



US Tall Building Fire Safety Post 9/11

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Overview

- ICC and US Regulations
- Impact of 9/11
- Today's Fire Safety Concerns
- Regulatory Infrastructure

International Code Council (ICC)

- NGO – Not for profit public benefit organization
- 64,000 members
- Publish 15 model codes (3 year cycle) and 18 standards



Hear on the order of
3000 proposals every
three years

Society of Fire Protection Engineers (SFPE)



The world's leading professional society for fire protection and fire safety engineering:

- 4,700 members around the world
- Publish handbooks, standards, two magazines, and more
- Education is a priority – SFPE hosted 88 live webinars and online seminars last year alone on all aspects of fire protection engineering.

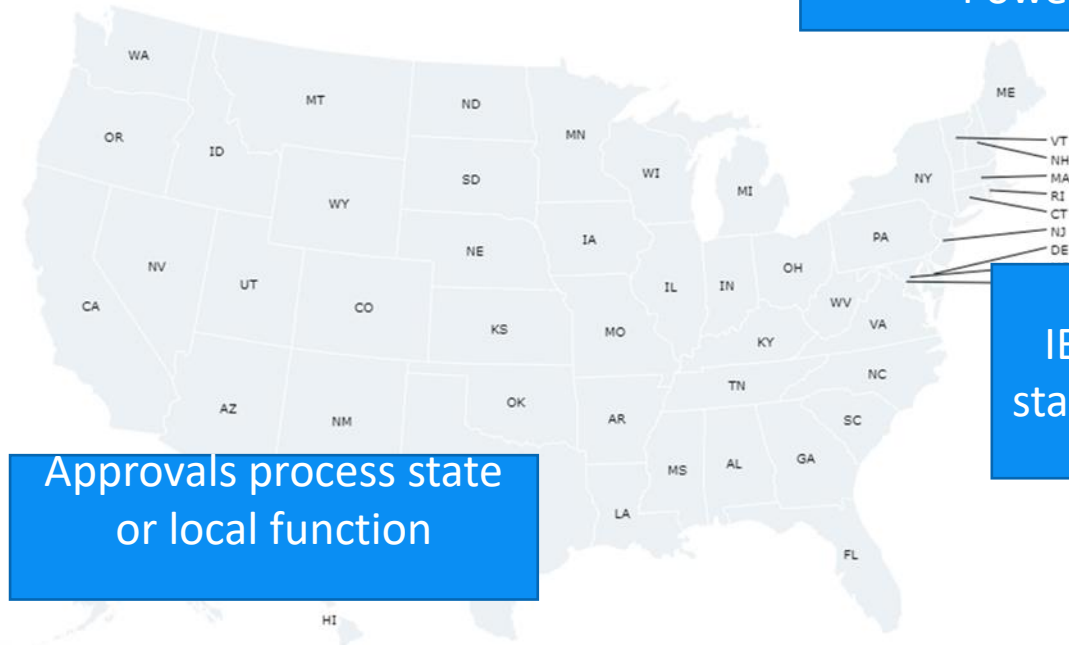


Family of Solutions



US Building Regulatory System

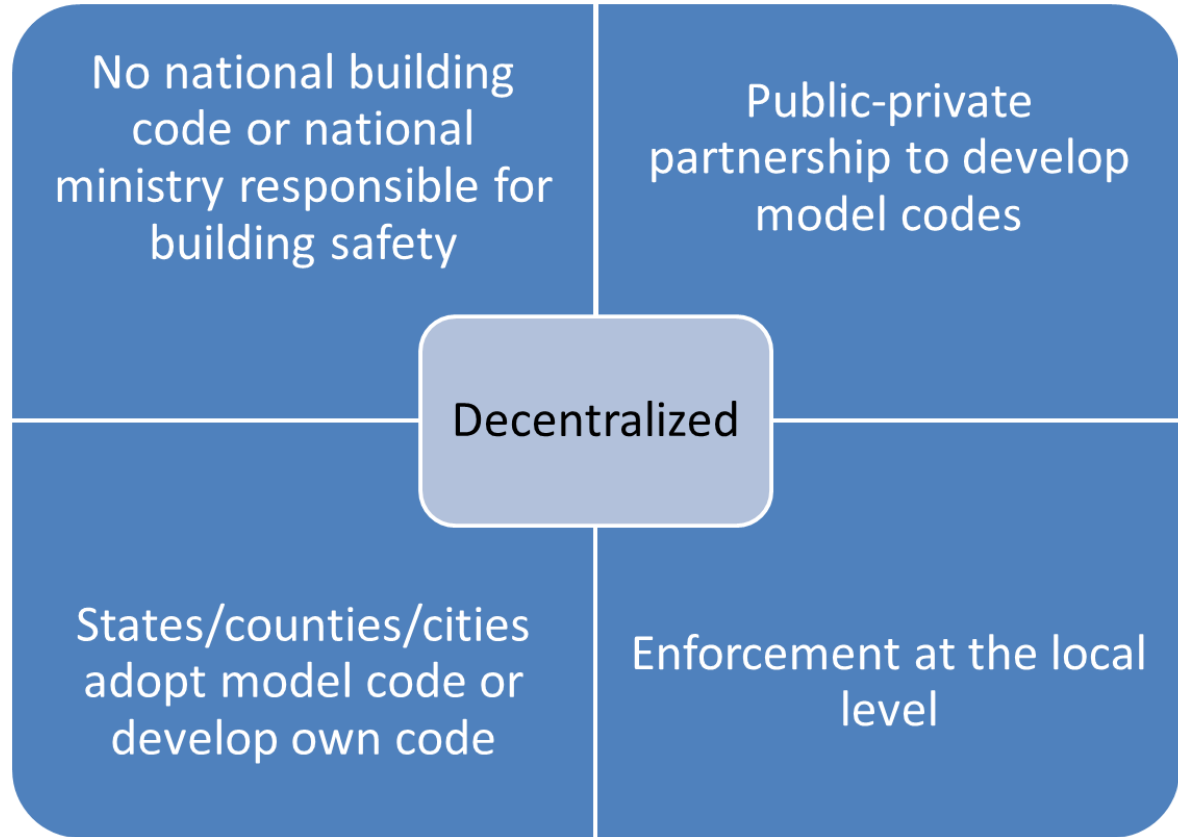
States have Police Power



Approvals process state or local function

IBC adopted in all states and territories

US Building Regulatory System



Primarily
Prescriptive code ~
Alternatives
permitted

ASTM	FM
ASCE	NFPA
ASME	ISO
CSA	UL
CEN	

International Building Code
(IBC)

- 2000 first edition
- 2021 next edition (8th)

Many supporting standards

Varies State to State

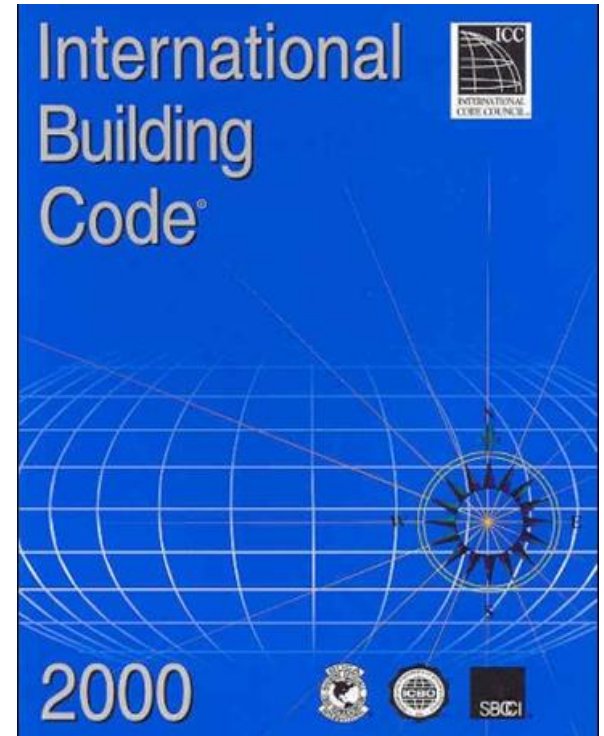
Implementation/Regulation

Enforcement/Compliance

- ICC ES ~ESR
- IAS Accreditation

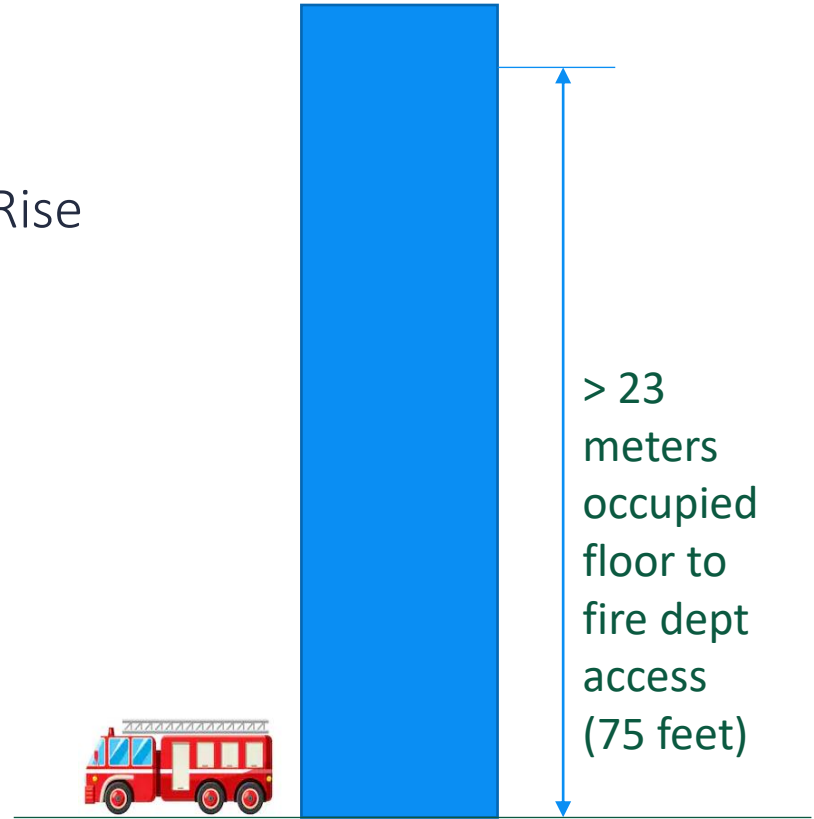
Prior to 9/11

- IBC result of legacy organizations that dated back to 1927
- IBC first published in 2000 by ICC
- Not yet adopted or implemented
- Prescriptive code



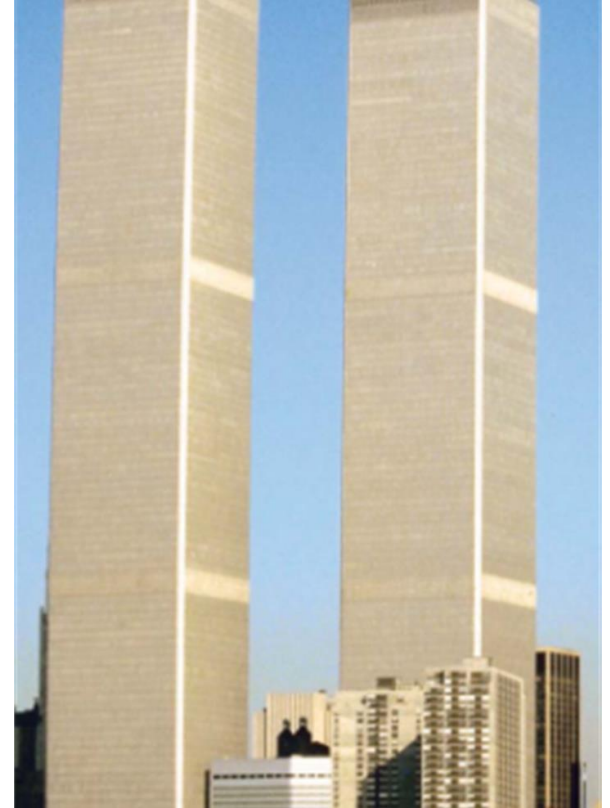
Tall Building – High-Rise

A building with an occupied floor located more than 23 meters (75 feet) above the lowest level of fire department vehicle access



2000 IBC Tall Building Fire Safety

- Sprinklers throughout
- Standpipes
- At least two stairways
- Elevator – Recall and Emergency Operation
- Standby power/emergency power
- Emergency Voice/Alarm Communication systems
- Two-way communication for fire fighters
- Fire Command center
- Higher types of construction



Prior to 9/11

- Terrorist incidents were more about securing entrances and weak points such as garages
- 1993 Attack on WTC was an interior attack
 - Truck bomb below north tower- 1336 lbs. (606 kg) urea nitrate-hydrogen gas device
 - 6 people died, > 1000 injured
 - 50,000 people evacuated
 - 10 hours to evacuate

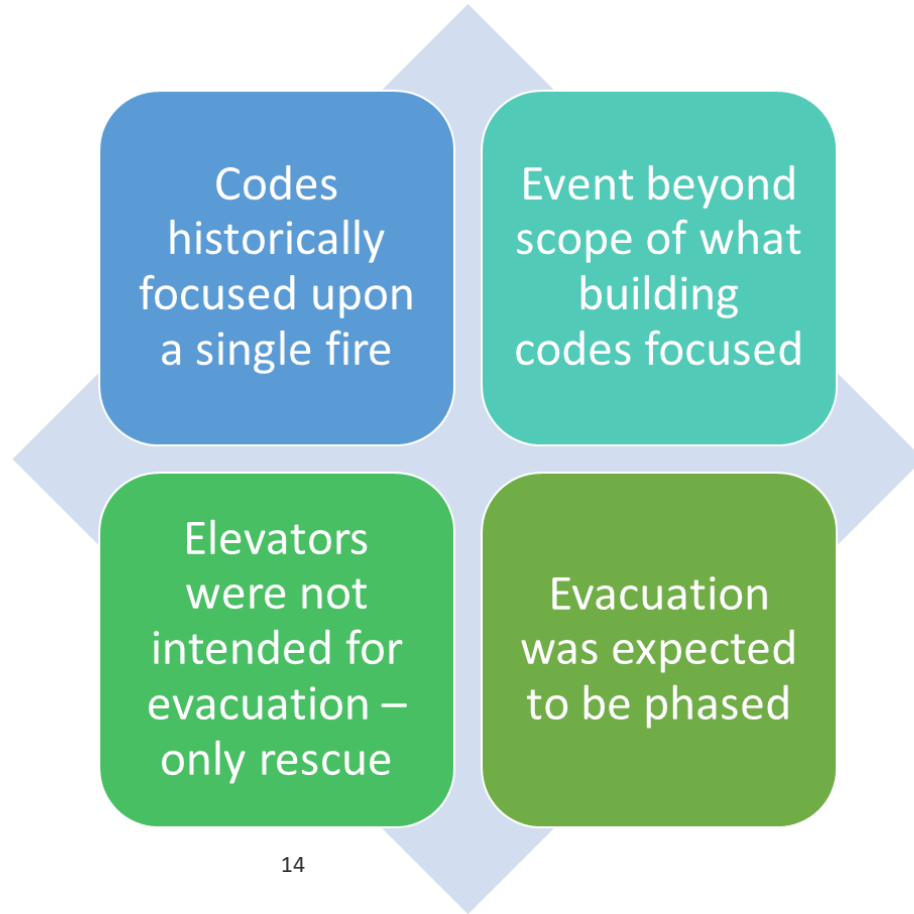


Reaction to 9/11

- Deadliest attack in history of US
 - 2977 People died – 2763 in the WTC and surrounding area
 - 414 Emergency responders perished
 - 343 FDNY
 - 71 PDNY
- Building collapse seemed impossible
- Event beyond the scope of everyone's wildest imagination



Purpose of Building Codes





2009 IBC Revisions

- Risk categories
- Passive
- Active
- Egress
- Emergency Responder Features



Risk Categories Established

WTC Recommendations
made clear at some height
building cannot be
supported from the ground

Two thresholds established
based on building height

- ≤ 420 feet (128 meters)
- > 420 feet (128 meters)

Passive

Construction type limitation. No reduction over 420 feet (128 m)

Bond strength of Sprayed Fire-Resistant Materials

- Up to 420 ft (128m): 430 psf (21 kPa)
- Greater than 420 ft (128m): 1000 psf (48 kPa)

Hardened Shafts. Elevator and stairway shafts

- >420 feet (128 m)
- Risk Category III or IV



Active

Additional sprinkler riser. 2nd riser serving alternate floors > 420 feet (128 m)

Additional water supply for required pumps. Separate water main connection for buildings > 420 feet (128 m)



Egress

Third Stairway or Occupant Evacuation Elevator. Buildings > 420 feet (128 m) in height

Remoteness of Exit stairways. Separated by ≥ 30 feet (9 m) or $\frac{1}{4}$ the length of maximum overall diagonal

Self luminous exit pathways. All exit stairways in all high-rise buildings required to provide

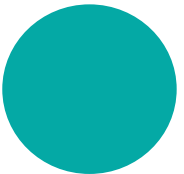
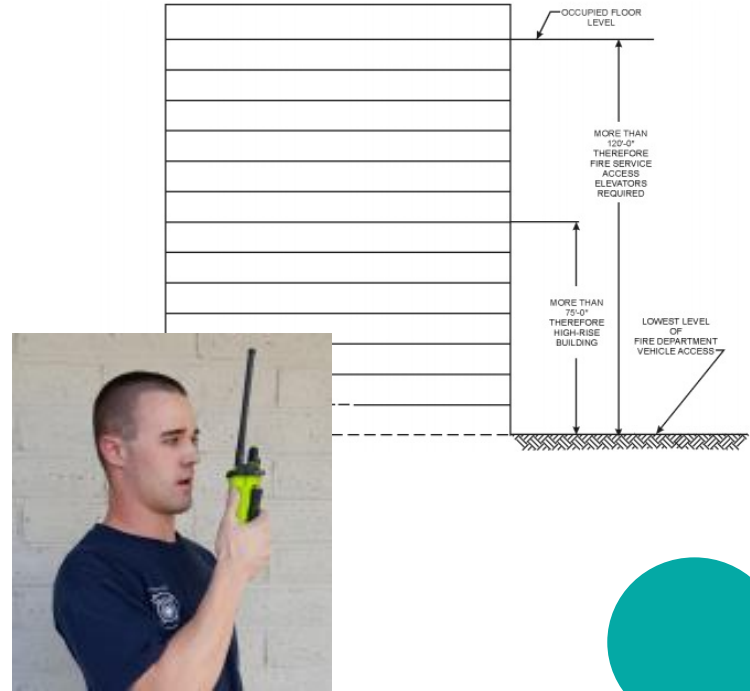


Emergency Responder Features

Fire Service Access Elevators. Buildings > 120 feet (23 meters) above the lowest level of fire department vehicle access

Emergency responder communication. Comprehensive coverage of in-building two-way communication coverage systems (repeaters etc.)

Fire Command Center Size. Increased from 96 sqft (9 m²) to 200 sq feet (19 m²)



Implementation

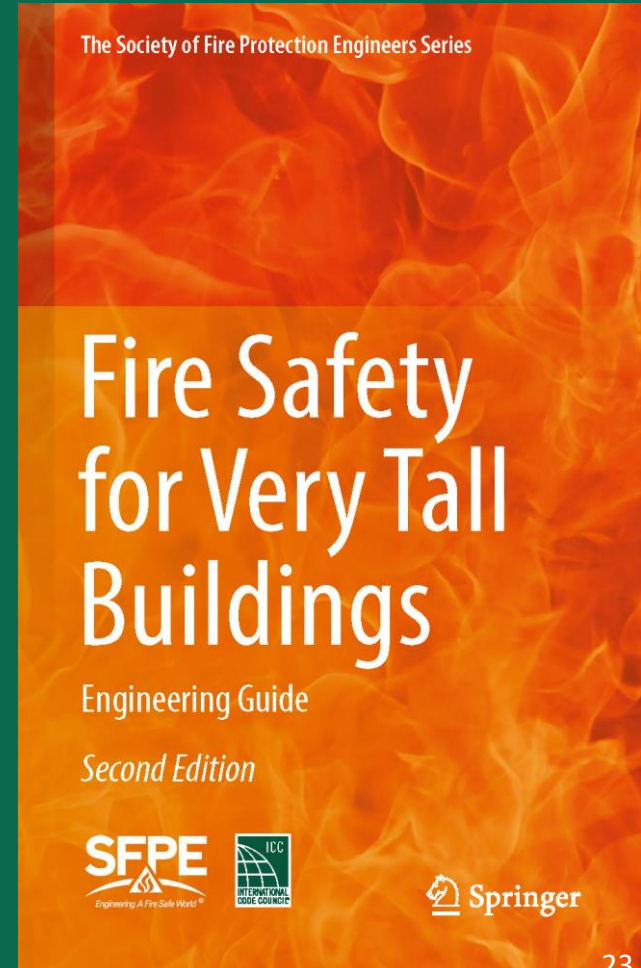


IBC Tall Building Fire Safety Today

- Generally unchanged and implemented into state and local regulations
- Some enhancements/adjustments
 - Fire Service Access Elevators (FSAE) – 2 now required
 - Occupant Evacuation elevators (OEE) – standby power revised
- Concepts such as FSAEs become everyday but OEEs still uncommon.
- Open parking structures now require an automatic sprinkler system

Tall Building Resources from SFPE

- New Engineering Guide: ***Fire Safety for Very Tall Buildings***
- Published by Society of Fire Protection Engineers, the International Code Council, and Springer Publishing Announce
- Several on-demand webinars and seminars on fire safety in tall buildings
- Live webinars/seminars held regularly – check sfpe.org for updates.



Today's Fire Safety Concerns

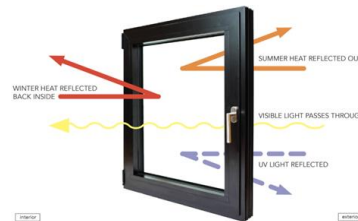
- 20 years later society's focus has shifted beyond fire safety
- Struggling to strike a balance with today's priorities

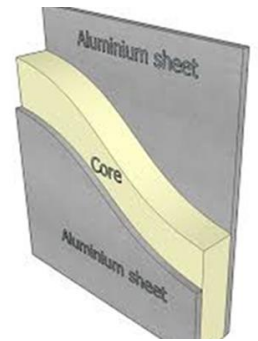
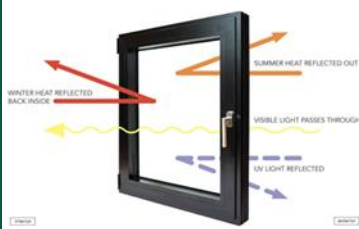




Competing Objectives and Priorities

- Energy efficiency
- Sustainable Design
- Alternative energy sources
- Environmental regulations
- Resiliency
- Need for affordable, equitable and inclusive housing





Tall Building Fire Safety Concerns

- Exterior wall cladding
- Energy Storage Systems
- Fire Fighter (Brigade) Communications
- Photovoltaics
- Modern vehicles
- Older existing buildings/Maintaining safety features
- Modern contents



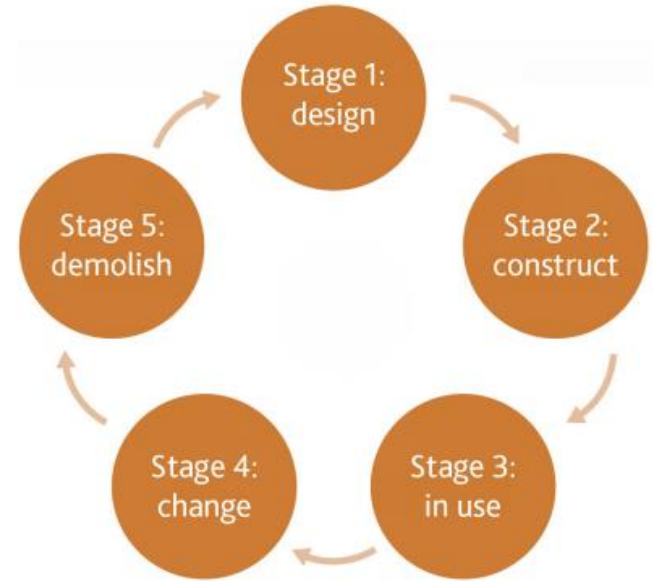
Looking to Regulations for Balance



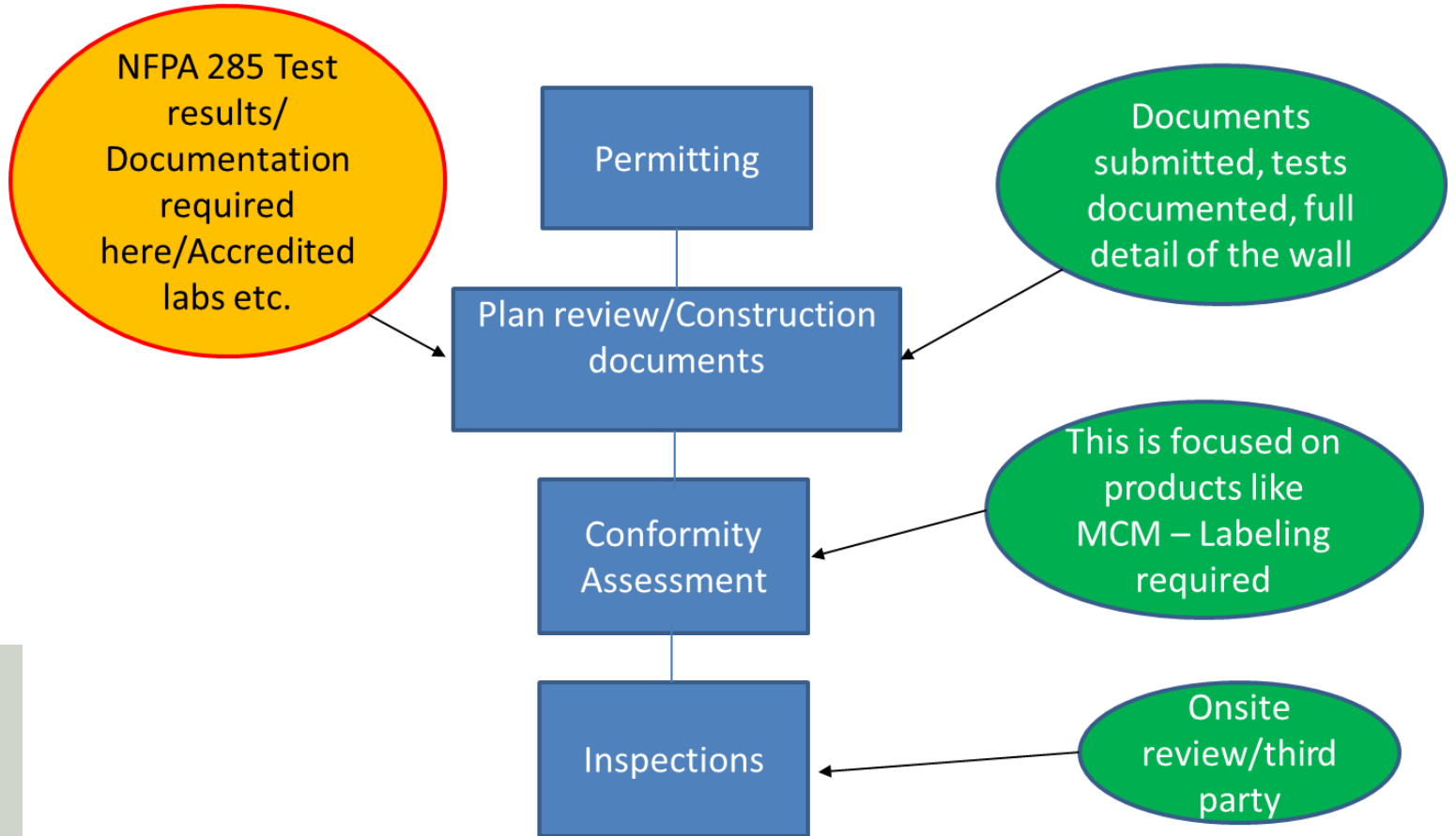
- Codes and Standards important tools
- Need to support innovation but provide safety

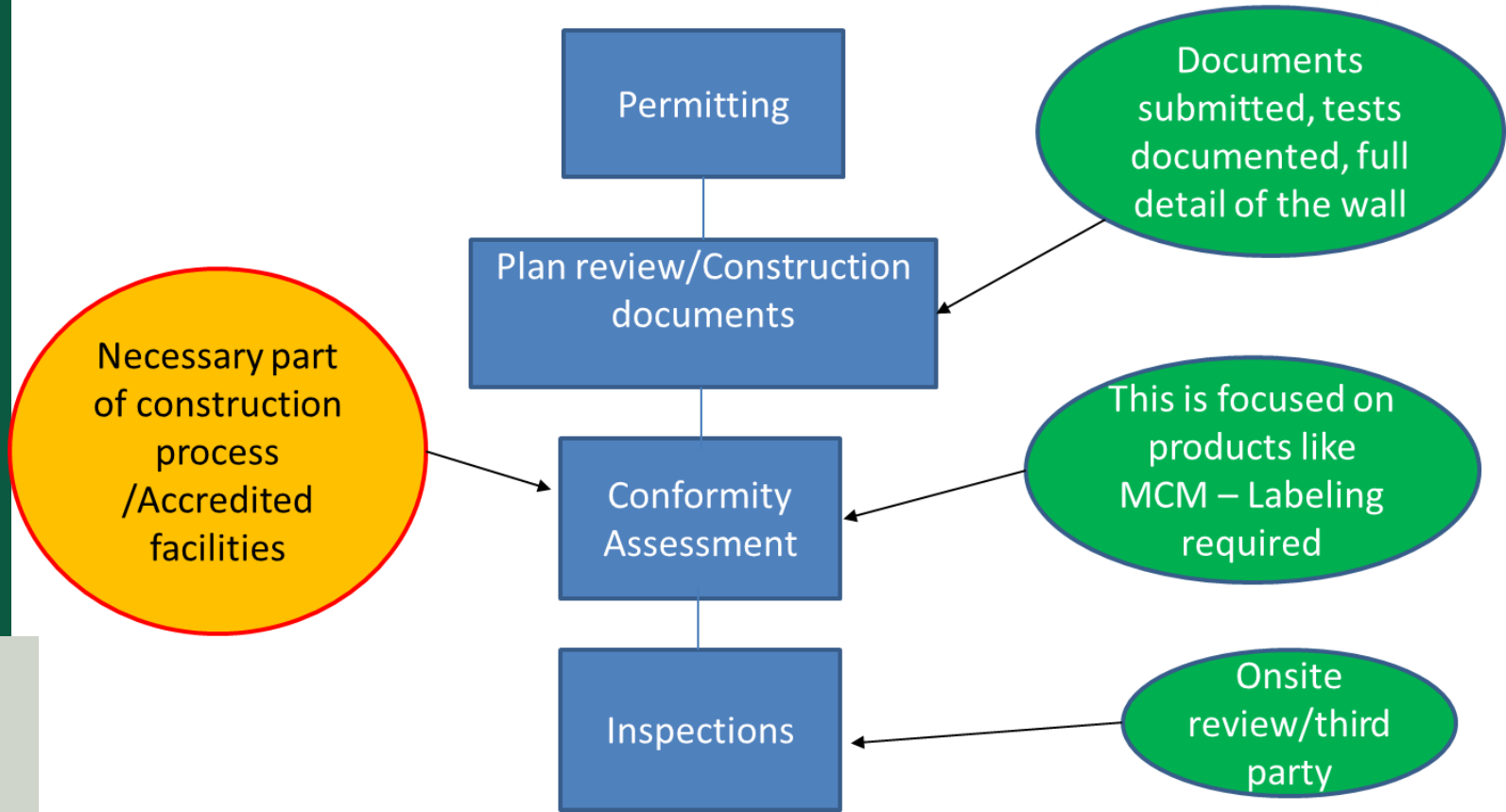
Regulatory Infrastructure

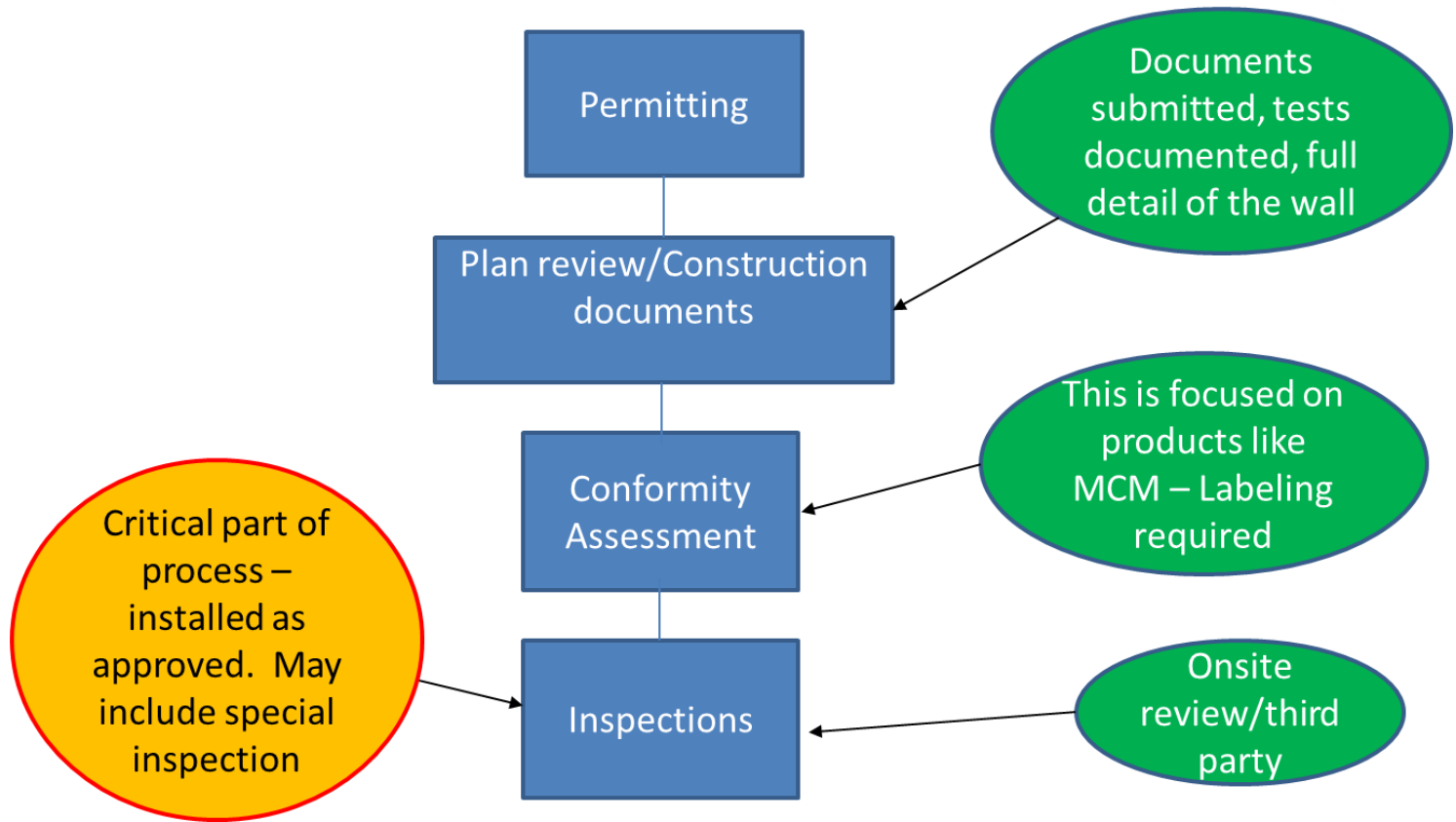
- Regulations/codes/standards are simply words
- How are these words being implemented?
- Need to address life cycle of building
- Approvals and follow-up process needs to be rigorous
- Qualifications and credentials key



IFSS Common Principles







Parting Thoughts

- Though our regulatory systems differ we struggle with similar issues
- Codes and standards that support innovation key
- Regulations Important – Proper Implementation just as important
- Societal priorities will continue to evolve
- Regulatory drivers related to climate change will continue to evolve the fire safety risk profile

Thank you!

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