Code Conforming Wood Design

AMERICAN WOOD COUNCIL

ICC INTERNATIONAL CODE COUNCIL®

About the American Wood Council

The American Wood Council (AWC) is the voice of North American traditional and engineered wood products. AWC develops state-of-the-art engineering data, technology, and standards on structural wood products for use by design professionals, building officials, and wood products manufacturers to assure the safe and efficient design and use of wood structural components. AWC also provides technical, legal, and economic information on wood design, green building, and manufacturing environmental regulations advocating for balanced government policies that sustain the wood products industry.

222 Catoctin Circle, SE, Suite 201
Leesburg, VA 20175
202-463-2766
www.awc.org

About the International Code Council

The International Code Council is a member-focused association. It is dedicated to developing model codes and standards used in the design, build and compliance process to construct safe, sustainable, affordable and resilient structures. Most U.S. communities and many global markets choose the International Codes. ICC Evaluation Service (ICC-ES) is the industry leader in performing technical evaluations for code compliance fostering safe and sustainable design and construction.

Headquarters: 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001-2070
District Offices: Birmingham, AL; Chicago, IL; Los Angeles, CA
1-888-422-7233
www.iccsafe.org

Updates & Errata

While every effort has been made to insure the accuracy of the information presented, and special effort has been made to assure that the information reflects the state-of- the-art, neither the American Wood Council nor its members assume any responsibility for any particular design prepared from this publication. Those using this document assume all liability from its use. Updates or Errata are posted to the American Wood Council website at www.awc.org. Technical inquiries may be addressed to info@awc.org.

Code Conforming Wood Design

Introduction

Wood construction offers distinct design options typically not found in a single structural material. It is inexpensive, readily available, easy to work with, strong and adaptable. The economic, environmental and energy efficiency advantages account for more buildings being constructed of wood than any other structural material.

The intent of this book is to summarize allowable wood use in buildings in accordance with the International Code Council (ICC) 2009 *International Building Code*® (IBC®). Emphasis will be placed on the design flexibilities permitted for wood in commercial construction. This is not meant to be a replacement for the IBC and does not encompass all of the design options in the IBC. The IBC should always be consulted for applicable specific requirements related to designs and site conditions.

Table of Contents

1. General Information

Use and Occupancy Classification

Building code requirements are dependent on the appropriate classification of the building or structure for its design purpose or current occupancy. Eight occupancies are discussed in this book:

- Group A, Assembly occupancies
- Group B, Business occupancies
- Group E, Educational occupancies
- Group F, Factory/Industrial occupancies
- Group I, Institutional occupancies
- Group M, Mercantile occupancies
- Group R, Residential occupancies
- Group S, Storage occupancies

The occupancies are described below, but when a structure is proposed for a purpose that is not specifically listed, it should be classified in the group that the occupancy most nearly resembles in accordance with Section 302.1. The authority having jurisdiction, the building official, has the ultimate responsibility for rendering interpretations of the code, including designation of the type of occupancy.

Group H (Hazardous) and U (Utility and Miscellaneous) occupancies also may be of wood construction, but are beyond the scope of this book.

Assembly Occupancies

The IBC lists Assembly (A) occupancies in Section 303. Group "A" occupancies are divided into five subcategories. Group A-1 includes fixed seating occupancies for viewing performing arts and motion pictures. Group A-2 includes buildings in which food and drink consumption occurs, for example, restaurants, banquet halls, bars and nightclubs; Group A-3 includes worship, recreation, amusement and other assembly uses not included in the other groups; Group A-4 includes indoor arenas, skating rinks, swimming pools and tennis courts; and Group A-5 includes outdoor grandstands, stadiums and amusement park structures.

Figure 1: Auditorium

Business Occupancies

Section 304 covers Business (B) occupancies. Group "B" includes airport traffic control towers, ambulatory health care facilities, animal hospitals, kennels and pounds, banks, barber and beauty shops, car washes, civic administration, outpatient clinics, dry cleaning and laundry (pick-up and delivery stations and self-service), educational occupancies (above the 12th grade), electronic data processing, testing and research laboratories, motor vehicle showrooms, post offices, print shops, professional service offices, radio and television stations, telephone exchanges and training and skill development facilities (not located in a school).

Figure 2: Office Building

Educational Occupancies

The IBC lists Educational (E) occupancies in Section 305. Group "E" includes any buildings or portions of a structure used to educate six or more people through the 12th grade. Buildings or portions of a structure used for supervision, personal care or education of more than five children at least 2 ½ years old are also Group E structures.

Figure 3: Elementary School

Factory/Industrial Occupancies

Section 306 covers Factory/Industrial (F) occupancies. Group "F" is subdivided into two occupancy groups: Group F-1 and Group F-2. Group F-1, moderate hazard industry, includes buildings or portions of buildings used for the manufacturing of aircraft, appliances, motor vehicles, boats, recreational vehicles, business machines, photo equipment, construction and agricultural machinery, engines, metals, woodworking and millwork. Group F-1 also includes textile production—canvas, clothing, carpet,

Figure 4: Factory

hemp, jute and paper—and laundries, printing and publishing, soaps and plastic products, alcoholic beverages, optical goods and wood distillation.

In addition, Group F-2, low hazard industry occupancies are buildings and facilities used for beverage production (up to 16-percent alcohol), brick, ceramics, glass, gypsum, ice, metal fabrication and assembly and foundries.

Institutional Occupancies

The IBC lists Institutional (I) occupancies in Section 308. Group "I" includes four subcategories: Group I-1, residential care for more than 16 people (24-hour care); Group I-2, hospitals, child care facilities (24-hour care), nursing homes and detoxification facilities; Group I-3, jails, detention centers and prisons; and Group I-4, day care facilities for more than five adults or children (less than 24-hour care).

Figure 5: Nursing Home

Mercantile Occupancies

Section 309 covers Mercantile (M) occupancies. Group "M" includes department stores, drugstores, markets, motor fuel-dispensing facilities, retail or wholesale stores and salesrooms. Essentially any place involving display and sale of merchandise is considered to be a Group M occupancy.

Figure 6: Retail Store

Residential Occupancies

The IBC lists Residential (R) occupancies in Section 310. Group "R" contains four subcategories. Group R-1 includes hotels, motels and boarding houses; Group R-2 includes apartments, dormitories, live/work units, timeshare properties and nontransient hotels, motels and boarding houses. Group R-3 includes single- and two-family dwellings, adult and child day care facilities with less than six clients and congregate living facilities for less than 17 people. Group R-4 includes residential care and assisted living facilities for six to 16 clients.

Figure 7: Apartments

Storage Occupancies

Section 311 covers Storage (S) occupancies. Group "S" includes subcategories Group S-1, moderate hazard storage and Group S-2, low hazard storage. Group S-1 contains buildings occupied for storage uses that are not classified as Group S-2, including aircraft hangars, storage of clothing, cloth, fiber, books, paper, wood, fur, furniture, mattresses, tires, tobacco products, sugar, soap and glue. Group S-1 also includes indoor storage of boats and motor vehicle repair garages.

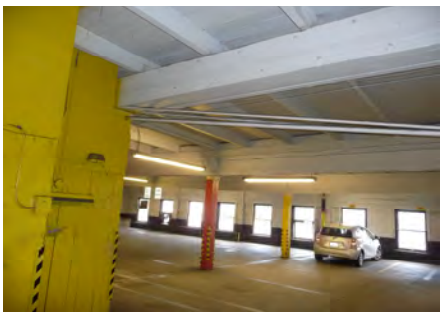


Figure 8: Parking Garage

Group S-2 includes buildings used for storage of noncombustible materials such as beverages up to 16-percent alcohol content, cement, chalk, batteries, electric coils and motors, distribution transformers, glass, some appliances including stoves, washers and dryers, metal furniture, metals, food products, fresh fruit and frozen foods. Open and enclosed parking garages are also Group S-2 occupancies.

Referenced Code and Standards

The IBC is developed by the International Code Council. Industry and professional standards are referenced in the IBC to clarify specific code requirements. Chapter 35 of the IBC provides a list of the standards referenced, the agency that writes the standard, the identification and title of the standard and its effective date.

Standards represent consensus on how a material, product or assembly is to be designed, manufactured, tested or installed so it achieves a specified level of performance. Several key standards relating to design of wood structures are utilized by the IBC. Specifically, the 2009 IBC references the American Forest & Paper Association (AF&PA), a legacy organization of the American Wood Council (AWC), 2*005 National Design Specification® (NDS-05®) for Wood Construction with 2005 Supplement* and the AF&PA/AWC SDPWS-08, *2008 Special Design Provisions for Wind and Seismic*. The NDS details structural and fire design methods for the use of lumber, timber, prefabricated wood I-joists, structural composite lumber and wood structural panels, using either Allowable Stress Design (ASD) or Load and Resistance Factor Design (LRFD). The SDPWS addresses materials, design and construction of wood members, fasteners and assemblies used to resist wind and seismic forces.

Section 8, Resources, of this book provides information on how to obtain these standards and other related materials.

2. Type of Construction

Chapter 6 of the IBC defines types of construction, with wood frame construction typically found in Types V, IV and III. Additionally, the IBC has specific applications that permit the use of wood in construction Types I and II. These circumstances will be addressed in Sections 5 and 6 of this book.

Type V Construction

Type V construction permits the use of wood or other approved materials for structural elements, including structural frame members, bearing walls, floor and roof construction, as well as nonbearing elements such as exterior walls and interior partitions. Type V construction is further defined as Type VA (all interior and exterior load-bearing walls, floors, roofs and all structural members are designed or protected to provide a minimum 1-hour fire-resistance rating) and Type VB (no fire-resistance rating is required).

Figure 9: Type V Construction

Type IV Construction

Figure 10: Type IV Construction

Type IV construction (Heavy Timber, HT) has exterior walls made of noncombustible materials or fire-retardant-treated wood (FRTW) and interior building elements made of solid or laminated wood without concealed spaces. Columns supporting roof and ceiling loads must be a minimum nominal dimension of 6 inches by 8 inches and 8 inches by 8 inches if supporting floor loads. Floor beams and girders must be a minimum nominal dimension of 6 inches by 10 inches and roof beams and girders must be a minimum nominal dimension of 4 inches by 6 inches. Flooring must be a minimum nominal 3-inch thickness covered with 1-inch nominal dimension tongue-and-groove flooring and roof decking must be a minimum nominal 2-inch thickness or $1^{1}/_{8}$-inch-thick wood structural panels. Partitions must be 1-hour fire-resistance-rated construction or a minimum two layers of 1-inch nominal board or laminated construction 4 inches thick.

Type III Construction

Figure 11: Type III Construction

Type III construction requires exterior walls to be noncombustible material or FRTW having a minimum 2-hour fire-resistance rating. All of the other building elements are permitted to be wood or other approved materials. Type IIIA construction needs to provide a minimum 1-hour fire-resistance rating for all building elements and Type IIIB construction does not require any fire-resistance rating other than the exterior load-bearing wall.

Type I and II Construction

Type I and II construction requires building elements constructed of noncombustible materials on other materials placed in the building. Sections 5 and 6 of this book outline circumstances where wood is permitted in Type I and II buildings.

3. Allowable Heights and Areas for Type V, IV and III Construction

When the first edition (2000) of the IBC was published, wood buildings were allowed to have areas and heights commensurate with the largest buildings permitted for each construction type under at least one of the regional legacy codes. Since then, allowable building sizes have not changed significantly, although the number of buildings that qualify for unlimited area under the special provisions of Section 507 has expanded. In addition, special allowances for various building features such as sprinklers or the use of FRTW continue to be added. As a result, size thresholds for wood structures are more often determined by structural considerations than by code limitations. This may not be the case in the future.

General building height and area allowances are given in Chapter 5 of the IBC. Height and per-story area limitations are shown in the Table 503 excerpt (Figure 12) and are based on occupancy and type of construction. These area and height limitations are unmodified and can be significantly increased based on certain provisions of the code that will be explained in this section.

Group	Height (ft)	Type of Construction				
		Type III		Type IV	Type V	
		A 65	B 55	HT 65	A 50	B 40
		Stories (S)				
		Area (A)				
A-1	S	3	2	3	2	1
	A	14,000	8,500	15,000	11,500	5,500
A-2	S	3	2	3	2	1
	A	14,000	9,500	15,000	11,500	6,000
A-3	S	3	2	3	2	1
	A	14,000	9,500	15,000	11,500	6,000
A-4	S	3	2	3	2	1
	A	14,000	9,500	15,000	11,500	6,000
A-5	S	UL	UL	UL	UL	UL
	A	UL	UL	UL	UL	A
B	S	5	3	5	3	2
	A	28,500	19,000	36,000	18,000	9,000
E	S	3	2	3	1	1
	A	23,500	14,500	25,500	18,500	9,500
F-1	S	3	2	4	2	1
	A	19,000	12,000	33,500	14,000	8,500
F-2	S	4	3	5	3	2
	A	28,500	18,000	50,500	21,000	13,000
I-1	S	4	3	4	3	2
	A	16,500	10,000	18,000	10,500	4,500
I-2	S	1	NP	1	1	NP
	A	12,000	NP	12,000	9,500	NP
I-3	S	2	1	2	2	1
	A	10,500	7,500	12,000	7,500	5,000
I-4	S	3	2	3	1	1
	A	23,500	13,000	25,500	18,500	9,000
M	S	4	2	4	3	1
	A	18,500	12,500	20,500	14,000	9,000
R-1	S	4	4	4	3	2
	A	24,000	16,000	20,500	12,000	7,000
R-2	S	4	4	4	3	2
	A	24,000	16,000	20,000	12,000	7,000
R-3	S	4	4	4	3	3
	A	UL	UL	UL	UL	UL
R-4	S	4	4	4	3	2
	A	24,000	16,000	20,500	12,000	7,000
S-1	S	3	2	4	3	1
	A	26,000	17,500	25,500	14,000	9,000
S-2	S	4	3	5	4	2
	A	39,000	26,000	38,500	21,000	13,500

Figure 12: Table 503 Excerpt

The height and area of a structure may be increased depending on the building location on the lot, the presence of automatic sprinkler systems or using some of the design options recognized in Chapter 5. Upper limits for the size of select buildings without sprinklers are located in Chapter 9. These increases and limits are discussed in detail in this section.

Equation 5-1 establishes the maximum allowable area per floor based on the Chapter 5 modifications.

$$A_a = \{A_t + [A_t \times I_f] + [A_t \times I_s]\} \quad \textbf{(Equation 5-1)}$$

where:

A_a = Allowable building area per story (square feet).
A_t = Tabular building area per story in accordance with Table 503 (square feet).
I_f = Area increase factor due to frontage as calculated in accordance with Section 506.2.
I_s = Area increase factor due to sprinkler protection as calculated in accordance with Section 506.3.

Allowable Increases for Frontage

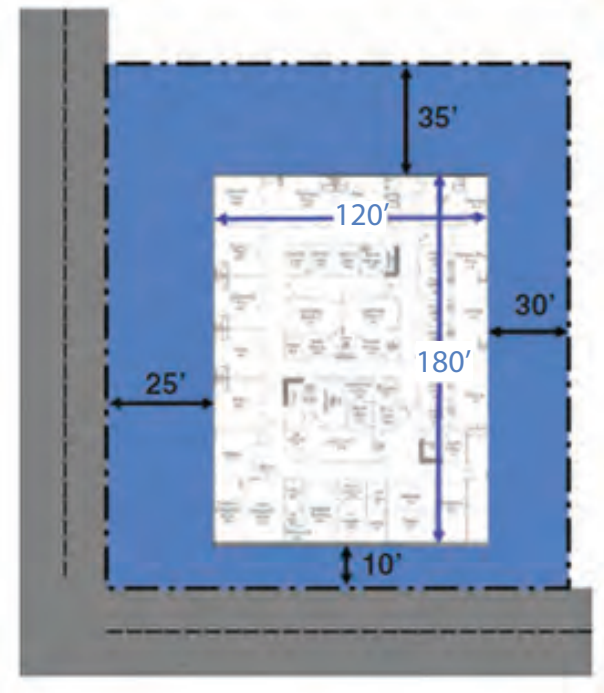
Buildings adjacent to open space adjoining a public way, with the exterior wall a minimum of 20 feet from the far edge of the public way for more than 25 percent of the building perimeter, may increase the allowable floor area from Table 503 using Equation 5-2.

$$I_f = [F / P - 0.25]\, W / 30 \quad \textbf{(Equation 5-2)}$$

where:

I_f = Area increase due to frontage.
F = Building perimeter that fronts on a public way or open space having 20 feet open minimum width (feet).
P = Perimeter of entire building (feet).
W = Width of public way or open space (feet) in accordance with Section 506.2.1. (A weighted average may be used when W varies along the perimeter.) W is the open space width plus the width of the public way.

It should be noted that frontage widths (W) greater than 30 feet will only receive credit for a value of 30 feet. The maximum increase that can be obtained for frontage would occur when 100 percent of the perimeter has frontage of 30 feet or more and would result in a 75-percent floor area increase. Figure 13 illustrates the frontage increase concept for a two-story restaurant of Type IIIA construction.



Given:

–Two-story restaurant
–Type IIIA construction
–Street width of 40 feet

Determine:

–Area limitation

Solution:

A_t = 14,000 sq ft

$I_f = (F / P - 0.25) - W / 30$

$I_f = [(600 / 600) - 0.25] \times 30 / 30 = 0.75$

$A_a = 14{,}000 + (14{,}000 \times 0.75) = 24{,}500$ per floor

$A_a = 24{,}500 \times 2 = 49{,}000$ for building

Actual = 21,600 per floor, 43,200 total ✓ OK

Figure 13: Frontage Calculation

Allowable Increases for Automatic Sprinkler Systems

When a building is equipped throughout with an NFPA 13-compliant automatic sprinkler system, the allowable floor area is permitted to be increased by 300 percent for a one-story building and 200 percent for a multistory building.

In addition to the area increase, Section 504.2 also permits the Table 503 building heights to be increased by 20 feet and the number of stories above grade plane to be increased by one story. This applies to all occupancies addressed in this book, except Group I-2 occupancies which are not allowed the increase of a story when an automatic sprinkler system is installed.

For Group R buildings, a similar height increase (but no area increase) is given for the use of NFPA 13R-compliant systems, up to 60 feet and four stories in accordance with Section 504.2.

Figure 14 illustrates the combined effect of frontage and automatic sprinkler systems on the allowable area calculation.

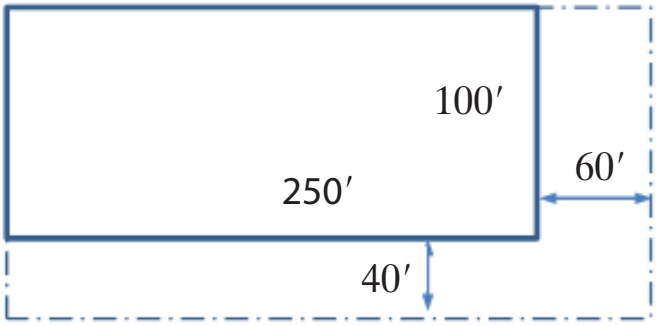


Figure 14: Allowable Building Area Calculation

Given: Single-story Type VB grade school
Provided with an NFPA 13-compliant automatic sprinkler system throughout and located on lot as shown.
Determine: Maximum allowable building area
Solution:

A_t = 9,500 (Table 503)
Frontage Increase (Section 506.2)
I_f = (F / P – 0.25) × W / 30
I_f = [(350 / 700) – 0.25] × 30 / 30 = 0.25 (where W > 30, use 30)
Sprinkler Increase (Section 506.3)
I_s = 3 (300% increase)
Total Allowable area (Section 506.1)
$A_a = A_t + (A_t \times I_f) + (A_t \times I_s)$
A_a = 9,500 + (9,500 × 0.25) + (9,500 × 3) = 40,375 square feet
Actual area = 250 × 100 = 25,000 sq ft ✓ OK

Area Limits for Nonsprinklered Buildings in Chapter 9

Many occupancies have floor area limits allowed by Chapter 5 that are greater than those permitted in Chapter 9 for nonsprinklered buildings. The same thresholds apply to all construction types, not just wood. The allowable area per story can exceed allowable fire areas and a sprinkler system may be required.

If sprinklers are provided, allowable area increases for both sprinklers and open frontage may be taken. Alternatively, fire areas may be kept below sprinkler thresholds by compartmentalizing floor areas with fire-resistance-rated construction in accordance with the definition for “Fire Area” and the requirements of Chapter 7. For several occupancies covered in this book, the requirement for sprinklers can also be triggered by specific use, height above grade or occupant load.

Sprinklers offer a substantial increase to life safety, which is well documented and merits the consideration of designers for that reason alone. But their advantages can also be economic. The code offers considerable trade-offs for providing sprinklers, including:

- Reductions in corridor ratings and corridor opening protection,

- Flexibility in means of egress (travel distance to exits, number and separation of exits, common path of travel),
- Reductions in dwelling unit separations,
- Alternate to emergency escape openings,
- Alternate to certain fire and smoke damper requirements, and
- Interior finish flexibility.

For these reasons, the addition of sprinklers should always be considered in the overall cost analysis for any project.

Total Building Area Limit

Single Occupancy

A single occupancy building with three or more stories above grade has a total building area of the allowable building area per story (A_a) multiplied by three in accordance with Section 506.4.1. Therefore, buildings with four or more stories of the same floor area will have smaller maximum areas per floor than a three-story building of the same type of construction and occupancy. For two-story buildings, the total building area is the maximum allowable building area multiplied by two. The maximum area of any story above grade cannot exceed the allowable building area per story. A single basement is not included in the total allowable building area in accordance with Section 506.4.

The actual building area for all stories added together must be less than the total allowable building area.

3, 3+ Story Building

Total Allowable Building Area

$$A_t = 3 \times A_a$$

2-Story Building

Total Allowable Building Area

$$A_t = 2 \times A_a$$

where:

A_t = allowable building area.

A_a = allowable building area per story.

The maximum allowable building area for residential buildings provided throughout with an NFPA 13R-compliant automatic sprinkler system is determined by multiplying the allowable building area per story (A_a), as determined in Section 506.1, by the number of stories above grade plane in accordance with Section 506.4, Exception 2.

Recall that use of NFPA 13R means there is no automatic sprinkler area increase in accordance with Section 506.3. A building area increase can only be applied due to the frontage calculations. The building height increase for Group R structures still applies in accordance with Section 504.2.

Mixed Occupancy

Mixed occupancy buildings are permitted a total allowable building area calculated in accordance with Section 506.5. But, a single-story basement does not need to be included in the total allowable building area, when the basement does not exceed the area permitted for a single story.

More than one occupancy in a single building can be accommodated by using the allowable area of the most restrictive occupancy (referred to as "nonseparated occupancies" in accordance with Section 508.3). Alternatively, the occupancies can be regulated as a "separated occupancies" (Section 508.4) to allow somewhat larger floor areas. This methodology will often mandate separation of the occupancies by fire barriers and/or horizontal assemblies. The code also accommodates limited area spaces that are accessory to the function of the main occupancy, if the restrictions of Section 508.2 are followed. See Section 506.5 for additional limits for single- and multistory mixed occupancy buildings.

The tables at the end of this book illustrate the allowable area and height increases permitted for individual occupancies. Tables 1, 3, 5, 7, 11 and 16 list allowable nonsprinklered building area per story for each occupancy. Tables 2, 4, 6, 8, 9, 10, 12, 13, 14, 15 and 17 list allowable sprinklered building area per story for each occupancy.

Unlimited Area Buildings

One-Story Buildings—Sprinklered

The following unlimited area buildings with a single story above grade plane are permitted if the building is equipped throughout with an NFPA 13-compliant automatic sprinkler system and surrounded on all sides by public ways or yards not less than 60 feet wide. The open frontage can be reduced in some circumstances (Section 507.5).

Unlimited area Group B, F, M and S buildings of any construction type are also permitted with no special restrictions in Section 507.3, as long as sprinklers and 60 feet of open frontage are provided.

Unlimited area Group A-4 buildings of Type IIIA, IIIB and IV construction are permitted by Section 507.3. For indoor activities such as tennis, swimming, skating and equestrian venues, the sprinkler system is not required if exit doors lead directly outside from participant areas and a fire alarm system with manual fire alarm boxes is installed as required by Section 907.

Unlimited area Group E buildings are permitted by Section 507.10 when of Type IIIA or IV construction and each classroom has two means of egress, with one means of egress a direct exit to the outside of the building complying with Section 1020.

Unlimited area Group A-3 buildings of Type III or IV construction, used as a place of religious worship, community hall, dance hall, exhibition hall, gymnasium, lecture hall, indoor swimming pool or tennis court, are permitted by Section 507.7 provided that the building does not have a stage other than a platform, the assembly floor is located within 21 inches of street or grade level and all exits are provided with ramps to the street or grade level.

Group A-1 and A-2 occupancies of Type III or IV construction are permitted by Section 507.3.1 in mixed occupancy buildings containing Group B, F, M or S occupancies of unlimited area provided that the occupancies are separated as required in Section 508.4.4 with no reduction allowed in the fire-resistance rating of the separation based on the installation of an automatic sprinkler system and all exit doors from Group A-1 and A-2 occupancies must discharge directly to the exterior of the building.

One-Story Buildings—Nonsprinklered

Nonsprinklered unlimited area Group F-2 or S-2 buildings, of any construction type, with a single story are permitted by Section 507.2 provided they are surrounded on all sides by public ways or yards not less than 60 feet wide.

Two-Story Buildings—Sprinklered

Unlimited area Group B, F, M or S buildings up to two stories above grade plane of any construction type are permitted by Section 507.4 provided they are equipped throughout with an NFPA 13-compliant automatic sprinkler system and are surrounded on all sides by public ways or yards not less than 60 feet wide.

Section 507.5 allows up to 75 percent of the perimeter open space to be less than 60 feet in width for unlimited area one- and two-story Group B, F, M and S buildings. There must be at least 40 feet provided and the exterior wall and all openings on those portions will require 3-hour minimum fire-resistance and fire protection ratings.

Allowable Increases with Fire Walls

A fire wall is a fire-resistance-rated wall with protected openings that restricts the spread of fire and extends continuously from the foundation to or through the roof. Fire walls built in compliance with Section 706 create separate buildings for the purpose of area limitations and other code-required features. Fire walls separating A, B, E, I, R-1 and R-2 occupancies require a 3-hour minimum fire-resistance rating (2-hour minimum for Type V construction). Fire walls separating F-1, S-1 and M occupancies require a 3-hour minimum fire-resistance rating while F-2, S-2, R-3 and R-4 occupancies require a 2-hour minimum fire-resistance rating. Each portion of a building separated by a fire wall is evaluated individually for allowable heights and areas based on the type of construction.

Fire walls in Type V construction may be wood frame; in other construction types they must be of noncombustible materials in accordance with Section 706.3.

Special Provisions for Stacked Buildings

Under specific circumstances, buildings of different types of construction are allowed to be built on top of each other and are commonly referred to as pedestal buildings. They are only permitted when following the provisions of Section 509. Two subsections recognize wood construction. Section 509.2 requires a 3-hour minimum fire-resistance-rated horizontal assembly between the lower and upper buildings. The lower building is limited to one story above grade plane and must be Type IA construction. The upper building's type of construction and building height in stories are determined as if it did not have a building below (except the height in feet is still limited and measured from grade plane in accordance with Section 509.2, Item 7), thus permitting all types of construction above the Type IA pedestal. Group B, M and R occupancies and Group S-2 open and enclosed parking garages are permitted in either building, subject to the building height and area limitations discussed previously. Multiple Group A occupancies, each with an occupant load of less than 300, are also permitted in either building. Group S occupancies other than parking garages are permitted only in the upper building.

Type IIIA construction in Groups R-1 and R-2 may be increased above the general limitations of Sections 503 and 504 to six stories and 75 feet where the first floor assembly has a fire-resistance rating of not less than 3 hours and the floor area is subdivided by 2-hour fire-resistance-rated fire walls into areas of not more than 3,000 square feet as provided by Section 509.5.

For Group R occupancies, the number of stories of a building with a single-story Group S-2 parking garage of Type I construction or open parking garage of Type IV construction, with grade entrance, are permitted by Section 509.4 to be measured from the floor above such a parking area. The floor assembly between the parking garage and the Group R above must be the type of construction required for the parking garage, must provide a fire-resistance rating in accordance with Table 508.4 and must comply with the requirements for horizontal assemblies in accordance with Section 711.

Group A, B, I, M and R occupancies over open parking structures are limited by Section 509.7. The upper building height and area are limited as previously discussed and the open parking garage is regulated in Section 406.3 and is permitted to be Type IV construction. The height of the upper building is measured from the grade plane and includes the open parking garage level.

Multiple upper buildings may be positioned on a single parking structure complying with Section 509.2, and be treated as separate buildings in accordance with Section 509.9. Lastly, Group S-2 open parking garages above a first-story occupancy of Group B or M are allowed in accordance with Section 509.8.

4. Establishing Fire Resistance

Table 601 establishes the required fire resistance of building elements (primarily the structural frame, walls, floors and roofs) due to the construction type of the building (e.g., Type IIIA, Type IIIB, Type IV, etc.). Required ratings are given in hours. The exception is Type IV, where the wood structural elements are assumed to have inherent fire resistance due to their required minimum dimensions (no fire-resistance rating is required except for exterior walls).

Fire resistance describes the rate at which a building material degrades due to a fire. Resistance is based on how fast a material will burn, how rapidly the strength of the member or assembly is affected by the fire and whether the member or assembly can maintain its design strength. Fire resistance of wood members and assemblies may be established by any one of five means listed in Section 703.3. The most common methods are indicated below.

Tested Assemblies

Tested assemblies include wood assemblies that have been tested to the ASTM E 119 or UL 263 standard. Using one of these standards, an assembly is typically assigned a 1- or 2-hour fire rating depending on its performance in the fire test(s). Designers choose listed assemblies from various fire-resistance publications or directories, such as the UL *Fire Resistance Directory* or the Gypsum Association *Fire Resistance Design Manual*.

Prescriptive Assemblies

The fire resistance of certain wood assemblies is prescribed in Section 720 based on testing using ASTM E 119 or UL 263. Section 703.3 permits the use of other sources, as well. Often used is the AWC publication AWC DCA 3, *Fire Rated Wood Floor and Wall Assemblies*, which is available for free download at www.awc.org/codes/dcaindex.html.

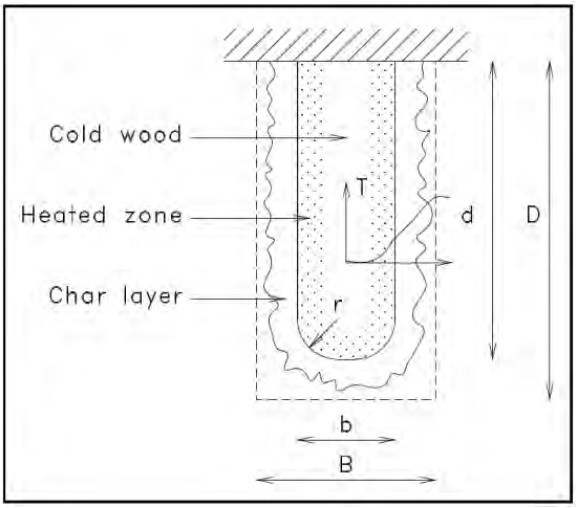


Figure 15: Heavy Timber Member Exposed to Fire

Calculated Fire Resistance

The fire resistance of exposed wood members may be calculated using the provisions of Chapter 16 of the *National Design Specification®* (*NDS®*) (see Section 721.1). AWC's Technical Report No. 10 (TR10), *Calculating the Fire Resistance of Exposed Wood Members,* contains full details of the NDS method as well as design examples, and is available for free download at www.awc.org/publications/TR/index.html. Although Section 721.6.3 contains an acceptable calculation method as well, it is limited to 1-hour fire resistance.

The fire resistance of wood frame assemblies also may be calculated using the provisions of Section 721.6, which is based on the known fire resistance of many tested assemblies. The information in AWC DCA 4, *Component Additive Method (CAM) for Calculating and Demonstrating Assembly Fire Endurance*, was the basis for these code provisions. It is available at for free download at www.awc.org/codes/dcaindex.html.

5. Wood Use in "Noncombustible" Construction

Type I and II construction typically requires the use of noncombustible materials. Section 603 specifies 25 applications where combustible materials are permitted without reclassifying the building to a different type of construction. For example, wood blocking is permitted for handrails, millwork, cabinets and window and door frames. Furring or nailing strips used in connection with "set-out" construction are also permitted. Show windows, wooden bulkheads below the window and nailing and furring strips are also permitted to be wood if the window is not more than 15 feet above grade.

Fire-Retardant-Treated Wood

There are many additional applications for fire-retardant-treated wood (FRTW) in Type I and II construction. FRTW is permitted in nonbearing partitions where the fire-resistance rating does not exceed 2 hours, and may be used in nonbearing exterior walls that do not require a fire-resistance rating. Roof construction, including structural framework, permits FRTW, except for Type IA construction of three stories or more where the lowest roof member is less than 20 feet measured vertically from the upper floor.

As mentioned above, FRTW may also be used in exterior walls of Type III and IV construction, which are required to be noncombustible by definition. Because of this, certain code provisions

that assume noncombustible exterior walls have become difficult to interpret. But usually a practical solution to these code questions can be achieved by working closely with the code official. For instance, the addition of solid FRTW wood blocking of a certain thickness in floor cavities that intersect with the exterior wall in Type III construction is an appropriate precaution to maintain the fire resistance and material integrity of the exterior wall.

Heavy Timber Members

Heavy timber (HT) construction is permitted in roof construction as an alternative to 1-hour or less fire-resistance-rated noncombustible construction. This would allow HT use in all roof construction except Type IA. HT columns and arches are permitted on the exterior of walls if the fire separation distance is 20 feet or more.

Figure 16: Heavy Timber Construction

6. Wood Features

Wood may be used as an architectural or structural component of a building. It is renewable and biodegradable, using less energy to manufacture than steel, concrete, aluminum or plastic. Wood use in foundations, doors, windows, exterior and interior finishes, trim and roofing contributes to the aesthetics of the building in an economical and efficient manner.

Wood Foundations

Wood foundations for buildings are permitted when designed and installed in accordance with the AF&PA/AWC *Permanent Wood Foundation Design Specification* (PWF). Insulated wood foundation systems conserve energy and easily accommodate installation of wiring, plumbing, ductwork and interior finishes. Savings in labor, time and material costs may be achieved when these systems are used.

Wood Walls and Partitions

Wood stud framing is permitted for all load-bearing and nonload-bearing interior walls and partitions in Type III and V construction. Type IV construction permits wood stud framed partitions of 1-hour fire-resistance-rated construction (Section 602.4.6) or solid wood formed by at least two layers of 1-inch matched boards or 4-inch-thick laminated construction. In Type I and II construction, partitions dividing single tenant offices or retail and not creating corridors serving 30 or more occupants are permitted to be FRTW, 1-hour fire-resistance-rated construction or of wood panels or similar light construction up to 6 feet in height.

Wood Interior Finish

In general, wood materials may be used as interior finish in almost all occupancies. Table 803.9 places minimum performance classifications on finish materials based on their location in the building. The material performance classification is determined by testing in accordance with the ASTM E 84 or UL 723 standard and results in a classification as Class A (flame spread index 0-25); Class B (26-75) or Class C (76-200). All classifications must have a smoke-developed index between 0-450 (Section 803.1.1).

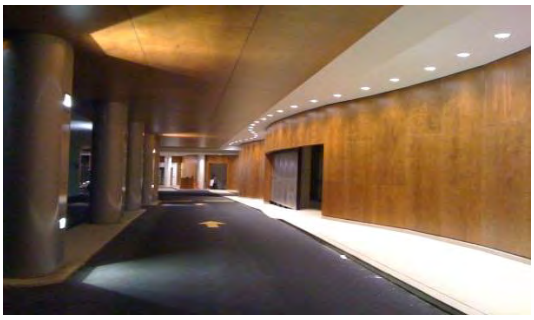


Figure 17: Wood Interior Finish
Photo Courtesy of Barbara J Sales

Nonsprinklered buildings typically require more restricted flame spread materials than sprinklered buildings. Figure 18 contains two tables outlining the required interior finish minimum classification for exit enclosures and passageways, corridors and enclosed spaces and rooms.

Nonsprinklered Buildings: Minimum Interior Finish Classification by Occupancy[a]			
Location	**Minimum Interior Finish Classification**		
	A[b]	**B**	**C**
Exit enclosures and exit passageways[c]	A, B, E, I, M, R-1, R-4	F, S, R-2	R-3
Corridors	A[d], I-2, I-3, I-4	B, E, M, S, I-1, R-1, R-2, R-4	F, R-3
Enclosed spaces and rooms		I, A-1, A-2, R-4	A-3, A-4, A-5, B, E, F, M, S, R-1, R-2, R-3

a. This simplified table is not comprehensive; more exceptions can be found in Table 803.9 footnotes.
b. Buildings less than three stories above grade plane permit the reduction of the exit enclosure and exit passageway classifications to Class B.
c. Exit enclosures and exit passageways are permitted to use Class C wainscotting or paneling in the grade lobby for not more than 1,000 square feet of applied surface when applied to a noncombustible base.
d. Lobby areas in corridors may use Class B interior finishes for Group A occupancies.

Sprinklered Buildings: Minimum Interior Finish Classification by Occupancy[a, b]			
Location	**Minimum Interior Finish Classification**		
	A	**B[c]**	**C**
Exit enclosures and exit passageways[d]	I-3	A, B, E, M, R-1, R-4, I-1, I-2, I-4	F, R-2, R-3, S
Corridors	I-3	A, I-2, I-4	B, E, F, M, R, S, I-1
Enclosed spaces and rooms		I-2, I-4	A, B, E, F, M, R, S, I-1, I-3

a. This simplified table is not comprehensive; more exceptions can be found in Table 803.9 footnotes.
b. Automatic sprinkler system meeting the requirements of NFPA 13 or NFPA 13R as appropriate.
c. Buildings less than three stories above grade plane permit the reduction of the exit enclosure and exit passageway classifications to Class C.
d. Exit enclosures and exit passageways are permitted to use Class C wainscotting or paneling in the grade lobby for not more than 1,000 square feet of applied surface when applied to a noncombustible base.

Figure 18: Summary of Table 803.9, Interior Wall and Finish Requirements by Occupancy

Most wood species qualify as Class C, while some, such as cedar, west coast hemlock, Idaho white pine, redwood, and spruce, can qualify as Class B. Wood boards and panels may meet Class A criteria when pressure treated with a fire-retardant chemical.

Traditional wood floor covering is exempt from interior floor finish requirements. Exposed portions of Type IV structural members are also exempt from the interior finish requirements (Section 803.3).

Wood Interior Trim

Baseboards, chair rails, picture molding, handrails, guards, windows and doors are permitted to be wood or wood-based materials. Trim is required to meet a Class C classification and combustible trim, excluding handrails and guards, cannot exceed 10 percent of the wall or ceiling area to which it is attached (Section 806.5).

Figure 19: Wood Trim

Wood Doors and Windows

Figure 20: Wood Windows

Wood doors and windows are often the optimum choice for buildings due to their aesthetics, energy efficiency and functionality. Exterior openings are generally required to be protected as an opening protective assembly when the exterior wall is within given distances of a lot line. Table 602 determines when the exterior walls are required to be fire-resistance rated due to their location on the lot and Table 705.8 defines the allowable percentages of protected and unprotected openings allowed in those walls.

Unlimited amounts of unprotected openings are permitted by Table 705.8, provided the exterior walls are 30 feet or more from the lot line, 10 feet or more if Type IIB or VB construction. No unprotected openings are permitted in the exterior wall within 5 feet of the lot line for nonsprinklered buildings and no openings are permitted if the wall is closer than 3 feet from the lot line.

Bay and oriel windows must conform to the type of construction required for the building; however, FRTW is permitted for these windows in buildings not more than three stories above grade plane and of construction Types I, II, III and IV (Section 1406.4).

Interior wood door assemblies are required to be fire-protection rated when the wall assembly they are in requires a fire-resistance rating and opening protection, such as door assemblies in exit enclosures or exit access corridor walls. The minimum required fire-protection rating of the fire door assembly is given in Table 715.4 and ranges from 20 minutes up to 3 hours based on the required fire-resistance rating and type of wall assembly.

Wood Siding

Figure 21: Wood Siding

Wood siding products come in a variety of sizes, shapes and textures, ranging from wood shingles and shakes to boards and wood structural panels. Each material brings different characteristics in look and performance. The IBC addresses the minimum expectations of these products in Chapter 14 as exterior wall components and Chapter 23 as a wood building material.

Wood shingles as a weather covering are required to be a minimum $^{3}/_{8}$ inch thick and wood siding without sheathing is required to be $^{1}/_{2}$ inch thick. According to Table 1405.2, wood siding less than $^{1}/_{2}$ inch thick requires bracing for support in accordance with Table 2304.6.

Wood Veneer

Wood veneer is permitted on buildings of Type I, II, III or IV construction and allowed up to 40 feet above grade, 60 feet if FRTW is used, provided the veneer is 1-inch nominal thickness, $^{7}/_{16}$-inch exterior hardboard siding or $^{3}/_{8}$-inch exterior-type wood structural panels or particleboard. Open or spaced veneers without concealed spaces are not permitted to project more than 24 inches from the building wall (Section 1405.5).

Wood Balconies, Open Exterior Exit Stairs and Ramps

Exterior balconies may be of Type IV construction or of wood construction that provides a fire-resistance rating equal to the floor rating required by Table 601. The aggregate length of the balcony is limited to 50 percent of the building perimeter. Type I or II structures not more than three stories above grade plane are permitted to have FRTW in the balcony as long as the balcony is not a required exit. Type III, IV and V buildings may have Type V construction of the balcony without requiring a fire-resistance rating if the balcony is sprinkler protected. In this case, the length limitation of the balcony is eliminated (Section 1406.3).

Figure 22: Wood Balcony

Open exterior exit stairs and ramps may be constructed of wood when the building is of Type IV and V construction (Sections 1009.6 and 1010.7). The IBC limits their use to buildings that do not exceed six stories above grade and do not have occupied floor levels 75 feet or more above the lowest level of vehicular access by the fire department.

Wood Roof Coverings

Roof assemblies and coverings are divided into classifications in accordance with testing by the ASTM E 108 or UL 790 standard. FRTW roof coverings are tested in accordance with the ASTM D 2898 standard. Table 1505.1 requires a minimum Class B roof covering for all types of construction except Types IIB, IIIB and VB. These construction types require minimum Class C materials and if the buildings are not more than two stories above grade plane, have no more than 6,000 square feet of roof area and 10-foot minimum frontage width on all sides of the roof, they are permitted to use No. 1 cedar or redwood shakes and No. 1 shingles (Section 1505.1).

Figure 23: Wood Shakes

Fire-retardant-treated wood shingles and shakes can qualify for Class A, B or C classification. Wood shingles and wood shake installation requirements are located in Sections 1507.8 and 1507.9 with a comparison of the materials in Table 1507.8.

Wood Projection Limitations

Cornices, eave overhangs, exterior balconies and similar projections are limited beyond the exterior wall based on the three criteria given in Section 705.2. Figure 24 illustrates two of the criteria and the third is to make sure that the projection doesn't extend more than 12 inches into the distance from the lot line where openings are prohibited, meaning the 3-foot distance from the lot line in which openings are prohibited in Table 705.8. Therefore, in no case can a projection extend closer than 2 feet to the lot line.

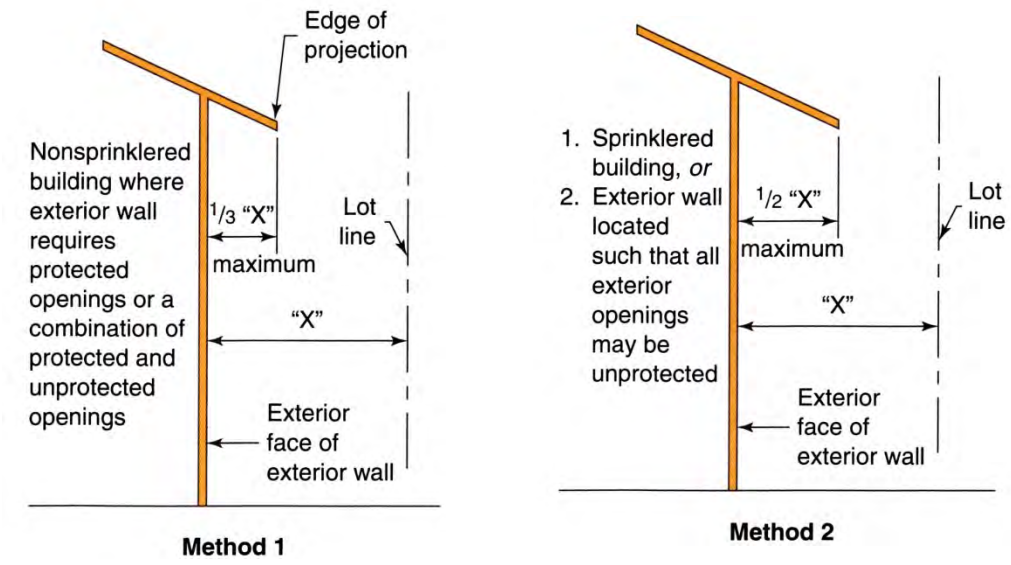


Figure 24: Wood Projection Limitations

Type III, IV and V construction permits combustible projections. When the projection is located within 3 feet of the lot line or where Table 705.8 requires protected openings, the projection is required to be 1-hour minimum fire-resistance-rated construction, Type IV construction or FRTW.

Wood Rooftop Structures

Wood penthouses are limited by the construction classification permitted for the building. FRTW is permitted for use on buildings of Type I construction two stories or less above grade plane and in Type II construction when the exterior of the penthouse is 5 feet or more from lot lines in accordance with Section 1509.

Type III, IV and VA construction permits the penthouse to be Type IV construction or FRTW if 20 feet or more from the lot line.

Wood penthouses used to enclose tanks or elevators must not exceed 28 feet in height above the roof. If enclosing other uses, the penthouse height is limited to 18 feet maximum.

Wood unroofed mechanical equipment screens, fences or enclosures limited to 4 feet in height are permitted on one-story buildings.

Wood towers, spires, domes and cupolas are permitted on buildings of Type III, IV and V provided that they do not exceed 85 feet in height above grade plane or 200 square feet in area. The IBC places further limitations on these structures in Section 1509.5.

Wood in Locations Subject to Decay or Termites

Wood that is located where it will be exposed to weather, moisture or termites is required to be naturally durable wood species or preservative-treated wood using water-borne preservatives, in accordance with AWPA U1. Naturally durable decay-resistant wood species are heartwoods of redwood, cedar, black locust and black walnut. Naturally durable termite-resistant wood species are heartwood of redwood, Alaska yellow-cedar, eastern red cedar and heartwood and sapwood of all western red cedars (Sections 2302 and 2304.11).

7. Precautions During Construction

Chapter 33 provides minimum safety precautions for fire during construction for all buildings. The section includes provisions for fire extinguishers, standpipes, means of egress and sprinkler system commissioning. The *International Fire Code*® (IFC®) also contains detailed requirements for fire precautions during construction.

Fire Extinguishers

During construction, one portable fire extinguisher must be placed at each stairway on all floor levels with combustible materials, in each storage or construction shed and where special hazards exist in accordance with Section 3309.

Maintaining Means of Egress

During construction, when a building height reaches 50 feet or four stories, a minimum of one temporary lighted stairway must be provided unless a permanent stairway is available for use at all times in accordance with Section 3310.

Standpipes

A minimum of one standpipe must be available during construction for fire department use. The standpipe is installed before the construction is 40 feet above fire department access. The standpipe is placed adjacent to usable stairs and has fire department hose connections. The standpipe is extended during construction to within one floor of the highest point of construction having flooring in accordance with Section 3311. During demolition, a standpipe is maintained in working condition. The standpipe may be demolished floor by floor as demolition proceeds.

Sprinkler System Commissioning

The sprinkler system must be tested and approved before the certificate of occupancy is awarded in accordance with Section 3312.

Additional requirements in the *International Fire Code*®

Additional requirements for fire safety during construction are contained in the IFC, as follows:

- Temporary heating equipment must be listed and labeled; installation and maintenance of the equipment must be in accordance with the listing (IFC 3303).
- Smoking is prohibited except in approved areas with posted signage (IFC 3304).
- A fire watch must be maintained with qualified personnel if required by the fire code official (IFC 3304).
- Welding operations must follow the provisions of IFC Chapter 35. Electrical wiring must follow the provisions of NFPA 70 (IFC 3304).
- The owner must designate a fire prevention superintendent responsible for the fire prevention program during construction. Requirements for the program are listed in IFC Section 3308.
- An accessible emergency phone must be provided in an approved location at the construction site. The construction site street address and fire department emergency phone number must be posted by the phone (IFC 3309).

- Fire-fighting vehicle access must be provided within 100 feet of temporary or permanent fire department connections (IFC 3310).
- An approved water supply for fire protection must be available when combustible material is at the construction site (IFC 3312).
- Requirements for safeguards during roofing operations are listed in IFC Section 3317.

8. Resources

For additional assistance and information, contact the American Wood Council (AWC) at (202) 463-4713 or info@awc.org. For additional assistance and information from the International Code Council (ICC), see www.iccsafe.org

American Wood Council Standards

2005 NDS®	*2005 National Design Specification®* (NDS®) *for Wood Construction with 2005 Supplement*
SDPWS-2008	*2008 Special Design Provisions for Wind and Seismic*
2001 WFCM	*2001 Wood Frame Construction Manual for One- and Two-family Dwellings*
2007 PWF	*2007 ANSI/AF&PA Permanent Wood Foundation Design Specification*
	2005 ANSI/AF&PA Span Tables for Joists and Rafters
WCD No. 4-2003	*2003 ANSI/AF&PA Wood Construction Data—Plank and Beam Framing for Residential Buildings*

These standards and related code publications, design aids, technical reports and guides for wood design and construction can be purchased or downloaded for free at www.awc.org.

Other Associations Publishing Referenced Standards

Standards from additional organizations are referenced in this publication. The following table lists the standard, its title and the site from which the standard is available.

Standard-Edition	Title	Website
AAMA/WDMA/CSA 101/I.S.2/A440-08	*North American Fenestration Standard/ Specifications for Windows, Doors and Skylights*	aamanet.org wdma.com
APA PDS—04	*Panel Design Specification*	apawood.org
ASCE 7-05	*Minimum Design Loads for Buildings and Other Structures*	asce.org
ASTM D 2898-04	*Test Methods for Accelerated Weathering of Fire-retardant-treated Wood and Wood-based Products*	astm.org
ASTM E 84-07	*Test Methods for Surface Burning Characteristics of Building Materials*	
ASTM E 108-07a	*Test Methods for Fire Tests of Roof Coverings*	
ASTM E 119-07	*Test Methods for Fire Tests of Building Construction and Materials*	
AWPA C1-03	*All Timber Products-Preservative Treatment by Pressure Processes*	awpa.com
AWPA M4-06	*Standard for the Care of Preservative-treated Wood Products*	
AWPA U1-07	*USE CATEGORY SYSTEM: User Specification for Treated Wood Except Section 6, Commodity Specification H*	
2009 IBC	*2009 International Building Code*	iccsafe.org
2009 IRC	*2009 International Residential Code*	
ICC 600-08	*Standard for Residential Construction in High Wind Regions*	
NFPA 13-07	*Installation of Sprinkler Systems*	nfpa.org
NFPA 13R-07	*Installation of Sprinkler Systems in Residential Occupancies Up to and Including Four Stories in Height*	
NFPA 70-08	*National Electrical Code*	
UL 263-03	*Standard for Fire Tests of Building Construction and Materials, with revisions through October 2007*	ul.com
UL 723-03	*Standard for Test for Surface Burning Characteristics of Building Materials- with Revisions through May 2005*	
UL 790-04	*Standard Test Methods for Fire Tests of Roof Coverings*	

This publication was developed by the International Code Council in cooperation with the American Wood Council. While every effort was made to insure accuracy of the information it contains, neither organization assumes responsibility for particular designs or plans prepared from this book.

9. Building Area Tables

These tables are organized by occupancy category. Each category has a nonsprinklered and sprinklered allowable building area table that contains the maximum number of stories and maximum allowable area per floor for Type IIIA and IIIB, IV, VA and VB construction.

Table 1 – Group A Nonsprinklered Buildings – Maximum floor area per story

Group A-1 Nonsprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2[f]	0-25	14,000	8,500	15,000	11,500	5,500
	50	17,500	10,620	18,750	14,370	6,870
	100	24,500	14,870	26,250	20,120	9,620
3	0-25	14,000	NP	15,000	NP	NP
	50	17,500	NP	18,750	NP	NP
	100	24,500	NP	26,250	NP	NP
Groups A-2, A-3, A-4 Nonsprinklered Buildings [a, b, c, d]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2[f]	0-25	14,000	9,500	15,000	11,500	6,000
	50	17,500	11,870	18,750	14,370	7,500
	100	24,500	16,620	26,250	20,120	10,500
3	0-25	14,000	NP	15,000	NP	NP
	50	17,500	NP	18,750	NP	NP
	100	24,500	NP	26,250	NP	NP
Group A-5 Nonsprinklered Buildings [a, e]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
UL	0-25	UL	UL	UL	UL	UL
	50	UL	UL	UL	UL	UL
	100	UL	UL	UL	UL	UL

NP = Not Permitted

UL = Unlimited

a. Frontage based on open space widths of 30 feet or more.

b. Interpolation permitted.

c. Sprinklers must be provided for Group A-1, A-3 and A-4 occupancies when the fire area exceeds 12,000 square feet in accordance with Section 903.2.1, or by reason of other specific conditions in that section. In lieu of sprinklers, compartmentalization of the floor area into fire areas not more than 12,000 square feet can be provided with fire-resistance-rated construction in accordance with Chapter 7.

d. Sprinklers must be provided for Group A-2 occupancies when the fire area exceeds 5,000 square feet in accordance with Section 903.2.1.2, or by reason of other specific conditions in that section. In lieu of sprinklers, compartmentalization of the floor area into fire areas not more than 5,000 square feet can be provided with fire-resistance-rated construction in accordance with Chapter 7.

e. Sprinklers must be provided for Group A-5 occupancies when the area exceeds 1,000 square feet in accordance with Section 903.2.1.5.

f. Type VB construction does not permit two stories above grade plane.

Table 2 – Group A Sprinklered Buildings – Maximum floor area per story

Group A-1 Sprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	56,000	34,000	60,000	46,000	22,000
	50	59,500	36,120	63,750	48,870	23,370
	100	66,500[e]	40,370[e]	71,250[e]	54,620	26,120
2, 3[d]	0-25	42,000	25,500	45,000	34,500	16,500
	50	45,500	27,620	48,750	37,370	17,870
	100	52,500	31,870	56,250	43,120	20,620
4	0-25	31,500	NP	33,750	NP	NP
	50	34,120	NP	36,560	NP	NP
	100	39,370	NP	42,180	NP	NP
Group A-2, A-3, A-4 Sprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	56,000	38,000	60,000	46,000	24,000
	50	59,500	40,370	63,750	48,870	25,500
	100	66,500[e,f]	45,120[e,f]	71,250[e,f]	54,620	28,500
2, 3[d]	0-25	42,000	28,500	45,000	34,500	18,000
	50	45,500	30,870	48,750	37,370	19,500
	100	52,500	35,620	56,250	43,120	22,500
4	0-25	31,500	NP	33,750	NP	NP
	50	34,120	NP	36,560	NP	NP
	100	39,370	NP	42,180	NP	NP
Group A-5 Sprinklered Buildings [b]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
UL	0-25	UL	UL	UL	UL	UL
	50	UL	UL	UL	UL	UL
	100	UL	UL	UL	UL	UL

NP = Not Permitted

UL = Unlimited

a. The maximum floor area for four stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the four stories is assumed to be equal.

b. Frontage based on open space widths of 30 feet or more.

c. Interpolation permitted.

d. Type VB construction does not permit three stories above grade plane.

e. Group A-1 and A-2 occupancies may be in unlimited area mixed occupancy buildings when meeting the provisions of Section 507.3.1.

f. Group A-4 may be unlimited in area if the frontage width is at least 60 feet and the building is of Type III or IV construction in accordance with Section 507.3.

Table 3 – Group B Nonsprinklered Buildings – Maximum floor area per story [a, b, c, d]

# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2 & 3[e]	0-25	28,500	19,000	36,000	18,000	9,000
	50	35,620	23,750	45,000	22,500	11,250
	100	49,870	33,250	63,000	31,500	15,750
4	0-25	21,370	NP	27,000	NP	NP
	50	26,710	NP	33,750	NP	NP
	100	37,400	NP	47,250	NP	NP
5	0-25	17,100	NP	21,600	NP	NP
	50	21,370	NP	27,000	NP	NP
	100	29,920	NP	37,800	NP	NP

NP = Not Permitted

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Sprinklers must be provided for ambulatory care facilities in accordance with Section 903.2.2, or by reason of other specific conditions in that section.
e. Type VB construction does not permit three stories above grade plane.

Table 4 – Group B Sprinklered Buildings – Maximum floor area per story [a, b, c]

# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	114,000	76,000	144,000	72,000	36,000
	50	121,120	80,750	153,000	76,500	38,250
	100	135,370	90,250	171,000	85,500	42,750
	100 (60')[d]	UL	UL	UL	UL	UL
2	0-25	85,500	57,000	108,000	54,000	27,000
	50	92,620	61,750	117,000	58,500	29,250
	100	106,870	71,250	135,000	67,500	33,750
	100 (60') [d]	UL	UL	UL	UL	UL
3	0-25	85,500	57,000	108,000	54,000	27,000
	50	92,620	61,750	117,000	58,500	29,250
	100	106,870	71,250	135,000	67,500	33,750
4	0-25	64,120	42,750	81,000	40,500	NP
	50	69,460	46,310	87,750	43,870	NP
	100	80,150	53,430	101,250	50,620	NP
5	0-25	51,300	NP	64,800	NP	NP
	50	55,570	NP	70,200	NP	NP
	100	64,120	NP	81,000	NP	NP
6	0-25	42,750	NP	54,000	NP	NP
	50	46,310	NP	58,500	NP	NP
	100	53,430	NP	67,500	NP	NP

NP = Not Permitted
UL = Unlimited

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Sprinklered Group B buildings of one or two stories may be unlimited in area if the frontage width is at least 60 feet in accordance with Sections 507.3 and 507.4.

Table 5 – Group E Nonsprinklered Buildings – Maximum floor area per story [a, b, c]

# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	23,500	14,500	25,500	18,500	9,500
	50	29,370	18,120	31,870	23,120	11,870
	100	41,120	25,370	44,620	32,370	16,620
2	0-25	23,500	14,500	25,500	NP	NP
	50	29,370	18,120	31,870	NP	NP
	100	41,120	25,370	44,620	NP	NP
3	0-25	23,500	NP	25,500	NP	NP
	50	29,370	NP	31,870	NP	NP
	100	41,120	NP	44,620	NP	NP

NP = Not Permitted

a. Frontage based on open space widths of 30 feet or more.
b. Interpolation permitted.
c. Sprinklers must be provided for Group E occupancies when the fire area exceeds 12,000 square feet in accordance with Section 903.2.3, or by reason of other specific conditions in that section. In lieu of sprinklers, compartmentalization of the floor area into fire areas not more than 12,000 square feet can be provided with fire-resistance-rated construction in accordance with Chapter 7.

Table 6 – Group E Sprinklered Buildings – Maximum floor area per story [a, b, c]

# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	94,000	58,000	102,000	74,000	38,000
	50	99,870	61,620	108,370	78,620	40,370
	100	111,620[e]	68,870	121,120[e]	87,870	45,120
2, 3[d]	0-25	70,500	43,500	76,500	55,500	28,500
	50	76,370	47,120	82,870	60,120	30,870
	100	88,120	54,370	95,620	69,370	35,620
4	0-25	52,870	NP	57,370	NP	NP
	50	57,280	NP	62,150	NP	NP
	100	66,090	NP	71,710	NP	NP

NP = Not Permitted

a. The maximum floor area for four stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Type VA and VB construction does not permit three stories above grade plane.
e. Single-story Group E buildings may be of unlimited area when meeting the requirements of Section 507.10.

Table 7 – Group F Nonsprinklered Buildings – Maximum floor area per story

Group F-1 Nonsprinklered Buildings [a, b, c, d, e]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2[f]	0-25	19,000	12,000	33,500	14,000	8,500
	50	23,750	15,000	41,870	17,500	10,620
	100	33,250	21,000	58,620	24,500	14,870
3	0-25	19,000	NP	33,500	NP	NP
	50	23,750	NP	41,870	NP	NP
	100	33,250	NP	58,620	NP	NP
4	0-25	NP	NP	25,120	NP	NP
	50	NP	NP	31,400	NP	NP
	100	NP	NP	43,960	NP	NP
Group F-2 Nonsprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	28,500	18,000	50,500	21,000	13,000
	50	35,620	22,500	63,120	26,250	16,250
	100	49,870	31,500	88,370	36,750	22,750
	100 (60')[h]	UL	UL	UL	UL	UL
2 & 3[g]	0-25	28,500	18,000	50,500	21,000	13,000
	50	35,620	22,500	63,120	26,250	16,250
	100	49,870	31,500	88,370	36,750	22,750
4	0-25	21,370	NP	37,870	NP	NP
	50	26,710	NP	47,340	NP	NP
	100	37,400	NP	66,280	NP	NP
5	0-25	NP	NP	30,300	NP	NP
	50	NP	NP	37,870	NP	NP
	100	NP	NP	53,020	NP	NP

NP = Not Permitted

UL = Unlimited

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.

b. Frontage based on open space widths of 30 feet or more.

c. Interpolation permitted.

d. Sprinklers must be provided in woodworking areas in Group F-1 occupancies when the fire area exceeds 2,500 square feet in accordance with Section 903.2.4.1.

e. Sprinklers must be provided for Group F-1 occupancies when the fire area exceeds 12,000 square feet, or the combined area of all Group F-1 occupancies exceeds 24,000 square feet, in accordance with Section 903.2.4, or by reason of other specific conditions in that section. In lieu of sprinklers, compartmentalization of the floor area into fire areas not more than 12,000 square feet per compartment and not more than 24,000 square feet total can be provided with fire-resistance-rated construction in accordance with Chapter 7.

f. Type VB construction does not permit two stories above grade plane.

g. Type VB construction does not permit three stories above grade plane.

h. Single-story Group F-2 occupancies may be unlimited in area if the frontage width is at least 60 feet in accordance with Section 507.2.

Table 8 – Group F Sprinklered Buildings – Maximum floor area per story

Group F-1 Sprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	76,000	48,000	134,000	56,000	34,000
	50	80,750	51,000	142,370	59,500	36,120
	100	90,250	57,000	159,120	66,500	40,370
	100(60')[d]	UL	UL	UL	UL	UL
2	0-25	57,000	36,000	100,500	42,000	25,500
	50	61,750	39,000	108,870	45,500	27,620
	100	71,250	45,000	125,620	52,500	31,870
	100(60')[d]	UL	UL	UL	UL	UL
3	0-25	57,000	36,000	100,500	42,000	NP
	50	61,750	39,000	108,870	45,500	NP
	100	71,250	45,000	125,620	52,500	NP
4	0-25	42,750	NP	75,370	NP	NP
	50	46,310	NP	81,650	NP	NP
	100	53,430	NP	94,210	NP	NP
5	0-25	NP	NP	60,300	NP	NP
	50	NP	NP	65,320	NP	NP
	100	NP	NP	75,370	NP	NP

NP = Not Permitted
UL = Unlimited

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Sprinklered Group F buildings of one or two stories may be unlimited in area if the frontage width is at least 60 feet in accordance with Sections 507.3 and 507.4.

Table 8 cont. – Group F Sprinklered Buildings – Maximum floor area per story

Group F-2 Sprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	114,000	72,000	202,000	84,000	52,000
	50	121,120	76,500	214,620	89,250	55,250
	100	135,370	85,500	239,870	99,750	61,750
	100(60')[d]	UL	UL	UL	UL	UL
2	0-25	85,500	54,000	151,500	63,000	39,000
	50	92,620	58,500	164,120	68,250	42,250
	100	106,870	67,500	189,370	78,750	48,750
	100(60')[d]	UL	UL	UL	UL	UL
3	0-25	85,500	54,000	151,500	63,000	39,000
	50	92,620	58,500	164,120	68,250	42,250
	100	106,870	67,500	189,370	78,750	48,750
4	0-25	64,120	40,500	113,620	47,250	NP
	50	69,460	43,870	123,090	51,180	NP
	100	80,150	50,620	142,030	59,060	NP
5	0-25	51,300	NP	90,900	NP	NP
	50	55,570	NP	98,470	NP	NP
	100	64,120	NP	113,620	NP	NP
6	0-25	NP	NP	75,750	NP	NP
	50	NP	NP	82,060	NP	NP
	100	NP	NP	94,680	NP	NP

NP = Not Permitted
UL = Unlimited

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Sprinklered Group F buildings of one or two stories may be unlimited in area if the frontage width is at least 60 feet in accordance with Sections 507.3 and 507.4.

Group I - Sprinklered Buildings

Section 903.2.6 requires all Group I buildings to have automatic sprinkler systems. Therefore, there are no maximum building heights and areas for nonsprinklered Group I buildings.

Exceptions allow Group I-1 buildings to use NFPA 13R or 13D-compliant sprinkler systems. In this case, there is no increase in area for having a sprinkler, rather only an increase in area for frontage is allowed. NFPA 13D and NFPA 13R-compliant maximum floor areas are shown in the table below.

Table 9 – Group I, NFPA 13R or 13D-Compliant Sprinklered Buildings – Maximum floor area per story

Group I-1 Sprinklered Buildings - NFPA 13R or 13D Compliant [a, b, c, d]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2 & 3[e]	0-25	16,500	10,000	18,000	10,500	4,500
	50	20,620	12,500	22,500	13,120	5,620
	100	28,870	17,500	31,500	18,370	7,870
4	0-25	12,370	NP	13,500	NP	NP
	50	15,460	NP	16,870	NP	NP
	100	21,650	NP	23,620	NP	NP

NP = Not Permitted

a. The maximum floor area for four stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Section 903.2.6 permits Group I-1 occupancies to be sprinklered with NFPA 13R and NFPA 13D-compliant systems that do not qualify for area increases due to sprinklers.
e. Type VB construction does not permit three stories above grade plane.

Table 10 – Group I Sprinklered Buildings – Maximum floor area per story

Group I-1 Sprinklered Buildings [a, b, c, d]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	66,000	40,000	72,000	42,000	18,000
	50	70,120	42,500	76,500	44,620	19,120
	100	78,370	47,500	85,500	49,870	21,370
2, 3	0-25	49,500	30,000	54,000	31,500	13,500
	50	53,620	32,500	58,500	34,120	14,620
	100	61,870	37,500	67,500	39,370	16,870
4	0-25	37,120	22,500	40,500	23,620	NP
	50	40,210	24,370	43,870	25,590	NP
	100	46,400	28,120	50,620	29,530	NP
5	0-25	29,700	NP	32,400	NP	NP
	50	32,170	NP	35,100	NP	NP
	100	37,120	NP	40,500	NP	NP
Group I-2 Sprinklered Buildings [b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	48,000	NP	48,000	38,000	NP
	50	51,000	NP	51,000	40,370	NP
	100	57,000	NP	57,000	45,120	NP
2[e]	0-25	NP	NP	NP	NP	NP
	50	NP	NP	NP	NP	NP
	100	NP	NP	NP	NP	NP

NP = Not Permitted

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Section 903.2.6 permits Group I-1 occupancies to be sprinklered with NFPA 13R and NFPA 13D systems that do not qualify for area increases due to sprinklers. See Table 9 for area limits.
e. Section 504.2 Exception 1 does not allow a building height increase with automatic sprinklers in Group I-2 buildings; a building area increase is allowed.

Table 10 cont. – Group I Sprinklered Buildings – Maximum floor area per story

Group I-3 Sprinklered Buildings [b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	42,000	30,000	48,000	30,000	20,000
	50	44,620	31,870	51,000	31,870	21,250
	100	49,870	35,620	57,000	35,620	23,750
2	0-25	31,500	22,500	36,000	22,500	15,000
	50	34,120	24,370	39,000	24,370	16,250
	100	39,370	28,120	45,000	28,120	18,750
3	0-25	31,500	NP	36,000	22,500	NP
	50	34,120	NP	39,000	24,370	NP
	100	39,370	NP	45,000	28,120	NP
Group I-4 Sprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	94,000	52,000	102,000	74,000	36,000
	50	99,870	55,250	108,370	78,620	38,250
	100	111,620	61,750	121,120	87,870	42,750
2	0-25	70,500	39,000	76,500	55,500	27,000
	50	76,370	42,250	82,870	60,120	29,250
	100	88,120	48,750	95,620	69,370	33,750
3	0-25	70,500	39,000	76,500	NP	NP
	50	76,370	42,250	82,870	NP	NP
	100	88,120	48,750	95,620	NP	NP
4	0-25	52,870	NP	57,370	NP	NP
	50	57,280	NP	62,150	NP	NP
	100	66,090	NP	71,710	NP	NP

NP = Not Permitted

a. The maximum floor area for four stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.

Table 11 – Group M Nonsprinklered Buildings – Maximum floor area per story [a, b, c, d]

# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2[e]	0-25	18,500	12,500	20,500	14,000	9,000
	50	23,120	15,620	25,620	17,500	11,250
	100	32,370	21,870	35,870	24,500	15,750
3	0-25	18,500	NP	20,500	14,000	NP
	50	23,120	NP	25,620	17,500	NP
	100	32,370	NP	35,870	24,500	NP
4	0-25	13,870	NP	15,370	NP	NP
	50	17,340	NP	19,210	NP	NP
	100	24,280	NP	26,900	NP	NP

NP = Not Permitted

a. The maximum floor area for four stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Sprinklers must be provided for Group M occupancies when the fire area exceeds 12,000 square feet, or the combined area of all Group M occupancies exceeds 24,000 square feet, in accordance with Section 903.2.7, or by reason of other specific conditions in that section. In lieu of sprinklers, compartmentalization of the floor area into fire areas not more than 12,000 square feet per compartment and not more than 24,000 square feet total can be provided with fire-resistance-rated construction in accordance with Chapter 7.
e. Type VB construction does not permit two stories above grade plane.

Table 12 – Group M Sprinklered Buildings – Maximum floor area per story [a, b, c]

# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	74,000	50,000	82,000	56,000	36,000
	50	78,620	53,120	87,120	59,500	38,250
	100	87,870	59,370	97,370	66,500	42,750
	100 (60')[d]	UL	UL	UL	UL	UL
2	0-25	55,500	37,500	61,500	42,000	27,000
	50	60,120	40,620	66,620	45,500	29,250
	100	69,370	46,870	76,870	52,500	33,750
	100 (60')[d]	UL	UL	UL	UL	UL
3	0-25	55,500	37,500	61,500	42,000	NP
	50	60,120	40,620	66,620	45,500	NP
	100	69,370	46,870	76,870	52,500	NP
4	0-25	41,620	NP	46,120	31,500	NP
	50	45,090	NP	49,960	34,120	NP
	100	52,030	NP	57,650	39,370	NP
5	0-25	33,300	NP	36,900	NP	NP
	50	36,070	NP	39,970	NP	NP
	100	41,620	NP	46,120	NP	NP

NP = Not Permitted
UL = Unlimited

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Sprinklered Group M buildings of one or two stories may be unlimited in area if the frontage width is at least 60 feet in accordance with Sections 507.3 and 507.4.

Group R Sprinklered Buildings

Section 903.2.8 requires all Group R buildings to have automatic sprinkler systems. Therefore, there are no maximum building heights and areas for nonsprinklered Group R buildings. When using NFPA 13R or 13D-compliant sprinkler systems, there is no increase in area for having a sprinkler, rather only an increase in area for frontage is allowed. NFPA 13D and NFPA 13R-compliant maximum floor area tables are below.

Table 13 – Group R, NFPA 13D-Compliant Sprinklered Buildings – Maximum floor area per story

Group R-4 Sprinklered Buildings – NFPA 13D Compliant [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2 & 3[d]	0-25	24,000	16,000	20,500	12,000	7,000
	50	30,000	20,000	25,620	15,000	8,750
	100	42,000	28,000	35,870	21,000	12,250
4	0-25	18,000	12,000	15,370	NP	NP
	50	22,500	15,000	19,210	NP	NP
	100	31,500	21,000	26,900	NP	NP

NP = Not Permitted

a. The maximum floor area for four stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories. The floor area of the four stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Type VB construction does not permit three stories above grade plane.

Table 14 – Group R, NFPA 13R-Compliant Sprinklered Buildings – Maximum floor area per story

Group R-1, R-2, R-4 Sprinklered Buildings – NFPA 13R-Compliant [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2 & 3[d]	0-25	24,000	16,000	20,500	12,000	7,000
	50	30,000	20,000	25,620	15,000	8,750
	100	42,000	28,000	35,870	21,000	12,250
4[d,e]	0-25	18,000	12,000	15,370	9,000	NP
	50	22,500	15,000	19,210	11,250	NP
	100	31,500	21,000	26,900	15,750	NP
Group R-3 Sprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2 & 3	0-25	UL	UL	UL	UL	UL
	50	UL	UL	UL	UL	UL
	100	UL	UL	UL	UL	UL
4[e]	0-25	UL	UL	UL	UL	UL
	50	UL	UL	UL	UL	UL
	100	UL	UL	UL	UL	UL

NP = Not Permitted

a. The maximum floor area for four stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories. The floor area of the four stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Due to story height increase in accordance with Section 504.2, Type VB construction permits three stories above grade plane and Type VA construction permits four stories above grade plane.
e. Maximum building height is 60 feet and four stories in accordance with Section 504.2.

Table 15 – Group R, NFPA 13 Sprinklered Buildings – Maximum floor area per story

Group R-1, R-2, R-4 Sprinklered Buildings [a, b, c, d]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	96,000	64,000	82,000	48,000	28,000
	50	102,000	68,000	87,120	51,000	29,750
	100	114,000	76,000	97,370	57,000	33,250
2, 3	0-25	72,000	48,000	61,500	36,000	21,000
	50	78,000	52,000	66,620	39,000	22,750
	100	90,000	60,000	76,870	45,000	26,250
4	0-25	54,000	36,000	46,120	27,000	NP
	50	58,500	39,000	49,960	29,250	NP
	100	67,500	45,000	57,650	33,750	NP
5	0-25	43,200	28,800	36,900	NP	NP
	50	46,800	31,200	39,970	NP	NP
	100	54,000	36,000	46,120	NP	NP
Group R-3 Sprinklered Buildings [a, b, c, d]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2, 3 & 4	0-25	UL	UL	UL	UL	UL
	50	UL	UL	UL	UL	UL
	100	UL	UL	UL	UL	UL
5	0-25	UL	UL	UL	NP	NP
	50	UL	UL	UL	NP	NP
	100	UL	UL	UL	NP	NP

NP = Not Permitted

a. The maximum floor area for four or more stories above grade plane shown was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage is based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Group R occupancies must have a NFPA 13 sprinkler system unless specifically allowed an NFPA 13R or 13D sprinkler system in accordance with Section 903.3.1. If NFPA 13R is used, the building must meet height limits of four stories and 60 feet in accordance with Section 504.2 and there is no increase in area per floor for sprinklers. Using NFPA 13D, there is no increase in building height or area due to use of the automatic sprinkler in accordance with Section 504.2. See Tables 13 and 14 for area increases due to frontage.

Table 16 – Group S Nonsprinklered Buildings – Maximum floor area per story

Group S-1 Nonsprinklered Buildings [a, b, c, d, e, f]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1, 2[g]	0-25	26,000	17,500	25,500	14,000	9,000
	50	32,500	21,870	31,870	17,500	11,250
	100	45,500	30,620	44,620	24,500	15,750
3	0-25	26,000	NP	25,500	14,000	NP
	50	32,500	NP	31,870	17,500	NP
	100	45,500	NP	44,620	24,500	NP
4	0-25	NP	NP	19,120	NP	NP
	50	NP	NP	23,900	NP	NP
	100	NP	NP	33,460	NP	NP
Group S-2 Nonsprinklered Buildings [a, b, c, h]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	39,000	26,000	38,500	21,000	13,500
	50	48,750	32,500	48,120	26,250	16,870
	100	68,250	45,500	67,370	36,750	23,620
	100 (60')[j]	UL	UL	UL	UL	UL
2 & 3[i]	0-25	39,000	26,000	38,500	21,000	13,500
	50	48,750	32,500	48,120	26,250	16,870
	100	68,250	45,500	67,370	36,750	23,620
4	0-25	29,250	NP	28,870	15,750	NP
	50	36,560	NP	36,090	19,680	NP
	100	51,180	NP	50,530	27,560	NP
5	0-25	NP	NP	23,100	NP	NP
	50	NP	NP	28,870	NP	NP
	100	NP	NP	40,420	NP	NP

NP = Not Permitted

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Group S-1 occupancies with storage of commercial trucks or buses must have sprinklers when the fire area exceeds 5,000 square feet. Group S-1 occupancies used to store mattresses must be sprinklered when the fire area exceeds 2,500 square feet. Sprinklers must be provided for Group S-1 occupancies when the fire area exceeds 12,000 square feet per compartment, or the combined area of all Group S-1 occupancies exceeds 24,000 square feet, in accordance with Section 903.2.9, or by reason of other specific conditions in that section. In lieu of sprinklers, compartmentalization of the floor area can be provided with fire-resistance-rated construction in accordance with Chapter 7.
e. Repair garages in Group S-1 occupancies with more than one story, including basements, must have sprinklers when a fire area exceeds 10,000 square feet.
f. Group S-1 occupancies storing tires must be sprinklered when the fire area exceeds 20,000 cubic feet.
g. Type VB construction does not permit two stories above grade plane.

h. Group S-2 occupancies with enclosed parking garages must have sprinklers when the fire area exceeds 12,000 square feet, in accordance with Section 903.2.10, or by reason of other specific conditions in that section. Buildings with parking garages for commercial trucks or buses must be sprinklered when the fire area exceeds 5,000 square feet.
i. Type VB construction does not permit three stories above grade plane.
j. Single-story Group S-2 occupancies may be unlimited in area if the frontage width is at least 60 feet in accordance with Section 507.2.

Table 17 – Group S Sprinklered Buildings – Maximum floor area per story

Group S-1 Sprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	104,000	70,000	102,000	56,000	36,000
	50	110,500	74,370	108,370	59,500	38,250
	100	123,500	83,120	121,120	66,500	42,750
	100(60')[d]	UL	UL	UL	UL	UL
2	0-25	78,000	52,500	76,500	42,000	27,000
	50	84,500	56,870	82,870	45,500	29,250
	100	97,500	65,620	95,620	52,500	33,750
	100(60')[d]	UL	UL	UL	UL	UL
3	0-25	78,000	52,500	76,500	42,000	NP
	50	84,500	56,870	82,870	45,500	NP
	100	97,500	65,620	95,620	52,500	NP
4	0-25	58,500	NP	57,370	31,500	NP
	50	63,370	NP	62,150	34,120	NP
	100	73,120	NP	71,710	39,370	NP
5	0-25	NP	NP	45,900	NP	NP
	50	NP	NP	49,720	NP	NP
	100	NP	NP	57,370	NP	NP

NP = Not Permitted
UL = Unlimited

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4. The floor area of the stories is assumed to be equal.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Sprinklered Group S buildings of one or two stories may be unlimited in area if the frontage width is at least 60 feet in accordance with Sections 507.3 and 507.4.

Table 17 cont. – Group S Sprinklered Buildings – Maximum floor area per story

Group S-2 Sprinklered Buildings [a, b, c]						
# of stories	% frontage	Maximum floor area per story (sq. ft.)				
		IIIA	IIIB	IV	VA	VB
1	0-25	156,000	104,000	154,000	84,000	54,000
	50	165,750	110,500	163,620	89,250	57,370
	100	185,250	123,500	182,870	99,750	64,120
	100(60')[d]	UL	UL	UL	UL	UL
2	0-25	117,000	78,000	115,500	63,000	40,500
	50	126,750	84,500	125,120	68,250	43,870
	100	146,250	97,500	144,370	78,750	50,620
	100(60')[d]	UL	UL	UL	UL	UL
3	0-25	117,000	78,000	115,500	63,000	40,500
	50	126,750	84,500	125,120	68,250	43,870
	100	146,250	97,500	144,370	78,750	50,620
4	0-25	87,750	58,500	86,620	47,250	NP
	50	95,060	63,370	93,840	51,180	NP
	100	109,680	73,120	108,280	59,060	NP
5	0-25	70,200	NP	69,300	37,800	NP
	50	76,050	NP	75,070	40,950	NP
	100	87,750	NP	86,620	47,250	NP
6	0-25	NP	NP	57,750	NP	NP
	50	NP	NP	62,560	NP	NP
	100	NP	NP	72,180	NP	NP

NP = Not Permitted
UL = Unlimited

a. The maximum floor area for four or more stories above grade plane was determined by dividing the maximum total allowable building area by the number of stories in accordance with Section 506.4.
b. Frontage based on open space widths of 30 feet or more.
c. Interpolation permitted.
d. Sprinklered Group S buildings of one or two stories may be unlimited in area if the frontage width is at least 60 feet in accordance with Sections 507.3 and 507.4.

American Wood Council
info@awc.org
www.awc.org

International Code Council
eCodes@iccsafe.org
www.iccsafe.org