SIMPSON GUMPERTZ & HEGER

Engineering of Structures
and Building Enclosures

How the other 27 Chapters of the Code Affect your Repair/Rehabilitation Project

David Jacoby, PE

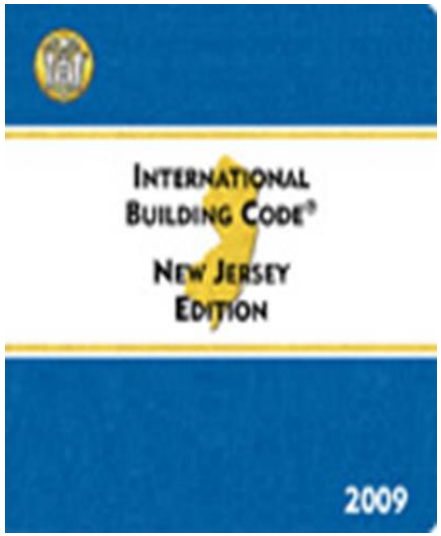
Agenda

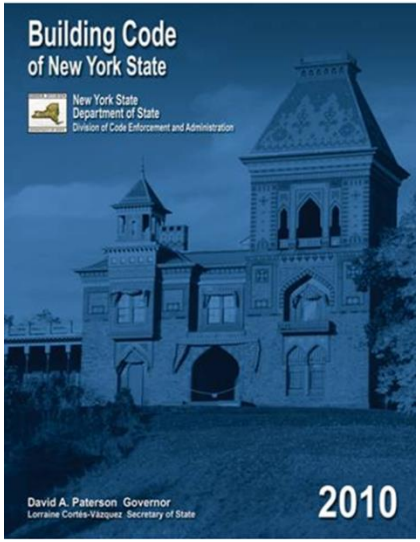
- Adopted Codes
- NYC Permitting
- Examples and Common issues

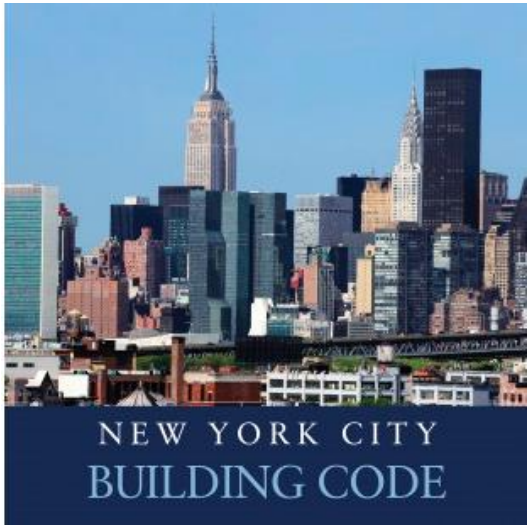
Local Code Adoptions

- NJ – 2009 I-Codes with Amendments

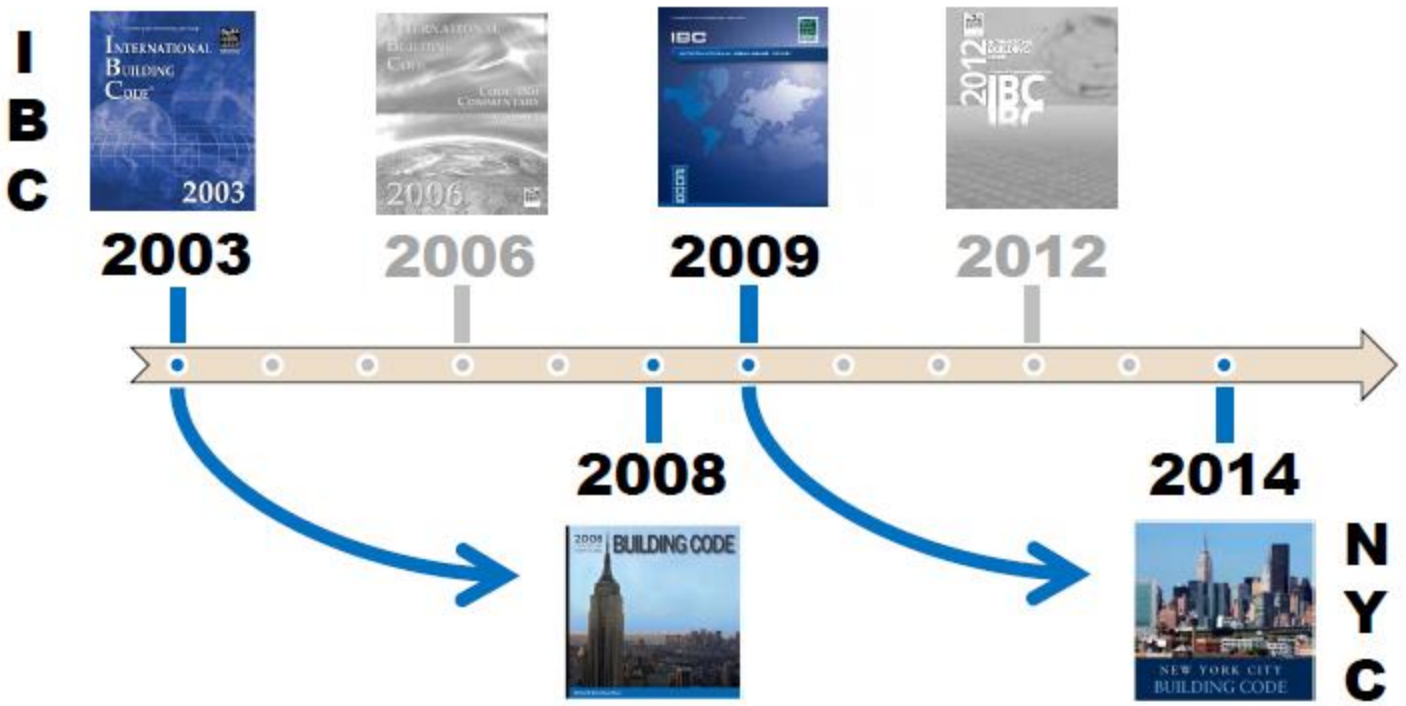
- NYC – 2003 I-Codes, heavy Amendments
  - Adopted July 2008, Mandatory July 2009
  - Currently undergoing revision
- NYS – 2006 I-Codes with Amendments
  - 2016? IBC 2015 amended







Construction Codes Development Cycles



IBC Chapters

- 1 Administration
- 2 Definitions
- 3 Use and Occupancy
- 4 Special Occupancies
- 5 Height and Area
- 6 Types of Construction
- 7 Fire and Smoke Protection
- 8 Interior Finishes
- 9 Fire Protection Systems
- 10 Means of egress
- 11 Accessibility
- 12 Interior Environment
- 13 Energy Efficiency
- 14 Exterior Walls
- 15 Roof Assemblies and Roof Top Structures
- 16 Structural Design
- 17 Structural Testing and Special Inspection
- 18 Soils and Foundations
- 19 Concrete
- 20 Aluminum
- 21 Masonry
- 22 Steel
- 23 Wood
- 24 Glass and Glazing
- 25 Gypsum Board and Plaster
- 26 Plastic
- 27 Electrical
- 28 Mechanical Systems
- 29 Plumbing Systems
- 30 Elevators and Conveying Systems
- 31 Special Construction
- 32 Encroachments in public way
- 33 Safeguard during Construction
- 34 Existing Buildings and Structures
- 35 Reference Standards

Administration

§28-101.4.4 Reductions of fire safety or structural safety of prior code buildings prohibited. Notwithstanding any other provision of this code, where the alteration of any prior code building or structure in accordance with a provision of this code would result in a reduction of the fire safety or structural safety of such building, relevant provisions of the 1968 building code shall apply to such alteration unless there is full compliance with those provisions of this code that would mitigate or offset such reduction of fire protection or structural safety. Where the owner, having a choice to elect the 1968 building code or this code, chooses this code, the applicant shall submit a comparative analysis acceptable to the commissioner of the relevant fire safety and structural safety provisions under the 1968 building code and this code, demonstrating that the alteration does not result in a reduction to the fire and life safety of the building.

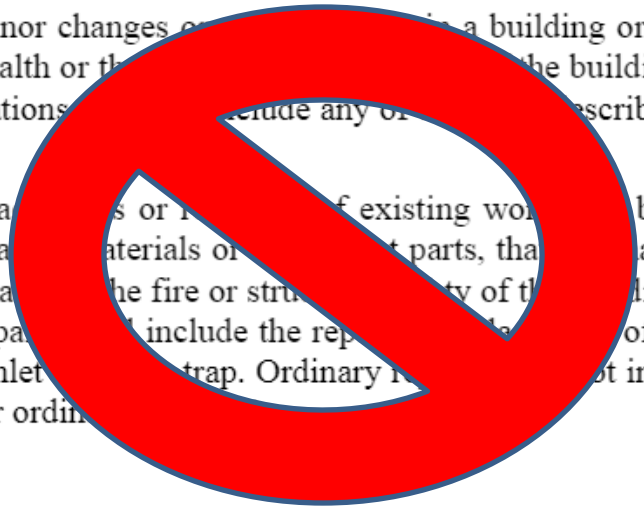
§28-105.4 Work exempt from permit. Exemptions from permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code, the zoning resolution or any other law or rules enforced by the department. Such exemptions shall not relieve any owner of the obligation to comply with the requirements of or file with other city agencies. Unless otherwise indicated, permits shall not be required for the following:

1. Emergency work, as set forth in section 28-105.4.1.
2. Minor alterations and ordinary repairs, as described in section 28-105.4.2.
3. Certain work performed by a public utility company or public utility corporation, as set forth in section 28-105.4.3.
4. Ordinary plumbing work, as set forth in section 28-105.4.4.
5. Permits for the installation of certain signs, as set forth in section 28-105.4.5.
6. Geotechnical investigations, as set forth in section 28-105.4.6.
7. Other categories of work as described in department rules, consistent with public safety.

Administration

MINOR ALTERATIONS. Minor changes [illegible] a building or any part thereof, excluding additions thereto, that do not in any way affect health or th[illegible]he building or the safe use and operation of the service equipment therein. Minor alterations [illegible]clude any of [illegible]scribed as "work not constituting minor alterations or ordinary repairs."

ORDINARY REPAIRS. Repla[illegible]s or r[illegible]f existing wo[illegible] building, or of parts of the service equipment therein, with the same or equiva[illegible]aterials of [illegible]t parts, tha[illegible]ade in the ordinary course of maintenance and that do not in any way affect hea[illegible]he fire or stru[illegible]ty of t[illegible]ding or the safe use and operation of the service equipment therein. Ordinary repa[illegible] include the rep[illegible]a[illegible] of any plumbing fixture, piping or faucets from any exposed stop valve to the inlet [illegible]trap. Ordinary r[illegible]t include any of the work described as "work not constituting minor alterations or ordi[illegible]



- Cutting, removal change of anything fire rated or load bearing
- Change to egress
- Changes to fire and life safety systems, elevator, accessibility
- Changes to plumbing
- Anything that affects the health, structural or fire safety of the building or safe operation of equipment

Administration - NYC Permitting

- Minor works 1-RCNY 101-14

II. Concrete Restoration	**1.** Structural repair, reinforcement of concrete (repair of re-bars, post- tension cables, curtain panel wall, pre-cast concrete).	**YES**
	2. Spandrels: repair of cracked or spalled concrete on exterior concrete spandrel beams, concrete fascias or balconies (whether or not repair of deteriorated steel reinforcement is required).	**YES**
	3. Repair or re-anchoring of existing aluminum or steel balcony handrails.	**NO**
	4. Concrete crack repair with injection of repair cement.	**NO**

Administration

Table 3
Façade Work that may be Exempt from Permit in All Buildings

	Exterior Facade Restoration Item (all buildings)	Permit required?
I. Masonry (not including Terra Cotta and Stone)	**1.** Brick re-pointing (or other unit masonry).	**NO**
	2. Removal and replacement of individual bricks - single outside wythe up to 10 sf., not to exceed 4 ft. horizontally, in any 100 sf. of wall area, and the cumulative area of all brick replacement on all facades does not exceed 150 sq. ft.	**NO**
	3. Mechanical anchorage (pinning) of brick masonry to underlying structure.	**YES**
	4. Parapet demolition and reconstruction.	**YES**
	5. Increasing height of an existing parapet.	**YES**
	6. Installation of new parapet coping (masonry).	**NO**
	7. Installation of new parapet guardrail.	**YES**
	8. Replacement of existing guardrail or parapet to the same height (for masonry parapets, replacement of existing parapet limited to 10 sq. ft. in any 100 sq. ft. of continuous parapet vertical surface area.	**NO**
	9. Installation of expansion or control joints in existing masonry construction (entailing saw-cutting of masonry).	**YES**
	10. Installation of flashing and weeps, repair or replacement of relieving angles (or lintels), installation of new brickwork, exceeding limits noted in #2 above.	**YES**
	11. Flashing: cutting in reglet, removing one or two courses of brick from a single wythe on inside face of parapets, exceeding limits noted in #2 above.	**YES**
	12. Masonry crack repair with injection of repair mortar.	**NO**
	13. Masonry cladding of existing exterior building walls.	**YES**
	14. Replacement of masonry sills.	**NO**

Chapter 2 Primary Structural Frame

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Blue Book Classifications

2009 IBC

- The IBC has been modified to require that bracing members essential to the vertical stability of the primary structural frame under gravity loading are to be considered part of the primary structural frame whether or not the bracing member carries gravity loads.

Chapter 3 Use and Occupancy Classifications

Occupancy	Old Classification	New Classification
Assembly	F-1	A-1
	F-4	A-2
	F-1,F-2,F-3	A-3
	F-3	A-4
	F-2	A-5
Business	E	B
Educational	G	E
Industrial	D-1	F-1
	D-2	F-2
High Hazard	A	H-1,H-2,H-3,H-4,H-5

Chapter 4

- Range of occupancies malls, high-rise, atria, hospital and hazardous materials
- Parking Garages
  - Must be concrete or other non-combustible, non-absorbent material
  - Must be sloped to facilitate drainage

Wheresmysocks at en.wikipedia

Chapters 5,6,7

- Fire Rating Must be Maintained
- Construction Type
  - Certificate of Occupancy

TABLE 503
ALLOWABLE BUILDING HEIGHTS AND AREAS[a]
Building height limitations shown in feet above grade plane. Story limitations shown as stories above grade plane.
Building area limitations shown in square feet, as determined by the definition of "Area, building," per story.

GROUP	HEIGHT (feet) / HEIGHT (S)	TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
		UL	160[e]	65	55	65	55	65	50	40
A-1	S A	UL UL	UL UL	6 17,500	3 10,500	6 14,700	3 5,600	6 15,000	3 8,400	2 5,500
A-2	S A	UL UL	UL UL	6 17,500	3 9,500	6 14,000	3 5,600	6 15,000	3 8,400	2 5,500
A-3	S A	UL UL	UL UL	6 17,500	3 9,500	6 14,000	3 5,600	6 15,000	3 8,400	2 5,500
A-4	S A	UL UL	UL UL	6 17,500	3 9,500	6 14,000	3 5,600	6 15,000	3 8,400	2 5,500
A-5	S A	UL UL	UL UL	UL UL	UL UL	UL UL	UL UL	6 UL	UL UL	UL UL

Chapters 5,6,7

TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (hours)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V[j]	
	A	B	A[d]	B	A[d]	B	HT	A[d]	B
Primary structural frame[g,k] (see Section 202)	3[a]	2[a]	1	0	1	0	HT	1	0
Bearing walls									
Exterior[f,g,h]	3	2	1	0	2	2	2	1	0
Interior	3[a]	2[a]	1	0	1	0	1/HT	1	0
Nonbearing walls and partitions Exterior	See Table 602								
Nonbearing walls and partitions Interior[e]	0	0	0	0	0	0	See Section 602.4.6	0	0
Floor construction[i] and secondary members (see Section 202)	2	2	1	0	1	0	HT	1	0
Roof construction and secondary members (see Section 202)	1½[b,c]	1[b,c]	1[b,c]	0[b,c]	1[b,c]	0	HT	1[b,c]	0

Chapters 5,6,7

TABLE 720.1(3)
MINIMUM PROTECTION FOR FLOOR AND ROOF SYSTEMS[a,q]

FLOOR OR ROOF CONSTRUCTION	ITEM NUMBER	CEILING CONSTRUCTION	THICKNESS OF FLOOR OR ROOF SLAB (inches)				MINIMUM THICKNESS OF CEILING (inches)			
			4 hour	3 hour	2 hour	1 hour	4 hour	3 hour	2 hour	1 hour
1. Siliceous aggregate concrete	1-1.1	Slab (no ceiling required). Minimum cover over nonprestressed reinforcement shall not be less than $^{3}/_{4}$inch.[b]	7.0	6.2	5.0	3.5	—	—	—	—
2. Carbonate aggregate concrete	2-1.1		6.6	5.7	4.6	3.2	—	—	—	—
3. Sand-lightweight concrete	3-1.1		5.4	4.6	3.8	2.7	—	—	—	—
4. Lightweight concrete	4-1.1		5.1	4.4	3.6	2.5	—	—	—	—

Fire Resistance

Fiber-Reinforced Polymer-Strengthened/Reinforced Concrete Structures Exposed to Fire: A Review

Chrysanthos Maraveas, Technical Director; **Konstantinos Miamis, Apostolos A. Vrakas,** C. Maraveas Partnership, Structural Engineering Department, Athens, Greece. Contact: c.maraveas@maraveas.gr

DOI: 10.2749/101686612X13363929517613

TABLE 721.5.1(5) FIRE RESISTANCE OF CONCRETE MASONRY PROTECTED STEEL COLUMNS

COLUMN SIZE	CONCRETE MASONRY DENSITY, POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY, T_e (inches)				COLUMN SIZE	CONCRETE MASONRY DENSITY POUNDS PER CUBIC FOOT	MINIMUM REQUIRED EQUIVALENT THICKNESS FOR FIRE-RESISTANCE RATING OF CONCRETE MASONRY PROTECTION ASSEMBLY, T_e (inches)			
		1-hour	2-hour	3-hour	4-hour			1-hour	2-hour	3-hour	4-hour
W14 × 82	80	0.74	1.61	2.36	3.04	W10 × 68	80	0.72	1.58	2.33	3.01
	100	0.89	1.85	2.67	3.40		100	0.87	1.83	2.65	3.38
	110	0.96	1.97	2.81	3.57		110	0.94	1.95	2.79	3.55
	120	1.03	2.08	2.95	3.73		120	1.01	2.06	2.94	3.72
W14 × 68	80	0.83	1.70	2.45	3.13	W10 × 54	80	0.88	1.76	2.53	3.21
	100	0.99	1.95	2.76	3.49		100	1.04	2.01	2.83	3.57
	110	1.06	2.06	2.91	3.66		110	1.11	2.12	2.98	3.73
	120	1.14	2.18	3.05	3.82		120	1.19	2.24	3.12	3.90

Chapter 7 – Maintain Fire Rating

Cantilever Buildings

- Requires a fire engineering analysis acceptable to the commissioner that conforms to Section 705.12.1.
- Fire ratings for structure and exterior wall must meet minimum for class of building

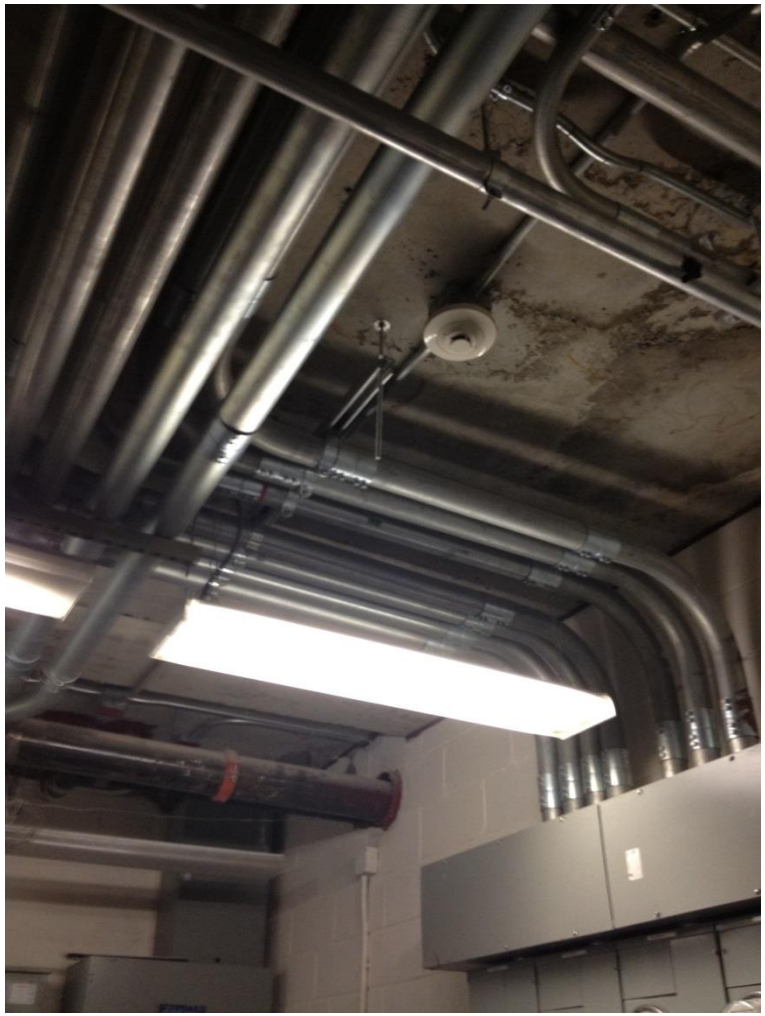
- Analysis. all elements must withstand the effects of the fire minimally:
  - 1. The structural supports and frame of the cantilevered portion of the building;
  - 2. The underside projecting assemblies of the cantilevered portion of the building; and 409
  - 3. The exterior walls and openings on all sides of the cantilevered portion of the building.
- 705.12.1.1 Criteria.
  - burn-out scenario
  - No suppression
  - No FD intervention,
  - Vertical compartmentation removed
  - Fuel load exceeds what is normally expected

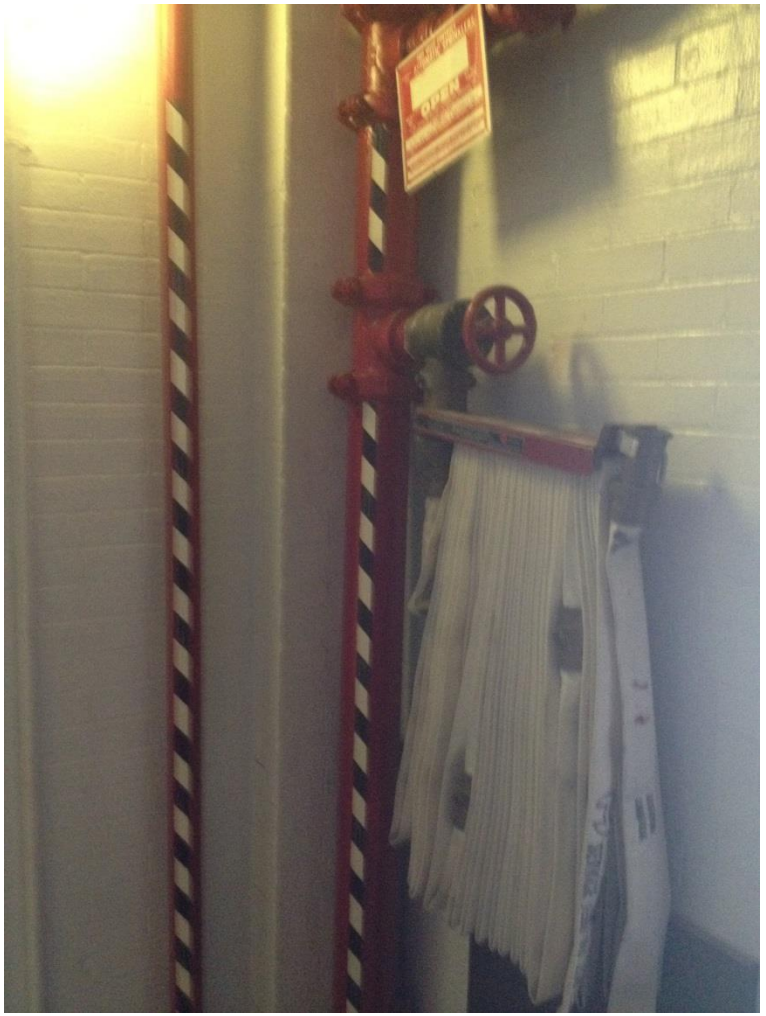
Chapter 8 Interior finish

- Interior finish is classified based on flame spread
- Class A, B, C

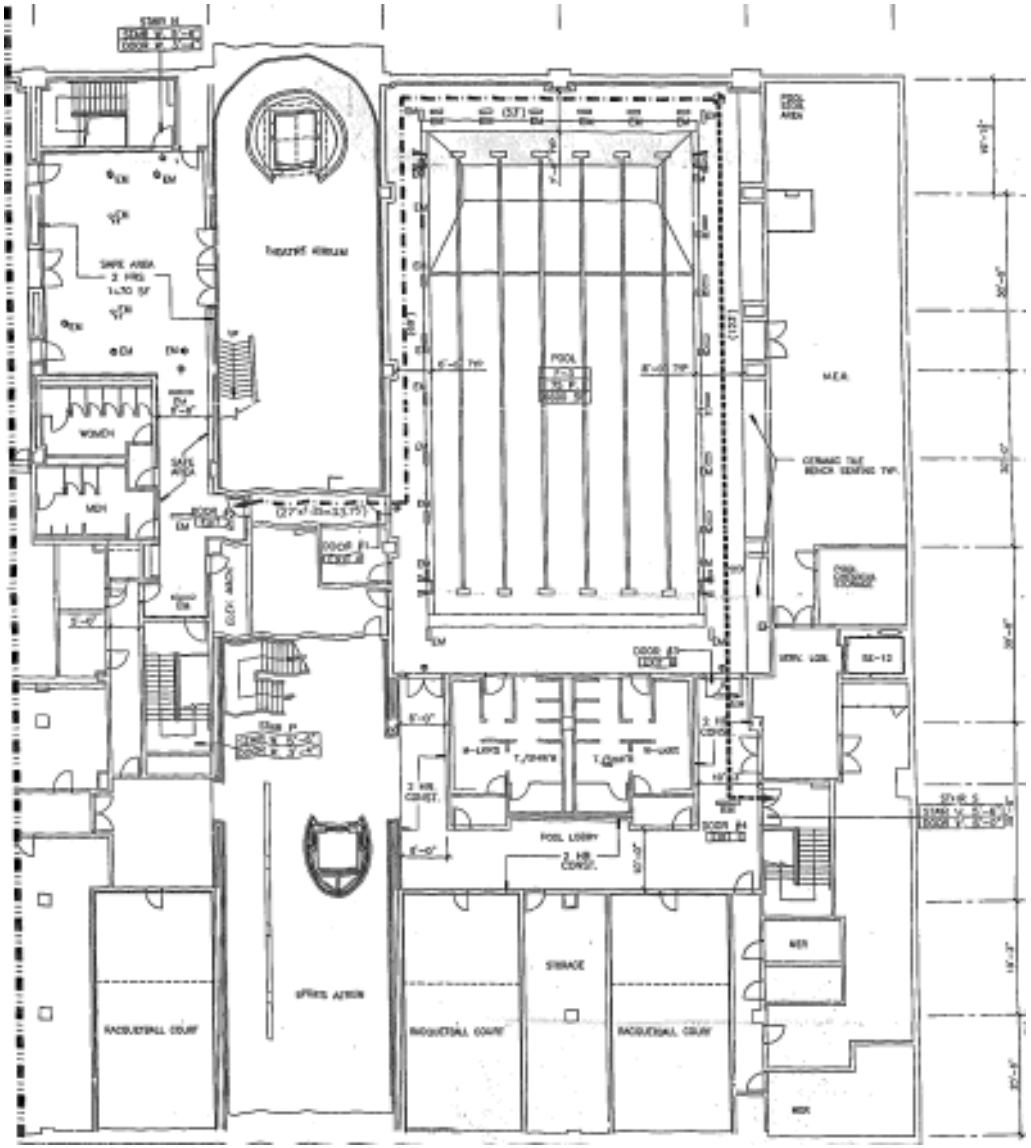
GROUP	SPRINKLERED[1]		
	Exit enclosures and exit passageways[a, b]	Corridors	Rooms and enclosed spaces[c]
A-1 & A-2	B	B	C
A-3[f], A-4, A-5	B	B	C
B, E, M, R-1	B	B	B
F	B	C	C
H	B	B	C[g]

Chapter 9 Fire protection Systems





Chapter 10 Egress



Chapter 11 Accessibility

FIG. 405.9.2
RAMP EDGE PROTECTION

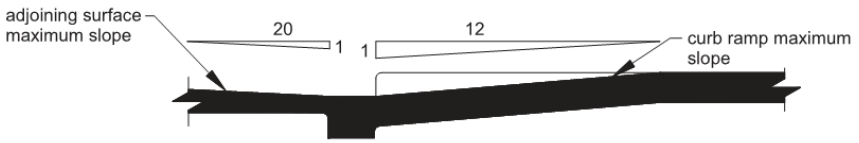
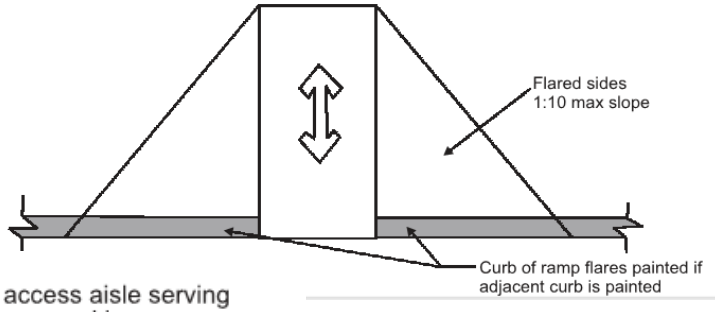


FIG. 406.2
COUNTER SLOPE OF SURFACES ADJACENT TO CURB RAMPS



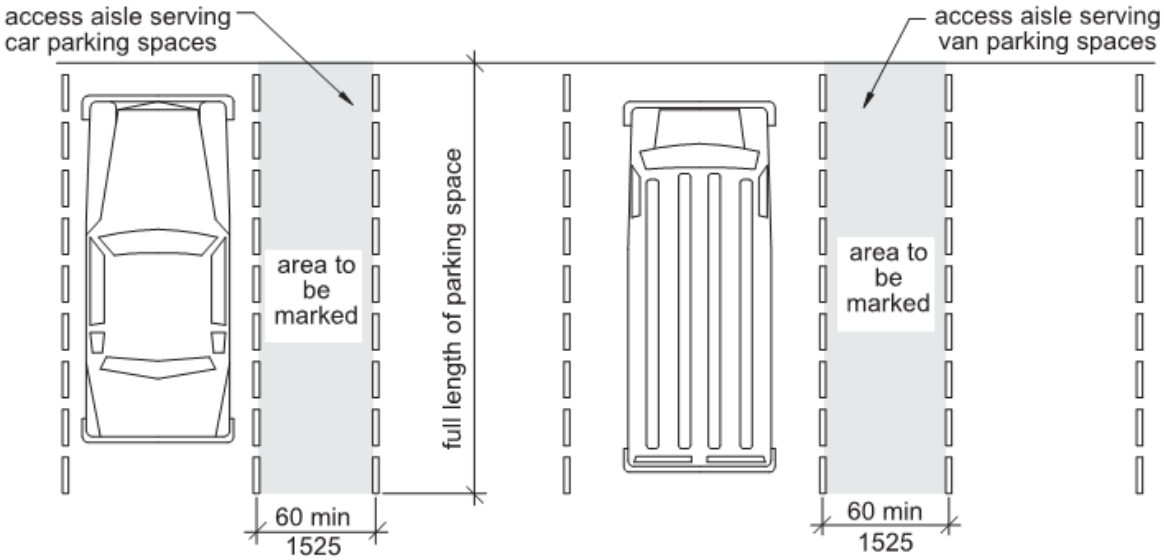


FIG. 502.4
PARKING SPACE ACCESS AISLE

Chapter 11 Accessibility

Chapter 14 Exterior Walls

- Required to meet structural and fire resistance as specified in other chapters
- Needs to provide weather protection
- May require flood resistance
- Requirements for vapor and water barriers

Chapter 26

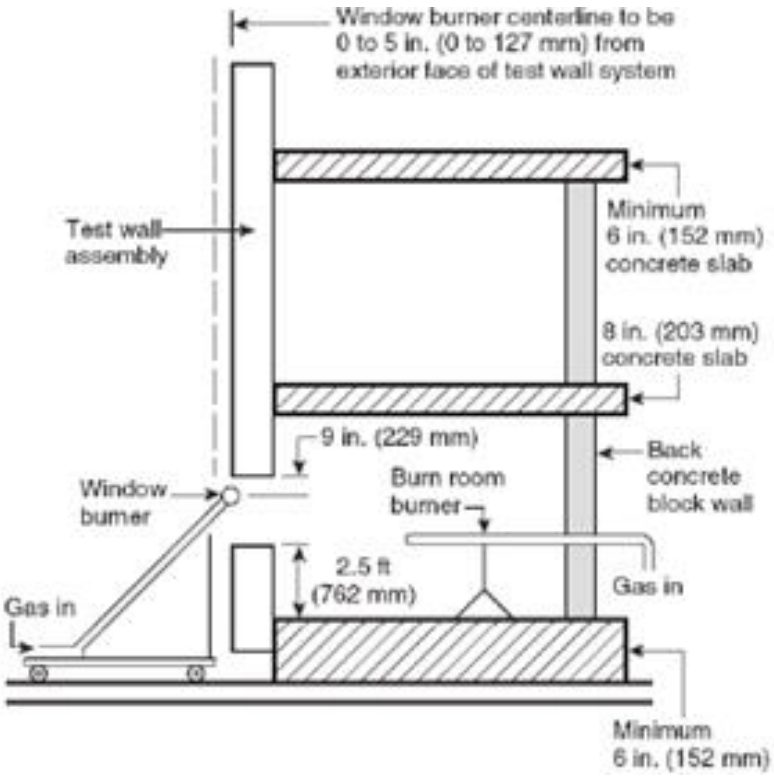
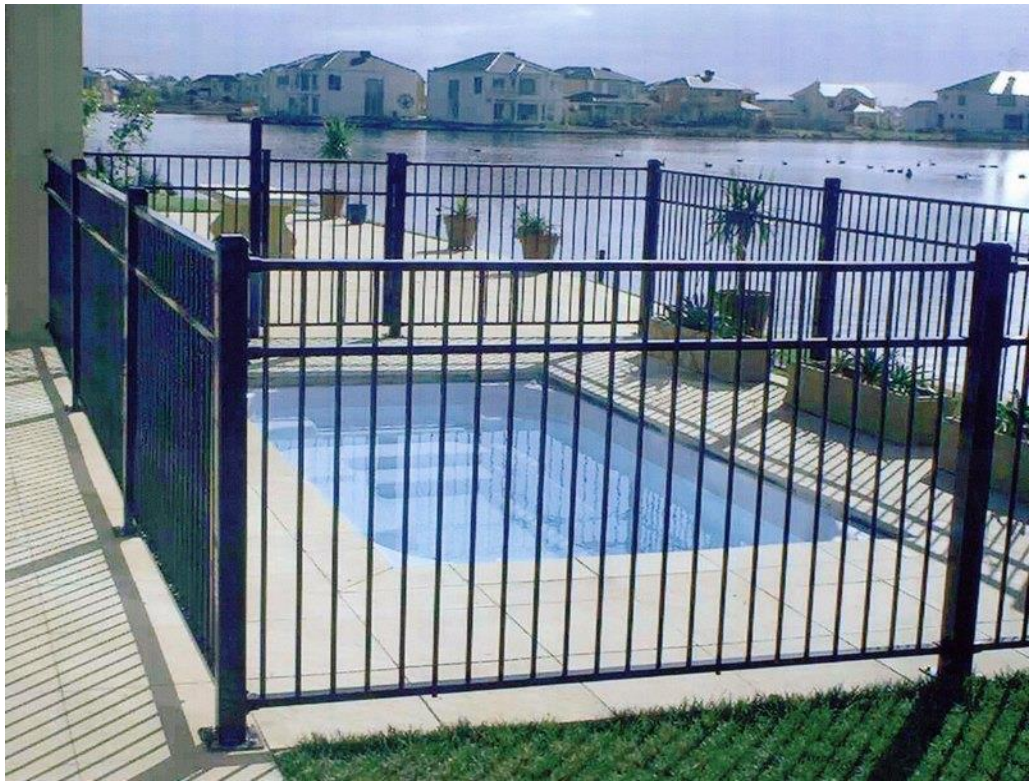


Figure 5: FOAMULAR® showing limited damage above the test window with brick veneer stripped away after the fire test

Pool Upgrades

- Chapter 31 Special Construction
  - Barrier 48 inches high
  - Maximum 4 inch opening
  - Self closing self latching/lockable gate
  - Max opening at base of barrier 4 inches



Chapter 29 - Plumbing

- Plumbing Code
  - Must maintain slope to drain
  - May cause drainage to be added
  - Separate sewer and storm drain

NYC Existing Buildings

Use of prior codes (28-101.4.3)

- No Change to optional use of:
  - 1968 Buildings
  - 1938 Building Code (if 1968 lets you)

- But exceptions have changed
  - Now there are 19

NYC Existing Buildings

Use of prior codes (28-101.4.3)

- Optional use of 1968 (1938) Codes:
  - 19 exceptions

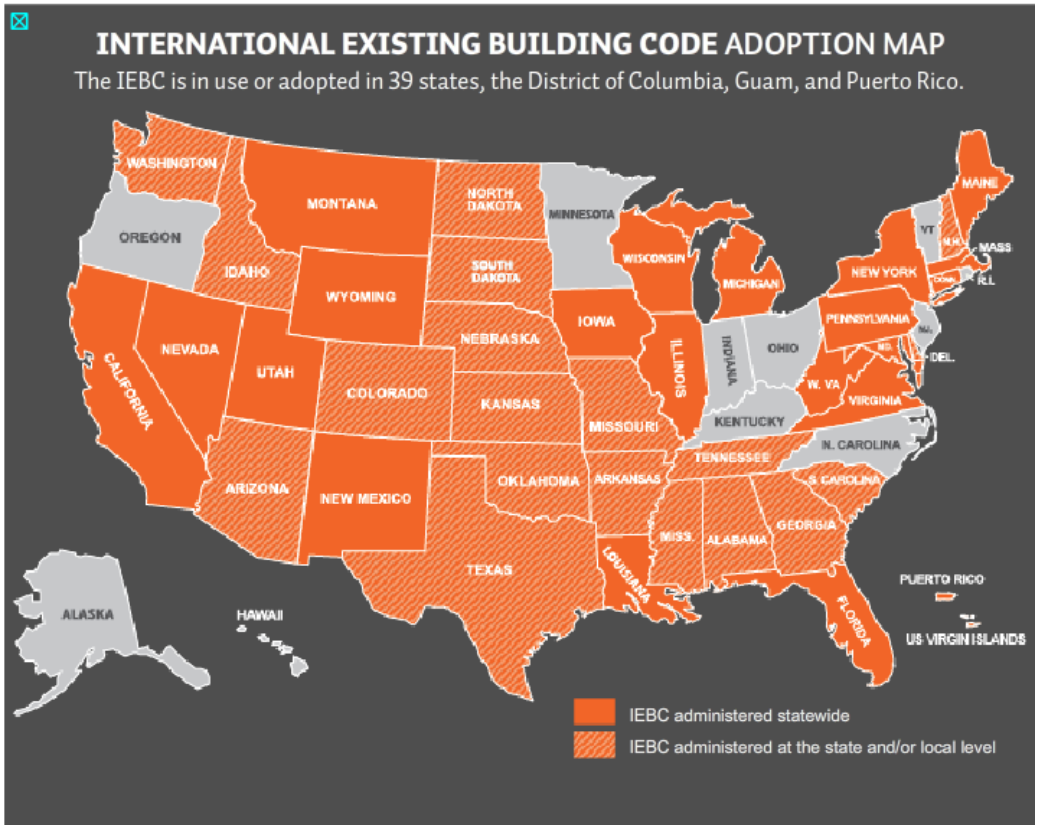
16. Structural.
17. Emergency and standby power.
18. Parking garages and open parking lots. (LL 130/2013)
19. Mold protection. (LL 13/2014)

NYC Existing Buildings

Special Provisions for Prior Code Buildings (28-101.4.3)

28-101.4.3	Subject	Code	Section
Exception 1	Plumbing Fuel Gas Mechanical	PC FG MC	102.4 102.4 102.4
Exception 2	Fire Protection	BC	901
Exception 3	Elevators	BC	3001
Exception 5	Accessibility	BC	1101
Exception 16	Structural	BC	1601

International Existing Building Code

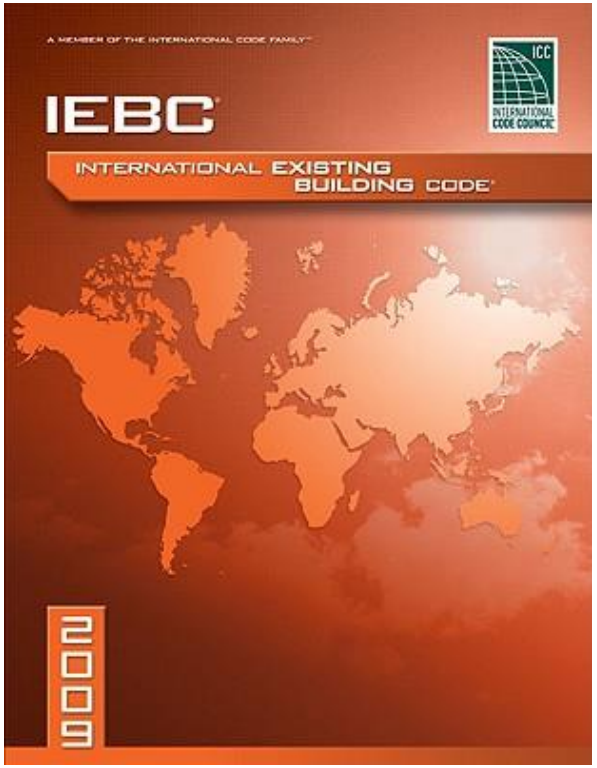


- Adopted by 39
  - 2003 -2012
  - With amendments
- Northeast Region – NJ and NYC do not adopt

Intent of the Code

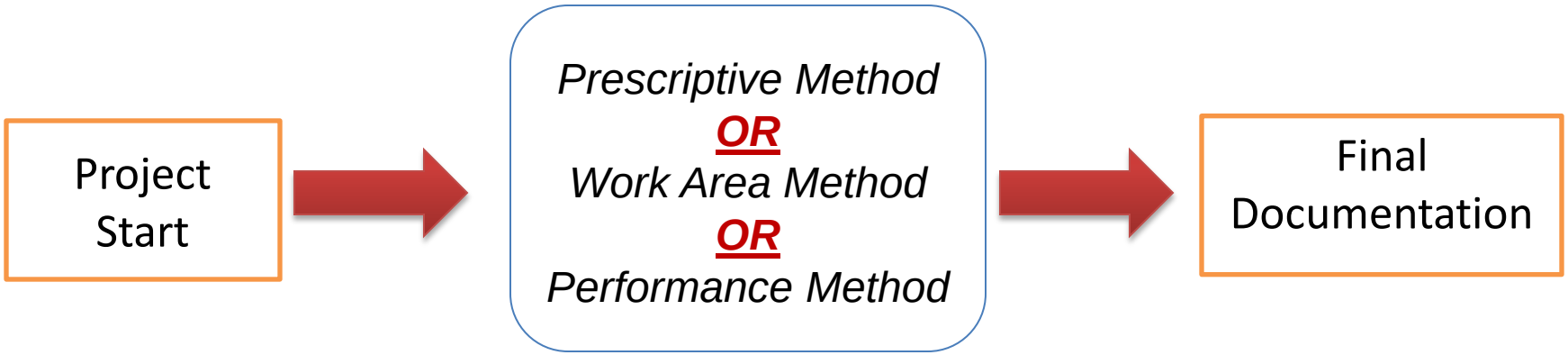
101.3 Intent. The intent of this code is to provide flexibility to permit the use of alternative approaches to achieve compliance with minimum requirements to safeguard the public health, safety and welfare insofar as they are affected by the *repair*, *alteration*, *change of occupancy*, *addition* and relocation of *existing buildings*.

"The provisions…are intended to maintain or increase public safety, health, and general welfare in existing buildings by permitting repair, alteration, addition, and/or change of use without requiring full compliance with the code for new construction except where otherwise specified…"



Three Compliance Methods in IEBC

- Only one method may be used and must be used across all aspects of the project by all consultants.



Chapter 3: Prescriptive Compliance Method

REPAIRS

- Applies to repairs due to damage from wind, fire, earthquakes and other natural or human events.
- Ordinary repairs or maintenance is excluded (permit not required, though work still must comply with code)

Nikola Smolenski/Vlada Marinkovic

Prescriptive Compliance Method: *Repairs*

- Repairs
  - Repairs to be made are based on the level of damage
  - Non-damaged components necessary for the work shall be considered part of the repair without creating additional triggers
  - Code Official may require the elimination of conditions deemed "*Dangerous*"
- Structural Triggers for Upgrade of Existing Construction
  - Gravity Loads:
    - If *Substantial Structural Damage*, repair shall comply with the IBC.
    - If less than *Substantial Structural Damage*, repairs need only restore the building to its preexisting condition.
    - Snow Loads shall be considered only if the *Substantial Structural Damage* was caused by or related to snow load
    - Non-damaged members supporting new or repaired members may also require upgrade

Chapter 4: Classification of work

- Chapter 5: Repairs
  - **patching or restoration** or replacement of damaged materials, elements, equipment or fixtures for the purpose of maintaining such components in good or sound condition
- Chapter 6: Alterations Level 1
  - the **removal and replacement** or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose.
- Chapter 7: Alterations Level 2
  - **reconfiguration** of space, the addition or elimination of any door or window, the reconfiguration or extension of any system, or the installation of any additional equipment.
- Chapter 8: Alterations Level 3
  - *work area* **exceeds 50 percent** of the aggregate area of the building and where required by a change of occupancy classification in accordance with section 912.1.1.

SIMPSON GUMPERTZ & HEGER

Engineering of Structures
and Building Enclosures

Thank you for your time.

Questions & Discussion

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