

IBC Chapter 5

- *General Building Heights and Areas*



Section 501 General

- *501.1 Scope. The provisions of this chapter control the height and area of structures hereafter erected and additions to existing structures.*



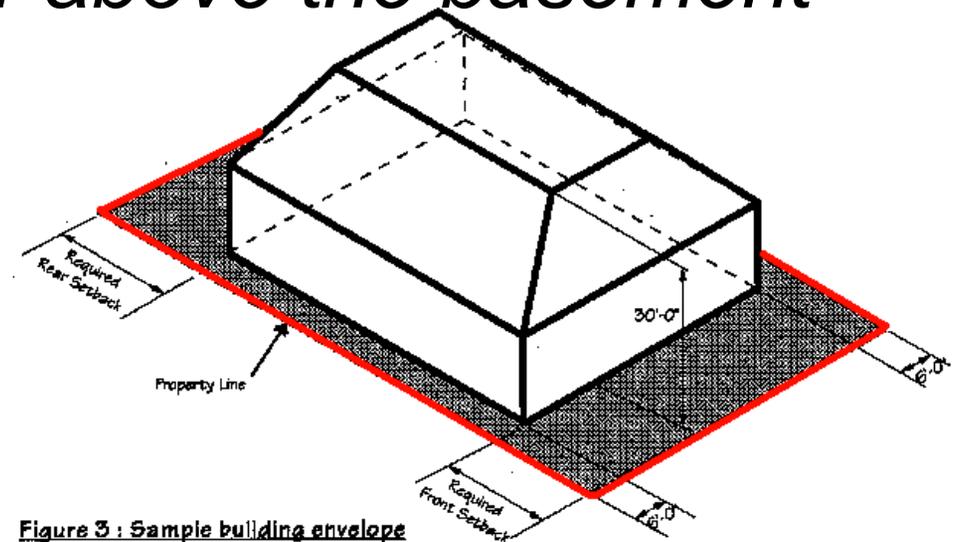
Section 502 Definitions

- *Words and terms used for the purposes of this chapter and as used elsewhere in this code...*
- *Area, Building*
- *Basement*
- *Grade Plane*
- *Height, Building*



Section 202 Story Above Grade Plane

- *Any story having its finished floor surface entirely above grade plane except that a basement shall be considered as a story above grade plane where the finished surface of the floor above the basement is...*

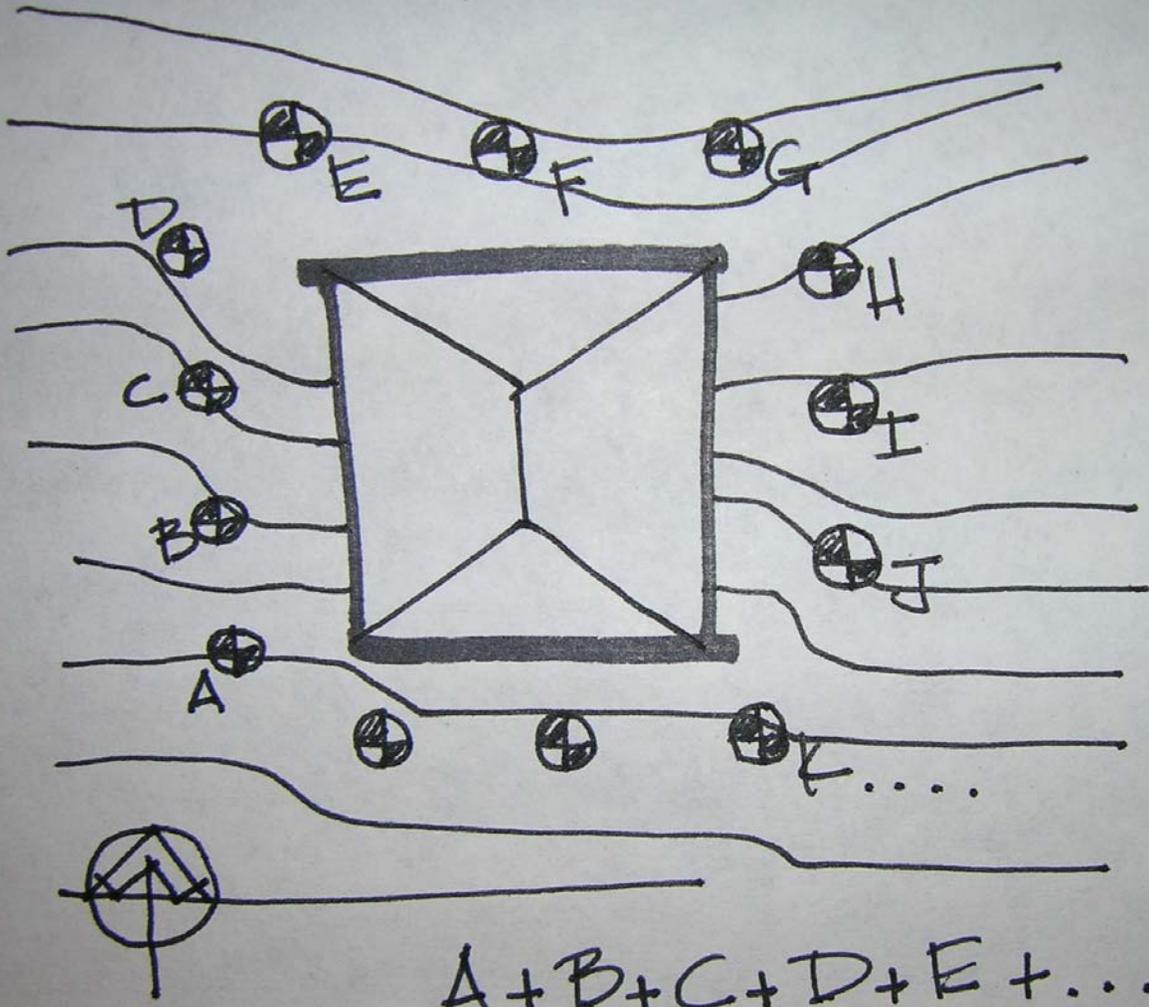


**Figure 3 : Sample building envelope
for R-1 zoned property**

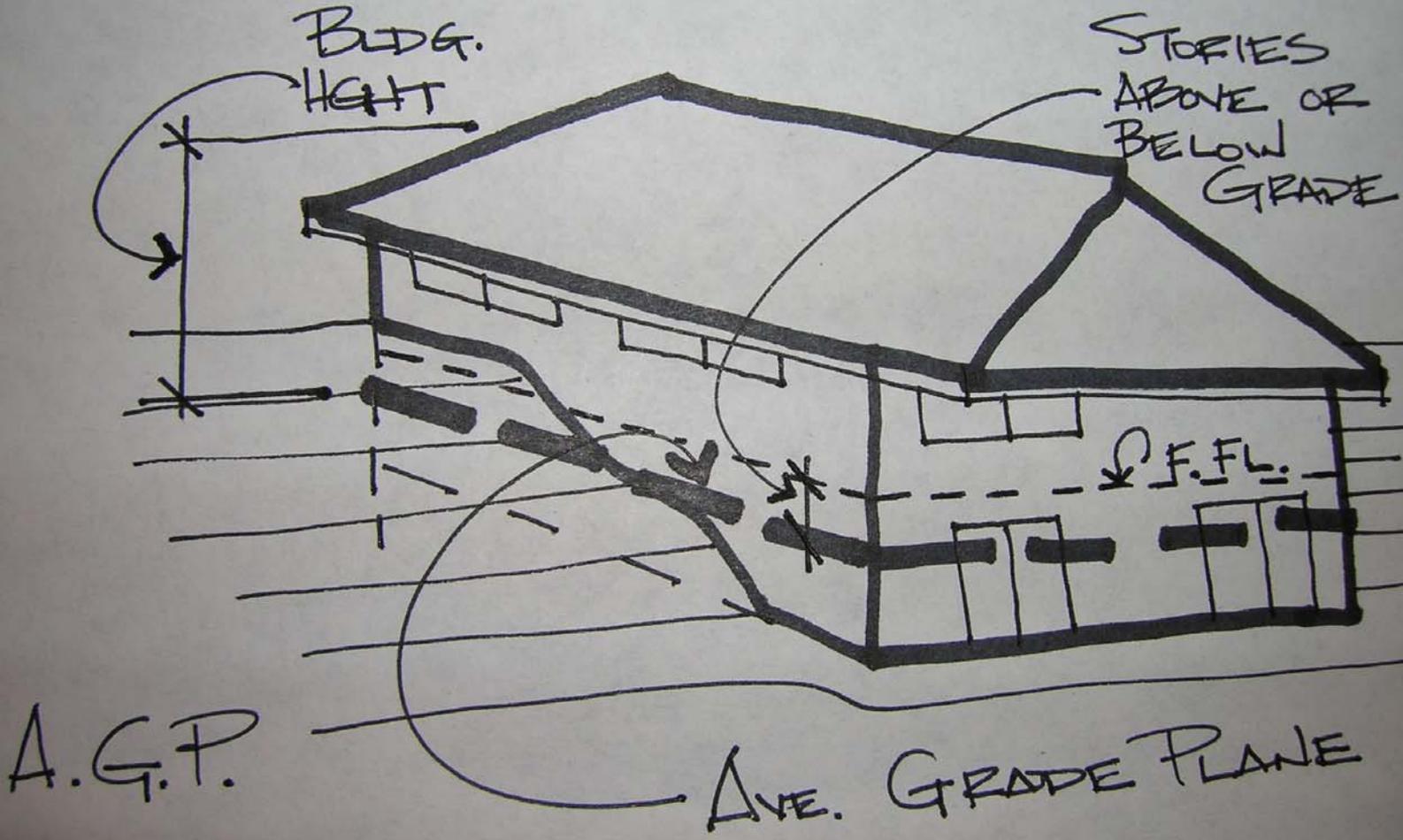
Grade Plane

- *A reference plane representing the average of finished ground level adjoining the building at exterior walls.*





$$\frac{A + B + C + D + E + \dots}{\text{TOTAL}} =$$



Section 503.1 General Height and Area Limitations

- *Use/Occupancy and Construction Type...Table 503*
- *Modifiers*
- *Exterior walls and Fire walls*

Section 503.1.2 Buildings on same lot.

- *Two or more buildings on the same lot...separate or considered as one based on Table 503 and as modified.*



Section 503.13 Type I construction

- *Unlimited tabular height and area not subject to section 507...*

Table 503

TABLE 503
ALLOWABLE HEIGHT AND BUILDING AREAS
 Height limitations shown as stories and feet above grade plane.
 Area limitations as determined by the definition of "Area, building", per floor.

		TYPE OF CONSTRUCTION								
		TYPE I		TYPE II		TYPE III		TYPE IV	TYPE V	
		A	B	A	B	A	B	HT	A	B
GROUP	HGT(ft)	UL	160	65	55	65	55	65	50	40
	Hgt(S)	UL	160	65	55	65	55	65	50	40
A-1	S	UL	5	3	2	3	2	3	2	1
	A	UL	UL	15,500	8,500	14,000	8,500	15,000	11,500	5,500
A-2	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
A-3	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
A-4	S	UL	11	3	2	3	2	3	2	1
	A	UL	UL	15,500	9,500	14,000	9,500	15,000	11,500	6,000
A-5	S	UL	UL	UL	UL	UL	UL	UL	UL	UL
	A	UL	UL	UL	UL	UL	UL	UL	UL	UL
B	S	UL	11	5	4	5	4	5	3	2
	A	UL	UL	37,500	23,000	28,500	19,000	36,000	18,000	9,000
r	S	UL	5	3	2	3	2	3	1	1

Section 504 Height

- *504.2 Automatic Sprinkler System Increase*
- *903.3.1.1 – maximum height is increased by 20 feet and maximum number of stories is increased by one.*
- *903.3.1.2 – Group R, not to exceed 60 feet or four stories.*



Exceptions to 504.2

- *Group I-2 of construction type IIB, III, IV or V*
- *Group H1, H2, H3 or H5*
- *Fire resistance rating substitution in accordance with Table 601, Note e*

Section 505 Mezzanines

- *Shall comply with 505...shall be considered a portion of the story below.*
- *Shall not contribute to either the building area or number of stories...*
- *Shall be included in the fire area...*
- *Clear height above and below shall not be less than 7 feet...*

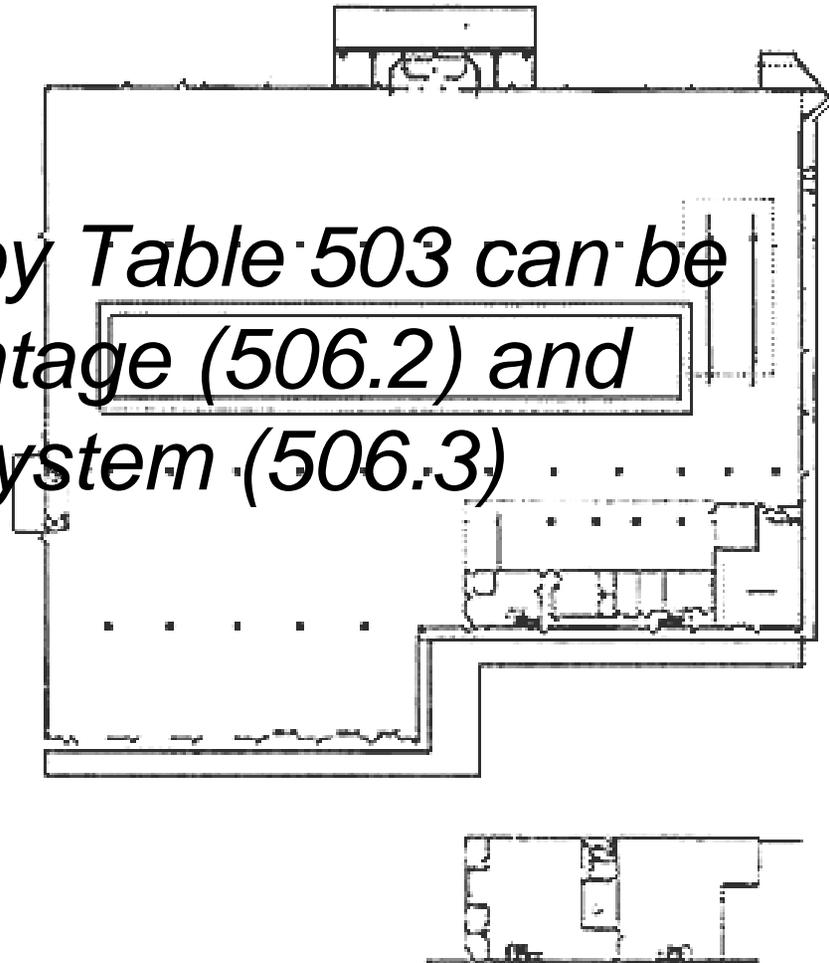
505.2 Area Limitations

- *The aggregate area of a mezzanine or mezzanines within a room shall not exceed one-third of the floor area of that room or space in which they are located.*



Section 506 Area Modifications

- *506.1 Areas limited by Table 503 can be increased due to frontage (506.2) and automatic sprinkler system (506.3)*



Area Modifications Formula

- $A_a = \{A_t + [A_t \times I_f] + [A_t \times I_s]\}$

Section 506.2 Frontage Increase

- $I_f = [F/P - 0.25] W/30$

506.2.1 Width Limits

- *“W” must be at least 20 feet.*
- *Where the value of “W” varies along the perimeter of the building...calculation shall be based on a weighted average of each portion of exterior wall and open space where the value of “W” is greater than or equal to 20 feet.*
- *Where “W” exceeds 30 feet, a value of 30 feet shall be used in calculating the weighted average.*

Width Limits Exception

- *The quantity of “W” divided by 30 shall be permitted to be a maximum of 2 when the building meets all the requirements of Section 507 (Unlimited Area) except for compliance with the 60 foot public way or yard requirement.*

Section 506.2.2 Open Space Limits

- *Open space shall be either on the same lot or dedicated for public use and shall be accessed from a street or approved fire lane.*



Section 506.3 Automatic Sprinkler System Increase

- *Automatic Sprinkler System 903.3.1.1*
- *200% for buildings more than one story above grade plane*
- *300% for buildings with no more than one story above grade plane*



Section 506.4 Area Determination

- *Maximum area of a building with more than one story...multiply the allowable area of the first story (A_a) by the number of stories above grade plane according to the following...*
- *Two stories above grade plane multiply by 2*

Section 506.4 Area Determination

- *Three or more stories above grade plane multiply by 3*
- *No story shall exceed A_a for the occupancy on that story*



Section 506.4.1 Mixed Occupancies

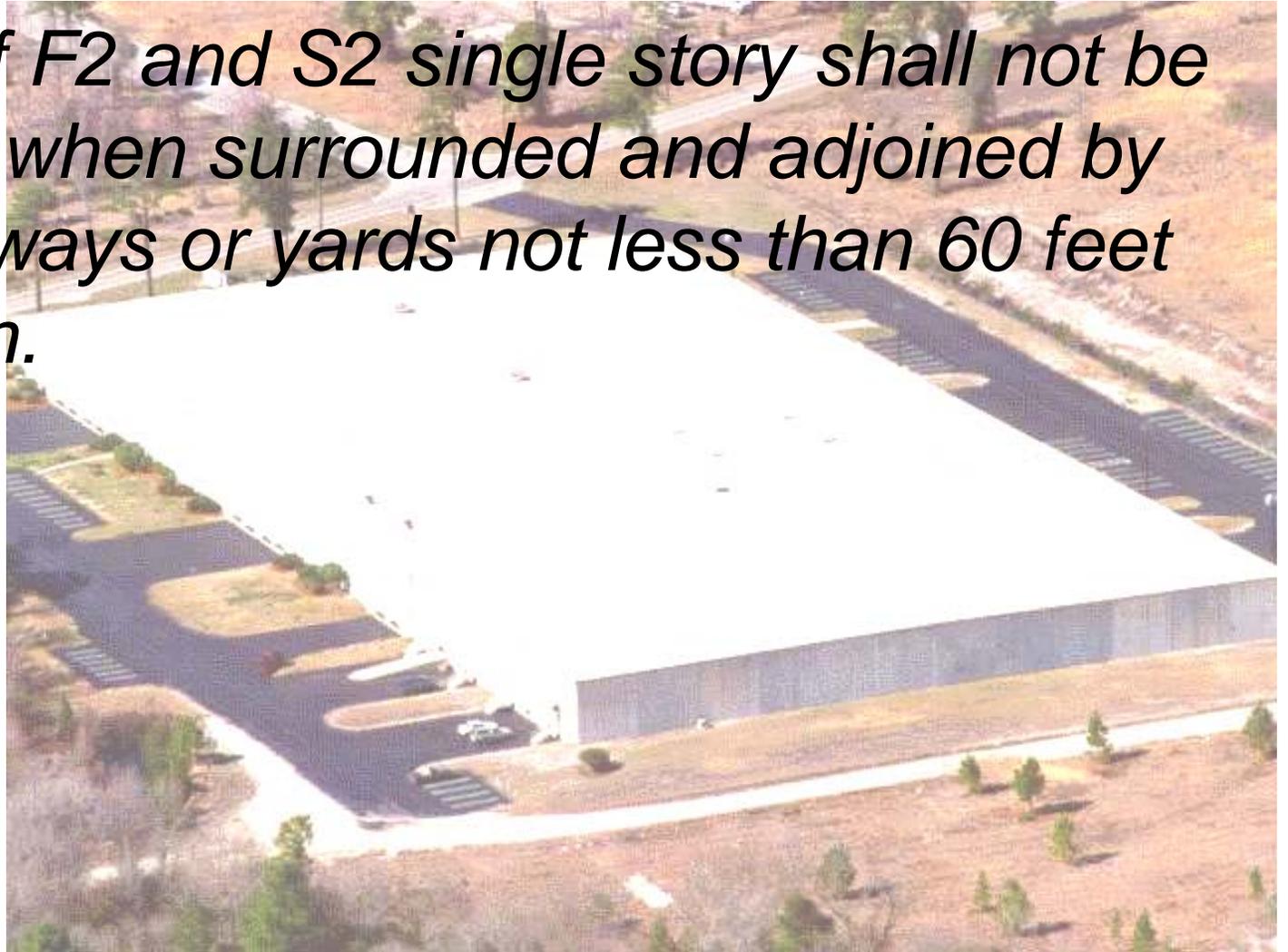
- *In mixed occupancies...allowable area shall be based on the most restrictive for each occupancy when treated according to 508.3.2 (unseparated)*
- *for two story buildings and 3 for building three stories of higher.*

Section 506.4.1 Mixed Occupancies

- *When occupancies are treated according to section 508.3.3 (separated) the maximum total building area shall be such that the sum of the ratios for each such area on all floors as calculated according to section 508.3.3.2 (ratio of 1) shall not exceed 2 for two story buildings and 3 for building three stories of higher.*

Section 507.2 Non-sprinklered, One Story

- *Area of F2 and S2 single story shall not be limited when surrounded and adjoined by public ways or yards not less than 60 feet in width.*

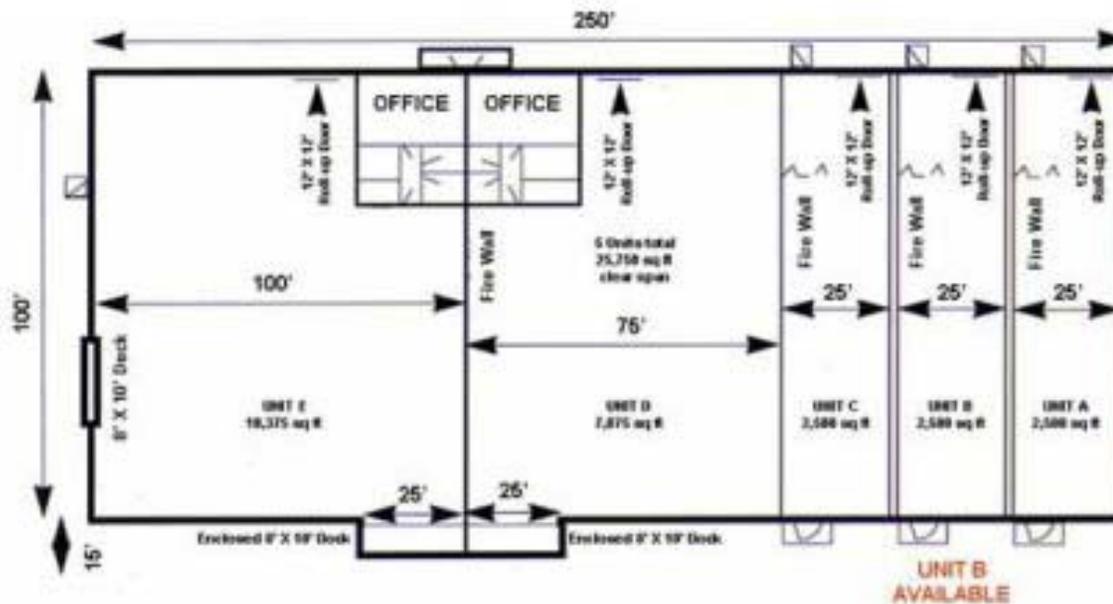


Section 507.3 Sprinklered One Story

- *Area of a B, F, M or S single story or a single story A4 of other than Type V construction shall not be limited...protected in accordance with 903.3.1.1 and is surrounded by public ways or yards not less than 60 feet in width.*

Section 508 Mixed Use and Occupancy

- *Buildings containing two or more occupancies or uses...*



Section 508.2 Incidental Uses

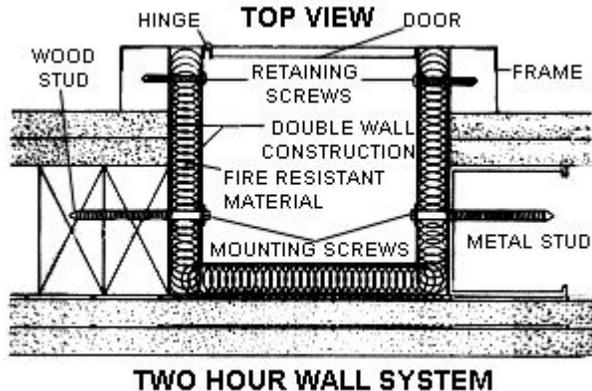
Exception...Incidental use areas within and serving dwelling units

Section 508.2.1 Occupancy Classification

- *Incidental use area shall be classified in accordance with the occupancy of that portion of the building in which it is located or the building shall be classified as mixed use in accordance with 508.3.*

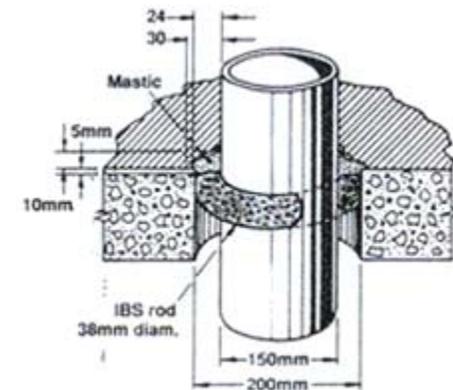
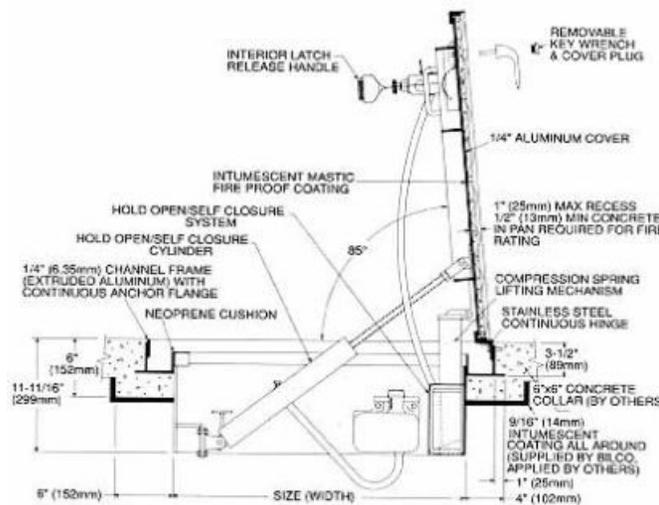
Section 508.2.2 Separation

- *Separated...Protected...or Both in accordance with Table 508.2*



Section 508.2.2.1 Construction

- *Fire Barriers in accordance with Section 706*
- *Horizontal assembly constructed in accordance with Section 711*



Section 508.2.3 Protection

- *Where Automatic Fire-extinguishing or Automatic Sprinkler is provided in accordance with 508.2 only the incidental use area need be equipped.*

Section 508.3.1 Accessory Occupancies

- *Subsidiary to the Main Occupancy*
- *Aggregate of accessory occupancies not more than 10% of the area of the story.*
- *Shall not exceed tabular values of Table 503 without increases.*
- *Exceptions...Accessory Assembly less than 750 sq.ft.*
- *Assembly area accessory to Group E*
- *Accessory Religious Education rooms*

Section 508.3.1.1 Occupancy Classification

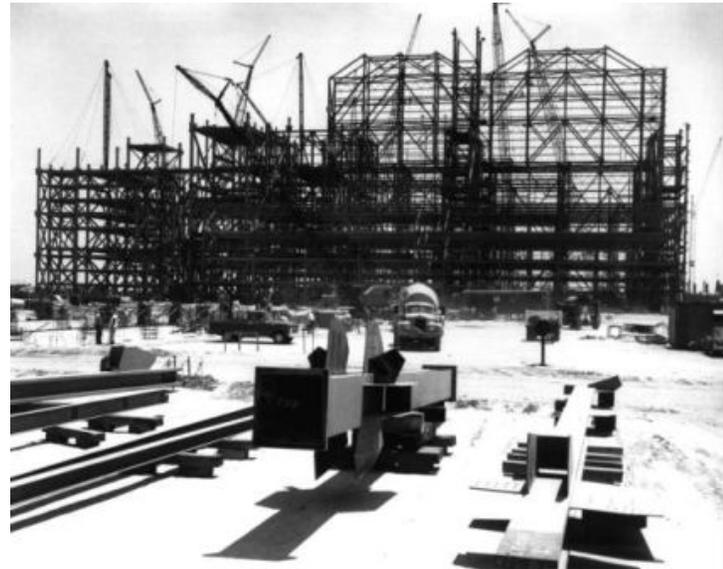
- *Individually Classified*
- *Code requirements based on classification*
- *Except...most restrictive of 403 and Chapter 9 apply to entire bldg.*

Section 508.3.1.2 Allowable Area and Height

- *Area and Height is based on the main occupancy*
- *The Height of any accessory occupancy shall not exceed the tabular values in Table 503*

Section 508.3.3.1 Occupancy Classification

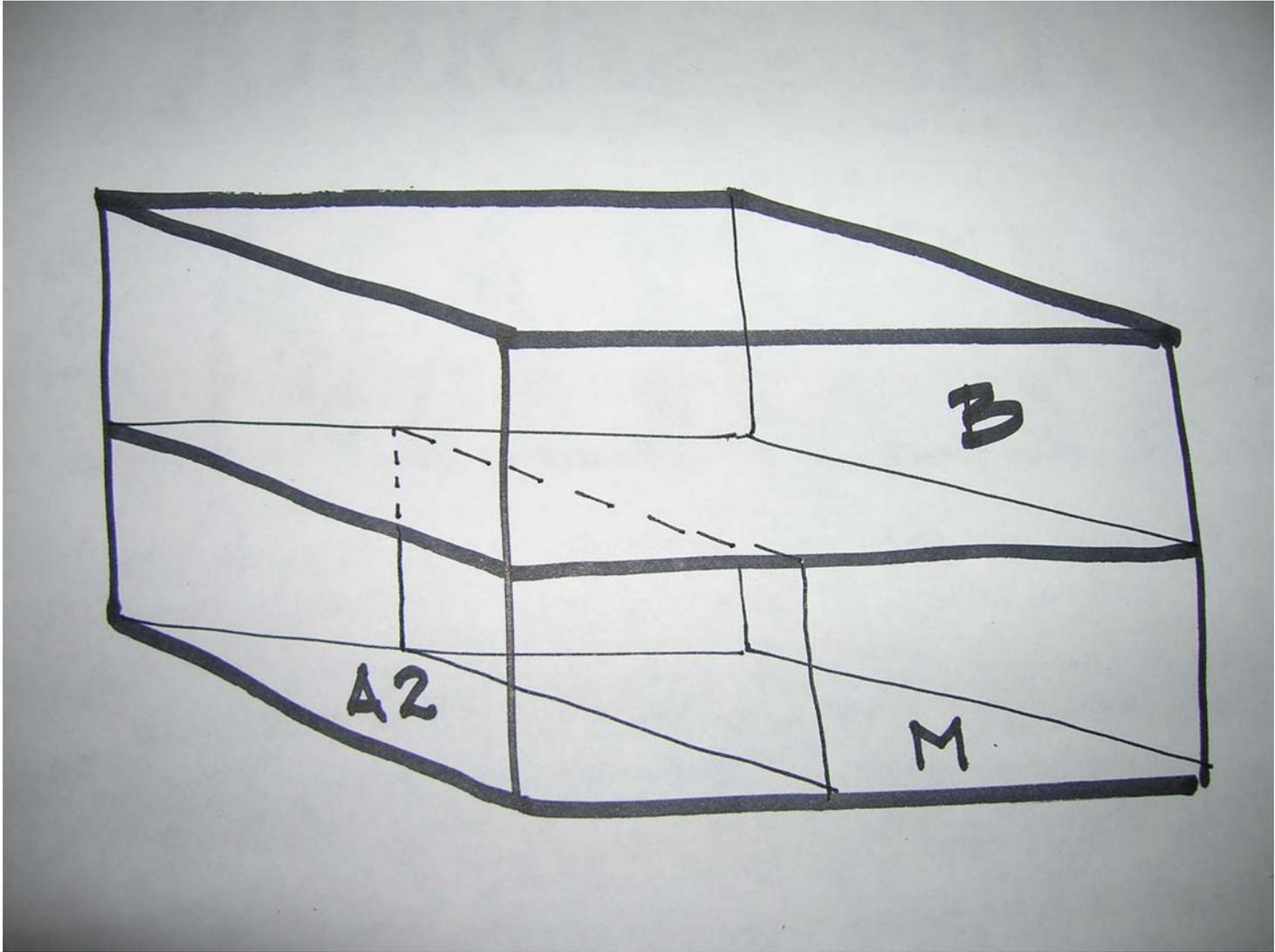
- *Classified in accordance with Section 302.1*
- *Each Fire Area shall comply based on Occupancy...*

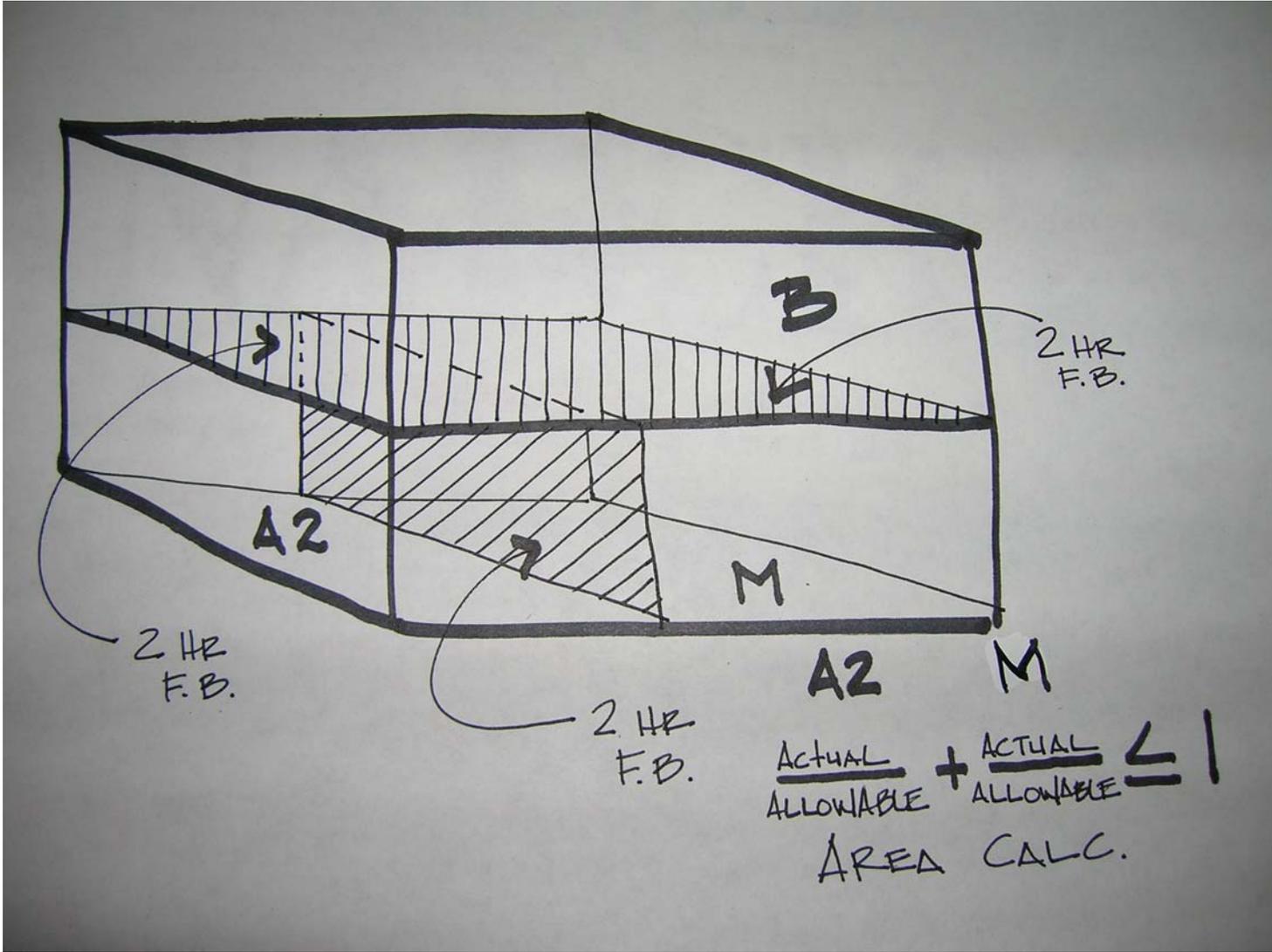


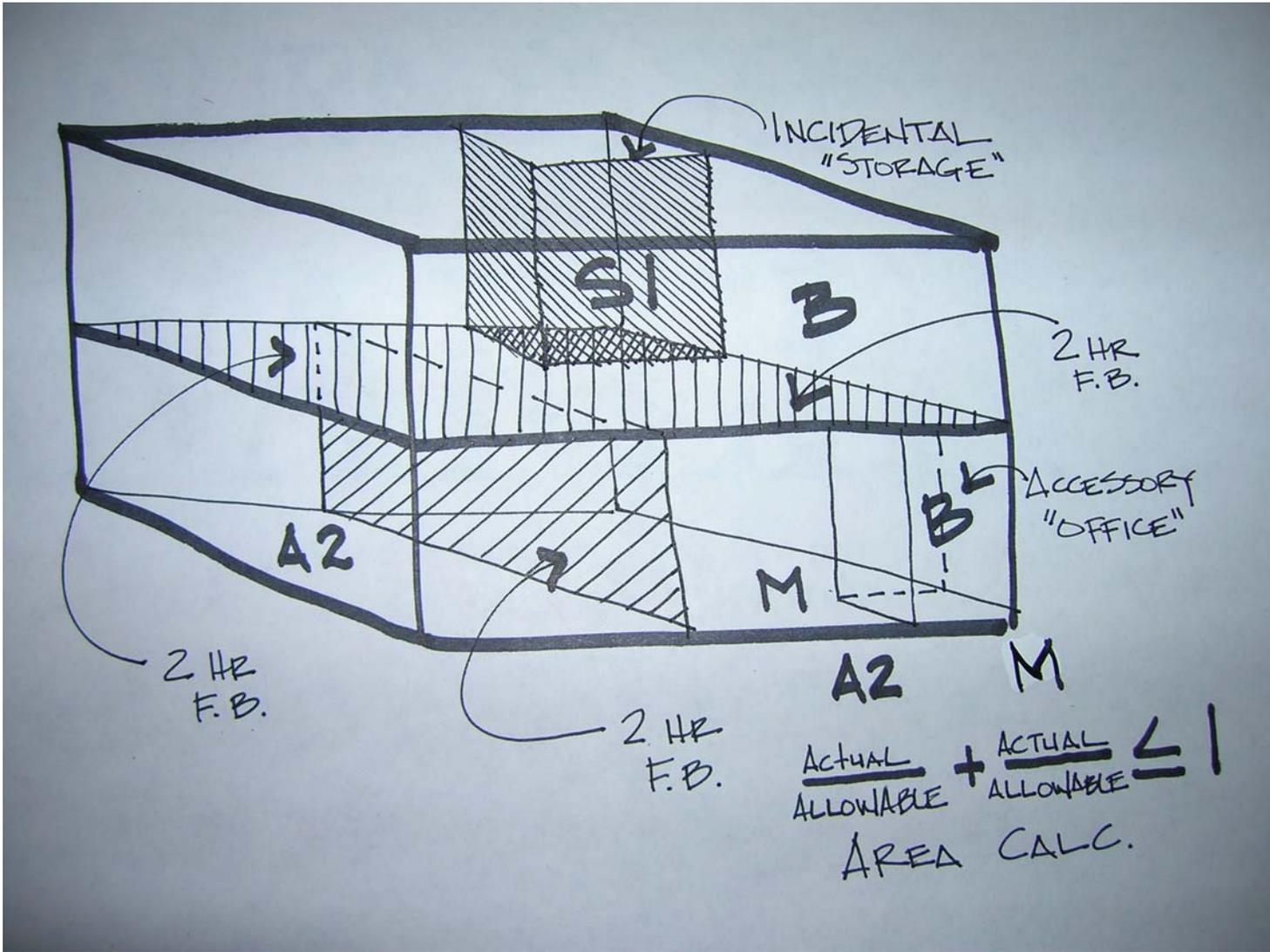
Section 508.3.3.2 Allowable Area

- *Sum of the Ratio of Actual...Divided by the Allowable of Each...Shall not exceed One...Huh?*









Section 508.3.3.3 Allowable Height

- *Each Occupancy based on construction type in accordance with 503.1*
- *Height in feet and stories shall be measured from Grade Plane*

Section 508.3.3.4.1

Construction

- *Fire Barriers (Section 706)*
- *Horizontal Assemblies (Section 711)*
- *Complete Separation from other Occupancies*

Section 509.2 Group S2 enclosed or open parking garage with Group A, B, M, R or S above

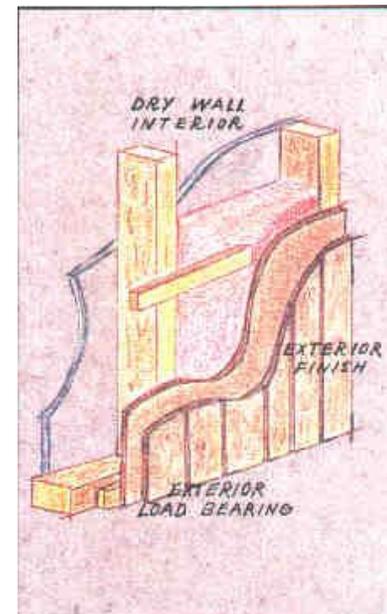
- *Basement and/or First Story... Separate and Distinct Building*
- *Basement and First Story Type IA... Horizontal 3-hour*
- *Shafts and Stairways... 2-hour*

Section 509.2 Group S2 enclosed or open parking garage with Group A, B, M, R or S above

- *Assembly above the horizontal less than 300 occupants*
- *Below the horizontal used for parking and storage of private motor vehicles*
- *Maximum height based on Section 503 measured from Grade Plane*

IBC Chapter 7

- *701.1 Scope. The provisions of this chapter shall govern materials and assemblies used for structural fire resistance and fire-resistance-rated construction...*



Section 702.1 Definitions

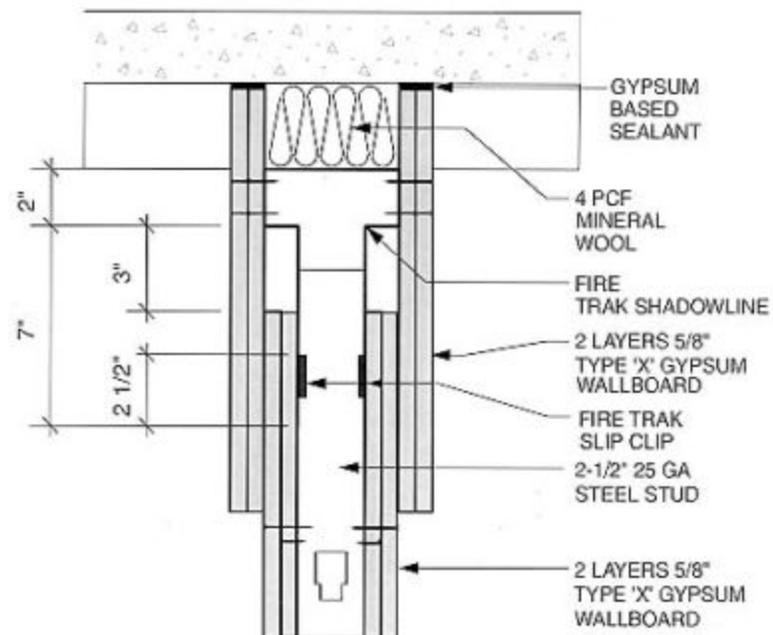
- *Annular Space*
- *Dampers*
- *Draftstop*
- *Fire Area*
- *Fire Barrier*
- *Fire Partition*

Section 702.1 Definitions

- *Fire Separation Distance*
- *Fire Wall*
- *Fire Blocking*
- *Membrane Penetration*
- *Through Penetration*
- *Shaft*

Section 703.2 Fire Resistant Ratings

- *ASTM E 119*



Section 703.2.1

Nonsymmetrical Wall Construction

- *Tested with both faces exposed to the furnace.*

Section 703.2.2 Combustible Components

- *Resulting tested assembly meets the fire-resistance test requirements*

Section 703.2.3 Restrained Classification

- *Shall not be considered to be restrained...unless evidence...ASTM E 119*

Section 703.3 Alternative Methods

- *Documented in Approved Sources*
- *Prescriptive Design (Section 720)*
- *Calculated (Section 721)*
- *Engineering Analysis – ASTM E 119*

Section 704 Exterior Walls



Section 704.2 Projections

- *Cornices, eave overhangs, exterior balconies...*
- *This section and Section 1406*
- *Egress Balconies and exit stairways*
Sections 1014.5 and 1023.1



Section 704.2 Projections

- *A point one-third the distance to the lot line from an assumed vertical plane located where protected openings are required in accordance with Section 704.8*
- *More than 12 inches into areas where opening are prohibited.*

Section 704.3 Buildings on the Same Lot

- *Imaginary Line*
- *New building construction and Imaginary line shall not affect existing building 704.5 and 704.8 (Fire Resistance and Allowable area of openings)*

Section 704.3 Buildings on the Same Lot Exception

- *Aggregate Area must be within the limits of Chapter 5.*
- *Most restrictive shall apply*



Section 704.4 Materials

- *Based on Construction Type*



Section 704.5 Fire Resistance Rating

- *Table 601 and 602*
- *Greater than 5 feet – Fire from inside*
- *5 feet and less – Fire from both sides*

Section 704.6 Structural Stability

- *Extend to height based on section 704.11*
- *Remain in place for the duration of time indicated*

Section 704.8 Allowable Area of Openings

- $A/a + A_u/a_u \leq 1.0$



Section 704.11 Parapets

- *Exceptions*
- *Same fire-resistant rating*
- *Uppermost 18 inches non-combustible*
- *Sloping roofs (greater than 2:12)*

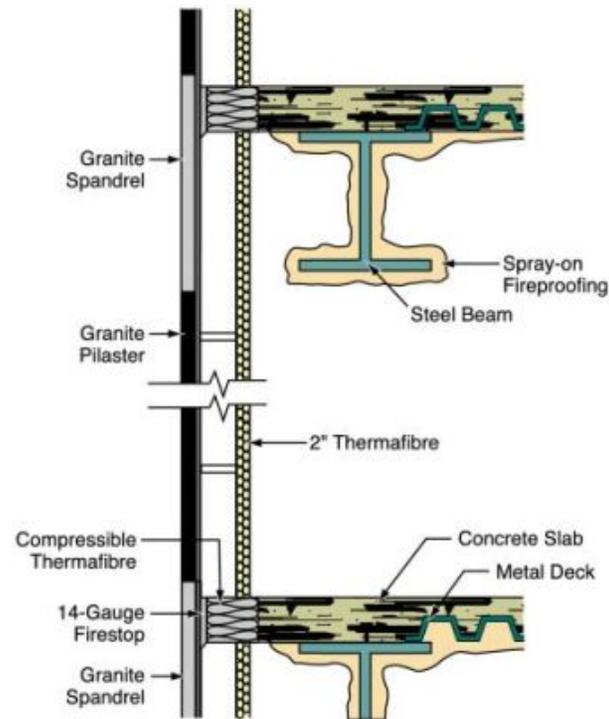
Section 704.12 Opening Protection

- *715.4 Fire Door and Shutter*
- *715.5 Fire-Resistant-Rated Glazing*



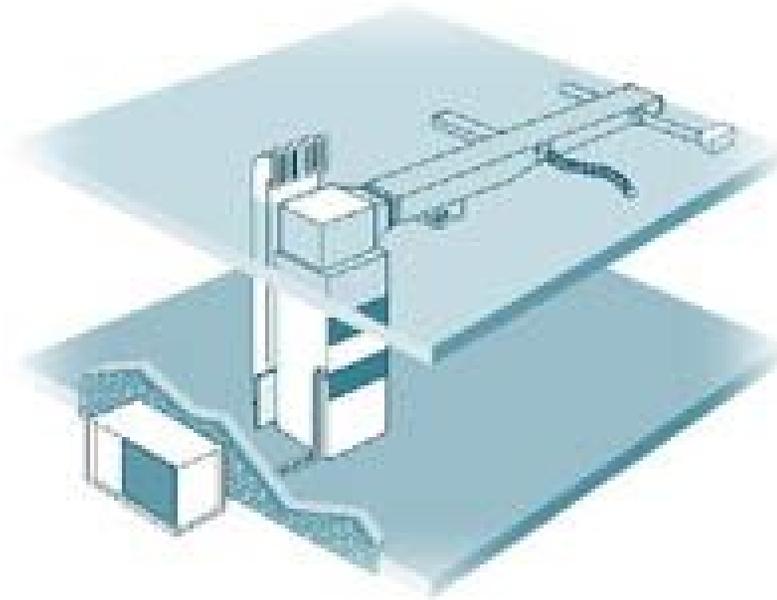
Section 704.13 Joints

- *Section 713*
- *704.13.1 Voids – Curtain Wall 713.4*



Section 704.14 Ducts and air transfer openings

- *Section 716*



Section 705 Fire Walls

Section 705.1 General

- *Separate Buildings*



Section 705.1.1 Party Walls

- *Any wall located on a lot line between separate buildings.*

Section 705.2 Structural Stability

- *Allow collapse of construction on either side without collapse of the wall for the duration of time indicated by the required fire-resistance rating.*

Section 705.3 Materials

- *Approved noncombustible*
- *Type V exception*



Section 705.4 Fire Resistance Rating

- *Table 705.4*

Section 705.5 Horizontal Continuity

- *18 inch extension*
- *Exceptions...*
- *Interior surface of combustible... 1-hour*
- *Interior surface of noncombustible...*
- *Interior surface of noncombustible... fire protection sprinkler on each side... 903.3.1.1 or 903.3.1.2*



Section 705.6 Vertical Continuity

- *Termination point at least 30 inches above both adjacent roofs*
- *Exceptions*

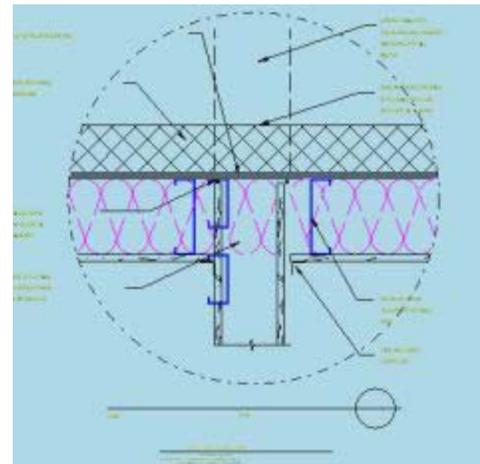
Section 705.6.1 Stepped Buildings

- *Termination point not less than 30 inches above the lower roof level.*
- *Exception...*
- *Lower roof within 10 feet is not less than 1-hour fire-resistance rating*
- *Openings not located in lower roof within 10 feet.*

Section 705.8 Openings

- *Section 715.4*
- *Not to exceed 120 square feet*
- *Aggregate width shall not exceed 25 percent of the length of the wall.*
- *Exceptions...*
- *Not permitted in Party Walls*
- *Not limited where Automatic Sprinkler System (903.3.1.1)*

Section 706 Fire Barriers



Section 706.2 Materials

- *Based on Construction Type*

Section 706.3 Fire Resistant Rating

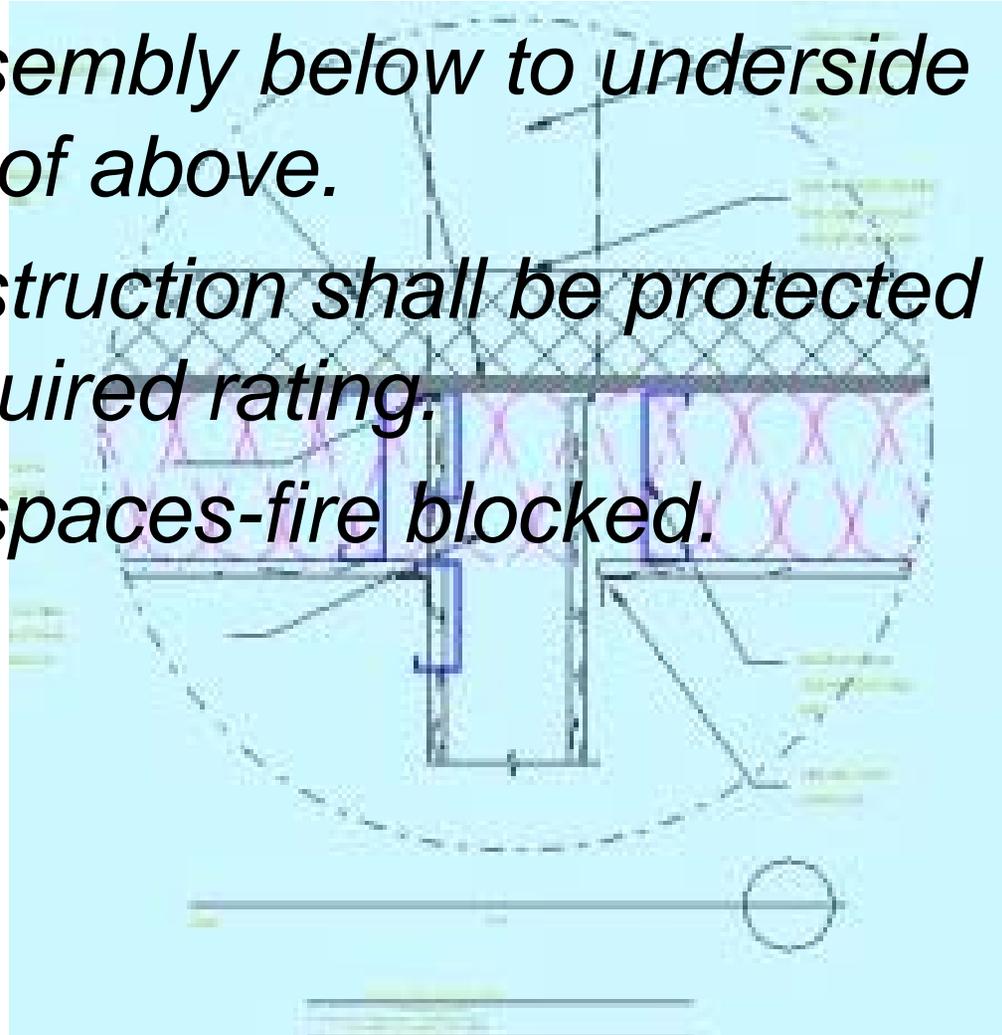
- *706.3.1 Shafts – Section 707.4*
- *706.3.2 Exit Enclosures – Section 1020.1*
- *706.3.3 Exit Passageway – Section 1021.1*
- *706.3.4 Horizontal Exit – Section 1022.1*

Section 706.3 Fire Resistant Rating

- *706.3.5 Atriums – Section 404.5*
- *706.3.6 Incidental Use Areas – Section 508.2*
- *706.3.7 Control Areas – Section 414.2.3*
- *706.3.8 Separation of Mixed Occupancies – Section 508.3.2*
- *706.3.9 Single-Occupancy Fire Areas – Table 706.3.9*

Section 706.5 Continuity

- *Floor/ceiling assembly below to underside of the floor or roof above.*
- *Supporting construction shall be protected to afford the required rating.*
- *Hollow vertical spaces-fire blocked.*



Section 706.7 Openings

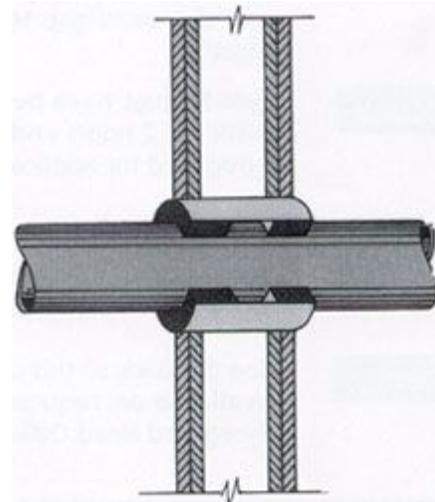
- *Section 715.4*
- *Not to exceed 156 square feet*
- *Aggregate width shall not exceed 25 percent of the length of the wall.*
- *Section 1020.1.1 and 1021.4*

Section 706.7 Openings

- *Exceptions...*
- *Not limited to 156 square feet where Automatic Sprinkler System (903.3.1.1)*
- *Fire doors serving exit enclosure*
- *Not limited where tested in accordance with ASTM E 119*
- *Fire windows in atrium separation walls not limited to 25 percent of length*

Section 706.8.1 Prohibited Penetrations

- *Only permitted into an exit enclosure or an exit passageway under Section 1020.1.2 or 1021.1.5*



Section 707 Shaft Enclosures



Section 707.1 General

- *Penetrations through floor/ceiling and roof/ceiling assemblies. Constructed as Fire Barriers (Section 706), Horizontal Assemblies (Section 711) or Both.*



Section 707.2 Shaft Enclosure Required

- *Openings through a floor/ceiling assembly shall be protected by a shaft enclosure.*
- *Exceptions...*
- *Totally within individual residential dwelling unit Escalator or stairway not part of means of egress protected by 903.3.1.1*

Section 707.2 Shaft Enclosure Required

- *-Draft curtain*
- *-Automatic Shutter*
- *Penetration (Section 712)*
- *Atrium (Section 404)*
- *Chimney (Section 717)*
- *Exception #7...not more than two floor levels*

Section 707.4 Fire Resistance Rating

- *2-hour fire-resistance-rating / 4 or more stories*
- *1-hour fire-resistance-rating / less than 4 stories*
- *Not less than floor system penetrated but need not exceed 2-hours*

Section 707.7 Openings

- *Reference Section 715*
- *Openings other than those necessary for the purpose of the shaft shall not be permitted in shaft enclosures.*



Section 707.14.1 Elevator Lobby

- *Connects more than 3 stories*
- *Fire Partitions equivalent to corridor rating*
- *At least one means of egress complying with chapter 10*



Section 708 Fire Partitions

- *Dwelling Unit Separations*
- *Sleeping Unit Separations (R-1 hotel, R-2 and I-1)*
- *Covered Mall Tenant Separations*
- *Corridor Walls (Section 1017.1)*
- *Elevator Lobby (Section 707.14.1)*
- *Residential Aircraft Hangars*

Section 708.3 Fire-Resistance Rating

- *Not less than 1-hour*
- *Exceptions...*
- *Corridor walls based on Table 1017.1*
- *Dwelling and sleeping units, Construction Type IIB, IIIB and VB equipped with automatic fire suppression system (903.3.1.1) – ½ hour*

Section 708.4 Continuity

- *Floor/ceiling assembly below to underside of the floor or roof above or to floor/ceiling or roof/ceiling assembly. Where not continuous to the deck above the space between the ceiling and deck shall be fireblocked or draftstopped in accordance with 717.2 and 717.3.*

Section 709 Smoke Barriers

- *A continuous membrane, either vertical or horizontal, such as a wall, floor, or ceiling assembly...designed and constructed to restrict the movement of smoke... 1-hour.*

Section 709.3 Fire-resistance rating

- *A 1-hour fire-resistance rating is required...*

Section 709.4 Continuity

- *Continuous from outside wall to outside wall from top of the foundation or floor/ceiling assembly to underside of the floor or deck above*
- *Exception...Barrier walls not required in interstitial spaces where ceiling is constructed to prevent passage of fire and smoke...*

Section 710 Smoke Partitions

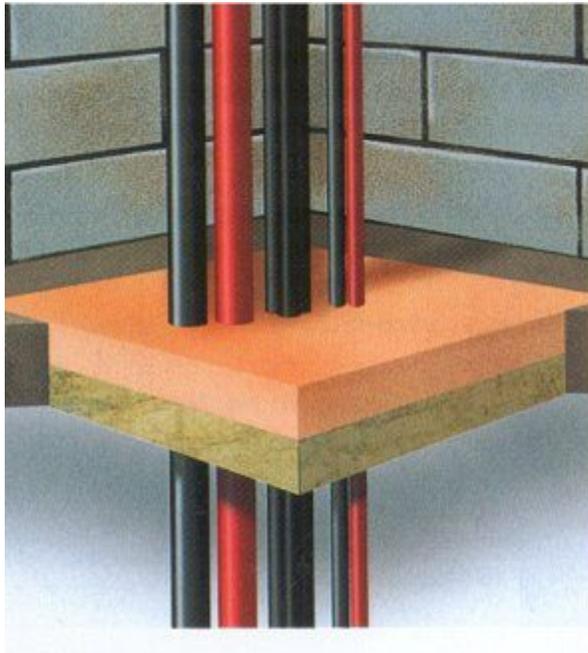
- *A continuous membrane, either vertical or horizontal, such as a wall, floor, or ceiling assembly...designed and constructed to restrict the movement of smoke...*

Section 710.3 Fire-resistance rating

- *Not required...*

Section 711 Horizontal Assemblies

- *Floor and roof assemblies required to have a fire-resistance rating...*

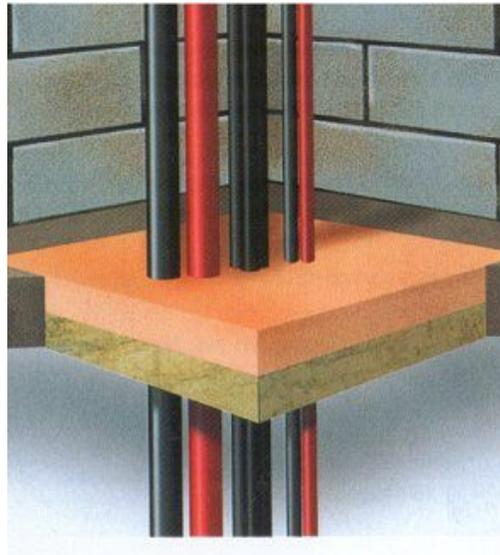


Section 711.3 Fire-resistance rating

- *Floor and Roof Assemblies based on construction type, separation requirements of Section 508.3.2, fire area based on Section 706.3.9 or dwelling/sleeping unit separation.*

Section 712 Penetrations

- *Through penetrations and membrane penetrations of horizontal assemblies and fire-resistance-rated wall assemblies.*



Section 712.2 Installation Details

- *Sleeves shall be securely fastened. Space between the penetrating item and the sleeve and any space between the sleeve and assembly penetrated shall be protected in accordance with this section.*

Section 712.3 Fire-resistance-rated walls

- *Through Penetrations*
- *Membrane Penetrations*

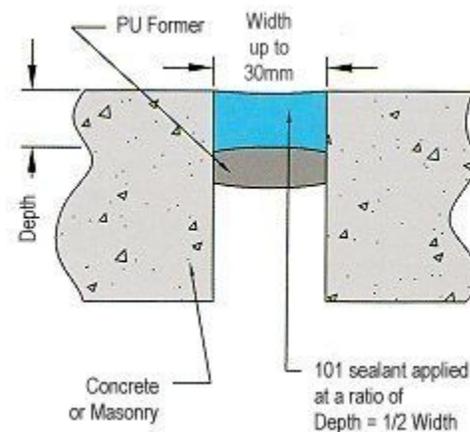


Section 712.4 Horizontal Assemblies

- *712.4.1 Fire-resistance rated assemblies*
- *Through*
- *Membrane*
- *712.4.2 Nonfire-resistance-rated assemblies*
- *712.4.2.1 Noncombustible penetrating items*
- *712.4.2.2 Penetrating items*

Section 713 Fire-resistant Joint Systems

- *Joints installed in or between fire-resistance-rated walls, floors or floor/ceiling assemblies shall be protected by an approved fire-resistant joint system...*



Section 713.3 Fire test criteria

- *ASTM E 1966 or UL 2079*
- *Exterior walls with horizontal fire separation distance greater than 5 feet...joint tested for interior fire exposure only.*

Section 713.4 Exterior curtain wall/floor intersection

- *Where fire resistance-rated floor or floor/ceiling assemblies are required, voids created at the intersection of the exterior curtain wall assemblies and such floor assemblies shall be sealed with a an approved materials or system to prevent the interior spread of fires.*

Section 714 Fire-resistance rating of structural members

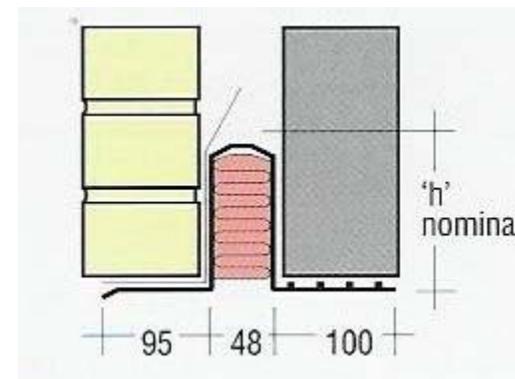
- *Structural members and assemblies shall comply with the type of construction and shall not be less than the rating required for the fire-resistance-rated assemblies supported.*

Section 714.2 Protection of Structural Members

- *714.2.1 Individual Protection...more than two floors, one floor and roof, supporting a load-bearing wall or non-load bearing more than two stories shall be individually protected on all sides...*

Section 714.6 Bottom flange protection

- *Fire protection is not required at the bottom flange of lintels, shelf angles and plates spanning not more than 6 feet...*



Section 715.2 Fire Resistive rated glazing

- *Labeled fire-resistance-rated glazing tested as part of a fire-resistance-rated wall assembly...ASTM E 119 shall not be required to comply with this section.*

Section 716 Ducts and Air Transfer Openings

- *Fire Dampers*
- *Smoke Dampers*
- *Combination fire/smoke dampers and*
- *Ceiling Radiation Dampers*

Section 716.4 Access and Identification

- *Fire and smoke dampers shall be provided with an approved means of access, which is large enough to permit inspection and maintenance of the damper and its operating parts.*



Section 716.5 Where required

- *716.5.1 Fire Walls – fire dampers*
- *716.5.2 Fire Barriers – fire dampers*
- *716.5.3 Shaft enclosures – fire and smoke dampers*
- *716.5.4 Fire Partitions – fire dampers*
- *716.5.4.1 Corridors – smoke damper*
- *716.5.5 Smoke Barriers – smoke dampers*

Section 716.6 Horizontal Assemblies

- *716.6.1 Through Penetrations*
- *716.6.2 Membrane Penetrations*
- *716.6.3 Nonfire-resistance-rated floor assemblies*