Completed: 2020 Amendments Drafted and Code Change Proposals Received

- 6/30/19 Committees/Work Groups Review
- 8/31/19 Final Drafts Developed
- 10/31/19 Drafts Reviewed
- 11/13/19 Codes and Standards Drafts Approval
- 2/29/20 Public Comment Period
- 5/31/20 Legislative Review/Approval
- 10/1/20 Code Takes Effect

Existing Building Code – Focus on Performance Compliance

Fall 2019 Career Development Series
James Quish, BO, FM, OEDM Trainer

DAS Office of Education and Data Management
Existing Building Code

• Today’s Objectives
  – Understand proper use of the IEBC
  – Review the IEBC general requirements
  – Understand the IEBC / Fire Code relationship
  – Understand the 3.1 IEBC compliance options
  – Understand mechanics of the performance option
  – Detail all components of a simple building summary worksheet
  – Understand the function of ancillary IEBC portions

Existing Building Code

• 101.2 Scope
  – IBC 101.4.7 Required reading
    • Existing building Code must be used for:
      – Repairs to existing buildings
      – Alterations to existing buildings
      – Addition impacts upon existing buildings
      – Change of occupancy of existing buildings
      – Relocation of existing buildings
  – IRC (CT)101.2 Option for compliance
    • Build as ‘new’ per IRC
      OR
    • Use the IEBC
Existing Building Code

• 101.4 Existing Buildings
  – 101.4.1 Existing buildings – never occupied
    • Update not required unless intended occupancy changes
      – Comply with Code under which permit was taken
    • Expired permit will prompt update
      – Current Code will prevail

Existing Building Code

• 101.4 General Issues
  – (CT)101.4.2 Existing previously occupied buildings
    • Stay with the Code – based on permit application date
    • No need for change or updates
      – Unless the State Fire Code specifically says otherwise
      – Unless Building Code specifically says otherwise
Existing Building Code

• (CT)101.4.3 General - Property Maintenance
  – ICC Maintenance Code is NOT Adopted
    • Applicable portions of CSFSC & Fire Prevention Code apply
      – Occasional retroactive issues

  – Connecticut State Fire Prevention Code
    • Minimum requirements - frequency of inspections
      – Annual inspections
        » A-1, A-2, E, H-1, I-1, All R groups, M & H-3 with fireworks
      – 2 year inspections
        » A-3, H-2, I-2, I-3, I-4 B Medical, B College
      – 3 year inspections
      – 4 year inspections
        » F-1, F-2, H-4, H-5, S-2, U

Existing Building Code

• 101.5 Chapter 15 applies to all work done
  – 1501.1 General to all IEBC Work
    • Storage of materials
      – Fire Safety
        » Extinguishers
        » MOE for workers
        » Standpipes
        » Sprinkler protection
        » Fire suppression water supply
      – Pedestrian safety
      – Adjoining property protection
      – Public property encroachment

    • 1501.1 Scope
      – Covers duration of work period
      – Twin of IBC Chapter 33
**Existing Building Code**

- **(CT)101.6** IEBC Appendix A may be used
  - Seismic resistance
    - A-1 Unreinforced masonry bearing walls
    - A-2 Concrete / masonry walls w/ flexible diaphragms
    - A-3 Wood frame cripple walls seismic
    - A-4 Wood frame residential walls
    - A-5 Concrete buildings

\[ DCR = 2.15D_0 \Sigma W_f (\Sigma y_i D + V_i) \]

(Equation A1-11)

- **301.1.4** Offers A as seismic design compliance option
  - When called for within Code
  - Engineer’s ‘menu’ item
  - BO must understand the option path
    - Need not understand the engineering

**Existing Building Code**

- **(CT)101.7** CT State **Fire Code Abatement**
  - Conflict resolution – Specific to Existing Buildings
    - State Fire Code – Conditional Superiority
      - Based on written FMO abatement orders
  - By exception:
    - New work must comply with current Building Code
      - Fire protection systems
      - Electrical
      - Plumbing
      - Mechanical
      - Structural
  - Simply stated: New structural, electrical, and mechanical work, to abate Fire Code issues, must be done in compliance with current Building Code
Existing Building Code

• Our Fire Code
  – (CT)101.9 Fire Code = 2018 CT Fire Code
    • State Fire Safety Code
      – Part I - Administrative
      – Part II - General
      – Part III – New, altered, renovated, occupancy changed buildings
      – Part IV – Existing Buildings
    • State Fire Prevention Code
      – Maintenance
      – Operational issues
      – Behavioral issues
  – (CT)101.10 MOE in Existing Buildings
    • Must comply with Part IV of 2018 CSFSC
      – Part IV applies only to the unaltered portions of the building

Existing Building Code

• Why do the Fire Guys Care?
  – IEBC = Fire Code, Part III
    • 2018 CSFSC - Alternative Compliance
      – CSFSC, Part III (CT)101.1.3
        » IEBC compliance = satisfaction of CSFSC Part III compliance
        » Specific to:
          • Alterations
          • Additions
          • Change of Occupancy
        » Untouched building portions remain with Fire Code Part IV
Existing Building Code

• 301.1 Compliance Methodology **3 Primary OPTIONS**
  – Option 1 – **301.1.1 Prescriptive Method**
    • Follow chapters 1, 2, 3, 4, 15
    • Ignore chapters 5-14
  – Option 2 – **301.1.2 Work Area Method**
    • Follow chapters 1, 2, 3, 5, 15
    • As directed by 5, follow chapters 6-13
    • Ignore chapters 4 & 14
  – Option 3- **301.1.3 Performance Method**
    • Follow chapters 1, 2, 3, 14, 15
    • Ignore chapters 4-13, unless 14 sends you there

Existing Buildings - Code Compliance - 3.1 Options

Chapters 1 & 2

>`

Chapter 3

Work Area Compliance

IEBC Chapter 5

IEBC Chapters 6-13 As directed

Prescriptive Compliance

IEBC Chapter 4

IEBC Chapters 15 & 16 as applicable

Performance Compliance

IEBC Chapter 14

IEBC COMPLIANCE
Existing Building Code

• Chapter 3 – Compliance Methods
  – 301.1 General – Buried ‘Special Rule’
    • Exception to the three compliance options
      – Subject to BO approval
        – Alterations may comply with ‘legacy’ Code
        – Applicable to limited structural alteration
          » 907.4.4 & 907.4.2 definition
          » 30% maximum floor & roof area over 5 year period
      – Flood area restrictions
      – New components must meet current requirements
      – NOTE: Intended for minor alterations

Existing Building Code

• Chapter 3 – Compliance Methods
  – 301.1 Applicant selects ONE compliance method
    • 1. Prescriptive
    • 2. Work Area
    • 3. Performance
    • .1 Legacy Code - minor alterations

  – BO’s job is to administer the Code
    • Ensure proper use of Code
    • Ensure proper engineering / documentation
    • Inspect as required
    • Execute Permit & CO duties
    • Coordinate with Local FMO
Existing Building Code

• 301.1.4 Seismic Evaluation
  – 301.1 Applies to ALL compliance methodology
    • Engineering options for seismic hardening
      – As will be called for within the Code
        » 301.1.4.1 Analysis per IBC
          • Two IBC options
            • IBC Chapter 16
            • ASCE 41
        » 301.1.4.2 ‘Reduced’ Seismic
          • Three IEBC options
            • 75% of IBC specified resistance
            • Use appropriate portions of appendix A1 – A5
            • ACSE 41 per table 301.1.4.2

  – BO responsibilities
    • 1) Recognize when the Code calls for seismic evaluation
    • 2) Understand path to proper resource
    • 3) Verify credentialing of professionals

Existing Building Code

• Chapter 3 – General Provisions
  – 302.2 Hierarchical Order
    • State Existing Building Code is ‘king’
      – As applied to work in Existing Buildings
        » Option for residential
    • Subordinate Codes apply as referenced:
      – Energy Conservation Code
      – State Fire Code
      – State Fire Prevention Code
      – Mechanical Code
      – Plumbing Code
      – Electrical Code
    • Any conflicts submit to this Code
  • Understand: This applies to all compliance methods
Existing Building Code

- **Chapter 3 General Provisions**
  - 302.3 Existing materials
    - OK unless stupid, unsafe, or 50% fast
  - 302.4 New / replacement materials
    - New work must meet current standards
    - Patch work may use similar materials
      - Unless hazardous or expressly prohibited in current Code
    - Essentially: as long as the repair isn’t stupid

**Existing Buildings – PRESCRIPTIVE IEBC Compliance**

- Situation: Applicant selects the prescriptive compliance method
- Chapters 1 & 2
- Chapter 3
  - Work Area Compliance
  - Prescriptive Compliance
  - Performance Compliance
  - IEBC Chapter 4
  - IEBC Chapter 14
  - IEBC Chapters 6-13 As directed
  - IEBC Chapters 15 & 16 as applicable
  - IEBC COMPLIANCE
Existing Building Code

• The Prescriptive Option – Chapter 4
  – 401.1 Scope
    • Application to existing buildings & structures undergoing:
      – Alteration
      – Repair
      – Addition
      – Change of Occupancy
      – Historic structures included

  – Key to prescriptive:
    • Follow Section 401
    • Follow Sections 402-410 as applicable to the work

Existing Buildings – WORK AREA Code Compliance

Situation: Applicant selects the Work Area compliance method

Chapters 1 & 2

Chapter 3

Prescriptive Compliance

Performance Compliance

IEBC Chapters 15 &16 as applicable

IEBC COMPLIANCE

IEBC Chapters 6-13 As directed

IEBC Chapter 14

IEBC Chapters 1 & 2

IEBC Chapter 4

Work Area Compliance

IEBC Chapter 5
Existing Building Code

• The Work Area Option – Chapter 5
  – 501.1 Scope
    • Application to existing buildings & structures undergoing:
      – Alteration
      – Repair
      – Addition
      – Change of Occupancy
      – Historic structures included
        » More detail in Section 508

– Key to work area compliance
  • Go to chapter 5
  • Go to Chapter 6-13 as directed by Chapter 5

Existing Buildings – PERFORMANCE Code Compliance

The main focus of today: Applicant selects the PERFORMANCE compliance method

Chapters 1 & 2

Chapter 3

IEBC Chapter 5

IEBC Chapters 6-13 As directed

IEBC Chapter 4

IEBC Chapter 14

IEBC Chapters 15 & 16 as applicable

IEBC COMPLIANCE
Existing Building Code

• So, Again; how do we get to the Performance method?
  – 301.1 Applicant selects compliance method
    • BO supervises the process
  – 301.1.3 Applicant selected performance -> Chapter 14
    • Chapters 4 through 13 are rendered ‘mute’

Existing Building Code

• The Performance Option – Chapter 14
  – 1401.1 Scope
    • Application to existing buildings & structures undergoing:
      – Alteration
      – Repair
      – Additions impacting existing portions
      – Change of Occupancy
      – Historic structures included
      – Moved structures

  – Key to work area compliance methodology
    • Go to chapter 14
    • Ignore 4-13
      – Unless specifically told otherwise by Chapter 14
Existing Building Code

• 1401.1 Compliance Alternative
  – Intention of Chapter 14
    • Provide an alternative to full prescriptive compliance
      – Chapters 4-13 are mute
        » UNLESS...... Chapter 14 specifically sends us there

Based on an old country axiom: You can’t make a silk purse out of a sow’s ear, no matter how hard you try! But, you can produce a very serviceable wallet

Existing Building Code

• Prelude to Chapter 14 – Performance Evaluation
  – A Comprehensive Look at Building Safety
    • Passive fire protection issues
      – Height & Area
      – Building Hazard Areas
      – Tenant Separation
      – Corridor Walls
      – Vertical Openings
      – Mechanical Systems Arrangement
    • Active fire protection issues
      – Fire Detection & Notification
      – Automatic extinguishing systems
      – Manual extinguishing systems
      – Smoke Control
    • Occupant safety issues
      – MOE arrangement
      – MOE / Emergency Lighting
      – Separation of hazards
Existing Building Code

• (CT)1401.2 Applicability
  – Really, really important stuff about Chapter 14:
    • May be used only for buildings existing prior to 10/1/2018
      – Existing = Legal permit & CO & all pre 10-1-1970 buildings
    • Applies only to Groups: A, B, E, F, I-2, M, R, S
      – Based upon the proposed classification
    • NOT used for rendering of a Group H, I-1, I-3, I-4
      – However, could be used occupancy change from one of these groups
    • Application ambiguity regarding group U
      – We’ll fix this in a few minutes

Existing Building Code

• 1401.2 Chapter 14 Alternative – Important rules
  – 1401.2.1 Special Rule – Specific to Occupancy Change
    • Judged based upon occupancy being rendered

Example: Existing Fire Station rendering to a large tavern will be judged as Group A-2
Existing Building Code

- **1401.2 Chapter 14 Alternative – Important rules**
  - **1401.2.2 Design Option - Partial Change in Occupancy**
    - Fire barrier may be used to separate unchanged portion of building
      - Fire barrier separation = Provisions apply only to the portion being changed
      - NO fire barrier = entire building must be evaluated

<table>
<thead>
<tr>
<th>Altered M group rendered from S-2 group</th>
<th>Unaltered, existing S-2 group need <strong>NOT</strong> be part of evaluation based on IBC compliant fire barrier separation</th>
</tr>
</thead>
<tbody>
<tr>
<td>May be individually evaluated</td>
<td></td>
</tr>
</tbody>
</table>

Existing Building Code

- **1401.2 Chapter 14 Alternative – Important rules**
  - **1401.2.3 Additions**
    - *Additions* are always judged as new construction
      - Floor space increase
      - Addition of stories
      - Installation of habitable mezzanines
    - *Addition*
      - Not permitted to push building in excess of IBC limits
        - Height
        - Area
      - However, an existing oversize building may be evaluated
  - Fire Wall per IBC 706
    - ‘Addition’ no longer
      - a separate building
Existing Building Code

- **1401.2 Chapter 14 Alternative – Important rules**
  - **1401.2.4 Alterations & Repairs**
    - Cannot reduce building’s level of safety or compliance !!!!!
    - Any reduction must meet the current Building Code

Really Important Stuff: Do not allow the building to become less safe or sanitary!!!

Existing Building Code

- **1401.2 Chapter 14 Alternative – Important rules**
  - **1401.2.5 Accessibility requirements**
    - Accessibility is prescriptive
      - Comply with either Section 410 or 705
        » Prescriptive method
        » Work area method

Performance option ramp designs?
Existing Building Code

• **1401.3 Acceptance of the Performance Option**
  – Building owner’s option to exercise this option
    • Therefore, BO must understand this option
  – BO **must** accept option, if exercised
    • BO will verify proper application of this option
    • BO will retain control of the process and documentation
  – Again; limited to *existing* structures:
    • Specified classifications
      – N/A for H group, I-1,1-3;1-4, U
    • Classified work
      – Repairs
      – Alterations
      – Additions
      – Changes of occupancy

Existing Building Code

• **1401.3 Acceptance issues**
  – **1401.3.1 Building Hazards Abatement**
    • BO must deal with unsafe conditions
      – Section 116 IBC
    • Works with general requirements Chapter 3
      – 302.3 Old materials - safety
      – 302.4 New materials - safety
Existing Building Code

– 1401.3.2 Project must be Fire Code compliant
  • Proposed project must comply with Fire Code:
    – State Fire Code
      » IEBC compliance is Fire Code Part III compliance
      » CSFSC Part IV applies to untouched existing portions
    – Property Maintenance Code
      » State Fire Prevention Code
  • BO & FMO must collaborate
    – IBC 105.3.1.2 FMO’s OK at permit
    – IBC 111.1.3 FMO’s OK before CO

Existing Building Code

• 1401.3 Acceptance
  – 1401.3.3 Flood Hazard Areas
    • This is not a route to escape flood issues
      – Substantial improvement = make if right per IBC1612 or IRC322
        » 50% of pre-improvement value trips the trigger

Performance option?
Water pressure switch operated window openers!
Existing Building Code

• 1401.4.2 Items the BO needs to collect
  – 1. Structural engineering analysis
    • Building’s ability to bear proposed loads
      – IBC Chapter 16 current requirements
  – 2. Registered Design Professional Prepared Plans
    • CGS 20-293 unless CGS 20-298 exempt
    • Threshold buildings & additions
  – 3. Completed building analysis
    • Based on properly conducted evaluation process
      – Table 1401.7 Documentation

  – BO’s role:
    • Collect required documentation
    • Evaluate information for accuracy

Table 1401.7
The Evaluation Worksheet
Part of the submittal package
Existing Building Code

• **1401.5 The Building Evaluation**
  – **1401.6 A formal process**
    • Based upon Table 1401.7
  – **3 ‘Safety Parameters’**

Existing Building Code

• **1401.5 The Evaluation – 21 Specific Items**
  • Height
  • Area
  • Compartmentation
  • Dwelling separation
  • Corridor walls
  • Vertical Openings
  • HVAC Systems
  • Fire detection
  • Fire notification
  • Smoke control
  • Means of egress capacity
  • Dead Ends
  • Exit travel distance
  • Elevator control
  • Emergency lighting
  • Mixed occupancies
  • Fire sprinklers
  • Standpipes
  • Incidental use areas
  • Smoke compartments
  • I-2 Patient Issues
Existing Building Code

• 1401.6 Building Evaluation process
  – Here’s the rules of the game.........
    • 1. Entire building must be evaluated
      – Separated buildings – each portion individually
      – Non-separated – As a whole
      – We have special rules for I-2 – analyze each smoke compartment
    • 2. The building is formally scored
      – Table 1401.7 is the score sheet
    • 3. The building must attain a minimum score
      – Table 1401.8 sets the minimum acceptable score
        » In each of the 3 categories
        » Group U is not on the Table
        » We may use for change from Group U
        » May NOT use for change to Group U

Existing Building Code

• The Process – Applied to our subject building
  – 1401.6 Building Evaluation Process – An Example
    • Built 1930
    • 3 story former mill
    • No basement
    • 40’ height to peak
    • Type IV construction
    • 80’ by 200’

  – Building will become a 48 unit apartment building
Existing Building Code

• 1401.6 Type IV Mill to Apartment Building Conversion Proposal

• Leaving Group F to become a Group R-2
  -- 1 hour wall for dwelling unit separation
  -- 1 hour common corridor construction
  -- 1 hour equivalent rated floor separation
  -- Mix of Accessible, A dwelling units, & B dwelling units
  -- Phase I & II Elevators, stretcher sized
  -- Individual mini-split, 4 zone/ HVAC units
  -- 16 dwelling units / floor – 48 dwelling unit total
  -- Rendered to type V-A construction
    -- Concealed spaces created (IBC 602.4)
    -- IBC 420.5 compliant NFPA72 Alarm system
      • AC/DC Interconnected smoke detection & notification-common areas
      • AC/DC Smoke alarms in each dwelling unit
      • Manual pull stations in common corridors & stairs
    -- NFPA13 Sprinkler System
      • Per IBC 903.2.8
      • AS water flow is fire alarm system monitored
  -- 50' open space separation on all sides of the building, existing small structure impediments will be removed
  -- Three exterior wall stairwells with operable windows maintained
  -- 4’ common corridors with 12’ maximum dead-ends
  -- 170’ maximum travel distance from most remote point in the building
  -- Illuminated exit signs with emergency lighting units – 90 minute battery power
  -- 40’ building height after addition of ‘rain roof’
  -- 16,000 ft² / floor after filling-in unused shafts

Important to Note: Regardless of result, maximum score is limited to 10 by Code narrative

Existing Building Code

• 1401.6.1 Height Formula – Step 1 of 21
  -- The lesser value
  -- Height in feet
    -- Equation 14-1
  -- Height in stories
    -- Equation 14-2

1401.6.1 Height formula. The following formulas shall be used in computing the building height value.

\[
\text{Height value, feet} = \frac{(AH) - (EBH)}{12.5} \times CF
\]

(Equation 14-1)

\[
\text{Height value, stories} = \frac{(AS - EBS)}{CF}
\]

(Equation 14-2)

where:

\[\begin{align*}
AH & = \text{Allowable height in feet (m)} \text{ from Section 504 of the International Building Code} \\
EBH & = \text{Existing building height in feet (m)} \\
AS & = \text{Allowable height in stories from Section 504 of the International Building Code} \\
EBS & = \text{Existing building height in stories} \\
CF & = 1 \text{ if } (AH) - (EBH) \text{ is positive} \\
& = \text{Construction-type factor shown in Table 1401.6.6(2) if } (AH) - (EBH) \text{ is negative.}
\end{align*}\]
Existing Building Code

- **1401.6.1.1 Height Formula – Step 1 of 21**
  - IBC permitted height and stories for a R-2, Type V-A with AS
    - IBC Table 504.3 permits an “AH” = 70’ overall
    - IBC Table 504.4 permits an ‘AS’ = 4 Stories
  - Table 1401.6.6(2) used for CF
    - Only when (AH) – (EBH) is negative

  \[
  HV_F = \left(\frac{AH - EBH}{12.5}\right) \times CF \\
  \text{Height value, feet} = \frac{(AH) - (EBH)}{12.5} \times CF \\
  \text{Equation 14-1}
  \]

  \[
  HV_S = \left[\frac{4 - 3}{12.5}\right] \times CF \\
  \text{Height value, stories} = \frac{(AS - EBS)}{12.5} \times CF \\
  \text{Equation 14-2}
  \]

  \[
  HV_S = 1 \\
  \text{CF = 1 because result is positive}
  \]

  \[
  HV_F = 2.4 \\
  \text{CF = 1 because result is positive}
  \]
Existing Building Code

1401.6.2 Area Formula – Step 2 of 21

- \( A_a = IBC \text{ Table 506.2} + \text{Frontage Increase} \)
  
  \[ A_a = A_t + (NS \times I_f) \]  
  (Equation 14-3)

- \( A_a = 36,000 + (12,000 \times .75) \)
- \( A_a = 36000 + 9,000 \)

- \( A_a = 45,000 \text{ ft}^2 \) per floor based on the sprinklers and open space about the structure

Text requires that we enter the lesser value for all three categories.

Again the absolute maximum value to be entered is 10!

Note that building height and area is not limited but will certainly result in many negative points if the building is beyond current IBC limitations.

A designer could control building area with fire separation.

NOTE: The allowable areas are based on the inclusion of a NFPA 13 sprinkler. This system is beyond the minimum required NFPA 13R system.
Existing Building Code

• 1401.6.2 Area Formula – Step 2 of 21
  – Calculation is simplified as we are dealing with only one occupancy
    • Second part of equation is used for additional unseparated occupancies

\[
\text{Area value } i = \frac{\text{Actual area } i}{1,200 \text{ square feet}} \left( 1 - \frac{\text{Actual area } j}{\text{Allowable area } j} \right)^{\frac{i}{j}}
\]

\[
\text{Area value } i = \frac{45,000}{1,200 \text{ square feet}} \left( 1 - \frac{16,000}{45,000} \right) = 24.2
\]

Area value = 37.5 \times (1 - (0.3555555556)) = 24.2

HOWEVER: 1401.6.2 limits the actual score to 50% of Table 1401.8 value
Therefore; we may take a maximum 50% of 21 or 10.5 points.

Existing Building Code

<table>
<thead>
<tr>
<th>SAFETY PARAMETERS</th>
<th>FIRE SAFETY (FS)</th>
<th>MEANS OF EGRESS (ME)</th>
<th>GENERAL SAFETY (GS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1401.6.1 Building Height</td>
<td>1</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>1401.6.2 Building Area</td>
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<tr>
<td>1401.6.3 Compartmentment</td>
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<td>1401.6.4 Tenant and Dwelling Unit Separations</td>
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<td>1401.6.5 Corridor Walls</td>
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<td>1401.6.6 Vertical Openings</td>
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<td>1401.6.7 HVAC Systems</td>
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<td>1401.6.8 Automatic Fire Detection</td>
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<td>1401.6.9 Fire Alarm System</td>
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<td>1401.6.10 Smoke control</td>
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<td>1401.6.11 Means of Egress</td>
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<td>1401.6.12 Dead ends</td>
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<td>1401.6.13 Maximum Exit Access Travel Distance</td>
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<td>1401.6.14 Elevator Control</td>
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<td>1401.6.15 Means of Egress Emergency Lighting</td>
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<td>1401.6.16 Mixed Occupancies</td>
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<td>1401.6.17 Automatic Sprinklers</td>
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<td>1401.6.18 Standpipes</td>
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<td>1401.6.19 Incidental Use</td>
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<td>1401.6.20 Smoke compartmentation</td>
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<tr>
<td>1401.6.21.1 Patient ability for self-preservation</td>
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<tr>
<td>1401.6.21.2 Patient concentration</td>
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<tr>
<td>1401.6.21.3 Attendant-to-patient Ratio</td>
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</tbody>
</table>

Values entered based on permitted maximum of 50% of the ‘Fire Safety Score found in Table 1401.8 per 1401.6.2. Note that the lesser of calculated or 50% limitation is applied to all three categories.

Huge points gained based on the voluntary upgrade of the sprinkler from a NFPA 13R to a NFPA 13 system.

NOTE: Installation of a 13R system, as permitted by Code, would have awarded only 4.2 points based on the reduced maximum permitted building area.
Existing Building Code

• 1401.6.3 Fire Area Compartmentation – Step 3 of 21
  – 1401.6.3.1 Walls
    • 2 hour barrier required for consideration
  – 1401.6.3.2 Floor / ceilings
    • 2 hour barrier required for consideration

• NOTE: This section deals with **BUILDING** compartmentation
  – Compartmentation = Fire walls or barriers
  – No credit for dwelling separation or rated corridors

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>(a) Compartment size equal to or greater than 10,000 square feet</th>
<th>(b) Compartment size of 7,500 square feet</th>
<th>(c) Compartment size of 5,000 square feet</th>
<th>(d) Compartment size of 2,500 square feet or less</th>
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<tbody>
<tr>
<td>A-1, A-2</td>
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<td>10</td>
<td>14</td>
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<td>A-3</td>
<td>4</td>
<td>10</td>
<td>14</td>
<td>18</td>
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<tr>
<td>A-4, B, E, S-2</td>
<td>0</td>
<td>5</td>
<td>10</td>
<td>15</td>
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</tbody>
</table>

We take the ‘goose egg’ as our building is not separated into fire compartments by a 2 hour wall. Our compartment is over 15K. Designer could gain 4 points by diving the building into two parts with a fire wall built to IBC Chapter 7 specs.
Existing Building Code

- **1401.6.4 Dwelling Unit Separation – Step 4 of 21**
  - Fire rated passive protection between dwelling units
    - a. no fire partition dwelling separation
    - b. partitions of less than 1 hour
      - NOTE: if we were using the prescriptive option, ½ hour would be required with AS per section 420
    - c. One hour partitions
    - d. One hour & better, less than two hour
    - e. Two hour dwelling unit separation

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>CATEGORIES</th>
<th>OCCUPANCY</th>
<th>CATEGORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
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<td>S-2</td>
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<tr>
<td></td>
<td></td>
<td>e</td>
<td>4</td>
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</tbody>
</table>

- We take nothing for the expected one hour rated partition dwelling separation. NOTE possible to lose points for lesser separation

- **NOTE:** Partitioning creates combustible voids within the building. Therefore, 1401.2.4 requires the alterations conform to the IBC as ‘new’ work. 1 hour separation is a mandate
Existing Building Code

- 1401.6.5 Corridor Wall Rating – Step 5 of 21
  - Note that points can be lost for inadequate protection
    - a. no fire partition
    - b. less than 1 hour
      - NOTE: if we were using the prescriptive option, ½ hour would be required with AS per section 420
    - c. One hour partitions
    - d. Two hour & better

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>CATEGORIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1</td>
<td>a 10 b -4</td>
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<tr>
<td>A-2</td>
<td>a 30 b -12</td>
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<tr>
<td>A-4, B, E, S-2</td>
<td>a 5 b -2</td>
</tr>
<tr>
<td>I-2</td>
<td>a 10 b 0</td>
</tr>
</tbody>
</table>

Existing Building Code

Again, nothing for the expected rated corridor. Since this work rendered the wide-open building as ‘less safe’; 1401.2.4 REQUIRES that the new work conform to the current IBC portion of State Building Code.
Existing Building Code

- **1401.6.6 Vertical Openings—Step 6 of 21**
  - Protection value multiplied by the construction type factor

  - **NOTE:** ALL vertical openings will meet IBC section 713, we will therefore use a Vertical Opening Protection value of **2 per the 1401.6.6 narrative**
    - VO=PV X CF
    - VO=2 X 3.3 = 6.6

---

**Existing Building Code**

Picking up points for good shaft protection based on full compliance with existing IBC requirements. Especially important in our void filled, ancient wood framed building.

Note that some very serious point could be lost for poor vertical opening separation.
Existing Building Code

- **1401.6.7 HVAC Systems—Step 7 of 21**
  - Based on degree of hazard, potential to spread fire/smoke
    - **1401.6.7.1 ‘categories’**
      - a – building cavity plenums
        » -10 points off
      - b – forced air in MOE
        » -5 points to the ‘bad’ side
      - c – A & B combined
        » -15 points to the negative
      - d – Controlled corridor air movement
        » 0 points
      - e – Single story HVAC or hydronic
        » +5 points

We’ll take the whole ‘pot’ for HVAC posing little hazard to the spread of fire or smoke
Existing Building Code

• **1401.6.8 Fire Detection**—Step 8 of 21
  – We have:
    • **Smoke detection** in all common areas as part of a fire alarm system
    • **Smoke alarms** in dwelling units don’t provide any credit, here
      – Apartment alarms are not part of the common area detection

<table>
<thead>
<tr>
<th>SAFETY PARAMETERS</th>
<th>FIRE SAFETY (F)</th>
<th>MEANS OF EGRESS (ME)</th>
<th>GENERAL SAFETY (G)</th>
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<tbody>
<tr>
<td>1401.6.1 Building Height</td>
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<td>1401.6.10 Smoke control</td>
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<td>1401.6.11 Means of Egress</td>
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<td>1401.6.12 Dead ends</td>
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<td>1401.6.13 Maximum Exit Access Travel Distance</td>
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<td>1401.6.15 Means of Egress Emergency Lighting</td>
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<td>1401.6.16 Mixed Occupancies</td>
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<td>1401.6.17 Automatic Sprinklers</td>
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<td>1401.6.19 Incidental Use</td>
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<tr>
<td>1401.6.21.3 Attendant-to-patient Ratio</td>
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</tbody>
</table>

**Building score**—total value

Note the potential to lose serious points for poor fire detection

Couple of points for a good fire detection scheme
Existing Building Code

• 1401.6.9 *Fire Alarm* Systems – Step 9 of 21
  - Our system meets the prescriptive IBC 907.2.9
    - Common area detection
    - Full building notification
    - Individual smoke alarms in dwelling units

Now we’re dealing with the occupant notification portion of fire detection

<table>
<thead>
<tr>
<th>TABLE 1401.6.9 FIRE ALARM SYSTEM VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>OCCUPANCY</td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>F, M, S</td>
</tr>
<tr>
<td>I-2</td>
</tr>
</tbody>
</table>

Cat. A – Nuttin’
Cat. B – Pull box & horns
Cat. C - IBC compliant alarm
Cat. D – Alarm & voice communications

Existing Building Code

<table>
<thead>
<tr>
<th>SAFETY PARAMETERS</th>
<th>FIRE SAFETY (FS)</th>
<th>MEANS OF EGRESS (ME)</th>
<th>GENERAL SAFETY (GS)</th>
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<tbody>
<tr>
<td>1401.6.1 Building Height</td>
<td>1</td>
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<tr>
<td>1401.6.2 Building Area</td>
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<td>1401.6.7 HVAC Systems</td>
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<td>1401.6.11 Means of Egress</td>
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<td>1401.6.19 Incidental Use</td>
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<tr>
<td>1401.6.21.1 Patient ability for self-preservation</td>
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<td>1401.6.21.2 Patient concentration</td>
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<tr>
<td>1401.6.21.3 Attendant-to-patient Ratio</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

System is that which is expected – we make no forward progress in point accumulation.

Again, big points could be lost for poor notification
Existing Building Code

• 1401.6.10 Smoke Control – Step 10 of 21
  – Automatic or manual smoke movement potential
    • a – no system or ventilation provided
    • b - AS + some operable window
    • c – At least 1 enclosed stairs with operable windows
    • d – smoke proof enclosure
    • e – AS + air handler
    • f – 909 compliant system

Our stairs with operable windows give us 3 points. We have meet the requirement imposed by footnote a. No points will be awarded if the building lacks good smoke detection.

Existing Building Code

We’ll take 3 points, but only in 2 categories. ‘Fire Safety’ is not really an issue - once a fire has started.
Existing Building Code

• 1401.6.11 MOE - Step 11 of 21
  – 1401.6.11.1 Categories
    • a – compliant with use of a fire escape
    • b – proper capacity & number of exits
    • c – good exit width and over abundance (125%) of egress capacity
    • d – plenty of exits and properly located, no excessive travel
    • e – meeting both items ‘c’ & ‘d’, above

MOE is a very important Life Safety issue. We can’t ‘win’ points, only lose if a fire escape is part of the egress scheme.

Existing Building Code

<table>
<thead>
<tr>
<th>SAFETY PARAMETERS</th>
<th>FIRE SAFETY (FS)</th>
<th>MEANS OF EGRESS (ME)</th>
<th>GENERAL SAFETY (GS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1401.6.1 Building Height</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>1401.6.2 Building Area</td>
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<td>1401.6.3 Compartment</td>
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<td>1401.6.4 Tenant and Dwelling Unit Separations</td>
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<td>1401.6.6 Vertical Openings</td>
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<tr>
<td>1401.6.7 HVAC Systems</td>
<td>2</td>
<td>2</td>
<td>2</td>
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<td>1401.6.9 Fire Alarm System</td>
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<td>1401.6.10 Sa stale control</td>
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<tr>
<td>1401.6.11 Means of Egress</td>
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<tr>
<td>1401.6.12 Dead ends</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

At least we didn’t lose points.

Based on the extensive alterations to this building; MOE must at least meet at least the capacity and quantity as required of a new building. The potential to lose points exists when a fire escape is used to meet that required capacity or required quantity.
Existing Building Code

- 1401.6.12  Dead Ends – Step 12 of 21
  - 1401.6.12.1  Categories
    - a – 35’+ / 70’+ with AS
    - c – no dead ends or very wide dead ends
    - D - corridors of death

We could have gained points if the designer had been able to eliminate all dead ends or make the dead ends very wide.
Existing Building Code

• 1401.6.13 Travel Distance—Step 13 of 21
  – Maximum allowable exit access travel distance

• IBC Table 1017.2
  – 250’ permitted with AS

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>WITHOUT SPRINKLER SYSTEM (feet)</th>
<th>WITH SPRINKLER SYSTEM (feet)</th>
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</thead>
<tbody>
<tr>
<td>A, E, F, 1, M, R, S, T</td>
<td>200</td>
<td>250</td>
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<tr>
<td>I</td>
<td>Not Permitted</td>
<td>250</td>
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<tr>
<td>B</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>F-2, S-2, U</td>
<td>300</td>
<td>400</td>
</tr>
</tbody>
</table>

Easy place to gain or lose big points, depending on length of Exit Access Travel Distance

Points = \( \frac{20 \times 170'}{250'} = 6.4 \) (Equation 14-6)

Existing Building Code

Nice boost for a fairly short travel distance in an AS protected structure.

Note that a travel distance greater than allowed for a new building would result in lost points.

Keep in mind that the egress capacity, and number of egress, must be compliant per 1401.6.11.1.
Existing Building Code

• 1401.6.14 Elevator Control – Step 14 of 21
  • Based on 1401.6.14.1
    – a – no elevator
    – b – elevators without FD control
    – c – phase I & phase II elevators
    – d – phase I / II, stretcher sized elevator, all floors

Note: New stretcher sized elevator voluntarily installed for accessibility and as a marketing scheme to permit bicycle storage inside apartments.

<table>
<thead>
<tr>
<th>ELEVATOR TRAVEL</th>
<th>CATEGORIES</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
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</thead>
<tbody>
<tr>
<td>Less than 25 feet of travel above or below the primary level of elevator access for emergency fire-fighting or rescue personnel</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>-</td>
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<tr>
<td>Travel of 25 feet or more above or below the primary level of elevator access for emergency fire-fighting or rescue personnel</td>
<td>+4</td>
<td>NP</td>
<td>0</td>
<td>+4</td>
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</table>

<table>
<thead>
<tr>
<th>SAFETY PARAMETERS</th>
<th>FIRE SAFETY (FS)</th>
<th>MEANS OF EGRESS (ME)</th>
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<tr>
<td>1401.6.1 Building Height</td>
<td>1</td>
<td>1</td>
<td>1</td>
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<tr>
<td>1401.6.2 Building Area</td>
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<td>1401.6.7 HVAC Systems</td>
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<td>1401.6.12 Dead ends</td>
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</tr>
<tr>
<td>1401.6.13 Maximum Exit Access Travel Distance</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
</tbody>
</table>

Installation of a stretcher capable elevator (intended to accommodate bicycles) boosted the count. Money well spend by a smart designer.
Existing Building Code

• 1401.6.15 MOE Emergency Lighting –15 of 21
  • Based on 1401.6.15.1
    – a – No power = really, really dark
    – b – 90 minute emergency MOE illumination
    – c – Generator emergency power 2+ hour fuel supply

<table>
<thead>
<tr>
<th>NUMBER OF EXITS REQUIRED BY SECTION 1018 OF THE INTERNATIONAL BUILDING CODE</th>
<th>a</th>
<th>b</th>
<th>c</th>
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<tr>
<td>Two or more exits</td>
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<td>4</td>
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<tr>
<td>Minimum of one exit</td>
<td>()</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Existing Building Code

Taking the goose eggs for our battery back-emergency lights. Fairly easy to pick-up four additional points with a generator. However, voluntary installation of a new generator would prompt IBC requirements that the unit be sized to handle the new elevator per IBC 3003.1.
Existing Building Code

- **1401.6.16** Mixed Occupancy Value – 16 of 21
  - Based on 1401.6.16.1
    - a – 1 hour fire barriers
    - b – IBC Section 508.4 compliant
    - c – 2 times IBC Table 508.4

**No mixed occupancies in our building means no chance to gain or lose points**

![Table 1401.6.16](image)

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>a</th>
<th>b</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-1, A-2, R</td>
<td>-10</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>A-3, A-4, B, E, F, M, S</td>
<td>-5</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>T-2</td>
<td>NP</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

**Existing Building Code**

**No mixed occupancies in our building means no chance to gain or lose points**
Existing Building Code

• 1401.6.17 Sprinkler System – Step 17 of 21
  • Based on 1401.6.17.1
    – a – required but not properly provided
    – b – partial system required but not properly provided
    – c – not required, not provided
    – d – partial system as required
    – e– complete system as required by IBC 903.2.8
    – f – complete system installed as an option

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>CATEGORIES</th>
<th>a</th>
<th>b</th>
<th>c</th>
<th>d</th>
<th>e</th>
<th>f</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-2</td>
<td>-4 -2 0 1 2 4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A-1, B, E</td>
<td>-12 -6 0 3 6 12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I-2</td>
<td>NP NP NP 8 10 SP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Our building will be outfitted with a NFPA 13 system. The 13 system exceeds the minimum 13R requirement for a sprinkler system.

Existing Building Code

Our building will have a NFPA 13 Sprinkler. Protection in all portions of the building will give us some points. Recall that the sprinkler ‘upgrade’ had a positive impact when earlier consideration was made to building height & area calculations.
Existing Building Code

• **1401.6.18  Standpipes – Step 18 of 21**
  - Based on 1401.6.18.1
    - a – required but not properly provided
    - b – not required, not provided
    - c – system as required
    - d – complete system installed as an option

No pipe in our building.
No pipe required as the top story floor level is less than 30’ above FD access elevation (IBC 905.3.1)

Another place for a designer to gain some points.
Existing Building Code

• 1401.6.19 Incidental Use Areas – Step 19 of 21
  • Based on IBC Section 509 protection requirements
    – Laundry rooms
    – Waste collection areas
    – Recycling closet
    – Common area maintenance closet

Laundry room & trash room are 1 hour separated & AS protected as expected of a NFPA 13 system.
We gain nothing for compliance as new.
Existing Building Code

- 1401.6.20 Smoke Compartments—Step 20 of 21
  - Applies only to Group I-2
- No way to add or lose points

### TABLE 1401.6.20

<table>
<thead>
<tr>
<th>OCCUPANCY</th>
<th>CATEGORIES*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a</td>
</tr>
<tr>
<td>I-2</td>
<td>0</td>
</tr>
</tbody>
</table>

N/A to groups other than I-2
Existing Building Code

- **1401.6.21** Patient Capabilities – Step 21 of 21
  - Applies *only to I-2*
    - **1401.6.21.1** Capability of patients to self-rescue
    - **1401.6.21.2** Number of patients / smoke compartment
    - **1401.6.21.3** Staff to patient ratio

  Note that the operational issue of staffing will become a ‘special stipulation’ to be noted on the C of O per IBC 111.2.
  FD also needs to be aware of this ‘maintenance’ issue.

---

### Existing Building Code

<table>
<thead>
<tr>
<th>SAFETY PARAMETERS</th>
<th>FIRE SAFETY (FS)</th>
<th>MEANS OF EGRESS (ME)</th>
<th>GENERAL SAFETY (GS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1401.6.1 Building Height</td>
<td>1</td>
<td>1</td>
<td>10.5</td>
</tr>
<tr>
<td>1401.6.2 Building Area</td>
<td>10.5</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td>1401.6.3 Compartmentation</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1401.6.4 Tenant and Dwelling Unit Separations</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1401.6.5 Corridor Walls</td>
<td>6.6</td>
<td>6.6</td>
<td>6.6</td>
</tr>
<tr>
<td>1401.6.6 Vertical Openings</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>1401.6.7 HVAC System</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1401.6.8 Automatic Fire Detection</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1401.6.9 Fire Alarm System</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1401.6.10 Smoke control</td>
<td><em>+++</em></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>1401.6.11 Means of Egress</td>
<td><em>+++</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1401.6.12 Dead ends</td>
<td><em>+++</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1401.6.13 Maximum Exit Access Travel Distance</td>
<td><em>+++</em></td>
<td>6.4</td>
<td>6.4</td>
</tr>
<tr>
<td>1401.6.14 Elevation Control</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>1401.6.15 Means of Egress Emergency Lighting</td>
<td><em>+++</em></td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1401.6.16 Mixed Occupancies</td>
<td>0</td>
<td><em>+++</em></td>
<td>0</td>
</tr>
<tr>
<td>1401.6.17 Automatic Sprinklers</td>
<td>4</td>
<td>4 -2 = 2</td>
<td>4</td>
</tr>
<tr>
<td>1401.6.18 Stairways</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1401.6.19 Incidental Use</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1401.6.20 Smoke compartmentation</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1401.6.21.1 Patient ability for self-preservation</td>
<td><em>+++</em></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1401.6.21.2 Patient concentration</td>
<td><em>+++</em></td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>1401.6.21.3 Attendant-to-patient Ratio</td>
<td><em>+++</em></td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Note: N/A indicates the parameter is not applicable or not considered in the group other than I-2.
Existing Building Code

1401.8 Mandatory Minimum Safety Scores

- Our result:
  - FS = 31.1
  - ME = 38.5
  - GS = 40.5

  - Compliant!
Existing Building Code

• Evaluation Notes:
  – 1401.9 Evaluation of Fire Separated Occupancies
    • 1401.9.1 Mixed Occupancy Buildings
      – Separated Occupancies meeting 1401.6.6 - Cat. A, B, or C
        » Each occupancy individually evaluated

<table>
<thead>
<tr>
<th>M group</th>
<th>B group</th>
<th>A-2 group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum score</td>
<td>Minimum score</td>
<td>Minimum score</td>
</tr>
<tr>
<td>23-40-40</td>
<td>30-40-40</td>
<td>21-32-32</td>
</tr>
</tbody>
</table>

Existing Building Code

• Evaluation Notes:
  – 1401.9 Evaluation of Non-Separated Occupancies
    • 1401.9.1 Mixed Occupancy Buildings
      – Non-separated Occupancies
        » Evaluation based on all relevant occupancy groups
        » Occupancy with lowest GS score prevails for all occupancies

<table>
<thead>
<tr>
<th>M group</th>
<th>B group</th>
<th>A-2 group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum score</td>
<td>Minimum score</td>
<td>Minimum score</td>
</tr>
<tr>
<td>per A-2 occupancy</td>
<td>per A-2 occupancy</td>
<td>21-32-32 Applies to all non-separated occupancies</td>
</tr>
</tbody>
</table>
Existing Building Code

• Before we go away.....Resource A
  – Guidelines for Fire Rating of Archaic Assemblies
    • Part I - Walls
    • Part II – Columns
    • Part III - Floor / ceiling assemblies
    • Part IV – Beams
    • Part V – Doors
  • A resource option for use by design engineers
  • BO must understand the option

Existing Building Code

• Wrap-up - IEBC Performance Compliance
  – 1 of 3.1 compliance options
  – If applicant selects, BO must accept choice
  – Limited to specified use groups
  – BO administers Code
  – Engineering report required
  – Formal building use analysis required
  – Accessibility issues remain prescriptive
  – Flood provisions apply upon substantial improvement
  – IEBC compliance = Fire Code compliance for the evaluated part
  – Special rules for evaluation of mixed occupancies
What did I fail to address?

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