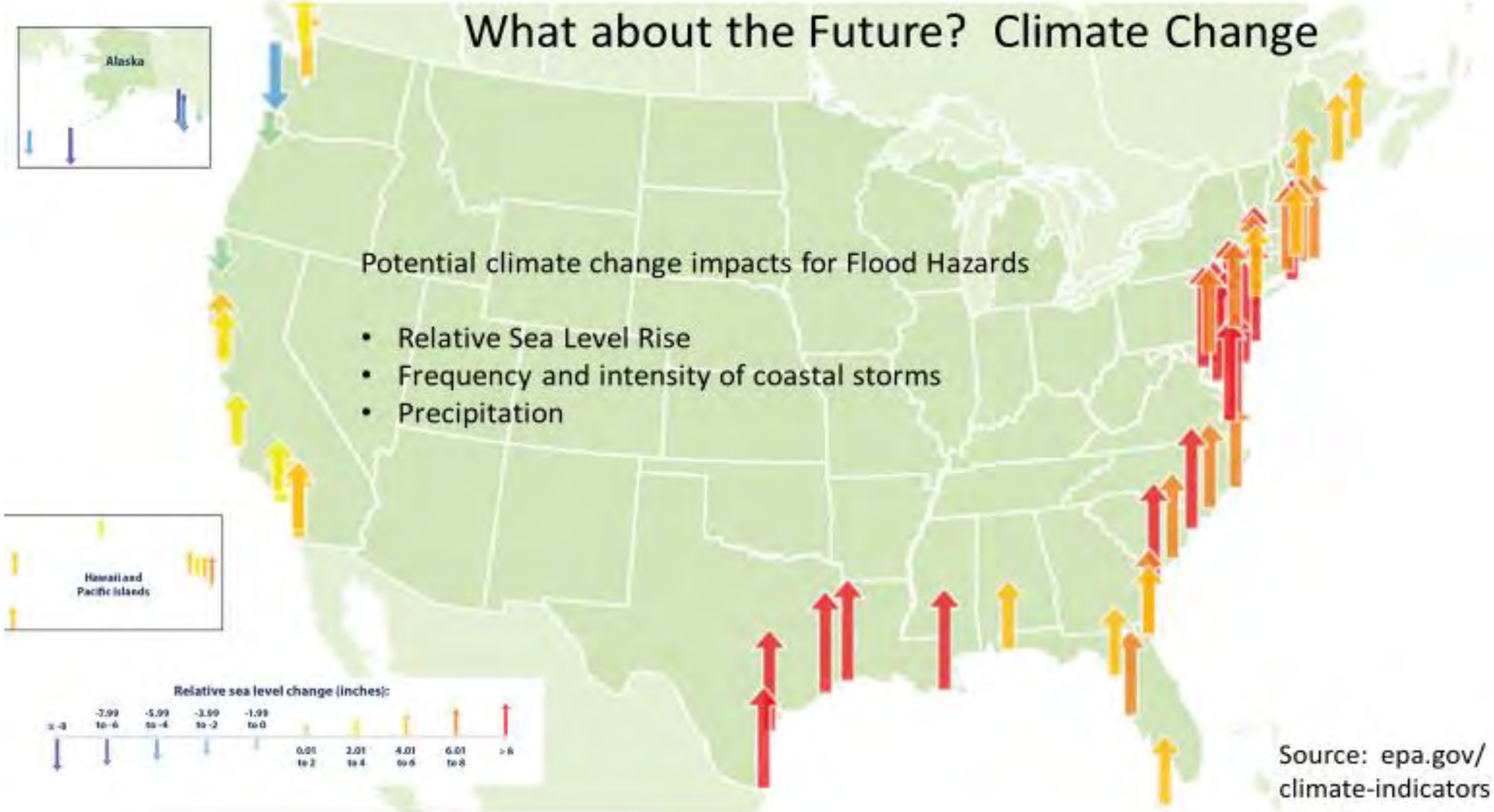
Note: ASCE 7 Chapter 5 does not prescribe elevation requirements for structures. ASCE 24 does that.

Chapter 5 Revisions (Supplement 2)

Add the effects of Relative Sea Level Rise



Future- Climate Change



Chapter 5 Revisions (Supplement 2)

Revisions provide requirements and guidance for Hazards, Loads, Load Cases, Reliability Analysis

- Hazard
  - Flood depth,
  - Flood velocity,
  - Wave conditions,
  - Scour depth,
  - Debris hazards

- Load
  - Hydrostatic,
  - Hydrodynamic,
  - Wave forces,
  - Debris impact

- Load Cases
  - Combinations of loads
  - Stability check

- Reliability Analysis
  - Consistency with Chapter 2

Flood Hazard Area

Hazard

- Flood depth,
- Flood velocity,
- Wave conditions,
- Scour depth,
- Debris hazards

Load

- Hydrostatic,
- Hydrodynamic,
- Wave forces,
- Debris impact

Load Cases

- Combinations of loads
- Stability check

Reliability Analysis

- Consistency with Chapter 2

5.3 DESIGN REQUIREMENTS

5.3.1 Flood Hazard Area.

For Risk Category II, III, and IV structures, the Flood Hazard Area shall be the 500-year floodplain designated as the Special Flood Hazard Area and the Shaded X-Zone. For Risk Category I structures, the Flood Hazard Area shall be the 100-year floodplain designated as the Special Flood Hazard Area.

Intention to extend the design requirements out to the 500-year floodplain for RC II, III, and IV structures

Flood Hazard Area

Hazard

- Flood depth,
- Flood velocity,
- Wave conditions,
- Scour depth,
- Debris hazards

Load

- Hydrostatic,
- Hydrodynamic,
- Wave forces,
- Debris impact

Load Cases

- Combinations of loads
- Stability check

Reliability Analysis

- Consistency with Chapter 2

5.3.3 Design Stillwater Flood Depth.

The design stillwater flood depth, d_f, in ft (m) shall be determined in accordance with Equation 5.3-1:

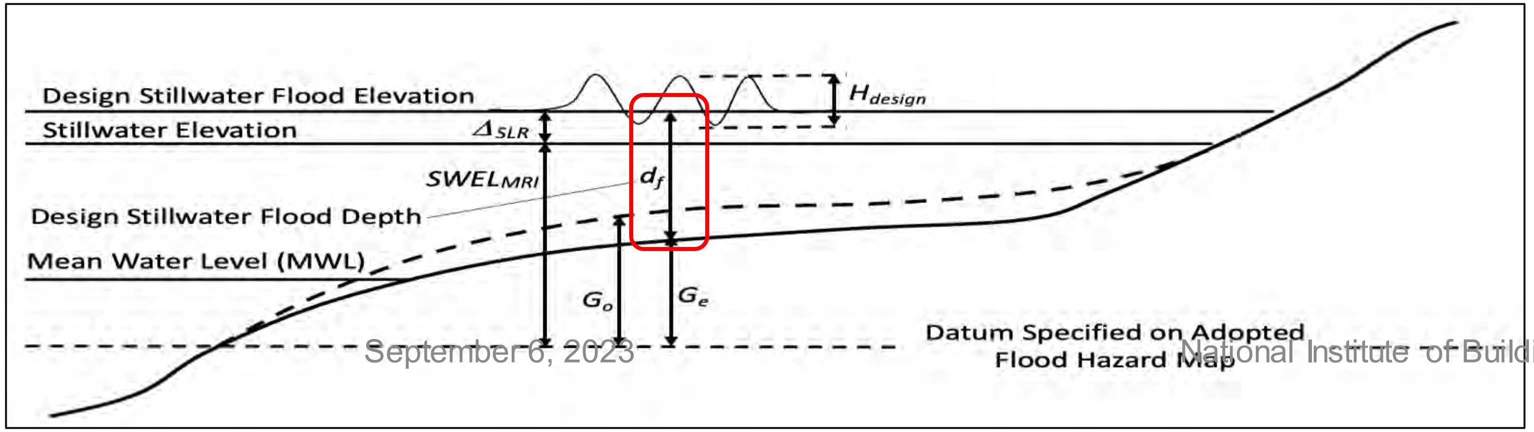
$$d_f = (SWEL_{MRI} - G_e) + \Delta_{SLR} \qquad (5.3\text{-}1)$$

where

$SWEL_{MRI}$ = stillwater elevation corresponding to the risk category and MRI defined in Table 5.3-1 provided by a flood hazard study adopted by the Authority Having Jurisdiction in ft (m). Where the stillwater elevation for a given MRI is not provided in the flood hazard study, the 100-year stillwater elevation shall be scaled to the required MRI per Section 5.3.3.1.

G_e = elevation of grade at the building or other structure inclusive of effects of erosion in ft (m), per Section 5.3.5.

Δ_{SLR} = relative sea level change for coastal sites in ft (m), see Section 5.3.4. D_{SLR} shall not be taken as less than 0.



Flood Hazard Area

Hazard

- Flood depth,
- Flood velocity,
- Wave conditions,
- Scour depth,
- Debris hazards

Load

- Hydrostatic,
- Hydrodynamic,
- Wave forces,
- Debris impact

Load Cases

- Combinations of loads
- Stability check

Reliability Analysis

- Consistency with Chapter 2

5.3.3.1 Stillwater Elevation Determination When MRI Data Not Available.

Where MRI data is not available, $SWEL_{MRI}$ shall be determined according to Equation 5.3-2

$$SWEL_{MRI} = C_{MRI}\,(SWEL_{100} - Z_{datum}) + Z_{datum} \qquad (5.3\text{-}2)$$

where

$SWEL_{100}$ = stillwater elevation for the 100-year MRI provided by a flood hazard study adopted by the Authority Having Jurisdiction in ft (m).

C_{MRI} = flood scale factor associated with the MRI from Table 5.3-1 for different locations.

Z_{datum} = elevation of mean water level based on local datum, in ft (m). For riverine sites, Z_{datum} shall be taken as the annual high-water level. Z_{datum} shall be permitted to be taken as zero for coastal sites. Values for $SWEL_{100}$, $SWEL_{MRI}$, and G_e shall all reference the same local datum.

V

Risk Category	MRI (year)	Annual Exceedance Probability (AEP)	C_{MRI} Gulf of Mexico Coastal Sites[1]	C_{MRI} All Other Coastal Sites[1]	C_{MRI} Great Lakes Sites[2]	C_{MRI} Riverine Sites
I	100	1.00%	1.00	1.00	1.00	1.00
II	500	0.20%	1.35	1.25	1.15	1.35
III	750	0.13%	1.45	1.35	1.20	1.45
IV	1,000	0.10%	1.50	1.40	1.25	1.50

Intention is to use modern flood information as it becomes available.

Requirement to Consider Sea Level Rise Based on Historic Rates

Hazard

- o Flood depth,
- o Flood velocity,
- o Wave conditions,
- o Scour depth,
- o Debris hazards

Load

- o Hydrostatic,
- o Hydrodynamic,
- o Wave forces,
- o Debris impact

Load Cases

- o Combinations of loads
- o Stability check

Reliability Analysis

- o Consistency with Chapter 2

5.3.4 Effects of Relative Sea Level Change.

The effects of relative sea level change shall be included in the calculation of flood conditions and flood loads for sites whose flooding comes from coastal sources. A project lifecycle of not less than 50 years shall be used for this quantification. The minimum rate of relative sea level change shall be the historically recorded sea level change rate for the site over a 50-year period. The increase in relative sea level during the project lifecycle of the structure shall be added to the design stillwater flood elevation as required by Section 5.3.3.

Historic rate does not include climate projections

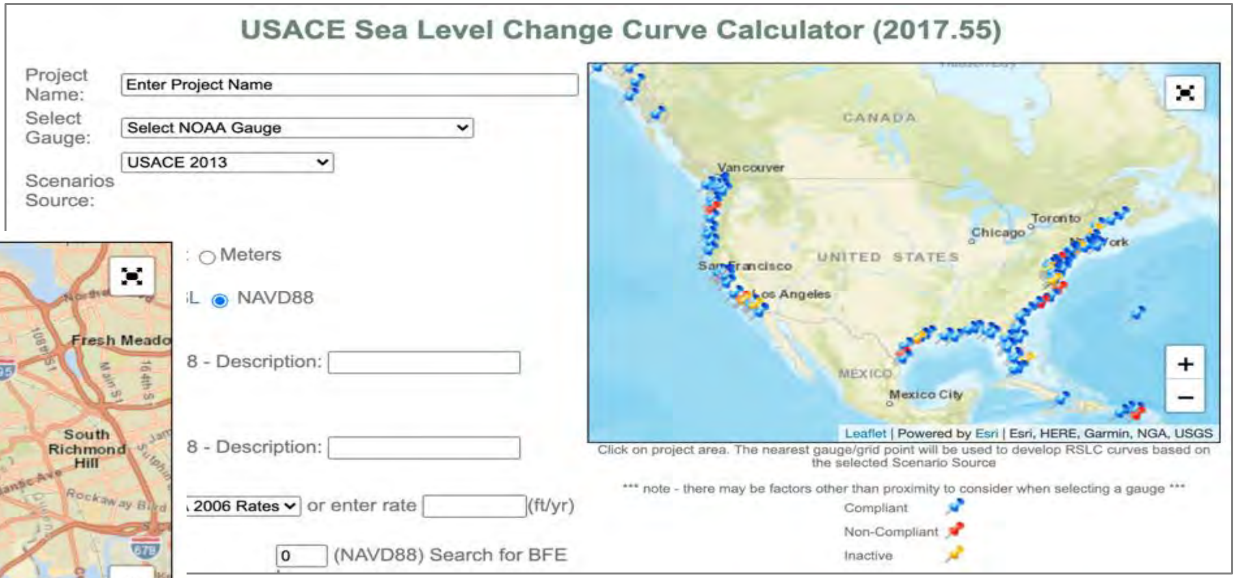


Figure shows how designer can get the necessary sea level rise information for project site

Combination of Loads

Hazard

- Flood depth,
- Flood velocity,
- Wave conditions,
- Scour depth,
- Debris hazards

Load

- Hydrostatic,
- Hydrodynamic,
- Wave forces,
- Debris impact

Load Cases

- Combinations of loads
- Stability check

Reliability Analysis

- Consistency with Chapter 2

5.5 FLOOD LOAD CASES

The flood load (F_a) used in the Chapter 2 load combinations shall include the following flood load cases in the applicable directions:

For coastal flooding:

1. Combination of hydrostatic loads including buoyancy (5.4.2), hydrodynamic loads (5.4.3) and debris impact loads (5.4.5)
2. Combination of hydrostatic loads including buoyancy (5.4.2), hydrodynamic loads (5.4.3) and wave loads (5.4.4)

For riverine flooding:

1. Combination of hydrostatic loads including buoyancy (5.4.2), hydrodynamic loads (5.4.3) and debris impact loads (5.4.5)

5.5.1 Stability for Uplift.
5.5.2 Stability for Sliding.

Clear requirement on how individual loads must be combined

Overall flood load F_a is used in Chapter 2.

Stability checks are often done in practice, but existing standard does not include this.

Summary

Complete revision to Chapter 5

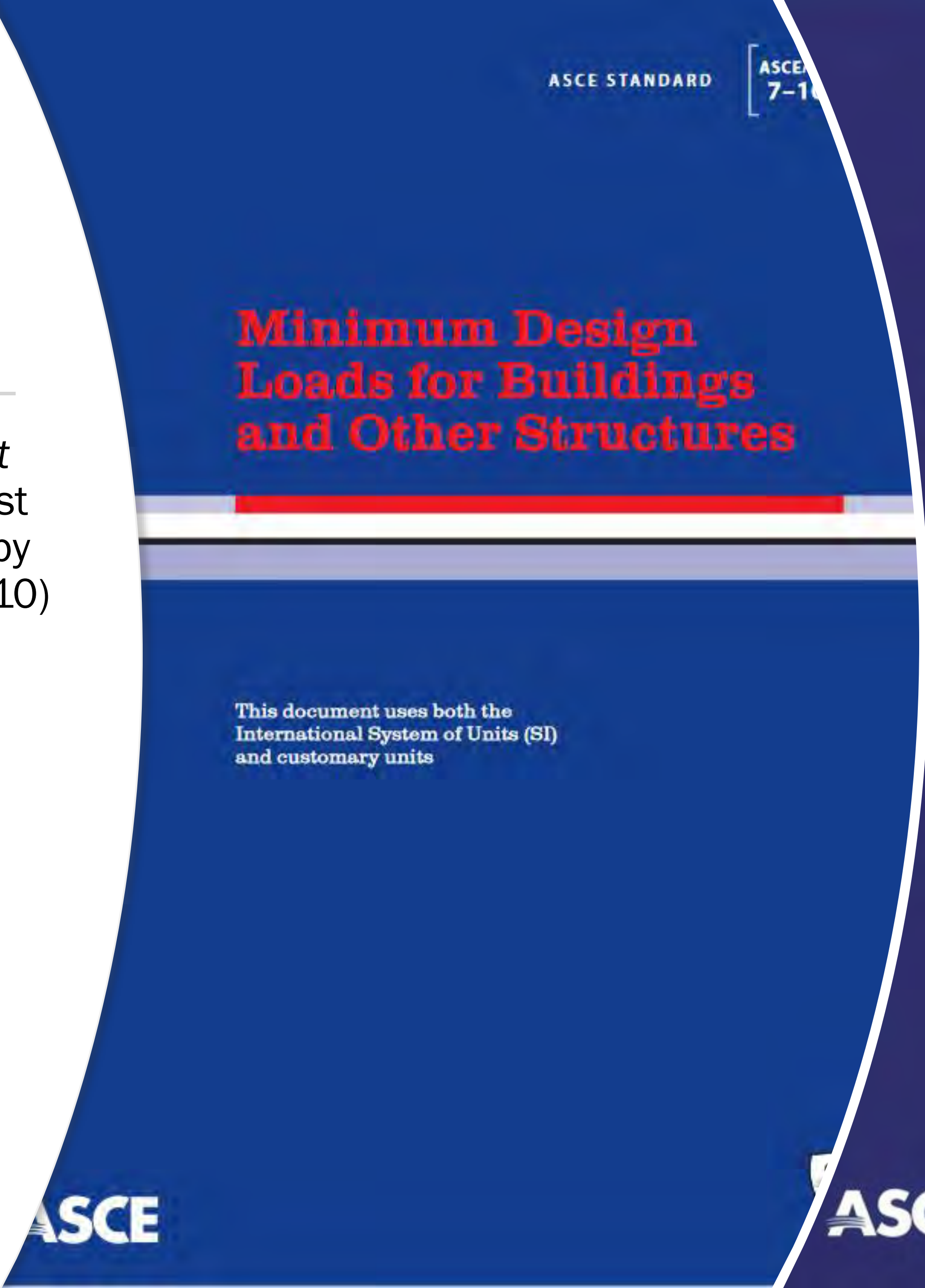
- Increase the flood hazard area from 100-year to 500-year for all RC II, III, and IV structures
- Incorporate a risk-based approach where flood hazard is tied to structure risk category
  RC I 100-year RC II 500-year RC III 750-year RC IV 1000-year
- Hazards: Flood depth, velocity, wave, scour and debris hazards
- Loads: Provides hydrostatic, hydrodynamic, wave, and debris impact loads
- Load cases: Combination of flood loads and stability checks, consistency w/ Chapter 2

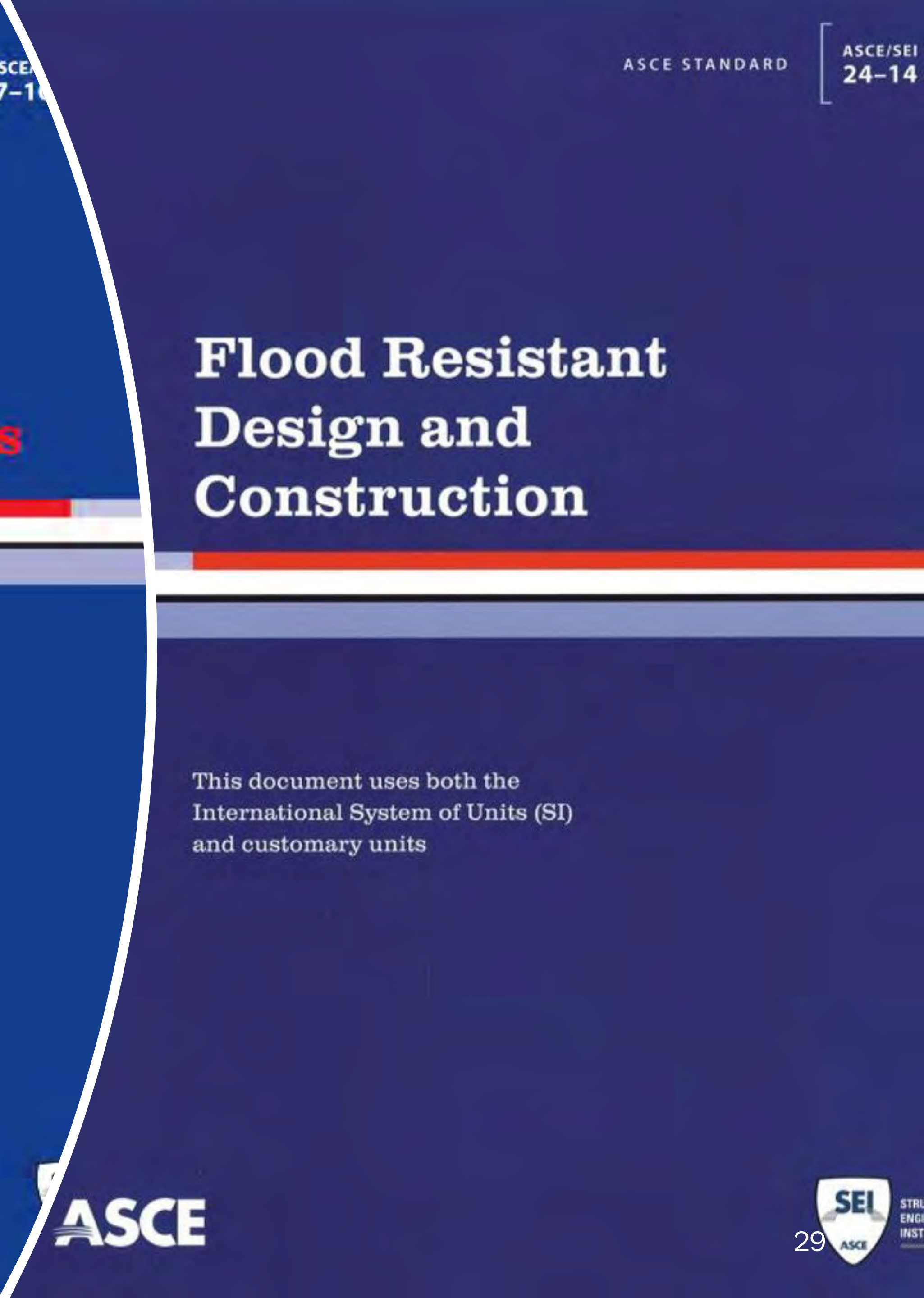
Implementation

- Understand how proposed changes would affect engineering design and impact related standards
- Document analytical work and case studies for future cycles and for engineering practice

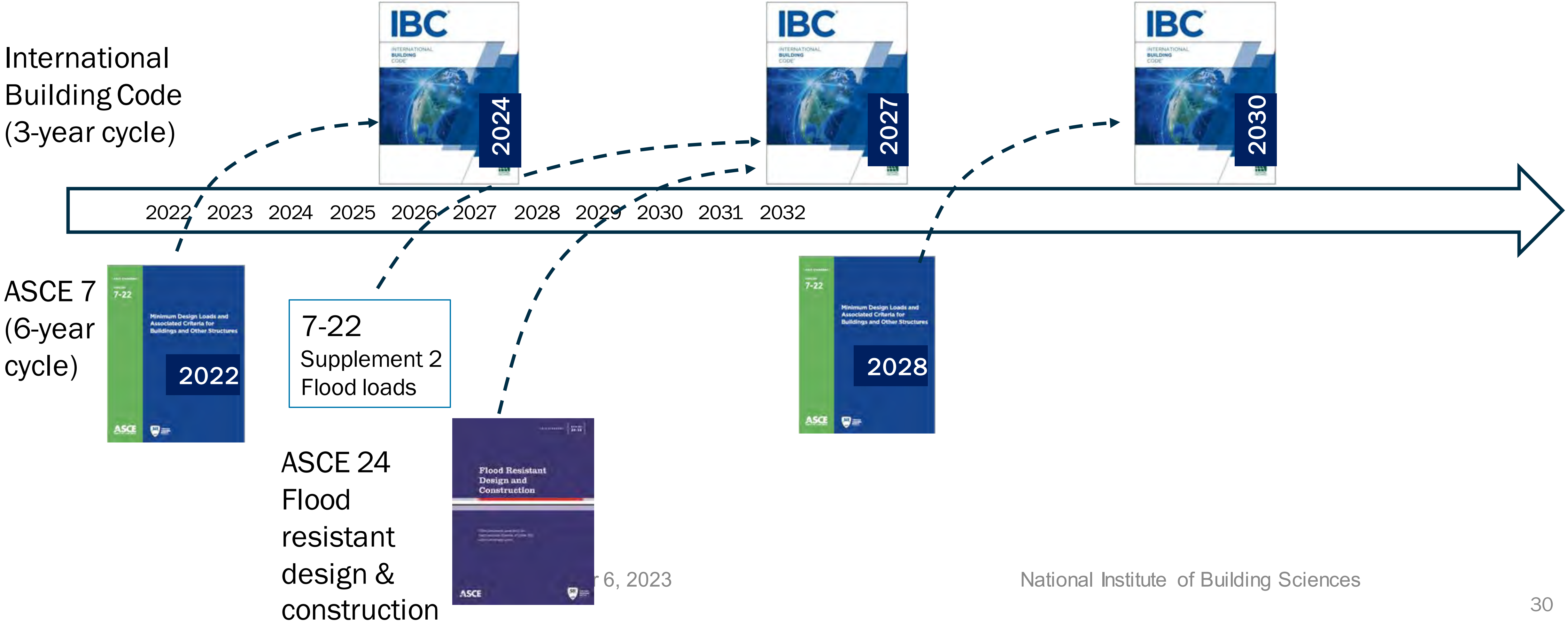
ASCE 7 informs ASCE 24

- ASCE 24-14: *Flood Resistant Design and Construction*, last updated in 2014, informed by ASCE 7-10 (published in 2010)
- ASCE 7-10 mostly considers base flood elevation and freeboard. It's less rigorous and less risk-informed than ASCE 7-22 Supplement 2.
- ASCE is working quickly to incorporate ASCE 7-22 into ASCE 24. A new version of ASCE 24 is expected to be published in fall 2024.





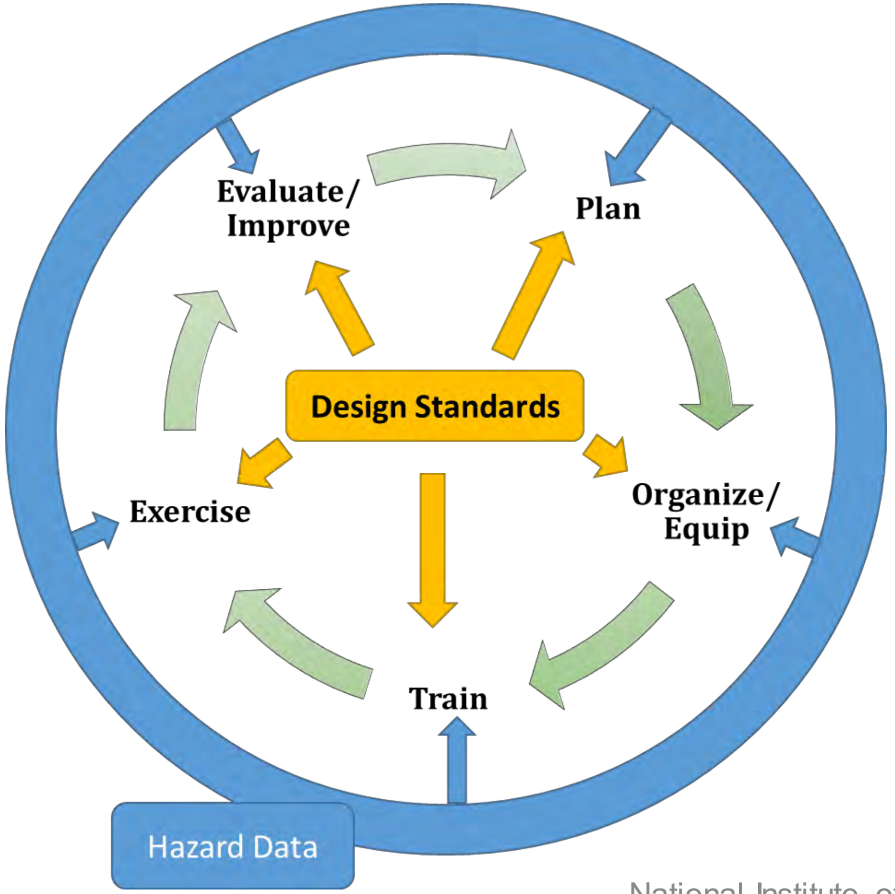
From ASCE Standard to ICC Code Adoption



FEMA's Role

- Provides Support to:
  - Communities
  - Design Community
  - Other Agencies
- Through:
  - Funding/Flood Insurance
  - Hazard Data Products
  - Guidance Publications
  - Technical Assistance

- Hazard & Design Data Is Key!



Federal Contribution

- Data from the **US Army Corps of Engineers** contributed to the C_{MRI} factor in ASCE 7 Chapter 5 Flood Loads
- Research, Data, Studies from **USGS, NIST, NOAA, FEMA**
- Participation in ASCE Standards Committees
- Integration of flood resistant design and construction requirements in consensus codes and standards
- Guidance on flood code provisions
- FEMA currently evolving flood hazard data from binary to graduated risk

Table 5.3-1. Design Flood MRI Scaling Factors.

Risk Category	MRI (year)	Annual Exceedance Probability (AEP)	C_{MRI} Gulf of Mexico Coastal Sites[1]	C_{MRI} All Other Coastal Sites[1]	C_{MRI} Great Lakes Sites[2]	C_{MRI} Riverine Sites
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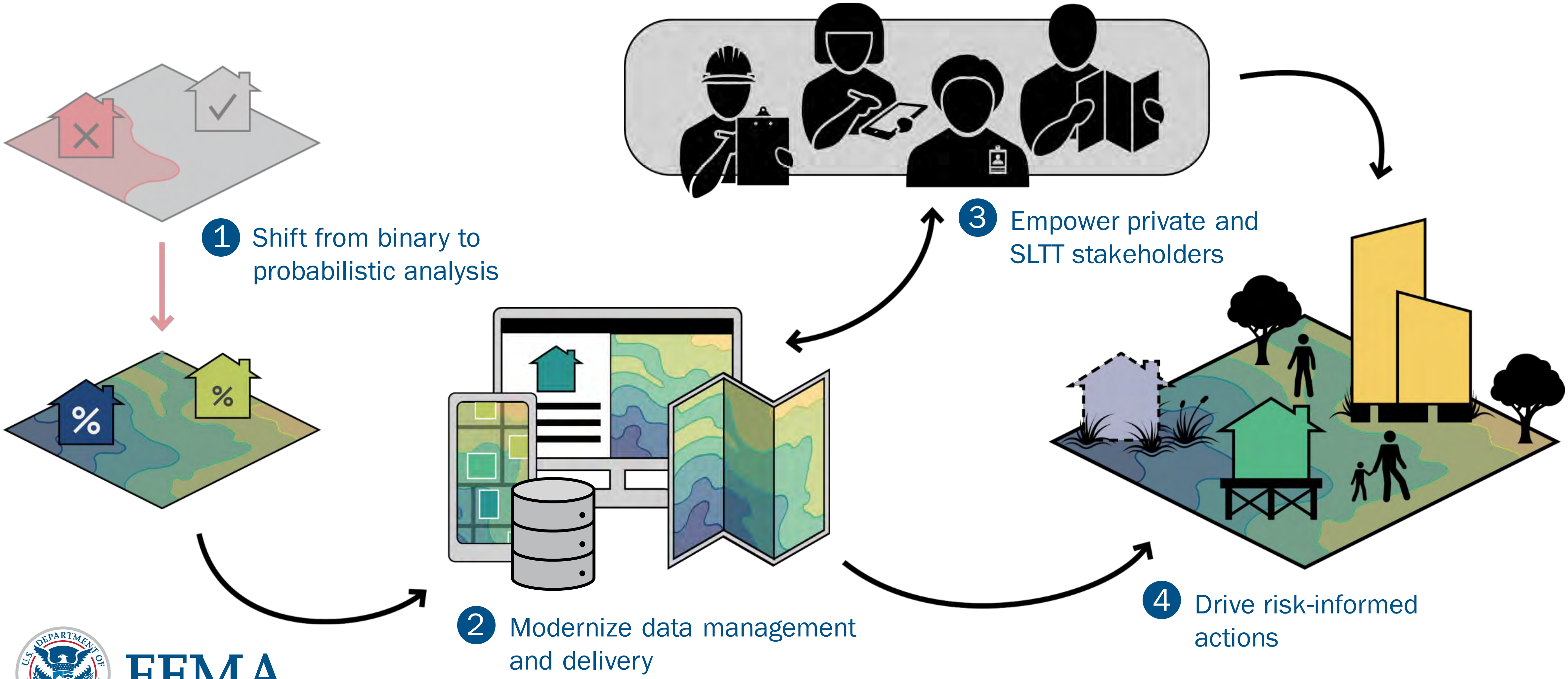
[1]Gulf Coast site scale factors are for coastlines of Texas, Louisiana, Mississippi, Alabama, and Florida west of 80.75 degrees W. All other coastlines shall be taken as Other.

[2]If flood loading is being considered on other lakes, the scale factors for riverine sites shall be used.

Source - ASCE Standard 7-22 Minimum Design Loads and Associated Criteria for Buildings and Other Structures SUPPLEMENT 2

Future of Flood Risk Data (FFRD)

Future of Flood Risk Data (FFRD) Initiative: Objectives



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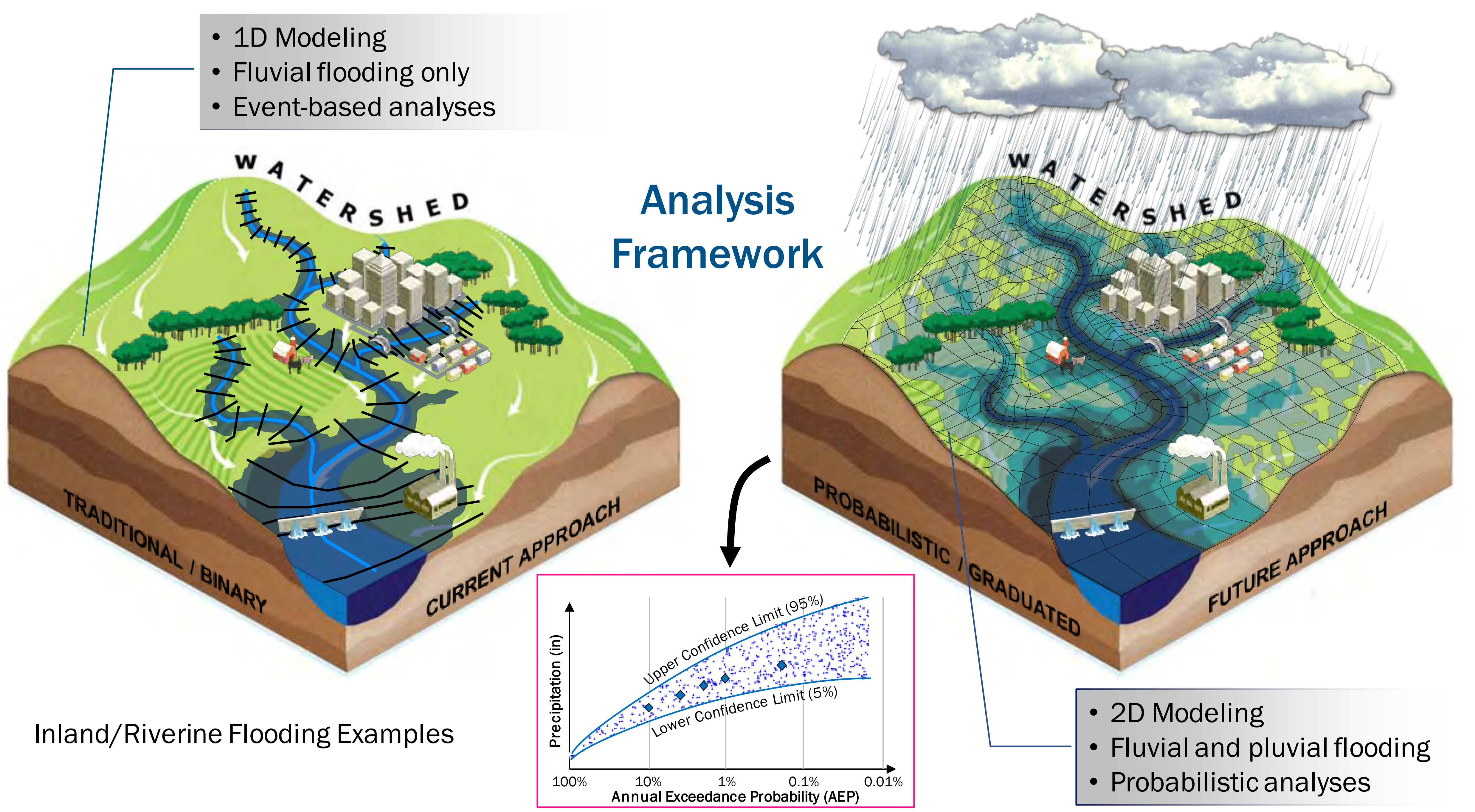
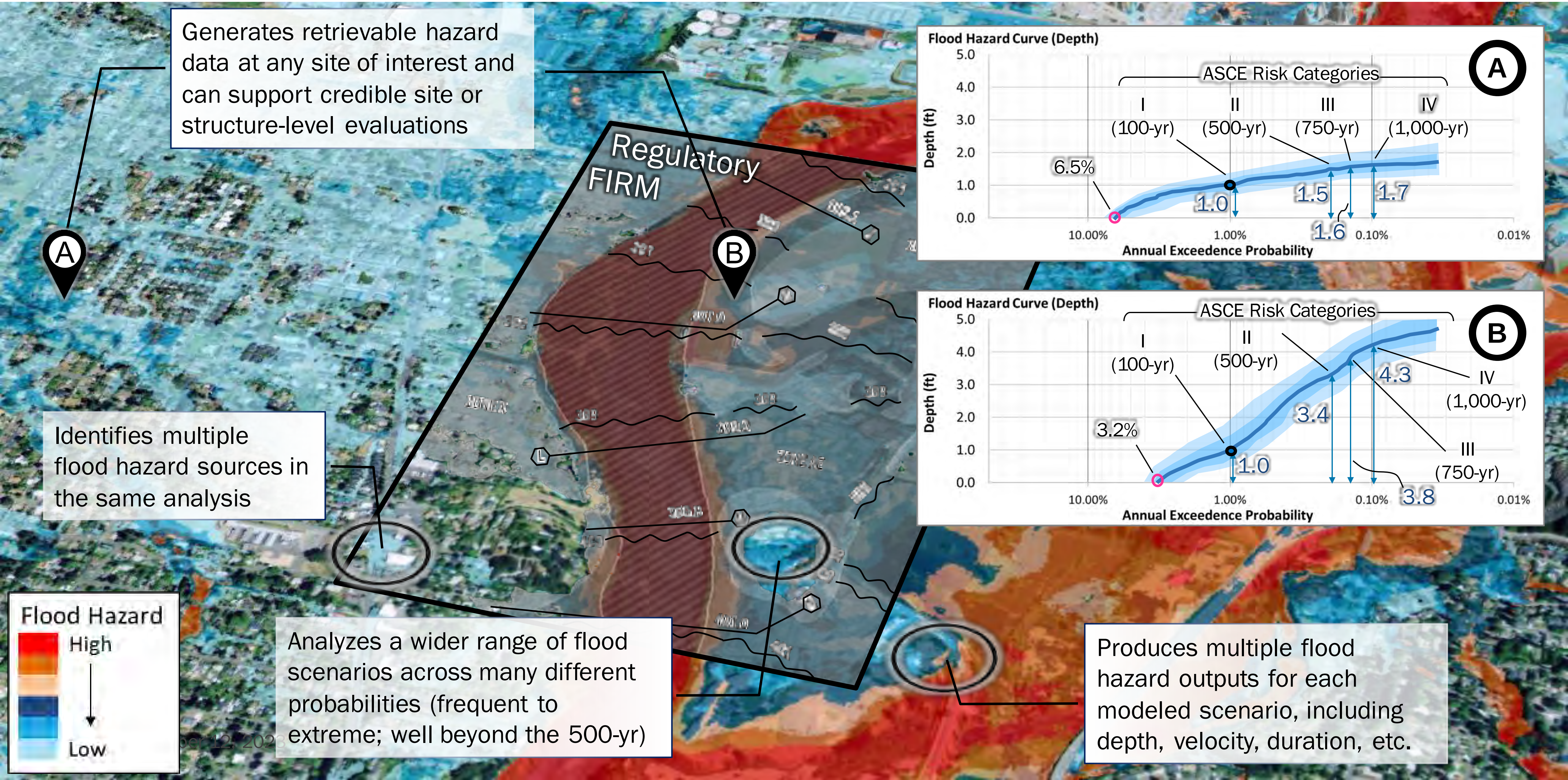
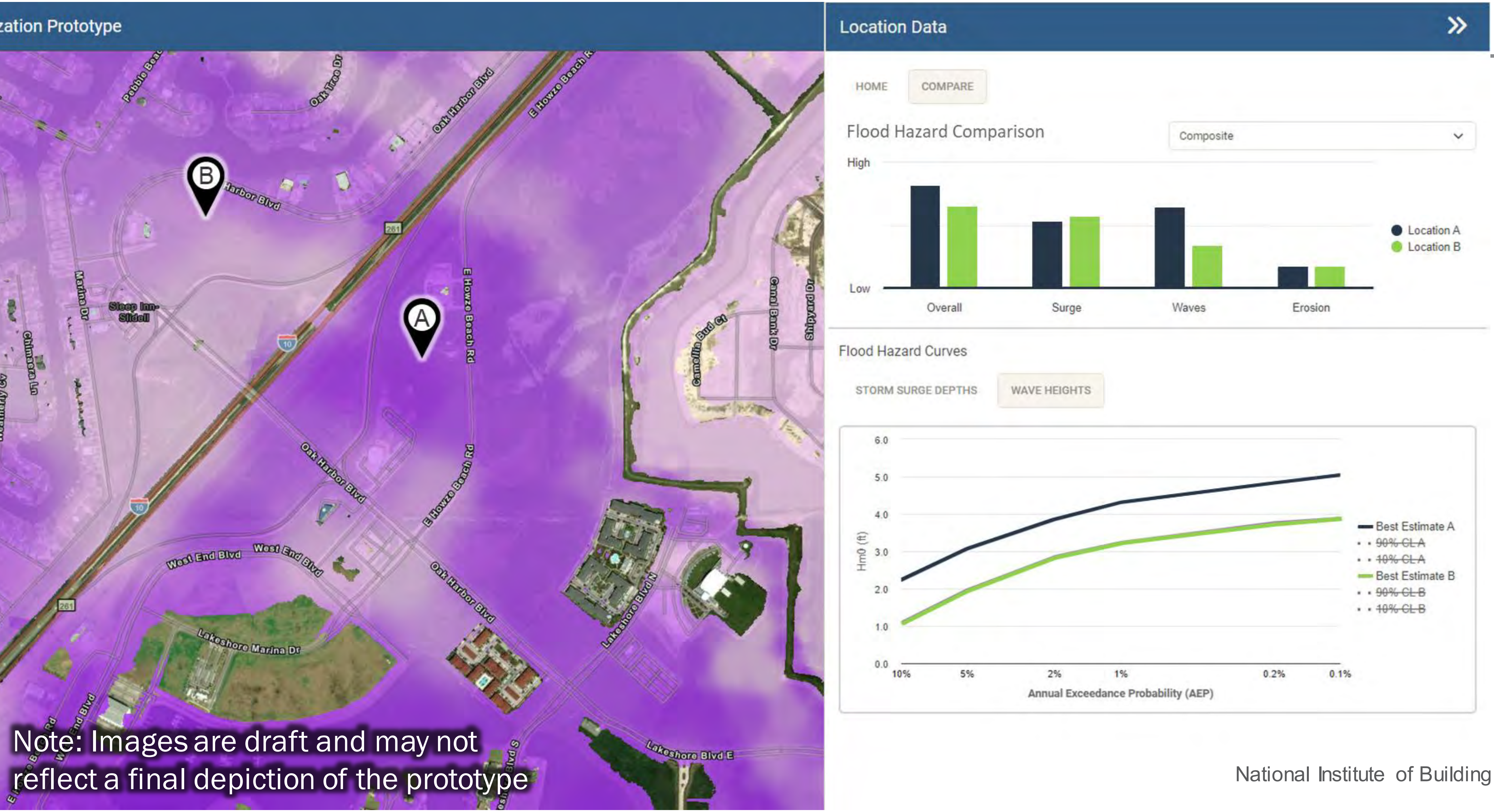

• 1D Modeling
• Fluvial flooding only
• Event-based analyses
WATERSHED
TRADITIONAL / BINARY
CURRENT APPROACH
Analysis Framework
WATERSHED
PROBABILISTIC / GRADUATED
FUTURE APPROACH
Upper Confidence Limit (95%)
Lower Confidence Limit (5%)
Precipitation (in)
100%
10%
1%
0.1%
0.01%
Annual Exceedance Probability (AEP)
Inland/Riverine Flooding Examples
• 2D Modeling
• Fluvial and pluvial flooding
• Probabilistic analyses

Some of the Features, Benefits, and Uses of FFRD



Prototype – Compare Conditions at Multiple Sites



Note: Images are draft and may not reflect a final depiction of the prototype

Developing Guidance on Supplement with Examples

Standard 7-22
Minimum Design Loads and Associated Criteria for Buildings and Other Structures

SUPPLEMENT 2

Chapter 1: General

1.3.1.3 Performance Based Procedures
Structural and nonstructural components and their connections designed with performance-based procedures shall be demonstrated by analysis in accordance with Section 2.3.5 or by analysis procedures supplemented by testing to provide a reliability that is generally consistent with the target reliabilities stipulated in this section.

Structural and nonstructural components subjected to dead, live, environmental, and other loads except earthquake, tsunami, and loads from extraordinary events shall be based on the target reliabilities in Table 1.3-1. Structural systems subjected to earthquake shall be based on the target reliabilities in Table 1.3-2 and 1.3-3. The design of structures subjected to tsunami loads shall be based on the target reliabilities in Table 1.3-4. Structures, components, and systems that are designed for extraordinary events, using the requirements of Section 2.5 for scenarios approved by the Authority Having Jurisdiction, shall be based on the target reliabilities in Table 1.3-5. The analysis procedures used shall account for uncertainties in loading and resistance.

Chapter 2: Combinations of Loads

2.2 SYMBOLS
A_k = Load or load effect arising from extraordinary event A

D = Dead load

D_i = Weight of ice

E = Earthquake load

F = Load caused by fluids with well-defined pressures and maximum heights

S2-1

Minimum Design Loads and Associated Criteria for Buildings and Other Structures

CLARIFICATION **text boxes provide additional information on topics to elicit a deeper understanding which may include section introduction information.**

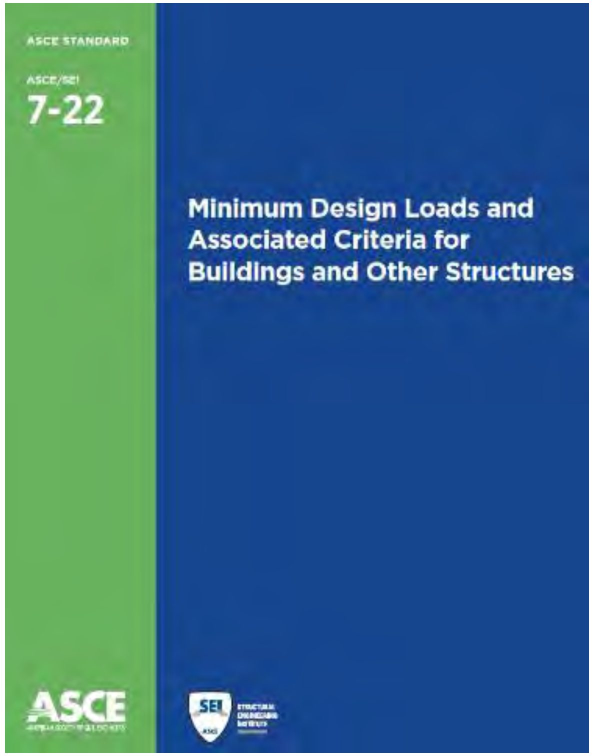
EXCEEDING MINIMUMS **text boxes provide methods and rationale to consider going above the minimums outlined in ASCE 7-22 Supplement 2 (ASCE 7-22-S2).**

ADDITIONAL CONSIDERATIONS **text boxes provide additional guidance to practitioners to aid in the completion of load calculations or a compliant design.**

RESOURCES **text boxes provide resources for further details on a specific topic or for tools to perform specific tasks.**

EXAMPLE **text boxes provide example calculations of methods either defined by ASCE-22-S2, this guidance document, or a combination thereof.**

Remain engaged in advancing flood-resilient standards



Pathways to Resilient Communities (1).pdf (asce.org)

Coming Attractions: **ASCE 7-28**

ASCE 7-28 **Future Conditions** Subcommittee goals;

- Current loads based on historical data, which may not represent future conditions well with respect to climate related loads in particular
- Propose a new chapter for ASCE 7-28 (chapter 36)
- Written in mandatory language for potential (voluntary) adoption by jurisdictions/projects
- Address **Flood, Snow, Rain, Ice, & Wind**
- Starting point for us: “preparing for a 3 deg C world” and its impacts on loads
- Use climate models rather than analysis of historical data
- Modifies environmental loads for those who wish/required to include them.
- Will be dependent on Design Life/Risk Category of the building

National Initiative to Advance Building Codes (NIABC) Priorities

Modernize Building Codes

- Incentivize state, local, tribal and territorial governments to adopt and enforce current building codes
- Improve resilience to hazards
- Incorporate science and technology

Improve Climate Resilience

- Increase smart design and construction
- Build resilience to extreme weather events
- Save lives and reduce property damage

Reduce Energy Costs

- Increase energy efficiency
- Establish federal building performance standards
- Achieve net-zero emissions across federal buildings by 2045

Prioritize Underserved Communities

- Invest in capacity building for communities
- Provide tools to reduce damage and accelerate recovery
- Identify needs for rural and underserved communities

Create Good Jobs

- Develop equitable workforce training partnerships
- Assist federal, state and local agencies in creating high-quality job opportunities
- Prioritize needs of disadvantaged communities

USDA FEMA SBA GSA NOAA NIST US Army Corps of Engineers

Mitigation Framework Leadership Group (MitFLG) Progress Report:

National Initiative to Advance Building Codes

December 2022

https://www.fema.gov/sites/default/files/documents/fema_niabc-progress-report_122022.pdf

NIABC: A Brief History

- **FACT SHEET:** Biden-Harris Administration Launches Initiative to Modernize Building Codes, Improve Climate Resilience, and Reduce Energy Costs released June 1, 2022.
- **Building Codes Task Force** formed under the Mitigation Framework Leadership Group to advance the 5 Key Priorities and 3 Key Activities in year one.
- **Agency implementation plans** developed to implement and advance the NIABC.
- **Progress Report** delivered to the White House Council on Environmental Quality and Climate Policy Office.
- **NIABC Infographic** developed to share national progress.

Key Priorities

- Modernize Building Codes
- Improve Climate Resilience
- Reduce Energy Costs
- Prioritize Underserved Communities
- Create Good Jobs

White House NIABC Implementation

NIABC Priorities

- Modernize Building & Energy Codes
- Reduce Energy Costs
- Prioritize Underserved Communities
- Create Good Jobs
- Improve Climate Resilience

NIABC Opportunities for Impact

122 programs
that fund construction, finance construction, and/or fund technical assistance across 8 agencies

(Source: NIABC Landscape Analysis)

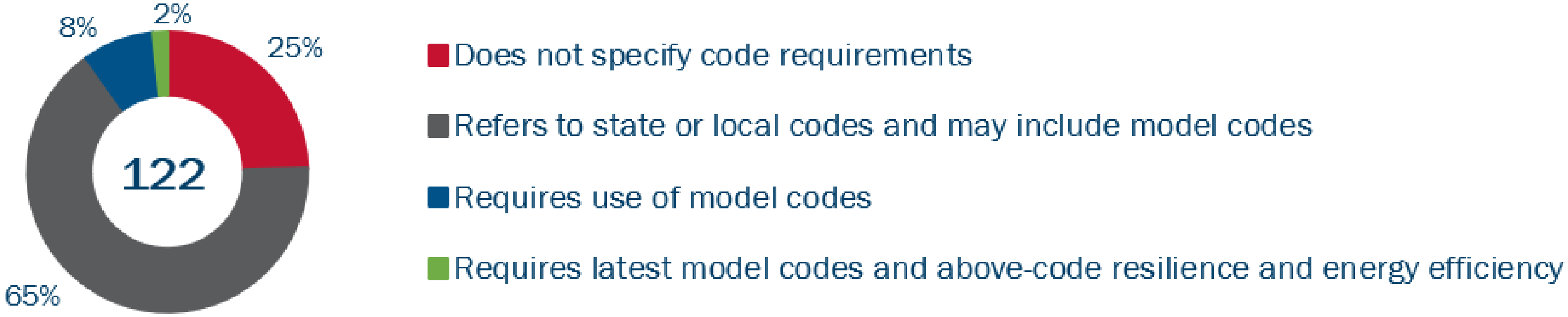
$100 billion+
available annually to **fund** construction

$500 billion+
available annually to **finance** construction

(Source: www.SAM.gov)

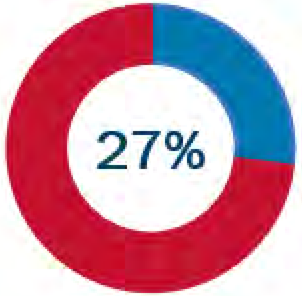
Program Building Code Requirements

Only 2% of tracked programs require the latest model codes and above-code resilience and energy efficiency.

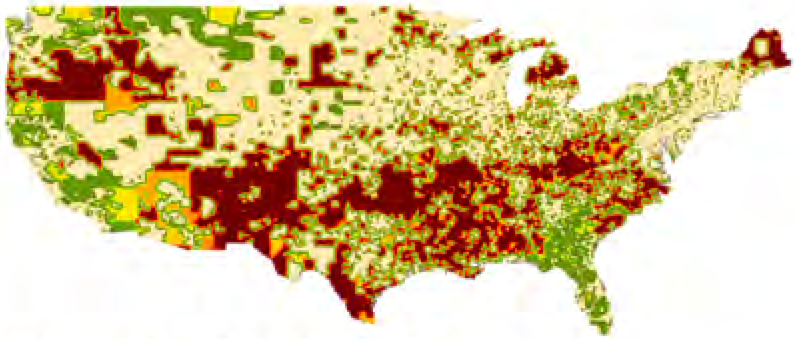


Most recent data collected April 2023; all percentages rounded to nearest whole number.

Looking Forward



Only 27% of jurisdictions across the U.S. have adopted hazard-resistant codes. *(BCAT, March 2023)*



An estimated 50% of jurisdictions with disadvantaged communities have not adopted hazard-resistant building codes. Communities across the South and Midwest are particularly vulnerable. *(BCAT, December 2022)*

Next Steps:

- *Develop codes and standards inventory*
- *Enhance equity and environmental justice guidance*
- *Leverage DOL resources to advance job quality*
- *Explore nexus between building and energy codes to promote and achieve above code and net zero*

NIABC Challenges and Year Two Priorities

Interagency Collaboration

- **Develop MOUs,** code implementation guidance, and guidance for funding and support for communities
- **Explore best practices across agencies:**
  - **Determine agency review processes and distribution of guidance**
  - **Provide feedback to finalize best practice guidance**
  - **Update or amend agency programs and guidance**
- Affordability and Community Needs
  - Utilize place-based approach, identify gaps to inform NOFOs, MOUs, etc., to better support communities and reward progress for code adoption
  - Prioritize underserved communities and examine nexus between energy, disaster resilience and affordability to better support communities. Address rural and Tribal outreach needs for technical assistance

Building Codes and Standards Expertise

- **Identify relevant POCs to develop a cadre of federal expertise**
  - Leverage SMEs across interagency and its working groups
  - Develop synergies with USFA & Fire Service
- Determine effective verification to measure success around resilience
- Identify relevant training opportunities
- Tie work to environmental justice, underserved communities and climate adaptation, and make the necessary building code overlays more explicit to get leadership buy-in

Communications

- Establish a federal communications cadre linking experts across federal agencies to develop NIABC story. Activities include:
  - Develop a strategic communications plan to **establish consistent communications around codes and standards**. Messaging considerations include illustrating financial benefits of codes and standards adoption; linking codes and standards, environmental justice, underserved communities and climate adaptation; etc.
  - Develop materials (e.g., talking points, one-pagers, etc.) to **garner buy-in from agency leadership** and other key stakeholders for NIABC
  - **Establish communication channels** with industry partners and federal interagency groups, and learn from public private partnerships
  - Strengthen engagements with external partners such as industry groups, public, communities, SLTTs (e.g., Tribal consultations) and HUD Tribal Intergovernmental Advisory Committee

Research and Data Needs

- **Data to illustrate ROI and benefits of building codes and standards to garner leadership buy-in.** Examples include examining:
  - Funds towards resilience and building codes
  - Accessible data for cost benefit analyses on use of IRC and IBC
  - Approaches quantified by hazard, energy, and severity of risk (annually)
  - Program compliance mechanisms to require codes and standards
  - Insurance claim reductions linkages with building codes
  - Affordability and community needs: examine certifications, implementation guidance and non-financial incentives, and compliance considerations

Advancing Flood-Resilient Standards, Design and Construction

- Advancing Flood Resilient Building Design
- Incorporating Future Conditions into Flood Design
- Future of Flood Risk Data (FFRD)
- Codes and Standards

Questions?

FEMA Flood/Wind Building Science Helpline:
FEMA-BuildingScienceHelp@fema.dhs.gov
866-927-2104

http://www.fema.gov/building-science