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Overview



This lecture will examine the requirements governing *repairs, alterations, changes of occupancy, and additions* to and within existing buildings.

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Presenter

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Existing Building

Definition

A structure erected prior to the date of adoption of the appropriate code, or one for which a legal building permit has been issued.


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Existing Building 

Application

The legal use and occupancy of any building or structure existing on the date of adoption of this code shall be permitted to continue without change, except as specifically covered in this code or the Connecticut State Fire Safety Code.

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Baseline



Maintenance
Unsafe structures/
equipment
Emergency measures
Vacant buildings
Connecticut Fire Safety Code


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Application 

No Proposed Work


- Chapter 34 – Maintenance
- Section 115 – Unsafe structures/
equipment
- Section 116 – Emergency measures
- Section 117 – Vacant buildings
- Connecticut Fire Safety Code

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Maintenance

- Maintained in a safe and sanitary condition.
- Devices or safeguards which are required by this code shall be maintained in conformance with the code edition under which installed.
- This chapter shall not provide the basis for removal of fire protection and safety systems and devices in existing structures.


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Unsafe Structures 

Unsafe, insanitary or deficient because of inadequate egress facilities, inadequate light and ventilation, or which constitute a fire hazard, or are otherwise dangerous to human life or the public welfare, or that involve illegal or improper occupancy or inadequate maintenance

A vacant structure that is not secured against entry shall be deemed unsafe.


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Vacant Buildings 

Buildings, structures and/or premises

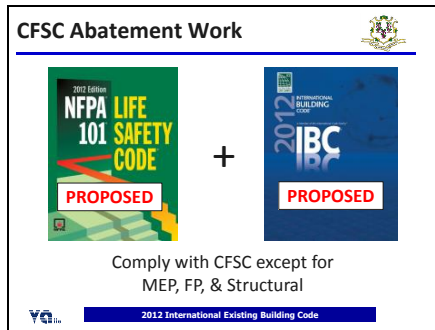
- Temporarily unoccupied
- Abandoned premises
- Safeguarding - security
- Fire protection
- Fire separation
- Combustibles – Hazardous materials

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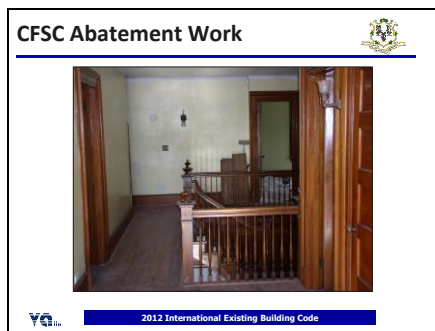
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Non-CFSC Abatement Work



Alterations, Additions, Change of Occupancy, and Repairs

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Application



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Application

Chapter 34 Existing Structures

3401.6 Alternative compliance. Work performed in accordance with the IEBC shall be deemed to comply with the provisions of this chapter.

Section 101.2 Exception 2 was deleted in the 2006 IBC


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Compliance Methods

Three Options

- Prescriptive (Chapter 4)
- Work Area (Chapters 5 - 13)
- Performance (Chapter 14)


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Compliance Methods


Additional Requirements


- Seismic Evaluation (Chapter 4)
 - IBC levels for new
 - Reduced IBC levels (*Appendix A – Guidelines for Seismic Retrofit of Existing Buildings*)
- Additional Codes (*IECC, IMC, IPC, IRC, IFB, etc.*)

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Compliance Methods

 **Prescriptive**


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Prescriptive Method

Chapter 4

- General
- Additions
- Alterations
- Repairs
- Glass Replacement
- Fire Escapes
- Occupancy Change
- Historic Buildings
- Moved Structures
- Accessibility


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Prescriptive Method

Materials & Systems

- Existing
 - Continue in use unless unsafe
 - Replacement can be like materials
- New
 - Permitted

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Prescriptive Method

Repairs

Defined. Restoration to good or sound condition – maintenance

- Not an alteration
- Focus is mainly on structural improvements.


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Prescriptive Method

Alterations

- New work = CSBC
 - Stair exception
 - Handrail exception
- Flood hazard areas
- Structural concerns
- Smoke alarms in R or I-1


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Prescriptive Method

Additions

- Meet CSBC
- No reduction in existing safety
- Existing & addition = H & A
- Flood hazard areas
- Structural concerns
- Smoke alarms in R or I-1


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Prescriptive Method

Change of Occupancy

- Meet CSBC
 - Stairway exception
- Seismic risk category changes may triggers seismic upgrades

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Prescriptive Method

Accessibility

Change of occupancy – **PARTIAL**

1. Alterations per CSBC - 4 exceptions
2. Accessible route when alterations affect a primary function area – 5 exceptions
3. Scoping for alterations

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Prescriptive Method

Accessibility

Change of occupancy – **PARTIAL**

CSBC Chapter 11 unless *technically infeasible*

- E-1: NR to be on an accessible route
- E-2: Accessible MOE NR
- E-3: Type A can meet Type B
- E-4: NR for Type B work area < 50%

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Prescriptive Method

Accessibility

Change of occupancy – **PARTIAL**

Accessible route required when alterations affect a primary function area

- E-1: Cost exceeds 20%
- E-2: NA to windows, controls, electric
- E-3: MEP
- E-4: Accessible route improvements
- E-5: Altered Type B units

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Prescriptive Method

Accessibility

Change of occupancy – **ENTIRE BLDG**


- Meet partial change, *and*
- ≥ 1 accessible entrance
- ≥ 1 accessible route to primary function areas
- Accessible parking, *if provided*
- Passenger loading zone, *if provided*

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Compliance Methods

Performance



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Performance Method

(TABLE 1407.2)
SUMMARY SHEET EXISTING CODE

Existing occupancy _____	Proposed occupancy _____
Year building was constructed _____	Number of stories _____ Height in feet _____
Type of construction _____	Area per floor _____
Percentage of open perimeter increase _____ %	Curbside wall rating _____
Completely suppressed: Yes _____ No _____	Required door closure: Yes _____ No _____
Fire resistance rating of vertical opening enclosure _____	Type and location _____
Type of EEDC system _____	Warning number of floors _____
Automatic fire detection: Yes _____ No _____	Type _____
Fire alarm system: Yes _____ No _____	Type _____
Smoke control: Yes _____ No _____	Type _____
Adequate exit routes: Yes _____ No _____	Dead ends: Yes _____ No _____
Maximum exit access travel distance _____	Elevator capable: Yes _____ No _____
Means of egress emergency lighting: Yes _____ No _____	Mixed occupancies: Yes _____ No _____


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Work Area Method

Chapter 5

- Repairs (CH-6)
- Alteration – Level 1 (CH-7)
- Alteration – Level 2 (CH-8)
- Alteration – Level 3 (CH-9)
- Change of Occupancy (CH-10)
- Additions (CH-11)
- Historic Buildings (CH-12)
- Relocated/Moved Buildings (CH-13)

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Work Areas

Definition

That portion or portions of a building consisting of all reconfigured spaces as indicated on the construction documents.

Excludes other portions of the building where incidental work must be performed and where work was not initially intended.


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Level 1 Alteration

Scope

Removal, replacement or the covering of existing materials, elements, equipment, or fixtures using new materials, elements, equipment, or fixtures that serve the same purpose


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Alterations

Chapter Organization

- General
- Special Use & Occupancy
- Building Elements & Materials
- Fire Protection
- Means of Egress
- Accessibility
- Structural
- Electrical
- Mechanical
- Plumbing
- Energy


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Alterations – Specific Issues

Means of Egress

- Level 1
Applies to the item touched




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Alterations – Specific Issues

Means of Egress

- Level 2
Applies through out the story containing the work area if work involves a corridor or stair shared by more than one tenant


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Alterations – Specific Issues

Means of Egress

- Level 2
 - Number of exits
 - Occupant load
 - Travel distance & dead-ends
 - Door swing
 - Corridors
 - Lighting & signs
 - Handrails & guards


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Alterations – Specific Issues

Means of Egress

- Level 3
 - Adds lighting and exit signs from the story containing the work area down to grade.


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Alterations – Specific Issues

Building Elements & Materials

- Level 1
 - Newly installed interior finish = CSBC
 - Proposed new work = CSBC

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Alterations – Specific Issues

Building Elements & Materials

- Level 2




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Alterations – Specific Issues

Building Elements & Materials

- Level 3
 - Encloses floor openings from work area to grade
 - Vertical continuity of tenant separation walls




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Alterations – Specific Issues

Accessibility

- Level 1
 - Applies to the item touched



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Alterations – Specific Issues

Accessibility

- Level 2
Reconfiguration = more requirements



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Alterations – Specific Issues

Accessibility

- Level 2
 - Addition of a stair triggers an accessible route between stories
 - Added dwelling units - accessible
 - Visual alarms for the units added

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Alterations – Specific Issues


Accessibility

- Level 3
Comply with Level 1 and 2

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Case Study



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Building Score

SAFETY PARAMETERS	FIRE SAFETY (FS)	MEANS OF EGRESS (ME)	GENERAL SAFETY (GS)
1402.6.1 Building Height			
1402.6.2 Building Area			
1402.6.3 Compartmentation			
1402.6.4 Stair and Dwelling Unit Separation			
1402.6.5 Corridor Width			
1402.6.6 Vertical Openings			
1402.6.7 MFC System			
1402.6.8 Automatic Fire Detection			
1402.6.9 Fire Alarm System	****		
1402.6.10 Smoke Control	****		
1402.6.11 Means of Egress	****		
1402.6.12 Dead ends	****		
1402.6.13 Maximum Trip Access-Traffic Distance	****		
1402.6.14 Elevator Control	****		
1402.6.15 Means of Egress Emergency Lighting	****		
1402.6.16 Mixed Occupancies		****	
1402.6.17 Automatic Sprinklers			+2+
1402.6.18 Horizontal Exit			
Building score — total value			

**** *Not applicable value to be inserted.

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Building Height

Height value in feet = $\frac{AH - EBH}{12.5} \times CF$

Height value in stories = $(AS) - (EBS) \times CF$

Where:
 AH = Allowable height in feet (Table 503)
 EBH = Existing building height in feet
 AS = Allowable height in stories (Table 503)
 EBS = Existing building height in stories
 CF = 1 if (AH) - (EBH) is positive
 CF = Type of construction factor shown in Table 1401.6.6(2) if (AH) - (EBH) is negative.

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Building Height

Height value in **feet** = $\frac{(40) - (26)}{12.5} \times 1$

Height value in **feet** = 1.12

Height value in **stories** = $(2) - (3) \times 1$

Height Value in **stories** = -1

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Formulas

$$A_s = [A_t + (A_t \times I_s) + (A_t \times L_f)]$$

Table 503 Sprinkler increase Frontage increase

$$I_f = \left[\frac{F}{P - 0.25} \right] \frac{W}{30}$$

Where:
 F = Bldg perimeter with 20' minimum open area
 P = Total building perimeter
 W = Weighted average of perimeter having a 20' min open area

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Frontage Increase

The diagram shows a building footprint with a 'Main Street' at the top. A 'City street setback' line is shown above the building. The 'Property Line' is shown as a dashed line around the building. A 'Parking' area is shown below the building. Arrows indicate the relationship between these lines and the building's perimeter.

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Frontage Increase

$$I_f = \left[\frac{220}{220 - 0.25} \right] \frac{30}{30}$$

$$I_f = 0.75$$

$$A_a = [A_t + (A_t \times I_s) + (A_t \times I_f)]$$

$$A_a = [9000 + (9000 \times 0) + (9000 \times 0.75)]$$

$$A_a = 24,750 \text{ SF}$$

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Building Area Value

$$\text{Area value } i = \frac{24750}{1200} \left[1 - \left[\frac{1450}{24750} \right] \right]$$

Area value = 19.4

Caution!! Maximum value of 15 due to a limit of 1/2 the Mandatory Fire Safety Value which is 30

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Compartmentation

Occupancy	Compartmentation Values			
	a ≥ 15,000 sq. ft.	b 10,000 sq. ft.	c 7,500 sq. ft.	d 5,000 sq. ft.
A-1, A-3	0	6	10	14
A-2	0	4	10	14
A-4, E, S-2	0	5	10	15
F, M, R, S-1	0	4	10	16

1,450 sq ft per floor	7500.....10
x 4 floors	7000.....11
	6500.....12
5,800 sq ft total	6000.....13 ← 13.5
	5500.....14
	5000.....15

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HVAC Systems

- a. Plenums not meeting IMC 602: -10 points
- b. Air movement in egress elements: -5 points
- c. Both categories above: -15 points
- d. Compliant HVAC: 0 points
- e. 1 story system or central boiler: 5 points

5 points

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Fire Detection

Occupancy	Automatic Fire Detection Values				
	a	b	c	d	e
A-1, A-3, F, M, R, S-1	-10	-5	0	2	6
A-2	-25	-5	0	5	9
A-4, B, E, S-2	5	-2	0	4	8

- a. None
- b. Existing SD in HVAC
- c. New SD in HVAC per IMC
- d. Common space detection
- e. SD throughout

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Fire Alarm

Occupancy	Fire Alarm System Values			
	a	b ^a	c	d
A-1, A-2, A-3, A-4, B, E, R	-10	-5	0	5
M, F, S	0	5	10	15

Note a: For buildings equipped throughout with an automatic sprinkler system, add 2 points for activation by a sprinkler water flow device.

- a. None
- b. Manual fire alarm
- c. Manual fire alarm & FD notification
- d. FA w/ voice & command center


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Maximum Travel Distance

Points = $20 \times \frac{\text{Max Allowable TD} - \text{Max Actual TD}}{\text{Max Allowable TD}}$

$9 = 20 \times \frac{200-110}{200}$

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Elevator

Elevator Control Values

Elevator Travel	Categories			
	a	b	c	d
Less than 25 feet of travel above or below the primary level of elevator access for emergency fire-fighting or rescue personnel	2	0	0	2
Travel of 25 feet or more above or below the primary level of elevator access for emergency fire-fighting or rescue personnel	-4	NP	0	4

a. No elevator
 b. Elevator w/o Phase I or II
 c. All elevators w/Phase I & II
 d. New elevators serve all floors

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Emergency Lights

Egress Emergency Lighting Values

No. of Exits Required by Section 1010.0	Categories		
	a	b	c
Two or more exits	NP	0	4
Minimum of One	0	1	1

a. EL and exit signs not provided w/EP
 b. EL and exit signs provided w/EP
 c. Generator

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Mixed Occupancy

Mixed Use Group Values*			
Occupancy	Categories		
	a	b	c
A-1, A-2, R	-10	0	10
A-3, A-4, B, E, F, M, s	-5	0	5

a. Min. 1-hr separation
 b. Separated occupancy requirements
 c. 2 x Separated occupancy requirements

No mixed occupancies – Value = 0


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Sprinklers

Sprinkler System Values						
Occupancy	Categories					
	a	b	c	d	e	f
A-1, A-3, F, M, R, S-1	-6	-3	0	2	4	6
A-2	-4	-2	0	1	2	4
A-4, B, E, S-2	-12	-6	0	3	6	12

a. Required throughout & not provided or wrong
 b. Required partially & not provided or wrong
 c. **Not required – Not provided**
 d. Required partially and provided partially
 e. Required throughout and provided throughout
 f. Not required and provided


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Incidental Use Areas

Protection Required by Table 302.1.1	Protection Provided					
	None	1-hr	AFSS	AFSS w/ SP	1-hr & AFSS	2-hr & AFSS
2-hr & AFSS	-4	-3	-2	-2	-1	-2
2-hr or 1-hr & AFSS	-3	-2	-1	-1	0	0
1-hr & AFSS	-3	-2	-1	-1	0	-1
1-hr	-1	0	-1	0	0	0
1-hr or AFSS w/SP	-1	0	-1	0	0	0
AFSS w/SP	-1	-1	-1	0	0	-1
1-hr or AFSS	-1	0	0	0	0	0

If none, use 0

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Change of Occupancy


Partial change w/o separation

- Entire building

Partial change w/ separation

- Portion undergoing change

Compliance with Level 3


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Change of Occupancy

TABLE 1012.4
 MEANS OF EGRESS HAZARD CATEGORIES

Relative Hazard	Occupancy Classification
1 (Highest Hazard)	H
2	I-2, I-3, I-4
3	A, E, I-1, M, R-1, R-2, R-4
4	B, F-1, R-3, S-1
5 (Lowest Hazard)	F-2, S-2, U

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Life Safety & Exits

Change to higher hazard (lower number)

- Egress shall meet CH 10 CSBC
- 7 minor exceptions

Change to equal or lower hazard (higher number)

- Existing egress meet Level 3
- New egress meet CH 10 CSBC

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Change of Occupancy

TABLE 1012.5 HEIGHTS AND AREAS HAZARD CATEGORIES	
Relative Hazard	Occupancy Classification
1 (Highest Hazard)	H
2	A-1, A-2, A-3, A-4, I, R-1, R-2, R-4
3	E, F-1, S-1, M
4 (Lowest Hazard)	B, F-2, S-2, A-5, R-3, U

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Heights & Areas

Change to higher hazard (lower number)

- H & A shall meet CH 5 CSBC

Change to equal or lower hazard (higher number)

- H & A deemed acceptable

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Change of Occupancy

TABLE 1012.6 EXPOSURE OF EXTERIOR WALLS HAZARD CATEGORIES	
Relative Hazard	Occupancy Classification
1 (Highest Hazard)	H
2	F-1, M, S-1
3	A, B, E, I, R
4 (Lowest Hazard)	F-2, S-2, U

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Exterior Walls

Change to higher hazard (lower number)

- Meet CSBC

Change to equal or lower hazard (higher number)

- Walls & openings deemed acceptable


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Work Area

Change of Occupancy

- Substantial improvements – 1612 CSBC
 - Costs \geq 50% pre-construction market value, or
 - Structure substantially damaged


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Level 1 Alteration

Flood Hazard Areas

- Substantial improvements – 1612 CSBC
 - Costs \geq 50% pre-construction market value, or
 - Structure substantially damaged

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Level 1 Alteration


Building Elements & Materials

- Interior finish & carpeting – *new*
- Materials & methods – *new*

Fire Protection – *maintain existing levels*

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Level 1 Alteration 

Means of Egress – *CFSC Part IV*

Accessibility

- A building, facility or element that is altered shall comply with applicable provisions of:
 - Prescriptive partial occupancy change
 - Chapter 11 CSBC
 - ICC A117.1


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Level 1 Alteration

Structural

- Replacement of equipment supported by the building, or re-roofing permit required
 - Unless additional dead loads $\leq 5\%$,
 - 2nd roof covering ≤ 3 lbs./SF
- Evaluate roof diaphragm for wind resistance if $> 50\%$ of material is removed.

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Level 2 Alteration

Comply with Level 2 and 1 Alterations

New construction, elements, components, systems & spaces – CSBC

Except:

- New windows from light & ventilation
- New electrical equipment per 608
- New dead-end corridors per 605.6
- New ceiling heights \geq 7-feet

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Level 2 Alteration

Special Use & Occupancy – Level 1

Building Elements & Materials

- Vertical openings in Level 2 work areas – 14 variations
- All vertical openings & egress stairs in work areas > 50% of a floor are governed


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Level 2 Alteration

Building Elements & Materials

- Smoke barriers in I-2
- Interior finish in exits & corridors – new
- Guards (If not provided or requiring replacement) – new

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Level 2 Alteration

Fire Protection

- Apply throughout the work area w/ Level 2 Alteration in high-rise if work includes exit or corridor shared by > 1 tenant or OL > 30
- Apply throughout floor if above work > 50% floor area
- But only if there is sufficient water from

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Level 2 Alteration

Fire Protection

- Apply throughout the work area w/ Level 2 Alteration in Groups A, E, F-1, H, I, M, R-1, R-2, R-4 & S if work includes exit or corridor shared by > 1 tenant or OL > 30, if
 - CBSC requires in new
 - Work area > 50% of floor area
 - Sufficient municipal water supply w/o fire pump

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Level 2 Alteration

Fire Protection

- Mixed uses
- Windowless stories
- Standpipes
- Fire alarm & detection

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Level 2 Alteration

Means of Egress

- CFSC Part IV *and*
 - Number of exits
 - Fire escapes
 - Group A – main entrance
 - Egress doors
 - Dead-end corridors
 - Egress lighting

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Level 2 Alteration

Accessibility

- Added stairs or escalators require an accessible route between stories
- CSBC Sections 1107 & CH 9 for alarms only apply to the Accessible or Type A units added

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Level 2 Alteration

Structural

- Additional equipment supported by the building or reconfiguration that increases gravity loading
- Increased lateral loads
- Increased snow drift loads


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Level 2 Alteration

Electrical

- New work – *new*
- Existing wiring in A-1, A-2, A-5, H, & I work areas – *chapter 5 methods and materials*
- Residential features


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Level 2 Alteration

Mechanical

- Reconfigured or new habitable spaces– *new*
- Min. performance for existing systems if altered, reconfigured or extended
- Exhaust required if airborne matter, odor, fumes, ...allergens, pathogenic organisms in quantities causing


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Level 2 Alteration

Plumbing

- Plumbing fixtures on a story when OL increases more than 20%– *new*

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Dependency of Levels			
01	General	General	General
02	Special Use & Occupancy	Special Use & Occupancy	Special Use & Occupancy
03	Building Elements & Materials	Building Elements & Materials	Building Elements & Materials
04	Fire Protection	Fire Protection	Fire Protection
05	Means of Egress	Means of Egress	Means of Egress
06	Accessibility	Accessibility	Accessibility
07	Structural	Structural	Structural
08		Electrical	
09		Mechanical	
10			

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Level 3 Alteration

Comply with Level 3, 2 and 1 Alterations

Special Use & Occupancy

- High-rise
 - Recirculating air systems
 - Elevators
- Boiler & Furnace Equipment

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Level 3 Alteration

Building Elements & Materials

- Egress stairs require enclosure to the LED
- Interior finish in exits governed to LED

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Level 3 Alteration

Fire Protection

- Apply throughout the work area in HR if there is sufficient water from existing standpipe or sprinkler riser
- Within rubbish & linen chutes
- Fire alarm though out building

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Level 3 Alteration

Means of Egress

- CFSC Part IV *and*
- Egress lighting and signs from highest work area to LED

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Thank You & Goodbye



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