

Code Conforming Wood Design

Wood Use Provisions in the *1997 Uniform Building Code* and *2000 IBC*



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Expanding the Use of Wood Construction A Comparative Analysis

2000 International Building Code and the 1997 Uniform Building Code

Development of the International Building Code

Publication of the 2000 Edition of the *International Building Code* (IBC) (1) marked the end of regional code development by the Building Officials and Code Administrators International (BOCA), the International Conference of Building Officials (ICBO), and the Southern Building Code Congress International (SBCCI). State, regional, and local adoption of the IBC signals a new era in model construction codes.

In 1994 the three existing national model code organizations created the ICC, a nonprofit organization dedicated to developing a single set of comprehensive and coordinated national model construction codes. The goal of the ICC was to have a family of national codes available by the year 2000, and ICC met that goal. In 1996 work began on the creation of the IBC. It was developed primarily from the provisions of the three nationally recognized model building codes: the *National Building Code* (NBC) (2), *Standard Building Code* (SBC) (3), and *Uniform Building Code* (UBC) (4) promulgated by BOCA, SBCCI, and ICBO, respectively. The model code organizations agreed that no further editions of their own codes would be maintained once the 2000 IBC was published. The ICBO published the last edition of the UBC in 1997. BOCA and SBCCI stopped publication of their codes in 1999.

The IBC is a comprehensive code and is the coordinating document for the suite of International codes. In certain instances, the IBC provisions are identical to those of the three model codes. In other instances, the provisions are a modification of requirements from one or more of the three regional codes. Some provisions are entirely new and unique to the IBC.

This Brochure

This brochure highlights the differences between the 1997 ICBO *Uniform Building Code* and the 2000 *International Building Code*. It is one of a series of brochures that compare the IBC to each of the three model codes. Where significant provisions of the IBC are identical or similar to those of the UBC, this fact is noted. Where provisions are significantly different, a comparison is provided.

The format of this document is intended to assist the reader in applying the information contained herein to the actual text of the code. For that reason the various sections of this brochure are titled to correspond with the code chapters to which they apply. The chapter subject matter and chapter numbering in the IBC are the same as in the UBC because both are based on the common code format utilized by the three model code organizations. Developed in 1998, the common code format

was implemented by each of the model code organizations in subsequent editions of their codes. ICBO, for example, adopted the common code format in its 1994 edition of the UBC. This common code format, in turn, simplified the development of the IBC and should be an aid to users in transition from one of the regional model codes to the IBC.

This publication is intended to give the reader insight into the provisions of the IBC that regulate the use of wood products and is based on the 2000 edition of the code. Although most of the information contained herein pertains to IBC provisions which specifically address wood and wood construction, some of what is discussed has general application. The reader is urged to always consult the current edition of the code and the authority having jurisdiction for local amendments.

Comparing the IBC and the UBC

ADMINISTRATION (CHAPTER 1)

As mentioned above, the goal of the ICC is to have a “family” of model International codes available for adoption. At the time of publication of this brochure there are 11 codes published by the ICC. Of these, four are of particular interest to the wood products industry: the *International Building Code*, the *International Residential Code (IRC)* (5), the *International Fire Code (IFC)* (6), and the *International Performance Code for Buildings and Facilities (IBPC)* (7). The most significant to the wood products industry are the IBC and the IRC.

The purpose of the IBC is to establish minimum requirements for structural strength, stability, means of egress, energy conservation, and safety to life from fire and other hazards attributed to buildings and other structures. The provisions of the IBC do not, however, apply to many one and two-family dwellings.

ICC specifically established a separate document, the IRC, for regulation of detached one- and two-family dwellings and townhouses. Under Section 101.2 of the IBC, use of the IRC is mandatory for residential buildings included under its scope. This practice is different from that of the UBC wherein all residential building were addressed, but which permitted compliance with the provisions of the Council of American Building Officials’ *One- and Two-Family Dwelling Code* (8) as an alternate through the adoption of UBC Appendix C. The *One- and Two-Family Dwelling Code*, incidentally, was used as the basis – both for content and for format – for the IRC.

In addition to regulating the construction of detached one- and two-family dwellings, the requirements of the IRC also apply to specific multifamily dwellings. Townhouses, as defined in the IRC, are governed by that code. The scope of the IRC, Section R101.2, taken with the formal definition of “townhouse” in Chapter 2 mean, in summary, that the IRC applies to multiple single-family dwellings not more than three stories high, with separate means of egress, with open space on at least two sides, and with each unit extending from the foundation to the roof.

The IBC, like the UBC, makes use of appendix chapters, which can play an important role in the regulatory process. Appendix chapters are not enforceable unless specifically adopted by the authority having jurisdiction.

DEFINITIONS (CHAPTER 2)

Definitions of terms used in the IBC were primarily compiled using terms from the three existing model codes. In the UBC Chapter 2 provides definitions for terms used throughout the code. In the IBC all defined words are listed in Chapter 2, but only the words of general application are actually defined in Chapter 2. Words which are specific to the technical provisions of a chapter are defined in the corresponding chapter. Words unique to wood construction provisions are found in IBC Section 2302.0.

USE & OCCUPANCY CLASSIFICATIONS (CHAPTER 3)

Although occupancy classifications used in the IBC are similar to those of the UBC, there are a few differences that are highlighted in the following paragraphs.

Assembly. The IBC has four divisions of assembly occupancy while the UBC has five. The IBC primarily bases its assembly occupancies on the use of the building, e.g., motion picture theaters and restaurants, etc. while assembly occupancies in the UBC are primarily based on occupant load.

The UBC Group A-1 occupancy, Large Assembly, is defined by having an occupant load of 1,000 or more, and having a legitimate stage. The UBC Group A-2 occupancy, Large Assembly, is defined by having an occupant load of less than a 1,000, and having a legitimate stage. The UBC Group A-2.1 occupancy, Assembly, is defined by having an occupant load of 300 or more, without a legitimate stage. The Group A-3 occupancy is defined as an assembly room having an occupant load of less than 300 occupants and without a legitimate stage. The Group A-4 occupancy is defined as stadiums, reviewing stands and amusement park structures not included within other Group A occupancies. There is no distinction in the UBC between actual uses such as churches, movie theaters, etc. Both the UBC and IBC state that “Rooms or spaces used for assembly purposes by less than 50 persons and accessory to another occupancy shall be included as a part of that occupancy.”

In the IBC there is no mention of occupant load or the presence of a stage. The four divisions of assembly occupancy are defined by general use as follows:

- A-1: Uses intended for the production and viewing of performing arts or motion pictures.
- A-2: Uses intended for food and/or drink consumption.
- A-3: Uses intended for worship, recreation, or amusement or other uses not classified elsewhere.
- A-4: Uses intend for viewing of indoor sporting events and activities with spectator seating.

There is no distinction in the IBC between night clubs and restaurants – all occupancies serving food and drink are classified as occupancy group A-2. This is generally consistent with the UBC. However, in the UBC nightclubs and restaurants with less than 50 occupants are classified as Group B, Business, and not an assembly use. There is not a similar provision in the IBC for small restaurants and bars. All are classified as A-2 in the IBC.

Educational. The IBC classifies any day care operation which serves six or more children of any age for less than 24 hours as part of Group E, Educational. In the UBC, the Group E-3 designation applies when the building is used for day-care purposes for more than six persons, and there is no mention of time.

Mercantile. Mercantile uses in the IBC are similar to those in the UBC, with one exception. The IBC limits the quantity of nonflammable solid hazardous material and nonflammable or noncombustible liquid hazardous materials stored or displayed in a single control area. In doing so, the IBC uses the concept of “control areas” to regulate spaces within the building enclosed and bounded by exterior building elements and/or fire resistive interior assemblies. The UBC does not utilize the concept of control areas. (For further information see the discussion of Chapter 7, Fire Resistance-Rated Construction.)

Mixed Uses. The challenging problem of mixed-use buildings is handled differently in the IBC than it is in the UBC. The UBC classifies a building containing two or more occupancies as a mixed occupancy building. Because each occupancy group differs from the others in the amount of combustible contents and other fire hazard characteristics, the UBC requires fire resistance separation between occupancy groups. The UBC does have some exceptions for occupancies having smaller accessory areas adjacent to the main occupancy in Section 302.1. The IBC utilizes a similar, but more detailed approach to mixed uses. The IBC classifies a mixed use building as containing either “separated uses” or “non-separated used.” Table I compares the methods of the UBC and the IBC for addressing mixed occupancy buildings.

Table I Code Comparison - Mixed Uses and Occupancies		
	IBC	UBC
Separated Uses	Allows mixed occupancies if they are separated as required in Section 302.3.3 and the sum of the occupancy ratios ¹ does not exceed one.	Allows mixed occupancies if they are separated as required in Section 302.1. Allowable height and area can't exceed that applying to the principle intended use. Also, each portion of the building must conform to all other requirements of the code for the occupancy contained therein.
Non-separated Uses	Allows uses to be unseparated within a fire area ² if the fire area does not exceed the allowable height and area for the type of construction, based on the more restrictive occupancy group	Does not allow unseparated uses except those exceptions noted in Section 302.1

1. Occupancy ratios is the actual occupancy floor area divided by the tabular area permitted for that occupancy group in specific construction type

2. Fire area is the aggregate floor area enclosed and bounded by exterior walls or fire resistive building elements as defined in IBC Section 702.

GENERAL BUILDING HEIGHTS & AREAS (CHAPTER 5)

IBC provisions regulating allowable building heights and areas are generally based on the least restrictive provision of any of the three model codes. ICC recognized that each code had a rationale for allowable heights and areas. So, in the absence of fire loss data indicating that any existing allowable building area in one of the model codes was hazardous, the largest building areas permitted by any model code for an occupancy group was generally chosen. Further, subsequent to the finalization of the 2000 IBC, amendments somewhat modified the original draft provisions by including some limits on overall building area and the method for calculation of increased area due to open spaces around the building perimeter. (See the discussion of area modifications below.)

General Height and Area Limitations (Section 503)

Because of the approach taken by the drafting committee to retain the area allowances for each of the contributing model building codes for any particular occupancy, the IBC generally provides larger per-floor areas for low-rise building than are allowed in the UBC. In some cases the IBC floor areas represent a substantial increase over areas allowed by the UBC. Table II provides maximum unmodified height and area limits in the IBC (as contained in IBC Table 503) for certain use groups constructed of combustible construction. This table is significant in the regulation of wood construction. Too often, designers see the areas contained in this table as a barrier to using wood construction. However, the code permits very large wood frame buildings if designers apply the permitted modifications to the areas of the IBC.

In addition to the single-story floor areas being different as discussed above, the provisions for calculating allowable areas of multistory buildings are handled very differently in the two codes. In the IBC, a per-floor tabular area is given, as is a maximum height in stories and in feet. The aggregate area of all floors in the building is limited to not more than three times the maximum adjusted allowable single-story area (in accordance with Section 503.3).

The UBC establishes in Table 5-B what the code refers to as “basic” permissible areas for one story buildings. By use of the term “basic” the code means that the building has no features which might be considered as improving the overall fire hazard for the building. When the building is provided with additional enhancements such as side yard separations or a sprinkler system, the “basic” allowable areas may be increased significantly, and can be compounded. All occupancies are subject to basic building height and area limitations which vary, depending upon type of construction. Basic allowable areas apply to one story buildings with at least one side facing a street, yard, or public space. For buildings more than two stories in height, basic allowable areas may be adjusted. Basic areas apply where the open space frontage is on at least one side of the building. However, there are a number of ways in which the allowable height and/or floor area may be increased with proper site placement and design planning.

Modifications of height and area limitations are permitted as discussed in the following sections of this brochure. Comparisons of modified allowable building areas based on use group are provided in Appendix A of this brochure.

		Table II IBC GENERAL HEIGHT & AREA LIMITATIONS FOR COMBUSTIBLE TYPES OF CONSTRUCTION Number of Stories Allowable Area Per Floor (square feet)				
		Type III		Type IV	Type V	
		A	B		A	B
Group	Hgt/Area	65	55	65	60	40
A-1 (Theaters)	H	3	2	3	2	1
	A	14,000	8,500	15,000	11,500	5,500
A-2 (Restaurants)	H	3	2	3	2	1
	A	14,000	9,500	15,000	11,500	6,000
A-3	H	3	2	3	2	1
	A	14,000	9,500	15,000	11,500	6,000
A-4 (Arenas)	H	3	2	3	2	1
	A	14,000	9,500	15,000	11,500	6,000
A-5 (Outdoor)	H	UL	UL	UL	UL	UL
B (Business)	H	5	4	5	3	2
	A	28,500	19,000	36,000	18,000	9,000
E (Education)	H	3	2	3	1	1
	A	26,500	14,500	25,500	18,500	9,500
F-1 (Factory)	H	3	2	4	2	1
	A	19,000	12,000	33,500	14,000	8,500
F-2 (Factory)	H	4	3	5	3	2
	A	28,500	18,000	50,500	21,000	13,000
H-1 (Hazardous)	H	1	1	1	1	NP
	A	9,500	7,000	10,500	7,500	
H-2 (Hazardous)	H	2	1	2	1	1
	A	9,500	7,000	10,500	7,500	3,000
H-3 (Hazardous)	H	4	2	4	2	1
	A	17,500	13,000	25,500	10,000	5,000
H-4 (Hazardous)	H	5	3	5	3	2
	A	28,500	17,500	36,000	18,000	6,500
H-5 (Hazardous)	H	3	3	3	3	2
	A	28,500	19,000	36,000	18,000	9,000
I-1 (Institutional)	H	4	3	4	3	2
	A	16,500	10,000	18,000	10,500	4,500
I-2 (Institutional)	H	1	NP	1	1	NP
	A	12,000		12,000	9,500	
I-3 (Institutional)	H	2	1	2	2	1
	A	10,500	7,500	12,000	7,500	5,000
I-4 (Institutional)	H	3	2	3	1	1
	A	23,500	13,000	25,500	18,500	9,000
M (Mercantile)	H	4	4	4	3	1
	A	18,500	12,500	20,500	14,000	9,000
R-1 (Hotels)	H	4	4	4	3	2
	A	24,000	16,000	20,500	12,000	7,000
R-2 (Apartments)	H	4	4	4	3	2
	A	24,000	16,000	20,500	12,000	7,000
R-3 (Townhouses)	H	4	4	4	---	---
	A	UL	UL	UL		
R-4 (Single-Family)	H	4	4	4	4	4
	A	24,000	16,000	20,500	12,000	7,000
S (Storage)	H	3	3	4	3	1
	A	26,000	17,500	25,500	14,000	9,000
S-2 (Storage)	H	4	4	5	4	2
	A	39,000	26,000	38,500	21,000	13,500
U (Utility)	H	3	2	4	2	1
	A	14,000	8,500	18,000	9,000	5,500

Height Modifications (Section 504)

Both the IBC and UBC provide for modifications to allowable building height. The modifications of both codes are somewhat different but rely to a large degree on the installation of automatic sprinkler systems.

IBC Table 5-B, for example, contains limitations to building height in both stories and in vertical distance (feet) for each occupancy group and type of construction. The limitations are based on whether or not the building is equipped with an NFPA 13 (9) automatic sprinkler system. UBC Table 5-B, therefore, recognizes the safety aspects of an NFPA 13 system by permitting an additional story in height for unsprinklered buildings when increases allowed for building areas are not used to increase the allowable area of a building or the automatic sprinkler system is not required throughout the building by other provisions in the Code. The UBC does not permit a height modification for the installation of NFPA 13R (10) or NFPA 13D (11) systems.

IBC height modifications are more complicated and expansive. The IBC, for example, permits modifications in height for buildings equipped with NFPA 13 sprinkler systems as well NFPA 13R systems. When IBC Section 903.3.1.1 is referenced, an NFPA 13 system is required. For modifications permitted for the use of an NFPA 13R system, reference is made to Section 903.3.1.2. No increase is permitted for use of a NFPA 13D system.

The IBC allows a one-story increase, in addition to a 20 foot height increase, for buildings equipped with an NFPA 13 sprinkler system. For residential buildings, e.g. hotels, multi-family buildings, fraternities, dormitories, a building equipped with an NFPA 13R system is permitted to be increased by one story and 20 feet, provided the building does not exceed 4 stories or 60 feet.

Area Modifications (Section 506)

As is the case with building height, the IBC and UBC provide for modifications to allowable building areas. Although area modifications in both codes rely on the installation of automatic sprinkler systems and the presence of large open spaces at the perimeter of the building, the methodologies for determining the allowable area increase and the amount of increase are different.

The *Uniform Building Code* establishes in Table 5-B what the code refers to as “basic” permissible areas for one story buildings. By use of the term “basic” the code means that the building has no features which might qualify as improving the overall fire hazard for the building. When the building is provided with additional enhancements such as side yard separations or a sprinkler system, the “basic” allowable areas may be increased significantly. All occupancies are subject to basic building height and area limitations which vary, depending upon type of construction. Basic allowable areas apply to one story buildings with at least one side facing a street, yard, or public space. For buildings more than two stories in height, basic allowable areas may be adjusted. Basic areas apply where the open space frontage is on at least one side of the building. However, there are a number of ways in which the allowable height and/or floor area may be increased with proper site placement and design planning.

Allowable increases for Open Space-Side yard separation (Section 505.1)

Basic floor areas may be significantly increased where open space exists on two or more sides of the building. The qualifying "open space" is defined as a street, public space, or yard more than 20 feet in width.

The UBC permits floor area increases where streets, public space, or yards more than 20 feet in width extend along and adjoin two sides of the building. The total area of all floors of a multi-story business building may have twice the area allowed for a one-story building, but no single floor area shall exceed that permitted for one-story buildings (See Table IV).

The IBC takes a more complex approach. The tabular areas of IBC Table 503 apply to unsprinklered buildings. These tabular areas are permitted to be increased in accordance with a formula if the building is sprinklered and/or the perimeter provides access to fire suppression ground operations. The allowable area is calculated based on the following equation:

$$A_a = A_t + \left[\frac{A_t I_f}{100} \right] + \left[\frac{A_t I_s}{100} \right]$$

Where:

- A_a = Allowable area per floor (square feet)
- A_t = Tabular area per floor
- I_f = Area increase due to frontage (percent)
- I_s = Area increase due to sprinkler protection

The frontage increase (I_f) allows for the tabular areas to be increased when the open space (*w*) is a minimum of 20 feet in width for at least 25 percent of the total perimeter in accordance with the following equation:

$$I_f = 100 \left[\frac{F}{P} - 0.25 \right] \frac{w}{30}$$

Where:

- w = Minimum fire separation distance
- F = Building perimeter which fronts on a public way or open space having 20 ft. open minimum width.
- P = Perimeter of entire building

Where provisions of the IBC require that a building be equipped throughout with an automatic sprinkler system, sprinklers must be installed throughout in accordance with NFPA 13, NFPA 13R or NFPA 13D as appropriate for the use of the building. The UBC doesn't permit an area modification for the installation of NFPA 13R or 13D systems.

Table III compares features that provide area increases in the two codes.

Table III Code Comparison - Area Increases		
Feature	IBC	UBC
Minimum open space for increase credit	20 feet	30 feet
Open space increase determination	Ratio of total perimeter to open perimeter - 75% maximum increase to allowable area.	The UBC permits floor area increases to be determined as follows; where streets, public space, or yards more than 20 feet in width extend along and adjoin two sides of the building, basic floor areas may be increased as much as 50 percent by a rate of 1 1/4 percent for each foot by which the minimum width exceeds 20 feet; as much as 100 percent by a rate of 2-1/2 percent for each foot by which the minimum width exceeds 20 feet on three sides; and as much as 100 percent by a rate of 5 percent for each foot by which the minimum width exceeds 20 feet on all sides.
Credit when an NFPA 13 automatic sprinkler system is installed	The allowable area increase for use of automatic sprinkler systems must be calculated: 300% increase for 1-story buildings, 200% increase for multi-story buildings NFPA 13, NFPA 13R, and NFPA 13D systems allowed for credit	The allowable area of sprinklered building is included in Table 5-B, which includes 300% increase for 1-story buildings 200% increase for multi-story buildings Only NFPA 13 system allowed for credit

Unlimited Area Buildings (Section 505.2)

Like the UBC, the IBC also has provisions that allow unlimited floor area buildings. In the UBC, business, mercantile, storage and factory occupancies of Types III, IV, and V construction are permitted to be unlimited in area for one-and two-story buildings when an automatic sprinkler system is installed, and when the building is surrounded on all sides by permanent open space not less than 60 feet in width. This procedure is used by architects and designers to allow a shopping center, including the large department stores, to conform to Type V-N construction. Other types of construction need only be a considered when the proposed building has mixed occupancies and a concern exists that the minor use may exceed 10% of the basic allowable area for the building.

The IBC also permits unlimited area single- and two-story buildings of use groups B, F, M, and S of any construction type, including traditional wood frame construction (IBC Type V), when the building is equipped with an automatic sprinkler system and has the required open space of 60 feet around the perimeter. Some of the other IBC provisions for unlimited area buildings are as follow:

Unsprinklered Uses

One-story buildings of Group S-2 (Low Hazard Storage) or Group F-2 (Factory/Industrial Low Hazard) are permitted to be of unlimited area regardless of construction type if the building is surrounded by a minimum of 60 feet open space. There is no requirement that the structure be of fire-rated construction.

Sprinklered, One-story Uses

The area of a one-story Group A-4 (Assembly), Group B (Business), Group F (Factory), Group M (Mercantile), or Group S (Storage) building is permitted to be unlimited if the building is provided with an automatic sprinkler system, and if the building is also provided with 60 feet of open space surrounding the entire perimeter.

Sprinklered, Two-story Uses

A two-story building of Group B (Business), Group F (Factory), Group M (Mercantile), or Group S (Storage), is permitted to be of unlimited area provided the building is built with an automatic sprinkler system .and if the building is surrounded on all sides by not less than 60 feet of open space.

In short, the IBC, much like the UBC, permits many unlimited area buildings, particularly those of combustible construction. Table IV compares the unlimited building area provisions of the IBC and UBC.

Table IV Code Comparison - Unlimited Area Buildings		
Feature	IBC	UBC
Unsprinklered Uses	F-2, S-2 regardless of type of construction	S-2, F-2 occupancies in one story buildings of Type II, Type II One Hour or IV construction when surrounded and adjoined by public ways or yards not less than 60 feet in width.
Sprinklered Uses: One-story	A-4, B, F, M, S regardless of type of construction	Groups B, F-1, F-2, M, or S, Division 1,2,3,4, or 5 and H - 5 occupancies, regardless of type of construction
Sprinklered Uses: Two-stories	B, F, M, S regardless of type of construction	Groups B, F-1, F-2, M, or S, Division 1,2,3,4, or 5 and H - 5 occupancies, regardless of type of construction
Required Open Space	60 feet	60 feet
Reduced Open Space	Permitted	Not Permitted

Special Provisions (Section 508)

Both the IBC and the UBC have special provisions for parking structures below residential occupancies. The special provisions in the IBC apply to parking structures and mixed use structures containing Group S-2 (Parking) and Group R-2 (Multifamily Dwelling Units).

The UBC allows the number of stories of Group B, Group M, or Group R, Division 1 occupancies to be measured from the floor above an open or enclosed parking area of Type I or II construction (UBC Section 311.2.2.1). The UBC also allows greater heights and areas than shown in UBC Table 5-B for open parking garages of noncombustible construction in buildings of mixed types of construction. Table V below summarizes the various provisions of the IBC that allow for mixing R-2 uses with parking or other specific uses.

Table V					
IBC Special Provisions for Multifamily (R-2) Construction					
Code Section	Use Groups	Separation Requirement	Height	Area	Special Considerations
508.2	A, B, M, R over S-2 enclosed Type I parking garage	3 hours	Number of stories measured from horizontal separation	T601	The building above is considered a separate building
508.5	R over S-2 open or enclosed Type I or open Type IV parking garage	2 hours	Number of stories measured from horizontal separation	T601	Limited to one-story, above grade plane S-2 parking garage
508.6	R-2 Type IIIA	3 hours	Height increased to 6 stories and 75'	T601	Parking must be subdivided by 2-hour walls into areas not exceeding 3,000 sf
508.8	A, I, B, M or R above open parking garage	Per Table 302.3.3	Height measured from grade plane		The height and number of stories includes the parking garage

TYPES OF CONSTRUCTION (CHAPTER 6)

Many of the IBC requirements related to construction type will be familiar to UBC users. However, there are significant differences in terminology used in the IBC when compared with that used in the UBC. In the IBC there are five types of construction similar to the UBC. Most of the definitions of the construction types in the two codes are very similar, although the specific name designations and order of number are different.

The UBC describes the different construction types as follows:

Type V -Wood Frame (Section 606)

Type V construction is defined as a construction type having exterior walls, bearing walls, partitions, floors, and roofs constructed of any materials permitted by the code and includes wood frame construction. Such buildings are further defined as Type V-1 hour (protected one-hour fire resistance) and Type V-N (unprotected). Type V-N construction has no general requirements for fire resistance and may be unprotected construction except where proximity to the property lines may require protected construction.

The usual case for Type V construction is the light wood-frame building consisting of walls and partitions of 2-inch by 4-inch or 2-inch by 6-inch wood studs. The floor or roof framing are usually of light wood joists of 2-inch by 6-inch or deeper. Roofs and floors may also be framed with engineered wood products, such as, I-joist, trusses, and laminated veneer lumber.

Type IV-Heavy Timber (Section 605)

Type IV construction is defined as a construction type having exterior walls of non-combustible materials (fire retardant treated wood framing may be used in some cases) and columns, floors, roofs and interior partitions of wood members having a certain minimum size. Members qualifying as "heavy timber" include lumber roof decking, 2" nominal thickness, and plywood roof decking, 1 1/8" net thickness; floor decking, 3" nominal thickness; roof framing, 4" x 6" nominal; floor framing, 6" x 10" nominal; and columns 8" x 8" nominal. Heavy-timber buildings have sometimes been referred to as slow burning construction. This is due to the fact wood under the action of fire loses its surface moisture and when the surface temperature reaches 400 degrees F, flaming and charring begins. Under continued application of heat, charring continues but at an increasing slower rate, as the charred wood insulates the inner portion of the wood member. This natural procedure has been recognized by the *Uniform Building Code* by providing a method in the Code to calculate the fire resistance of an exposed wood member. This procedure is contained in U.B.C. Standard 7-7 and will be discussed in Part IV of the booklet.

The Type IV "Heavy Timber" building is essentially the same as a Type III building except with a heavy timber interior. In both types of construction the exterior walls have a general requirement to be constructed of non-combustible materials. Section 503.4.3 does allow approved fire retardant treated wood within the assembly of the exterior walls when Table 5-A (exterior wall and opening protection based on location of property) allows a fire resistive rating of two hours or less.

Type III (Section 604)

Type III construction is considered a combustible type of construction and is defined as a construction type having exterior walls of noncombustible materials (fire retardant treated wood framing as permitted in Section 503.4.3) and floors, roofs and interior walls and partitions of wood frame. Such buildings are further defined as Type III-1 hour (protected-one hour fire resistance) and Type III-N (unprotected).

The Type III building is essentially the same as a Type IV- heavy timber building except with a combustible interior. In both types of construction the exterior walls have a general requirement to be constructed of non-combustible materials. Section 503.4.3 does allow approved fire retardant treated wood within the assembly of the exterior walls when Table 5-A (exterior wall and opening protection based on location of property) allows a fire resistive rating of two hours or less.

Types I and II -(Sections 602 and 603)

Structural elements of Types I and II construction are generally required to be of noncombustible materials with fire ratings up to four hours. However, as can be seen under Sections V and VI, there are circumstances permitting use of wood in such buildings. Table VI compares the construction type designations contained in the two codes.

Table VI Comparison of Types of Construction Between the IBC and the UBC		
General Description	IBC Designation	UBC Designation
Noncombustible	Type I (A & B) Type II (A) Type II (B)	Type I Type II Type II-N Type II-1 hour
Mixed noncombustible and combustible	Type III (A) Type III (B)	Type III- 1 hour Type III-N
Combustible – heavy timber and traditional wood frame	Type IV (Heavy Timber) Type V (A) Type V (B)	Type IV (Heavy Timber) Type V-N Type V- 1 hour

Design Opportunities with Wood

A significant difference occurs between the two codes concerning situations where fire-retardant treated wood is permitted to be used. Table VII summarizes these applications. While the UBC permits the use of fire-retardant wood (FRTW) in some applications in noncombustible types of construction, the IBC has broadened those applications.

Table VII Code Comparison - Allowable Use of Fire Retardant Treated Wood			
IBC Construction Type	Building Assembly	IBC	UBC
Type I and II Construction	Roof structures	Permitted in buildings not over two-stories (T601, note c3)	Not Permitted
	Exterior walls	Permitted when the wall is non-load bearing and a fire rating is not required (603.1.1.2)	Permitted in non-load bearing partitions where the fire rating is 1 or 2 hours and not part of a shaft assembly. (Section 602). Not permitted in Type II-N construction.
	Interior walls	Permitted in non-load bearing partitions where the fire rating is 2 hours or less (603.1.1.1)	Permitted in interior nonbearing partitions in Types I, & II (602.1 and 603).
Type III and IV Construction	Exterior walls	Permitted in exterior walls when the required rating is 2-hours or less.	Permitted in exterior walls when the required rating is 2-hours or less.
Type V Construction	All assemblies	Requirements for IBC Type V construction and UBC Type V construction are identical. Use of fire retardant treated wood is unrestricted.	

As mentioned above, designers often believe that using a combustible type of construction brings with it restrictions in building size that may not meet building needs. While wood frame construction (IBC Type V) is the most limited in building area, adding sprinklers and/or providing open space around the building can offset much of the restriction. Further, using heavy timber construction (IBC Type IV/UBC Type IV) can provide floor areas comparable to noncombustible construction. Additionally, IBC Type III (UBC Type III) construction also allows floor areas comparable to noncombustible construction but yet still permits the use of a significant amount of wood, particularly if the building is located away from the property line.

In Section 602.3 the IBC defines Type III Construction as being “... that type ... in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by the code.” The section goes on to say that fire-retardant treated wood is permitted in exterior wall assemblies in lieu of noncombustible materials when the rating of the wall is required to be 2-hours or less. Table VIII below provides a snapshot of situations in which a Type III building can be totally of wood construction. It compares the unmodified IBC allowable areas and heights of unprotected Type III (B) with those of noncombustible unprotected Type II (B). The area and height modifications discussed above for sprinklers and perimeter open space are applicable to these values.

Table VIII					
Comparison of Heights and Areas					
Allowed for IBC Type IIB and Type IIB Construction					
IBC Occupancy Group	Table 503 Unmodified Allowable Area (sq ft)		Table 503 Unmodified Allowable Height (stories/feet)		Horizontal Distance Required from Property Line to Permit 2-hr Rating or Less (T601 & T602)
	Type IIB	Type IIB	Type IIB	Type IIB	
A-3 church	9,500	9,500	2/55	2/55	Regardless of distance to property line, rating for bearing & non-load bearing exterior walls is 2-hr or less for these occupancies
B	23,000	19,000	4/55	4/55	
E	14,500	14,500	2/55	2/55	
M	12,500	12,500	4/55	4/55	
R-1 hotel	16,000	16,000	4/55	4/55	

FIRE-RESISTANCE-RATED CONSTRUCTION (CHAPTER 7)

This chapter departs from the UBC in a number of significant ways. The general terminology for fire resistive assemblies used in the IBC is very different from what is found in the UBC. The IBC often requires that fire-resistance-assemblies perform a particular function, and in those situations the assemblies are referred to by particular names. Some of these terms are used in the UBC, others are new.

As noted in Table IX on the next page, an important difference between the two codes involves the way in which fire walls are addressed. In both codes fire walls or area separation walls are primarily used to separate buildings. That is, each part of a building or structure on either side of a fire/area separation wall is considered to be a separate building.

The rating of fire walls in the IBC is linked to occupancy groups. IBC Table 705.4 permits most occupancy groups to employ 3-hour fire walls. Four-hour walls, which were required in all but one instance in the UBC (in townhouses) are required in the IBC only in buildings housing H-1 and H-2 occupancy groups. In some situations fire walls in the IBC can be 2-hour rated. Additionally, IBC Section 705.3, which requires that fire walls be of noncombustible materials, contains an exception which permits fire walls in Type V construction (wood frame) to be of combustible materials. The structural performance requirements of the fire wall are the same whether the wall is combustible or noncombustible. The designer must demonstrate the structural integrity of the wall, given collapse of the building on either side.

Chapter 7 of the IBC incorporates the provisions taken from the UBC for both the “component additive method” of determining fire resistance and the procedures for use of the design methodology for fire-exposed heavy timber members (large-section wood members).

STRUCTURAL DESIGN (CHAPTER 16)

Chapters 16 of both codes prescribe minimum loads that must be used in the design of buildings and structures to insure structural safety. The purpose of Chapter 16 is to insure that every building or structure has sufficient strength to support loads and forces it will likely encounter during its life without any of its structural elements being unduly stressed. Chapter 16 covers general requirements concerning loads, load combinations, deflection of structural members, and serviceability. The provisions of the IBC and UBC are very similar. As in the UBC, the IBC load values primarily come from the American Society of Civil Engineers (ASCE) standard *Minimum Design Loads for Buildings and Structures* (ASCE 7) (12). Whereas the UBC is mostly based on the ASCE 7-95, the 1995 edition of the standard, the IBC is primarily based on ASCE 7-98.

Seismic load values in the IBC and UBC derive from ASCE 7 and the National Earthquake Hazard Reduction Program’s (NEHRP) *Recommended Provisions for the Development of Seismic Regulations for New Buildings* (13) The IBC values are based on the 1998 version of the NEHRP standard, while those in the UBC are based on the 1994 version.

TABLE IX
Code Comparison - Fire Rated Assemblies

Feature	IBC	UBC
Fire Partition	A rated vertical assembly with specific continuity and opening protection provisions, required for separation of dwellings and corridors, among other uses	Not specifically used although fire resistant partitions in the UBC are addressed with respect to fire separation requirements of Section 704.2.
Fire Barrier	A rated horizontal or vertical assembly with specific continuity and opening protection provisions, required for separation of mixed occupancies, shaft protection, exit stair separation, and elevator lobbies among other uses	Not specifically used. In the IBC a fire barrier separates occupancies. The UBC also establishes occupancy separation requirements, but does not name them “fire barriers.” They are referred to as “occupancy separations”.(Section 302.4)
Party Wall	Any wall located on a property line between adjacent buildings which is used or adapted for joint service between the two buildings. Party walls create separate buildings. Party walls are constructed as fire walls without openings.	In the UBC the term party wall is not used. An “area separation wall” is used to create separate buildings.
Fire Wall	A rated wall extending from the foundation to the roof, of combustible or non-combustible construction, able to withstand collapse of construction on either side. Used to separate buildings for area limitations, fire walls are required to be continuous and extend beyond the exterior walls of the building. The required rating depends on the construction type and the occupancy groups involved.	The IBC relates fire wall ratings to occupancy groups. In the UBC the fire resistance rating of the “area separation wall” is independent on the type of construction. The fire resistance rating of an area separation wall in Types II-N or V Construction in the UBC is two hours. In all other types of construction it is 4 hours. In the IBC fire wall ratings vary.
Smoke Barrier	A 1-hour rated horizontal or vertical element with opening and penetration protection designed to restrict the passage of smoke, required to subdivide floor areas in institutional occupancies.	A 1-hour rated horizontal or vertical element with opening and penetration protection designed to restrict the passage of smoke, required to subdivide floor areas in institutional occupancies. (UBC Section 308.2.2.1).

The main difference between the UBC's use of ASCE 7-95 and the IBC's use of ASCE 7-98 involves wind loads. IBC wind provisions are 3-second gust wind speeds while the UBC wind provisions are based on fastest-mile wind speeds. The wind speed map in Figure 1609 of the IBC presents 3-second gust wind speed contours, which are significantly different from the fastest-mile wind speed contours of the UBC. To assist the code user in transitioning from fastest-mile speeds to 3-second gust speeds, the IBC provides a convenient table for converting wind speeds of the two methodologies (Table 1609.3.1). This conversion table enables the continued use of industry design standards such as AF&PA's *Wood Frame Construction Manual: SBC High Wind Edition* (WFCM) (14), which is referenced as an alternative methodology for the design of one- and two-family dwelling in the IBC. The IBC provides a simplified procedure for determining the wind loads on low-rise buildings (buildings with a mean roof height not exceeding 60 feet). The special low-rise provisions in the IBC were developed from ASCE 7-98 .

IBC seismic design issues are similar to those in the UBC. Much of the seismic loading values in the IBC were derived from the UBC and NEHRP. Important to buildings located in high wind areas is the requirement in IBC Section 1609.1.5 stipulating that lateral-force-resisting systems must meet seismic detailing requirements and limitations even when the wind load effects are greater than seismic load effects. This requirement is intended to insure that fastening of wood members will adequately meet the multidimensional forces of earthquakes in addition to the monotonic forces of a wind event. The IBC, like the UBC, specifically exempts from analysis those seismic-force-resisting systems of wood frame buildings that conform to the seismic provisions of conventional light-frame construction contained in Chapter 23.

Finally, it should be noted that the IBC requires structures located in flood hazard areas to be designed in accordance with ASCE 24-98, *Flood Resistance Design and Construction* (15), a standard which is not referenced in the UBC. The UBC references its own "Standard for Flood-Resistant Design" in Appendix Chapter 31, Division 1.

WOOD (CHAPTER 23)

Chapter 23 of both the IBC and the UBC govern the materials, design, construction, and quality of wood members and their fasteners. Chapter 23 contains a number of specifications intended to provide guidance to nonprofessional as well as professional users of the code. Chapter 23 of both the IBC and the UBC requires that the design of wood structural elements or systems be based on allowable stress design (ASD), load and resistance factor design (LRFD), or conventional light-frame construction. UBC Chapter 23 was actually used for the basis of the Chapter 23 IBC provisions.

The IBC contains the same material as the UBC, with some reorganization, while adding details regarding seismic and wind loading, shear walls, and diaphragms. For example, the IBC institutes minimum requirements for connecting roof framing to walls below and provisions for roof framing connections outside high wind areas. As a convenience to the user, the IBC includes pre-calculated joist and rafter span tables and a number of illustrations that were not provided in the UBC. The IBC deletes the termite infestation map and provisions for under-slab soil treatment.

Otherwise, many of the IBC's prescriptive provisions for conventional construction of light-frame wood structures are similar to those found in the UBC. The IBC and UBC provisions involving seismic issues, are very similar since the provisions from the UBC were again used as the basis for the IBC Conventional Construction provisions.

When exterior walls are not subjected to high winds or seismic forces, they are required to be braced to resist lateral loading. Historically, the traditional exterior wall was sheathed with wood boards applied diagonally, and the rigidity of this system provided adequate bracing for lateral loading and has been used as the basis for comparing other methods and systems. The bracing requirements of the IBC and the UBC are similar and are based on NEHRP recommendations. The IBC sets out six conditions considered to constitute irregular structures and institutes wall bracing requirements for the irregular buildings. The IBC braced wall provisions included cantilevers and conditions where load bearing walls do not align vertically in two or more story buildings. Otherwise, for regular buildings the wall bracing requirements are similar to those in the UBC. Like the UBC, the IBC does not specifically limit conventional construction to residential buildings, but its use is similarly limited to buildings with floor loads not exceeding 40 psf – for all practical purposes that means residential buildings. And use of the provisions is limited to areas where hurricane level winds are not likely to occur. The conventional prescriptive provisions of the wood chapter of the IBC as in the UBC, are further limited by seismic thresholds. Structures that fall outside of the general scoping provisions of IBC conventional construction Section 2308 must comply with the design requirements of Chapter 16.

However, as discussed above in “Administration (Chapter 1)” it should be remembered that the conventional construction provisions in the IBC do not apply to one- and two-family dwellings. Conventional construction requirements for one- and two-family dwellings and multiple single-family townhouse units are contained in the *International Residential Code* (IRC). Therefore, the scope of the IBC is significantly different from that of the UBC with respect to residential structures. The UBC addresses the requirements for all residential building and structures within the body of the code, but it allows the optional use of the Council of American Building Officials' (CABO) *One- and Two-Family Dwelling Code* for Group R3 occupancies. The IBC, on the other hand, makes the use of a separate document, the IRC, mandatory for one- and two-family dwellings.

It should be noted that the CABO code permits application of its provisions to townhouses. However, the CABO definition of “townhouse” is somewhat different from that in the IRC, with the IRC definition being a little broader, and permitting application of the IRC to a larger range of buildings.

The conventional construction provisions in the IRC came primarily from the CABO code (which was later designated the *International One- and Two-Family Dwelling Code*). Those provisions have been updated to some extent. However, the differences between the IRC provisions for wood construction and those in the UBC are minor. There are pre-calculated joist and rafter span tables that didn't exist in the UBC. There are also a number of illustrations that may be familiar to users of the *One- and Two-Family Dwelling Code* but which will be new to UBC users.

The IRC has updated the seismic-related provisions of the *One- and Two-Family Dwelling Code* and contains prescriptive bracing requirements for construction in all but the highest seismic areas. It doesn't contain similar provisions for buildings in high-wind areas, however. For these buildings,

which would otherwise be considered beyond the scope of the IRC and require professional design, AF&PA's *Wood Frame Construction Manual: SBC High Wind Edition* (WFCM) is referenced as an alternative design standard.

Conclusion

The arrival of the *International Building Code* brings increased opportunity for design and construction with wood. It allows greater building areas for combustible construction types, increased alternatives for wood in fire resistance rated assemblies, and more definitive design criteria. The advantages for wood construction, in contrast to the limitations imposed by the *Uniform Building Code*, can be dramatic— especially for designs which incorporate contemporary fire protection features such as automatic sprinkler systems. The *International Building Code* enhances the opportunities already rendered by the *Uniform Building Code*, and which are often overlooked by designers of commercial structures. See the tables contained in the Appendix of this brochure.

The opportunities for wood construction will continue to become evident as the *IBC* gains acceptance from widespread use and scrutiny. Even as states and jurisdictions across the U.S. and North America are adopting the *IBC* into law, the development of the second edition is nearing completion. For comparisons of requirements for wood construction in the *IBC* to the *BOCA National Building Code* or the *Standard Building Code*, see the companion brochures found on the website of the American Wood Council, www.awc.org.

Special effort has been made to assure the accuracy of the information presented. However, the American Forest & Paper Association does not assume responsibility for particular designs or calculations prepared from this publication.
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**Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter:
IBC Use Group B (UBC Group B)^{1,2,3,5}**

		UBC Type of Construction					
		III 1-Hr	III-N	IV(HT)	V 1-Hr.	V-N	
UBC Single story Unsprinklered Floor Areas		18,000	12,000	18,000	14,000	8,000	
UBC Multi-story Unsprinklered Floor Areas		36,000	24,000	36,000	28,000	16,000	
UBC Single Story Sprinklered Areas		54,000	36,000	54,000	42,000	24,000	
UBC Multi-story Sprinklered Areas		72,000	48,000	72,000	56,000	36,000	
UBC Allowable Stories - Unsprinklered		4	2	4	3	2	
UBC Allowable Stories - Sprinklered		5	3	5	4	3	
		IBC Type of Construction					
		3A	3B	4 (HT)	5A	5B	
IBC Tabular (Unsprinklered) Areas		28,500	19,000	36,000	18,000	9,000	
IBC Allowable Stories		5	4	5	3	2	
<i>IBC Maximum Stories for Increase</i>		3	3	3	3	2	
Unsprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	36,000	24,000	36,000	28,000	16,000
		IBC	85,500	57,000	108,000	54,000	18,000
	50%	UBC	54,000	36,000	54,000	42,000	24,000
		IBC	106,875	71,250	135,000	67,500	22,500
	75%	UBC	72,000	48,000	72,000	56,000	32,000
		IBC	128,250	85,500	162,000	81,000	27,000
	100%	UBC	72,000	48,000	72,000	56,000	32,000
		IBC	149,625	99,750	189,000	94,500	31,500
	Sprinklered Building Aggregate Floor Area (square feet)						
	Percent Open Perimeter ¹	25%	UBC	72,000	48,000	72,000	56,000
IBC			256,500	171,000	324,000	162,000	54,000
50%		UBC	108,000	72,000	108,000	84,000	48,000
		IBC	277,875	185,250	351,000	175,500	58,500
75%		UBC	144,000	96,000	144,000	112,000	64,000
		IBC	299,250	199,500	378,000	189,000	63,000
100%		UBC	144,000	96,000	144,000	112,000	64,000
		IBC	320,625	213,750	405,000	202,500	67,500

**Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter:
IBC Use Group R-2 (UBC Group R-1)^{1,2,3}**

		UBC Type of Construction					
		III 1-Hr.	III-N	IV (HT)	V 1-Hr.	V-N	
UBC Single story Unsprinklered Floor Areas		13,500	9,100	13,500	10,500	6,000	
UBC Multi-story Unsprinklered Floor Areas		27,000	18,200	27,000	21,000	12,000	
UBC Single Story Sprinklered Areas		40,500	27,300	40,500	31,500	18,000	
UBC Multi-story Sprinklered Areas		54,000	36,400	54,000	42,000	24,000	
UBC Allowable Stories - Unsprinklered		4	2	4	3	2	
UBC Allowable Stories - Sprinklered		5	2	5	4	2	
		IBC Type of Construction					
		3A	3B	4 (HT)	5A	5B	
IBC Tabular (Unsprinklered) Areas		24,000	16,000	20,500	12,000	7,000	
IBC Allowable Stories		4	4	4	3	2	
<i>IBC Maximum Stories for Increase</i>		3	3	3	3	2	
Unsprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	27,000	Section	27,000	21,000	Section
		IBC	72,000	48,000	61,500	36,000	14,000
	50%	UBC	40,500	Section	40,500	31,500	Section
		IBC	90,000	60,000	76,875	45,000	17,500
	75%	UBC	54,000	Section	54,000	42,000	Section
		IBC	108,000	72,000	92,250	54,000	21,000
	100%	UBC	54,000	Section	54,000	42,000	Section
		IBC	126,000	84,000	107,625	63,000	24,500
Sprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	54,000	Section	54,000	42,000	Section
		IBC	216,000	144,000	184,500	108,000	42,000
	50%	UBC	76,000	Section	76,000	63,000	Section
		IBC	234,000	156,000	199,875	117,000	45,500
	75%	UBC	108,000	Section	108,000	84,000	Section
		IBC	252,000	168,000	215,250	126,000	49,000
	100%	UBC	108,000	Section	108,000	84,000	Section
		IBC	270,000	180,000	230,625	135,000	52,500

**Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter:
IBC Use Group A-3 (UBC Group A-3, Occupant load less than 300)^{1,2,3,4}**

		UBC Type of Construction					
		III 1-Hr.	III-N	IV (HT)	V 1-Hr.	V-N	
UBC Single story Unsprinklered Floor Areas		13,500	9,100	13,500	10,500	6,000	
UBC Multi-story Unsprinklered Floor Areas		27,000	NA	27,000	21,000	NA	
UBC Single Story Sprinklered Areas		40,500	27,300	40,500	31,500	18,000	
UBC Multi-story Sprinklered Areas		54,000	18,200	54,000	42,000	12,000	
UBC Allowable Stories - Unsprinklered		3	1	4	3	1	
UBC Allowable Stories - Sprinklered		4	2	4	4	2	
		IBC Type of Construction					
		3A	3B	4 (HT)	5A	5B	
IBC Tabular (Unsprinklered) Areas		14,000	9,500	15,000	11,500	6,000	
IBC Allowable Stories		3	2	3	2	1	
<i>IBC Maximum Stories for Increase</i>		3	2	3	2	1	
Unsprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	27,000	9,100	27,000	21,000	6,000
		IBC	42,000	19,000	45,000	23,000	6,000
	50%	UBC	40,500	13,650	40,500	31,500	9,000
		IBC	52,500	23,750	56,250	28,750	7,500
	75%	UBC	54,000	18,200	54,000	42,000	12,000
		IBC	63,000	28,500	67,500	34,500	9,000
	100%	UBC	54,000	18,200	54,000	42,000	12,000
		IBC	73,500	33,250	78,750	40,250	10,500
	Sprinklered Building Aggregate Floor Area (square feet)						
	Percent Open Perimeter ¹	25%	UBC	54,000	18,200	54,000	42,000
IBC			126,000	57,000	135,000	69,000	18,000
50%		UBC	81,000	27,300	81,000	63,000	18,000
		IBC	136,500	61,750	146,250	74,750	19,500
75%		UBC	108,000	36,400	108,000	84,000	24,000
		IBC	147,000	66,500	157,500	80,500	21,000
100%		UBC	108,000	36,400	108,000	84,000	24,000
		IBC	157,500	71,250	168,750	86,250	22,500

**Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter:
IBC Use Group A-2 (UBC Group A-2, Occupant load greater than 300)^{1,2,3,4}**

		UBC Type of Construction					
		III 1-Hr.	III-N	IV (HT)	V 1-Hr.	V-N	
UBC Single story Unsprinklered Floor Areas		13,500	N.A.	13,500	10,500	N.A.	
UBC Multi-story Unsprinklered Floor Areas		27,000	N.A.	27,000	21,000	N.A.	
UBC Single Story Sprinklered Areas		40,500	N.A.	40,500	31,500	N.A.	
UBC Multi-story Sprinklered Areas		54,000	N.A.	54,000	42,000	N.A.	
UBC Allowable Stories - Unsprinklered		2	N.A.	2	2	N.A.	
UBC Allowable Stories - Sprinklered		3	N.A.	3	3	N.A.	
		IBC Type of Construction					
		3A	3B	4 (HT)	5A	5B	
IBC Tabular (Unsprinklered) Areas		14,000	9,500	15,000	11,500	6,000	
IBC Allowable Stories		3	2	3	2	1	
<i>IBC Maximum Stories for Increase</i>		3	2	3	2	1	
Unsprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	27,000	N.A.	27,000	21,000	N.A.
		IBC	42,000	19,000	45,000	23,000	6,000
	50%	UBC	40,500	N.A.	40,500	31,550	N.A.
		IBC	52,500	23,750	56,250	28,750	7,500
	75%	UBC	54,000	N.A.	54,000	42,000	N.A.
		IBC	63,000	28,500	67,500	34,500	9,000
	100%	UBC	54,000	N.A.	54,000	42,000	N.A.
		IBC	73,500	33,250	78,750	40,250	10,500
	Sprinklered Building Aggregate Floor Area (square feet)						
	Percent Open Perimeter ¹	25%	UBC	54,000	N.A.	54,000	42,000
IBC			126,000	57,000	135,000	69,000	18,000
50%		UBC	81,000	N.A.	81,000	63,500	N.A.
		IBC	136,500	61,750	146,250	74,750	19,500
75%		UBC	108,000	N.A.	108,000	84,000	N.A.
		IBC	147,000	66,500	157,500	80,500	21,000
100%		UBC	108,000	N.A.	108,000	84,000	N.A.
		IBC	157,500	71,250	168,750	86,250	22,500

**Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter:
IBC Use Group M (UBC Group M)^{1,2,3}**

		UBC Type of Construction					
		III 1-Hr.	III-N	IV (HT)	V 1-Hr.	V-N	
UBC Single story Unsprinklered Floor Areas		18,000	12,000	18,000	14,000	8,000	
UBC Multi-story Unsprinklered Floor Areas		36,000	24,000	36,000	28,000	16,000	
UBC Single Story Sprinklered Areas		54,000	36,000	54,000	42,000	24,000	
UBC Multi-story Sprinklered Areas		72,000	48,000	72,000	56,000	32,000	
UBC Allowable Stories - Unsprinklered		4	2	4	3	2	
UBC Allowable Stories - Sprinklered		5	3	5	4	3	
		IBC Type of Construction					
		3A	3B	4 (HT)	5A	5B	
IBC Tabular (Unsprinklered) Areas		18,500	12,500	20,500	1,400	9,000	
IBC Allowable Stories		4	4	4	3	1	
<i>IBC Maximum Stories for Increase</i>		3	3	3	3	1	
Unsprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	36,000	24,000	36,000	28,000	16,000
		IBC	55,500	37,500	61,500	4,200	9,000
	50%	UBC	54,000	36,000	54,000	42,000	24,000
		IBC	69,375	46,875	76,875	5,250	11,250
	75%	UBC	72,000	48,000	72,000	56,000	32,000
		IBC	83,250	56,250	92,250	6,300	13,500
	100%	UBC	72,000	48,000	72,000	56,000	32,000
		IBC	97,125	65,625	107,625	7,350	15,750
	Sprinklered Building Aggregate Floor Area (square feet)						
	Percent Open Perimeter ¹	25%	UBC	72,000	48,000	72,000	56,000
IBC			166,500	112,500	184,500	12,600	27,000
50%		UBC	108,000	72,000	108,000	84,000	48,000
		IBC	180,375	121,875	199,875	13,650	29,250
75%		UBC	144,000	96,000	144,000	112,000	64,000
		IBC	194,250	131,250	215,250	14,700	31,500
100%		UBC	144,000	96,000	144,000	112,000	64,000
		IBC	208,125	140,625	230,625	15,750	33,750

**Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter:
IBC Use Group 1-2 - 24-hour care to more than 5 children, 2 1/2 years of age or less (UBC Group**

		UBC Type of Construction					
		III 1-Hr.	III-N	IV (HT)	V 1-Hr.	V-N	
UBC Single story Unsprinklered Floor Areas		N.A.	N.A.	N.A.	N.A.	N.A.	
UBC Multi-story Unsprinklered Floor Areas		N.A.	N.A.	N.A.	N.A.	N.A.	
UBC Single Story Sprinklered Areas		6,800	N.A.	6,800	5,200	N.A.	
UBC Multi-story Sprinklered Areas		13,600	N.A.	13,600	10,400	N.A.	
UBC Allowable Stories - Unsprinklered		2	N.A.	2	2	N.A.	
UBC Allowable Stories - Sprinklered		2	N.A.	2	2	N.A.	
See UBC for other exceptions		IBC Type of Construction					
		3A	3B	4 (HT)	5A	5B	
IBC Tabular (Unsprinklered) Areas		12,000	N.A.	12,000	9,500	N.A.	
IBC Allowable Stories		1	N.A.	1	1	N.A.	
<i>IBC Maximum Stories for Increase</i>		<i>1</i>	<i>N.A.</i>	<i>1</i>	<i>1</i>	<i>N.A.</i>	
Unsprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	Not Allowed				
		IBC	12,000	N.A.	12,000	9,500	N.A.
	50%	UBC	Not Allowed				
		IBC	15,000	N.A.	15,000	11,875	N.A.
	75%	UBC	Not Allowed				
		IBC	18,000	N.A.	18,000	14,250	N.A.
	100%	UBC	Not Allowed				
		IBC	21,000	N.A.	21,000	16,625	N.A.
	Sprinklered Building Aggregate Floor Area (square feet)						
	Percent Open Perimeter ¹	25%	UBC	6,800	N.A.	6,800	5,200
IBC			36,000	N.A.	36,000	38,000	N.A.
50%		UBC	10,200	N.A.	10,200	7,800	N.A.
		IBC	39,000	N.A.	39,000	30,875	N.A.
75%		UBC	13,600	N.A.	13,600	10,400	N.A.
		IBC	42,000	N.A.	42,000	33,750	N.A.
100%		UBC	13,600	N.A.	13,600	10,400	N.A.
		IBC	45,000	N.A.	45,000	35,625	N.A.

**Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter:
IBC Use Group A-3 (UBC Group A-1 with stage)**

		UBC Type of Construction					
		III 1-Hr.	III-N	IV (HT)	V 1-Hr.	V-N	
UBC Single-story Unsprinklered Floor Areas		NOT ALLOWED					
UBC Single-story Sprinklered Floor Areas							
UBC Allowable Stories - Unsprinklered							
UBC Allowable Stories - Sprinklered							
		IBC Type of Construction					
		3A	3B	4 (HT)	5A	5B	
IBC Tabular (Unsprinklered) Areas		14,000	9,500	15,000	11,500	6,000	
IBC Allowable Stories		3	2	3	2	1	
IBC Maximum Stories for Increase		3	2	3	2	1	
Unsprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	Not Allowed				
		IBC	42,000	19,000	45,000	23,000	6,000
	50%	UBC	Not Allowed				
		IBC	52,500	23,750	56,250	28,750	7,500
	75%	UBC	Not Allowed				
		IBC	63,000	28,500	67,500	34,500	9,000
	100%	UBC	Not Allowed				
		IBC	73,500	33,250	78,750	40,250	10,500
	Sprinklered Building Aggregate Floor Area (square feet)						
	Percent Open Perimeter ¹	25%	UBC	Not Allowed			
IBC			126,000	57,000	135,000	69,000	18,000
50%		UBC	Not Allowed				
		IBC	136,500	61,750	146,250	74,750	19,500
75%		UBC	Not Allowed				
		IBC	147,000	66,500	157,500	80,500	21,000
100%		UBC	Not Allowed				
		IBC	157,500	71,250	168,750	86,250	22,500

Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter: High IBC Use Group E (UBC Group E-1)^{1,2,3,7}

		UBC Type of Construction						
		III 1-Hr.	III-N	IV (HT)	V 1-Hr.	V-N		
UBC Singlestory sprinklered Floor Areas		20,200	13,500	20,200	15,700	9,100		
UBC Multi-story Sprinklered Areas		40,400	N.A.	40,400	31,400	N.A.		
UBC Allowable Stories - Unsprinklered		N.A.	N.A.	N.A.	N.A.	N.A.		
UBC Allowable Stories - Sprinklered		2	1	2	2	1		
		IBC Type of Construction						
		3A	3B	4 (HT)	5A	5B		
IBC Tabular (Unsprinklered) Areas		23,500	14,500	25,500	18,500	9,500		
IBC Allowable Stories		3	2	3	1	1		
<i>IBC Maximum Stories for Increase</i>		3	2	3	1	1		
Unsprinklered Building Aggregate Floor Area (square feet)								
Percent Open Perimeter ¹	25%	UBC	Not Allowed					
		IBC	70,500	29,000	76,500	18,500	9,500	
	50%	UBC	Not Allowed					
		IBC	88,125	36,250	95,625	23,125	11,875	
	75%	UBC	Not Allowed					
		IBC	105,750	43,500	114,750	27,750	14,250	
	100%	UBC	Not Allowed					
		IBC	123,375	50,750	133,875	32,375	16,625	
	Sprinklered Building Aggregate Floor Area (square feet)							
	Percent Open Perimeter ¹	25%	UBC	40,400	13,500	40,400	31,400	9,100
			IBC	211,500	87,000	229,500	74,000	38,000
		50%	UBC	60,600	20,250	60,600	47,100	13,650
IBC			229,125	94,250	248,625	78,625	40,375	
75%		UBC	80,800	27,000	80,800	62,800	18,200	
		IBC	246,750	101,500	267,750	64,750	33,250	
100%		UBC	80,800	27,000	80,800	62,800	18,200	
		IBC	264,375	108,750	286,875	69,375	35,625	

**Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter:
IBC Use Group S-1 (UBC Group S-1 Moderate Hazard)^{1,2,3,5}**

		IBC Type of Construction					
		III 1-Hr.	III-N	IV (HT)	V 1-Hr.	V-N	
IBC Single story Unsprinklered Floor Areas		18,000	12,000	18,000	14,000	8,000	
IBC Multi-story Unsprinklered Floor Areas		36,000	24,000	36,000	28,000	16,000	
IBC Single Story Sprinklered Areas		54,000	36,000	54,000	42,000	24,000	
IBC Multi-story Sprinklered Areas		72,000	48,000	72,000	56,000	32,000	
IBC Allowable Stories - Unsprinklered		4	2	4	3	2	
IBC Allowable Stories - Sprinklered		5	3	5	4	3	
		IBC Type of Construction					
		3A	3B	4 (HT)	5A	5B	
IBC Tabular (Unsprinklered) Areas		26,000	17,500	25,500	14,000	9,000	
IBC Allowable Stories		3	3	4	3	1	
<i>IBC Maximum Stories for Increase</i>		3	3	3	3	1	
Unsprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	36,000	24,000	36,000	28,000	16,000
		IBC	78,000	52,500	76,500	42,000	9,000
	50%	UBC	54,000	36,000	54,000	42,000	24,000
		IBC	97,500	65,625	95,625	52,500	11,250
	75%	UBC	72,000	48,000	72,000	56,000	32,000
		IBC	117,000	78,750	114,750	63,000	13,500
	100%	UBC	72,000	48,000	72,000	56,000	32,000
		IBC	136,500	91,875	133,875	73,500	15,750
	Sprinklered Building Aggregate Floor Area (square feet)						
	Percent Open Perimeter ¹	25%	UBC	72,000	48,000	72,000	56,000
IBC			234,000	157,500	229,500	126,000	27,000
50%		UBC	108,000	72,000	108,000	84,000	48,000
		IBC	253,500	170,625	248,625	136,500	29,250
75%		UBC	144,000	96,000	144,000	112,000	64,000
		IBC	273,000	183,750	267,750	147,000	31,500
100%		UBC	144,000	96,000	144,000	112,000	64,000
		IBC	292,500	196,875	286,875	157,500	33,750

**Comparison of IBC-UBC Allowable Building Area Based on Percentage of Open Perimeter:
IBC Use Group R-1 (UBC Group R-1)^{1,2,3}**

		UBC Type of Construction ^{4,8}					
		III 1-Hr.	III-N ⁸	IV (HT)	V 1-Hr.	V-N ⁸	
UBC Single story Unsprinklered Floor Areas		13,500	9,100	13,500	10,500	6,000	
UBC Multi-story Unsprinklered Floor Areas		27,000	12,100	27,000	21,000	9,000	
UBC Single Story Sprinklered Areas		40,500	27,300	40,500	31,500	18,000	
UBC Multi-story Sprinklered Areas		54,000	24,200	54,000	42,000	18,000	
UBC Allowable Stories - Unsprinklered		5	2	3	3	2	
UBC Allowable Stories - Sprinklered		5	5	3	3	2	
		IBC Type of Construction					
		3A	3B	4 (HT)	5A	5B	
IBC Tabular (Unsprinklered) Areas		24,000	16,000	20,500	12,000	7,000	
IBC Allowable Stories		4	4	4	3	2	
<i>IBC Maximum Stories for Increase</i>		3	3	3	3	2	
Unsprinklered Building Aggregate Floor Area (square feet)							
Percent Open Perimeter ¹	25%	UBC	27,000	Section	27,000	21,000	Section
		IBC	72,000	48,000	61,500	36,000	14,000
	50%	UBC	40,500	Section	40,500	31,500	Section
		IBC	90,000	60,000	76,875	45,000	17,500
	75%	UBC	54,000	Section	54,000	42,000	Section
		IBC	108,000	72,000	92,250	54,000	21,000
	100%	UBC	54,000	Section	54,000	42,000	Section
		IBC	126,000	84,000	107,625	63,000	24,500
	Sprinklered Building Aggregate Floor Area (square feet)						
	Percent Open Perimeter ¹	25%	UBC	54,000	Section	54,000	42,000
IBC			216,000	144,000	184,500	108,000	42,000
50%		UBC	81,000	Section	81,000	63,000	Section
		IBC	234,000	156,000	199,875	117,000	45,500
75%		UBC	108,000	Section	108,000	84,000	Section
		IBC	252,000	168,000	215,250	126,000	49,000
100%		UBC	108,000	Section	108,000	84,000	Section
		IBC	270,000	180,000	230,625	135,000	52,500