

Fire Resistance Rated Construction
 Reference
 Chapter 7 of the 2012 IBC
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 Division of Construction Services



For Training Purposes Only
 Content Subject to Change
 Based on the Adoption of 2012 ICC
 Codes by the State of Connecticut

IBC 2012 Chapter 7 New Title:
Fire and Smoke Protection Features
 701.1 Scope:
 • Provisions of this chapter shall govern the Materials, Systems and Assemblies used for structural fire resistance and fire-resistance-rated construction separation of adjacent spaces to safeguard against spread of fire and smoke within a building and the spread of fire to or from buildings

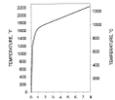
Fire-Resistance Rated Construction
 • What is Fire Resistance Rated Construction
 • What makes up Fire Resistance Rated Construction assemble
 • What are the requirements for placement and locations.

**Connecticut State Building Code (Proposed)
Chapter 7: Fire and Smoke Protection Features**

- 701 General
- 702 Definitions
- 703 Fire Ratings / Tests
- 704 Resistance- Structural
- 705 Exterior Walls
- 706 Fire Walls
- 707 Fire Barriers
- 708 Fire Partitions
- 709 Smoke Barriers
- 710 Smoke Partitions
- 711 Horizontal Assemblies
- 712 Vertical Openings
- 713 Shaft Enclosures
- 714 Penetrations
- 715 Fire Resistant Joints
- 716 Opening Protectives
- 717 Ducts / Transfer Openings
- 718 Concealed Spaces
- 719 Fire Resistance - Plaster
- 720 Thermal / Sound Insulation
- 721 Prescriptive Fire Resistance
- 722 Calculated Fire Resistance

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- 703.2 Fire Resistance ratings & Fire Tests
 - Essentially identical fire tests
 - ASTM E119
 - UL 263
 - Tests components & assemblies for:
 - Structural strength maintenance
 - Columns, girders, beams, bearing walls
 - Ability to contain fire
 - Fire barriers, fire doors, shutters, etc



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- 703.3 Fire Resistance Compliance Options
 - 1. Documented sources
 - 2. Section 721 prescriptive designs
 - 3. Section 722 calculated designs
 - 4. Engineering analysis
 - 5. Section 104.11 Alternatives



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703.2 Fire-resistance ratings. The fire-resistance rating of building elements, components or assemblies shall be determined in accordance with the test procedures set forth in ASTM E 119 or UL 263 or in accordance with Section 703.3. Where materials, systems or devices that have not been tested as part of a fire-resistance-rated assembly are incorporated into the building element, component or assembly, sufficient data shall be made available to the *building official* to show that the required fire-resistance rating is not reduced. Materials and methods of construction used to protect joints and penetrations in fire-resistance-rated building elements, components or assemblies shall not reduce the required fire-resistance rating.



Fire-Resistance Rating Requirements for Building Elements – Table 601

Minimum Rating ^a	TYPE I				TYPE II				TYPE III			
	R	W	E ^b	C ^c	R	W	E ^b	C ^c	R	W	E ^b	C ^c
Structural frame — including columns, girders, trusses	2 ^d	2 ^d	1	0	1	1	0	0	1 ^e	1 ^e	0	0
Roofing walls — exterior ^f	1	1	0	0	1	1	0	0	1 ^e	1 ^e	0	0
Roofing walls — interior	0	0	0	0	0	0	0	0	0	0	0	0
Nonbearing walls and partitions — exterior	0	0	0	0	0	0	0	0	See Section 703.2.4	0	0	0
Nonbearing walls and partitions — interior	0	0	0	0	0	0	0	0	See Section 703.2.4	0	0	0
Floor construction — including supporting beams and joists	2	2	1	0	1	1	0	0	1 ^e	1 ^e	0	0
Floor construction — including supporting beams and joists	1 ^g	1 ^g	1 ^g	0	1 ^g	1 ^g	0	0	1 ^e	1 ^e	0	0

Notes: 1. See Section 703.2.4.
 2. The minimum fire-resistance rating for the columns and the girders, trusses, beams and joists shall be determined by the columns and joists and the beams and joists, respectively, based on the fire-resistance rating of the columns and joists.
 3. The minimum fire-resistance rating for the columns and the girders, trusses, beams and joists shall be determined by the columns and joists and the beams and joists, respectively, based on the fire-resistance rating of the columns and joists.
 4. The minimum fire-resistance rating for the columns and the girders, trusses, beams and joists shall be determined by the columns and joists and the beams and joists, respectively, based on the fire-resistance rating of the columns and joists.
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 6. The minimum fire-resistance rating for the columns and the girders, trusses, beams and joists shall be determined by the columns and joists and the beams and joists, respectively, based on the fire-resistance rating of the columns and joists.
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 9. The minimum fire-resistance rating for the columns and the girders, trusses, beams and joists shall be determined by the columns and joists and the beams and joists, respectively, based on the fire-resistance rating of the columns and joists.

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- Section 703 Fire Tests
 - 703.5.1 Non combustible materials
 - ASTM E136
 - 703.5.2 Composites
 - 703.6 Glazing



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- 703.7 Marking & Identification
 - Protected fire separation assemblies
 - Marking required:
 - Permanent
 - All accessible spaces
 - Specific intervals
 - Specific size lettering
 - Exception for R-2



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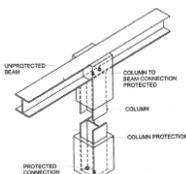
- 704 Fire Resistance Rating of Structural Members
 - 704.2 Column protection
 - Continuous encasement
 - Connections protected
 - 704.3 Structural frame other than Columns
 - Key components to be continuously protected
 - 704.4 Secondary structural members
 - Encasement or membrane protected



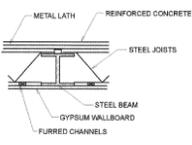
Massive column concrete encasement

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Component Encasement



Membrane protection



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- 704 Fire Resistance Rating of Structural Members
 - 704.5 Truss protection
 - Approved design
 - 704.6 Attachments
 - Bolt length location
 - 704.6.1 Connections
 - 704.7 Reinforcing
 - Measurement requirements
 - 704.8 Embedment / enclosures
 - No pipe / conduit within individual encasement protective cover
 - 704.9 Impact protection
 - 5' from floor level
 - 704.10 Exterior structural members
 - Protected same as interior
 - 704.11 Bottom flange protection
 - Short steel lintels require no protection



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- 704 Fire Resistance Rating of Structural Members
 - 704.12 Seismic isolation systems
 - Building dampening device rating = structure rating



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- 704 Fire Resistance Rating of Structural Members
 - 704.13 Sprayed Fire Resistance materials
 - Installation requirements
 - Surface preparation
 - Application restrictions
 - Finished condition
 - Important inspection item



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- Section 705 Exterior Walls
 - Applicable to exterior walls
 - Focus on fire protection issues
 - Supplemental to other exterior wall requirements
 - Table 601
 - Table 602



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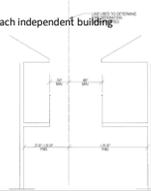
- 705.2 Wall Projections
 - Based on separation distance to lot line
 - Minimum distance measured from separation line
 - Type I & II projections shall be non-combustible
 - Types III, IV, V may be combustible

**TABLE 705.2
 MINIMUM DISTANCE OF PROJECTION**

FIRE SEPARATION DISTANCE (FSD)	MINIMUM DISTANCE FROM LINE USED TO DETERMINE FSD
0 feet to less than 2 feet	Projections not permitted
2 feet to less than 5 feet	24 inches
5 feet or greater	40 inches

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- 705.3 Wall Projections – Same Lot Buildings
 - Assumed imaginary line
 - Position based on:
 - Separation distance required for each independent building
 - Occupancy
 - Construction



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- 705.4 Materials - Exterior Walls
 - Wall matched to construction type
- 705.5 Fire Resistance
 - Table 601 – Rating of bearing walls
 - Table 602 – Exterior wall rating based on distance
 - Important distinction
 - >10' separation - rate wall based on interior
 - <10 separation – rating based on both sides exposed

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- 705.6 Structural stability
 - Walls must remain viable for duration of rating
- 705.7 Surface temperature rise
 - Some non E119 / UL263 walls may be used



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- 705.8 Openings
 - Exterior walls
 - % of wall area
 - Factors:
 - Fire Separation Distance
 - Opening protection
- Table 705.8
 - Details to follow



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- Exterior wall opening protection options:
 - (UP, NS) Unprotected, no sprinklers
 - Glazing per chapter 24 & 26
 - (UP, S) Unprotected, sprinkler system installed
 - Glass or plastic glazing
 - Chapter 9 Sprinkler System
 - (P) Protected openings
 - Section 716.5 shutters / doors
 - Section 716.6 fire rated windows



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- 705.8 Protected openings
 - Rated door
 - Rated automatic shutter
 - Rated window



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- 705.8.2 Protected opening exception
 - Auto sprinkler
 - Window spray system



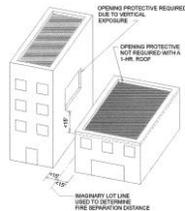
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- 705.8.5 Vertical opening separation options
 - Vertical spacing of 5' minimum
 - OR
 - 3' of rated construction between
 - OR
 - Non combustibile horizontal projections



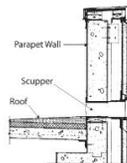
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- 705.8.6 Vertical exposure issues
 - Buildings on same lot
 - 1/2 hour rated openings



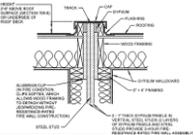
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- 705.11 Parapets
 - All exterior walls will be provided with parapets
 - 6 exceptions
 - Unrated exterior wall
 - Small buildings
 - Rated roof
 - Other construction method
 - R-2 & R-3 exception
 - Over 25% permitted wall opening
- 705.11.1 Parapet Construction
 - Materials
 - Dimensions



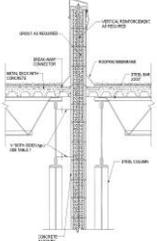
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- Section 706 Fire Walls
 - 706.1 Used to separate buildings
 - 706.1.1 Lot line walls
 - Constructed as a fire wall
 - Specific exception



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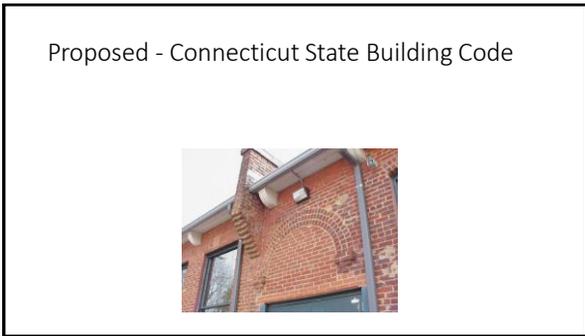
- 706.2 Structural stability
 - Self supporting
 - Foundation to top
 - Permit structural collapse
 - Either side
 - NFPA 221
 - Double wall construction
 - Appropriate rating
 - Table 706.4



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- 706.3 Materials
 - Generally non-combustible
- 706.5 Horizontal continuity
 - Projecting from wall
- 706.6 Vertical continuity
 - Projecting above roof
- Table 706.4 rating
 - 2 hours





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- Section 706 Fire Walls
 - 706.3 Materials
 - 706.4 Resistance rating
 - 706.5 Horizontal continuity
 - 706.6 Vertical continuity
 - 706.7 Combustible framing
 - 706.8 Openings
 - 706.9 Penetrations
 - 706.10 Joints
 - 706.11 Ducts / air openings

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- 706.6.1.1 Fire Walls – Stepped Buildings
 - 30" extension above lower roof
 - 15' high - 1 hour wall
 - ¾ hour opening protection

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- 706.6.1 Fire Walls – Stepped Buildings
 - Exception

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- 706.6.2 Fire Walls – Sloped roofs
 - Extension height
 - Measure relative to slope at 4'

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<ul style="list-style-type: none"> 707 - Fire BARRIER <ul style="list-style-type: none"> Resistance rated Wall assembly Maintained continuity 	<ul style="list-style-type: none"> 706 - Fire WALL <ul style="list-style-type: none"> Resistance rated Self-supporting Collapse resistant Protected openings Foundation through roof Parapets Horizontal extension
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• Section 707 Fire barriers

- Used for:
 - Separating exits
 - Incidental use areas
 - Shafts
 - Hazardous materials areas
 - Managing fire control areas



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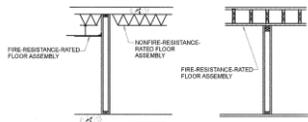
• Section 707 Fire barriers

- 1) What type of materials may be used for a fire barrier within a type V construction building?
- 2) What is the required fire barrier rating for separation between a 200 square foot waste collection area and the remaining areas of an ambulatory care facility?
- 3) How far above the ceiling cover must a fire barrier extend?

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• 708 Fire PARTITION

- Lower hourly rating
- Exit access corridors
- Separate sleeping units
- Separate tenant spaces
- Elevator lobbies



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- 709 Smoke Barriers
 - Divides building into smoke compartments
 - Permits horizontal exit to safe area
 - 709.3 1 hour fire rating
 - To ensure survival of the barrier
 - 709.2 Construction matches building type
 - Exception for I-3
 - 709.5 Openings
 - Section 716
 - 709.6 Penetrations
 - Section 714
 - 709.4 Continuity
 - Based on application



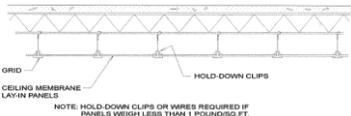
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- 710 Smoke Partitions
 - Installed as required elsewhere in this Code
 - 710.3 Unrated
 - 710.2 Materials match construction type
 - 710.4 Continuity
 - 710.5 Openings
 - Less restrictive
 - 710.6 Penetrations
 - Less restrictive
 - 710.7 Joints
 - Filled



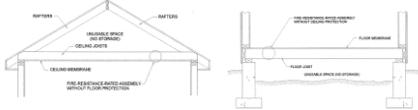
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- 711 Horizontal Assemblies
 - Floor & roof protection
 - Membrane protection
 - Rated gypsum / plaster / concrete protective covering
 - Rated ceiling panels



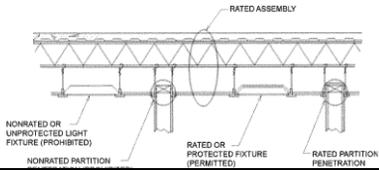
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- 711.3.3 Useable space
 - Protection provided for living areas of buildings



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- 711.4 Continuity
 - Junction with protected wall
 - Rated light fixtures, speakers, HVAC vents, etc.
 - Pipe and cable penetrations



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- 711.4 Continuity of membrane
 - Junction with protected wall
 - Rated light fixtures, speakers, HVAC vents, etc.
 - Rated access panels



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- 712 Vertical Openings
 - Protection requirements
 - Specifics to follow.....



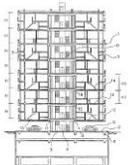
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- 712.1.1 Shaft enclosures
 - Vertical 'shaft'
 - 202 definition
 - Fire protected from remainder of building
 - As required by Code
 - All openings protected
 - Shaft protective must be maintained



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- 712.1.2 Individual dwelling units
 - Multi story opens within a single dwelling unit
 - Unconcealed openings only!
 - Stairs
 - Elevators
 - Atrium openings
 - 4 stories maximum



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- 712.1.3 Escalator openings
 - Within a sprinkler protected building
 - Draft curtain
 - Opening size controlled
 - High density sprinklers at opening

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- 712.1.3.2 Escalator openings
 - Fire shutter option
 - Non-combustible
 - 1.5 hour rated
 - Activation by SD
 - Stops escalator
 - Slow close

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- 712.1.6 Atriums
 - Chapter 2 basic definition
 - Section 202
 - Chapter 4 specifics
 - Section 404 Requirements

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- 712.1.8 ‘Convenience Openings’
 - 2 stories maximum
 - Not part of MOE
 - No fire or smoke barrier penetration
 - Wide open
 - Does not open to I group / R group corridor
 - Not open to corridor w/o sprinklers
 - No communication with other floors
 - Barrier separation
 - No air exchange



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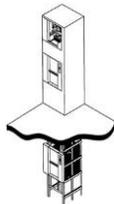
- 712.1.9 Parking Garages
 - Openings permitted between floors
 - Really?, no kiddin’
 - Section 403 High rise?
 - Section 405 Underground?
 - Section 406 Motor Vehicle Related occupancies
 - 406.5
 - 406.6

TABLE 406.6 MINIMUM RATED FIRE RESISTANCE FOR OPENINGS			
TYPE OF OPENING	RATED FIRE RESISTANCE	MINIMUM RATED FIRE RESISTANCE	
		TYPE OF OCCUPANCY	MINIMUM RATED FIRE RESISTANCE
1a	2	Group A	2
1b	2	Group B	2
1c	2	Group C	2
1d	2	Group D	2
1e	2	Group E	2
1f	2	Group F	2
1g	2	Group G	2
1h	2	Group H	2
1i	2	Group I	2
1j	2	Group J	2
1k	2	Group K	2
1l	2	Group L	2
1m	2	Group M	2
1n	2	Group N	2
1o	2	Group O	2
1p	2	Group P	2
1q	2	Group Q	2
1r	2	Group R	2
1s	2	Group S	2
1t	2	Group T	2
1u	2	Group U	2
1v	2	Group V	2
1w	2	Group W	2
1x	2	Group X	2
1y	2	Group Y	2
1z	2	Group Z	2



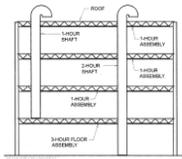
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- Section 713 Shaft Enclosure
 - 713.1 Application to shafts penetrating multiple floor levels
 - 713.2 Constructed as fire barriers
 - 713.3 Materials based on construction type



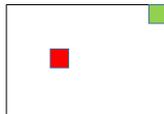
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- Section 713 Shaft Enclosure
 - 713.4 Fire resistance
 - 2 hours when for 4 stories, or more
 - 1 hour for less than 4 stories
 - Matched to floor ratings
 - Not more than 2 hours



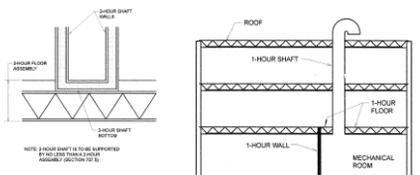
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- 713.6 Exterior walls
 - Requirements of Section 705 apply
 - Exterior building wall protection based on:
 - Location relative to other structures
 - Construction type



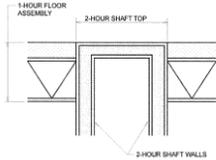
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- 713.11 Bottom of enclosures



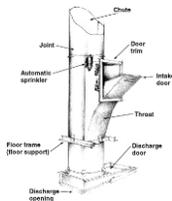
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- 713.12 Top of enclosures



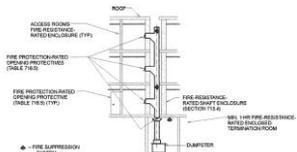
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- 713.13 Refuse and Laundry Chutes
 - Dedicated shaft
 - No corridor openings
 - Automatic / self closing doors
 - Access rooms
 - 1 hour rated
 - ¾ hour doors
- 713.13.6 Sprinkler protection
 - Locations per 903.2.11.2



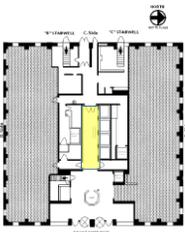
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- 713.13.4 Refuse and Laundry Chute Termination
 - Room separated from remainder of building
 - Auto / self closing doors
 - Same protection level as access rooms



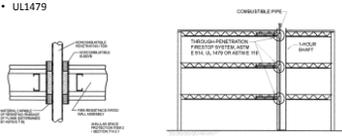
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- 713.14 Elevator Protection
 - Enclosed elevator lobby required at each floor
 - Exceptions
 - Less than 3 stories connected
 - Section 712 exemption
 - AS system
 - Some exceptions to the exception
 - Smoke partitions
 - Pressurized hoist way
 - Parking garages
 - Rare in contemporary buildings



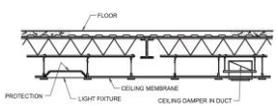
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- Section 714 Penetrations
 - 714.2 Installation details
 - 714.3 Fire & smoke resistance rated walls
 - 714.3.1.2 Fire stop systems
 - ASTM E814
 - ULL479



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- 714.3.2 Membrane Penetrations
 - Application to 2 hour rating maximum
 - Small steel boxes permitted
 - Horizontal separation minimum
 - Fire blocking or other draft control means



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• Section 714 Assembly Penetrations

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• 714.4.1.2 Membrane Penetrations

- Lighting
- Speakers
- HVAC grilles

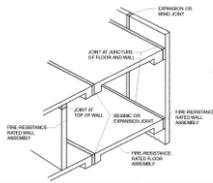
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• 714.4.2 Non-rated Assemblies

- Non combustibles may run 5 stories
 - Annular space must be filled
 - Non-combustible fill
 - Tested product
- 2 story penetrations
 - Annular space fill
 - Approved materials

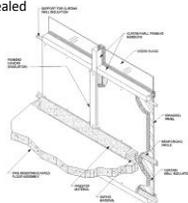
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- Section 715 Fire-Resistant Joint Systems
 - Joints between fire rated walls, floor, ceiling, roof, etc.
 - Approved joint system
 - Same rating as barrier
 - Tested joint systems
 - ASTM E1966
 - UL2079



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- 715.4 Exterior Curtain Walls
 - Fire resistant floor / ceilings sealed
 - Approved system
 - ASTM E2307 – F Rating
 - Exception for glass
- 715.4.1 Non-fire rated
 - Sealed
- 715.6 Smoke barriers
 - UL2079



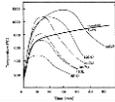
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- Section 716 Opening Protectives
 - Glazing
 - Doors
 - Doors with glazing panels
 - Fire shutters



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- 716.4 Alternative testing methods
 - Approved source designs
 - Other testing agencies
 - Approved calculations
 - Mathematical analysis based on specific exposure
 - Engineering analysis
 - Analysis based on comparison to standard fire test
 - Performance based on 104.11
 - Alternate materials (104.11)
 - Supported by research (104.11.1)
 - Verification through testing (104.11.2)



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- Fire doors, window, and shutters



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- 716.5 Fire Doors & Shutters
 - 716.5.1 Swinging and pivoting door test criteria
 - 716.5.2 Testing of other assemblies
 - 716.5.3 Corridor and smoke barrier door testing
 - Smoke & draft control
 - Doors with glazing
 - 716.5.4 Fire partition door testing
 - 716.5.5 Interior exit stairway / ramp door testing
 - Exception for sprinklers
 - Glazing in interior stairwell doors
 - 716.5.6 Fire doors with transom and/or sidelight windows

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- 716.5.7 Labeled protective assemblies
 - NFPA 80 complaint label
 - Name of manufacturer
 - Name of inspection agency
 - Listed accessories
 - Light kits
 - Louvers
 - Oversized door labeling
 - Smoke / draft door labeling



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- 716 Glazing material
 - 716.5.8 Specific to glazing with fire door assemblies
 - 716.6 Specific to glazing in fire window assemblies



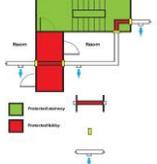
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- High school, horizontal fire barrier assembly, rated per Section 707.
 - 1) Minimum fire door rating?
 - 2) Label requirements of vision panel?
 - 3) Fire window assembly rating?
 - 4) Must the glazing offer impact resistance?



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- 717 Ducts & Air Transfer Openings
 - 717.1 Applicable to:
 - duct penetrations in rated assemblies
 - non-rated floor assembly duct penetrations
 - Referenced sections:
 - Exterior walls – 705.10
 - Fire walls – 706.11
 - Fire barriers – 707.10
 - Fire partitions – 708.9
 - Smoke barriers – 709.8
 - Smoke partitions – 710.8
 - Horizontal assemblies – 711.7
 - Shafts – 713.10
 - Penetrations -714.1.1



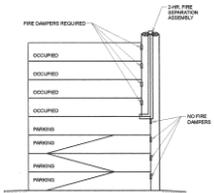
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- Section 717 Dampers
 - 717.2 Installation
 - Integration with smoke control system
 - HazMat Duct limitations
 - 717.3 Testing, rating, labeling
 - Table 717.3.2.1
 - 717.4 Access & Identification
 - Approved
 - Damper must be marked



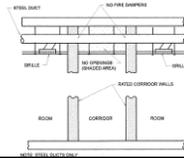
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- 717.5 Fire / Smoke dampers - Where Required
 - 717.5.1 Fire walls
 - 717.5.1.1 Horizontal exits
 - 717.5.2 Fire barriers
 - 717.5.3 Shaft enclosures
 - Many exceptions



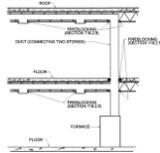
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- 717.5 Where Required
 - 717.5.4 Fire partitions
 - Exceptions
 - 717.5.4.1 Corridors
 - Exceptions
- Smoke barriers
- Exterior walls
- Smoke partitions
- Horizontal assemblies
- Membrane assemblies



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- 717.6.3 Ducts penetrating non-fire rated floor assemblies
 - 3 options:
 - Enclose in a shaft
 - Up to 2 stories
 - Annular space fill
 - 3 stories
 - Annular fill
 - Internal fire damper
 - Exception for dwelling unit



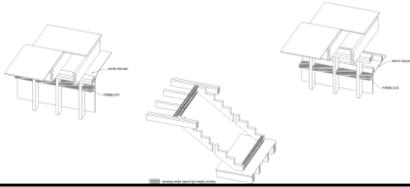
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- 717.7 Flexible ducts & connectors
 - May not pass through walls, floors, or ceilings.



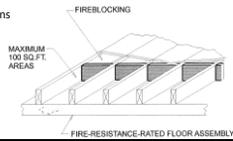
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- 718 Concealed Spaces
 - Many Residential Code similarities



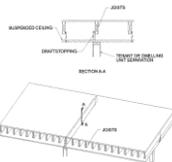
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- 718.2.7 Concealed sleeper spaces
 - Application to wood on concrete, fire rated floors
 - Approved fill required
 - 100 ft² maximum open area
 - Fire block as required
 - Very specific exceptions



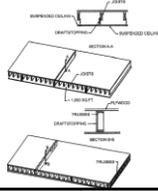
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- 718.3.2 Floor Draft stopping
 - 'R' Occupancy Classifications
 - All R-1
 - R-2 with 3 units+
 - R-3 with 2 units+
 - All R-4
 - Floor & ceiling spaces
 - Sleeping area separation
 - AS exception
 - NFPA13 system
 - NFPA13R with space protector



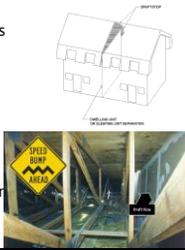
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- 718.3.3 Draft stopping – other classifications
 - Other than 'R' Occupancy Classifications
 - 1000 ft² floor area
 - Exception for NFPA13 AS system



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- 718.4 Draft stopping – Attics
 - 3000 ft² maximum area
- 718.4.2 Every two units, if smaller than 3k ft²
 - Exemption for NFPA13 system
 - R-2 specific requirement
 - Exemption for 13R system
 - Full coverage.
- 718.5 Type I & II Construction
 - Materials restrictions



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- 719 Fire resistance – Plaster & Gypsum
 - Absorbs and retains tremendous amount of water
 - Used as part of a rated fire resistance system:
 - Survival time of cover components can be increased
 - Plaster / gypsum is sacrificed as water is liberated



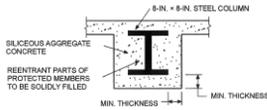
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- Section 720 Insulation
 - 720.1 General
 - Thermal, sound, insulation facings
 - 720.2 Concealed Insulation
 - Flame & smoke requirements
 - 720.3 Exposed Insulation
 - 720.4 Loose-fill insulation
 - 720.5 Roof insulation
 - 720.6 Cellulose loose-fill
 - 720.7 Pipe Insulation



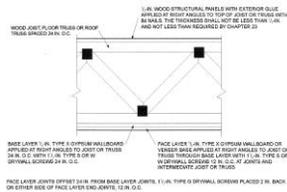
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- Section 721 Prescriptive Fire Resistance
 - Table 721.1(1) Protection of Structural Components
 - Table 721.1(2) Resistance for Walls & Partitions
 - Table 721.1(3) Floor and Roof Assemblies



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- Section 721 - Hourly rating of the diagramed assembly?



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- Section 722 Calculated Fire Resistance
 - Prescriptive protection based on engineering
 - Alternative for establishing Code compliance
 - Infrequently used section
- 107.6.2 Requirements
 - Threshold limit structures
 - Based on CGS 29-276b
 - "Threshold Limit" structures
 - BO shall require independent engi



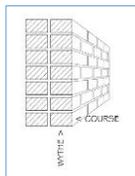
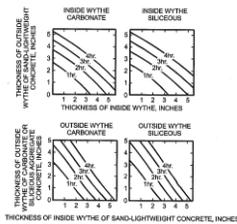
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- Fire Resistance Rating
 - Thickness
 - Material composition
 - Installation methodology

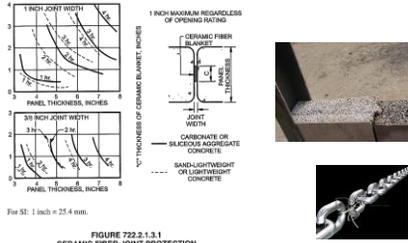
TABLE 722.2.2.1
 MINIMUM SLAB THICKNESS (inches)

CONCRETE TYPE	FIRE-RESISTANCE RATING (hours)				
	1	1½	2	3	4
Siliceous	3.5	4.3	5	6.2	7
Carbonate	3.2	4	4.6	5.7	6.6
Sand-lightweight	2.7	3.3	3.8	4.6	5.4
Lightweight	2.5	3.1	3.6	4.4	5.1

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TABLE 722.2.1.4.1
 TIME ASSIGNED TO FINISH MATERIALS ON FIRE-EXPOSED SIDE OF WALL

FINISH DESCRIPTION	TIME (minutes)
Gypsum wallboard	
1/2 inch	10
5/8 inch	15
1 inch	20
2 layers of 1/2 inch	24
1 layer 5/8 inch, 1 layer 1/2 inch	35
2 layers 1/2 inch	40
Type X gypsum wallboard	
1/2 inch	25
5/8 inch	40
Portland cement-sand plaster applied directly to concrete masonry	See Note a
Portland cement-sand plaster on metal lath	
1/2 inch	20
5/8 inch	25
1 inch	30
Gypsum sand plaster on 1/2 inch gypsum lath	
1/2 inch	35
5/8 inch	40
1 inch	50
Gypsum sand plaster on metal lath	
1/2 inch	50
5/8 inch	60
1 inch	80

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TABLE 722.2.2.1
 MINIMUM COVER FOR PRESTRESSED CONCRETE BEAMS 8 INCHES OR GREATER IN WIDTH

RESTRAINED OR UNRESTRAINED	CONCRETE AGGREGATE TYPE	BEAM WIDTH (inches)	FIRE RESISTANCE RATING (hours)			
			1	2	3	4
Restrained	Carbonate or siliceous	8	1 1/2	1 1/2	1 1/2	2 1/2
	Carbonate or siliceous	≥ 12	1 1/2	1 1/2	1 1/2	1 1/2
	Sand lightweight	8	1 1/2	1 1/2	1 1/2	2
Unrestrained	Carbonate or siliceous	8	1 1/2	1 1/2	2 1/2	3
	Carbonate or siliceous	≥ 12	1 1/2	1 1/2	2 1/2	3
	Sand lightweight	8	1 1/2	1 1/2	2	—
		≥ 12	1 1/2	1 1/2	2	2 1/2



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TABLE 722.2.4
MINIMUM DIMENSION OF CONCRETE COLUMNS (inches)

TYPES OF CONCRETE	FIRE-RESISTANCE RATING (hours)				
	1	1½	2*	3*	4*
Siliceous	8	9	10	12	14
Carbonate	8	9	10	11	12
Sand-lightweight	8	8½	9	10½	12

For SI: 1 inch = 25 mm.

- a. The minimum dimension is permitted to be reduced to 8 inches for rectangular columns with two parallel sides at least 36 inches in length.
- b. The minimum dimension is permitted to be reduced to 10 inches for rectangular columns with two parallel sides at least 36 inches in length.

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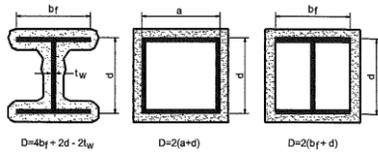


FIGURE 722.5.1(1)
DETERMINATION OF THE HEATED PERIMETER OF STRUCTURAL STEEL COLUMNS

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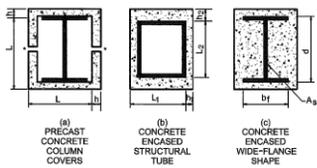


FIGURE 722.5.1(6)
CONCRETE PROTECTED STRUCTURAL STEEL COLUMNS^{5,6}

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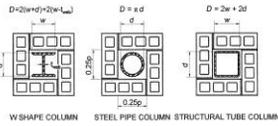


FIGURE 722.6(1)
 CONCRETE OR CLAY MASONRY PROTECTED STRUCTURAL STEEL COLUMN

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**TABLE 722.6.1
 FIRE RATED TO WALLS AND WEIRAGED**

DESCRIPTION OF FINISH	TIME (MIN)
1/2 inch wood structural panel finished with exterior gpm	5
1/2 inch wood structural panel finished with exterior gpm	10
1/2 inch wood structural panel finished with exterior gpm	15
1/2 inch gypsum wallboard	15
1/2 inch gypsum wallboard	20
1/2 inch gypsum wallboard	30
1/2 inch Type X gypsum wallboard	25
1/2 inch Type X gypsum wallboard	40
Double 1/2 inch gypsum wallboard	25
Double 1/2 inch gypsum wallboard	35
Double 1/2 inch gypsum wallboard	45

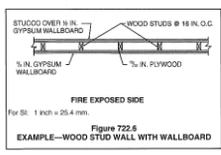


FIGURE 722.6
 EXAMPLE—WOOD STUD WALL WITH WALLBOARD

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- Section 722 Review
 - Calculated Fire Resistance variables:
 - Embedment / membrane material
 - Thickness of material
 - Method of assembly fabrication
 - Joint treatment
 - Exposure side of protective assembly
 - Restrained / unrestrained assemblies
 - Protection of steel tendons
 - Spalling of concrete – loss of material mass
 - Configuration of steel to protective cover
 - Method of protective cover attachment
 - Mass of protective cover
 - Air spaces within cover
 - Simple panel protection values

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Fire and Smoke Protection Features

Office of the State Building Inspector
165 Capitol Avenue, Room 265
Hartford, CT 06106
Telephone: 860-713-5900
Fax: 860-713-7410

Office of State Fire Marshal
165 Capitol Avenue, Room 258
Hartford, CT 06106
860-713-5750 phone
860-713-7424 fax

• Thank you

Office of Education & Data Management
Division of Construction Services
Department of Administrative Services
State of Connecticut
165 Capitol Avenue, Room 431
Hartford, CT 06106
Telephone: 860-713-5522
Fax: 860-713-7426
