2021 IBC Update
Structural Provisions

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Learning Objectives

- ***The intent of this course is to...***
  1. Highlight some significant changes that have occurred from the 2018 IBC to the current 2021 version.
  2. To understand key changes in relation to the structural provisions of the IBC.
  3. Highlight how these changes will affect enforcement, design, and construction.

2

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Front Matter

3

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Marginal Markings

- ***Solid Vertical Lines:***
  - Indicate a technical change

704.4 Protection of secondary members. Secondary members that are required to have protection to achieve a *fire-resistance rating* shall be protected by individual encasement protection.

International Code Council, 2018 IBC©

704.4 Protection of secondary structural members. *Secondary structural members* that are required to have protection to achieve a *fire-resistance rating* shall be protected by individual encasement protection.

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Marginal Markings

- [➡] Entire section, paragraph, exception or table is deleted

[F] 903.2.4 Group F-1. An *automatic sprinkler system* shall be provided throughout all buildings containing a Group F-1 occupancy where one of the following conditions exists:

1. A Group F-1 *fire area* exceeds 12,000 square feet (1115 m^2).
2. A Group F-1 *fire area* is located more than three stories above *grade plane*.
3. The combined area of all Group F-1 *fire areas* on all floors, including any *mezzanines*, exceeds 24,000 square feet (2230 m^2). ⬅

International Code Council, 2021 IBC©

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Marginal Markings

- [➡] Entire section, paragraph, exception or table is deleted

[F] 903.2.4 Group F-1. An *automatic sprinkler system* shall be provided throughout all buildings containing a Group F-1 occupancy where one of the following conditions exists:

1. A Group F-1 *fire area* exceeds 12,000 square feet (1115 m^2).
2. A Group F-1 *fire area* is located more than three stories above *grade plane*.
3. The combined area of all Group F-1 *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m^2).
4. A Group F-1 occupancy used for the manufacture of upholstered furniture or mattresses exceeds 2,500 square feet (232 m^2).

International Code Council, 2018 IBC©

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Marginal Markings

- [*] Text/table has been relocated
- [**] Location text/table has been relocated

RELOCATIONS	
2021 LOCATION	**2018 LOCATION**
508.5–508.5.11	419.1–419.9
904.12	904.14
904.13	904.12
904.14	904.13
1010.2	1010.1.9
1010.2.1	1010.1.9.6
1010.2.2	1010.1.9.1

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Mass Timber

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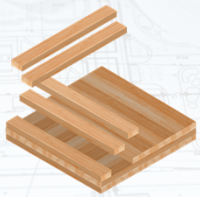
Mass Timber

- ***Cross-Laminated Timber (CLT) is coming…***
  - This is perhaps the biggest change in the 2021 IBC, so let's discuss this first.
  - The 2021 IBC will now allow Mass Timber buildings up to 18-stories and having a height of 270-feet!



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Mass Timber

- ***Let's start with IBC 602.4…***
  - There are now four separate Type IV options:
    - Type IV-HT (Heavy Timber)
    - Type IV-C (CLT – Mostly exposed)
    - Type IV-B (CLT – Mostly protected)
    - Type IV-A (CLT – Completely protected)
  - The American Wood Council has a one-page sheet providing a comparison between each:

https://awc.org/pdf/tmt/TMT-TypeofConstructionComparison-180316.pdf

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Mass Timber

- ***Added Requirements***
  - Added requirements to ***IBC Table 601***
  - Added allowable height, story, and area provisions to ***IBC Tables 504.3***, ***504.4***, and ***506.2***.
  - Added a definition of "Mass Timber" and "Noncombustible Protection" to Chapter 2.
  - Added new code inspection requirement for a "***Connection Protection Inspection***" in IBC 110.3.5.

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Mass Timber

- ***Fire barrier separations*** within Type IV-B and IV-C shall have ½-inch gypsum separation on the interior of the building per IBC 508.4.4.1 and 509.4.1.1.
- IBC 703.6 and 703.7 provide ***testing*** and ***sealing*** requirements for intersections and abutting edges.
- Added exterior wall ratings for Type IV-A and IV-B to ***IBC Table 705.5***.

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Mass Timber

- Added ***prescriptive*** fire-resistance requirements for Mass Timber to IBC 722.7.
- Added ***special inspection*** requirements via IBC Table 1705.5.2.
- IBC 2304.10.1 lists how mass timber ***connection protection*** can be approved via testing or engineering calculations.
- IBC 403.3.2 adds Type IV-A and IV-B buildings > 120-feet to the ***redundant water supply*** requirement.
- ***There is a lot to study on Mass Timber!***

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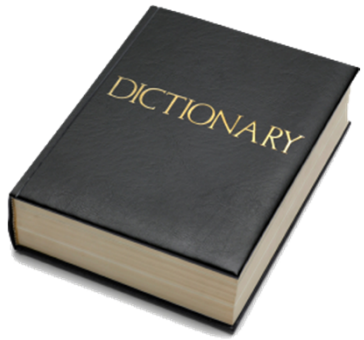
IBC Chapter 2



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Dangerous

- ***IBC 202: Dangerous***
  - Clarified loads to be considered...
  - Previously noted *"service"* loads
  - Now lists permanent, routine, or frequent loads in addition to...
  - Snow, wind, rain, flood, earthquake or other environmental loads.

REVISED

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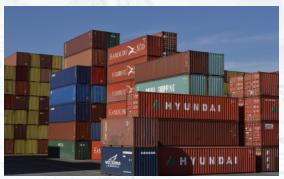
Shipping Container

- ***IBC 202: Intermodal Shipping Container***
  - *"A six-sided steel unit originally constructed as a general cargo container used for the transport of goods and materials."*



ADDED

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Mass Timber

- ***IBC 202: Mass Timber***
  - *"Structural elements of Type IV construction primarily of solid, built-up, panelized or engineered wood products that meet minimum cross-section dimensions of Type IV construction."*

ADDED

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Mechanical-Access

- ***IBC 202: Mechanical-Access Open Parking Garage***
  - *"An enclosed parking garage that employs parking machines, lifts, elevators or other mechanical devices for vehicle moving from and to street level and in which public occupancy in the garage is prohibited in all areas except the vehicle access bay."*

ADDED

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Noncombustible Protection

- ***IBC 202: Noncombustible Protection (For Mass Timber)***
  - *"Noncombustible material, in accordance with Section 703.6, designed to increase the fire-resistance rating and delay the combustion of mass timber."*

ADDED

19

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Truss Bracing **ADDED**

- ***IBC 202: Permanent Individual Truss Member Restraint (PITMR)***
  - *"Restraint that is used to prevent local buckling of an individual truss chord or web member because of the axial forces in the individual truss member."*
- ***IBC 202: Permanent Individual Truss Member Diagonal Bracing (PITMDB)***
  - *"Structural member or assembly intended to permanently stabilize the PITMRs."*

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Storage Racks

- ***IBC 202: Storage Racks, Steel Cantilevered***
  - *"…primarily in the form of vertical columns, extended bases, horizontal arms projecting from the faces of the columns, and longitudinal (down-aisle) bracing between columns. …"*

ADDED

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Underpinning

- ***IBC 202: Underpinning***
  - *"The alteration of an existing foundation to transfer loads to a lower elevation using new piers, piles or other permanent structural support elements installed below the existing foundation."*
  - Noted several times in Chapter 18 when excavating near existing foundations.
  - IBC 1804.2.1 requires sequencing of the underpinning.

ADDED

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IBC Chapter 6

Combustible

Non-Combustible

- **Type V** Combustible Construction
- **Type IV** Heavy Timber Construction
- **Type III** Non-Combustible Exterior
- **Type II** Non-Combustible Exterior and Components
- **Type I** Non-Combustible Materials and Structure

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Table 601 REVISED

TABLE 601
FIRE-RESISTANCE RATING REQUIREMENTS FOR BUILDING ELEMENTS (HOURS)

BUILDING ELEMENT	TYPE I		TYPE II		TYPE III		TYPE IV				TYPE V	
	A	B	A	B	A	B	A	B	C	HT	A	B
Primary structural frame[f] (see Section 202)	3[a, b]	2[a, b, c]	1[b, c]	0[c]	1[b, c]	0	3[a]	2[a]	2[a]	HT	1[b, c]	0
Bearing walls												
Exterior[e, f]	3	2	1	0	2	2	3	2	2	2	1	0
Interior	3[a]	2[a]	1	0	1	0	3	2	2	1/HT[g]	1	0
Nonbearing walls and partitions Exterior	See Table 705.5											
Nonbearing walls and partitions Interior[d]	0	0	0	0	0	0	0	0	0	See Section 2304.11.2	0	0
Floor construction and associated secondary structural members (see Section 202)	2	2	1	0	1	0	2	2	2	HT	1	0
Roof construction and associated secondary structural members (see Section 202)	1 1/2[b]	1[b, c]	1[b, c]	0[c]	1[b, c]	0	1 1/2	1	1	HT	1[b, c]	0

For SI: 1 foot = 304.8 mm.
a. Roof supports: Fire-resistance ratings of primary structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.
b. Except in Group F-1, H, M and S-1 occupancies, fire protection of structural members in roof construction shall not be required, including protection of primary structural frame members, roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below. Fire-retardant-treated wood members shall be allowed to be used for such unprotected members.
c. In all occupancies, heavy timber complying with Section 2304.11 shall be allowed for roof construction, including primary structural frame members, where a 1-hour or less fire-resistance rating is required.
d. Not less than the fire-resistance rating required by other sections of this code.
e. Not less than the fire-resistance rating based on fire separation distance (see Table 705.5).
f. Not less than the fire-resistance rating as referenced in Section 704.10.
g. Heavy timber bearing walls supporting more than two floors or more than a floor and a roof shall have a fire resistance rating of not less than 1 hour.

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Type IV Construction

- ***IBC 602.4: Type IV***
  - Building elements are mass timber
  - Fire-resistance ratings per Table 601
  - Types IV-A, IV-B or IV-C have noncombustible protection applied directly to mass timber
  - CLT → labeled per ANSI/APA PRG 320
  - Concealed spaces are not permitted

ADDED / REVISED

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Type IV Construction

- ***IBC 602.4: Type IV***
  - Interior exits & elevator shaft enclosures for high-rise buildings:
    - Up to 12 stories or 180-feet → Interior protection for IV-A
    - If > 12 stories or 180-feet → Noncombustible
  - Detailed provisions for IV-A, IV-B, IV-C & IV-HT

ADDED

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FRT Wood Sheathing

- ***IBC 603.1: Type I and II***
  - The use of FRTW is no longer permitted for…
  - ***2-hour non-bearing partitions*** that create shaft enclosures, in…
  - Group I-2 or Group B ambulatory care facilities.
  - This conforms with the applicable Federal Standards and CMS enforcement rules.

REVISED

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IBC Chapter 7

Fire & Smoke Protection Features

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Fire Resistance

- ***IBC 703.7: Sealing of Adjacent Mass Timber Elements***
  - Required in IV-A, IV-B or IV-C
  - Adhesive that resists the passage of air
  - Identical in construction, loading & materials
  - At abutting panel edges and intersections
  - ASTM C920 or ASTM D3498

ADDED

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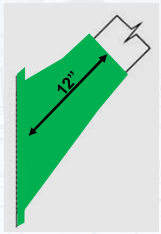
Fireproofing

- ***IBC 704.6.1: Secondary Attachments to Structural Members***
  - If primary or secondary steel is required to be protected, ***secondary steel attachments*** must also be protected for ***12-inches beyond*** the structural member.



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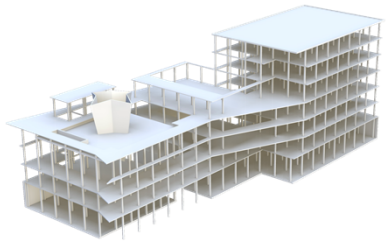

IBC Chapter 16

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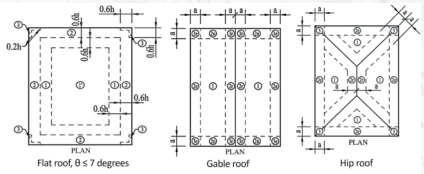
Wind Data

- ***IBC 1603.1.4: Wind Design Data***
  - Requires the component and cladding loads to be specified on the plans if…
  - Not included in design by EOR.
  - Now must list applicable zones & dimensions.

REVISED



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Risk Category

- ***IBC Table 1604.5: Risk Category***
  - Assemblies:
    - ***Primary Occupancy*** and overall building has > 300 occupants → Risk Category III
    - ***ADDED:*** Multiple assembly spaces, each > 300 occupants, and combined occupant load > 2,500 → Risk Category III
  - ***Day Care:*** Added to Group E requirement, if ***> 250*** occupants → Risk Category III

REVISED

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Load Combinations

- ***IBC 1605: Load Combinations***
  - The IBC now simply refers to Chapter 2 of ASCE 7 for applicable strength or allowable stress design (ASD) load combinations.
  - The alternative ASD load combinations are still included in IBC 1605.2.

REVISED

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Dead Loads

- ***IBC 1606: Dead Loads***
  - Clarifies what should be considered as dead load at the roof.
  - Materials, fixed-service equipment, PV arrays, and vegetative roofs.
  - Added PV considerations.
  - Added vegetative roof considerations.

Livingroofs.org, "Biosolar Green Roofs – Combining Solar Panels and Green Roofs"

ADDED

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Live Loads

Added reference to other IBC Sections

- ***IBC Table 1607.1: Live Loads***

TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS

	OCCUPANCY OR USE		UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
1.	Apartments (see residential)		—	—	—
2.	Access floor systems	Office use	50	2,000	—
		Computer use	100	2,000	—
3.	Armories and drill rooms		150[f]	—	—
4.	Assembly areas	Fixed seats (fastened to floor)	60[e]	—	—
		Follow spot, projections and control rooms	50		
		Lobbies	100[e]		
		Movable seats	100[e]		
		Stage floors	150[f]		
		Platforms (assembly)	100[e]		
		Bleachers, folding and telescopic seating and grandstands	100[e] (See Section 1607.19)		
		Stadiums and arenas with fixed seats (fastened to the floor)	60[e] (See Section 1607.19)		
		Other assembly areas	100[e]		
5.	Balconies and decks		1.5 times the live load for the area served, not required to exceed 100	—	—

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Live Loads

Previously under "Recreational Uses"

❑ ***IBC Table 1607.1: Live Loads***

TABLE 1607.1
MINIMUM UNIFORMLY DISTRIBUTED LIVE LOADS, L_o, AND MINIMUM CONCENTRATED LIVE LOADS

	OCCUPANCY OR USE		UNIFORM (psf)	CONCENTRATED (pounds)	ALSO SEE SECTION
1.	Apartments (see residential)		—	—	—
2.	Access floor systems	Office use	50	2,000	—
		Computer use	100	2,000	—
3.	Armories and drill rooms		150[b]	—	—
4.	Assembly areas	Fixed seats (fastened to floor)	60[e]	—	—
		Follow spot, projections and control rooms	50		
		Lobbies	100[e]		
		Movable seats	100[e]		
		Stage floors	150[b]		
		Platforms (assembly)	100[e]		
		Bleachers, folding and telescopic seating and grandstands	100[e] (See Section 1607.19)		
		Stadiums and arenas with fixed seats (fastened to the floor)	60[e] (See Section 1607.19)		
		Other assembly areas	100[e]		
5.	Balconies and decks		1.5 times the live load for the area served, not required to exceed 100	—	—

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Live Loads

ADDED

❑ Most footnotes removed and new Sections created at end of IBC 1607.

- IBC 1607.19: Seating for Assembly Areas
- IBC 1607.20: Sidewalks, Vehicular Driveways and Yards Subject to Trucking
- IBC 1607.21: Stair Treads
- IBC 1607.22: Residential Attics

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Live Loads

❑ ***IBC 1607.7: Passenger Vehicle Garages***

- You can use the values in IBC Table 1607.1, or…
- ***Passenger vehicles*** = 3,000# uniform load acting on an area of 4.5" x 4.5"
  - Limited to 9 passengers
- ***Mechanical parking structures*** = 2,250# per wheel
  - Structures without a slab/deck

ADDED

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Fixed Ladders

❑ ***IBC 1607.17: Fixed Ladders***

- Added fixed ladder provisions to IBC 1607.7.
- Concentrated Load = ***300# per rung***

ADDED

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Snow Loads

- ***IBC Figure 1608.2(1-2): Ground Snow Loads***
  - Now matches Figures in ASCE 7-16

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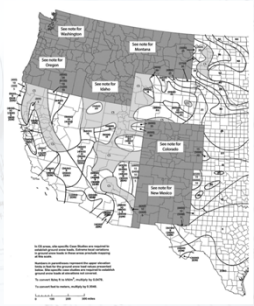

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Soil Loads

- ***IBC 1610: Soil Loads & Hydrostatic Pressure***
  - Previously entitled "Soil Lateral Loads"
  - Added ***IBC 1610.2***…
  - Basement floors, slabs-on-ground, foundations, etc. are now required to be designed for hydrostatic pressure and uplift from expansive soils.

REVISED

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IBC Chapter 17

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Observations

- ***IBC 1704.6: Structural Observations***
  - Clarified that:
    - *"…shall visually observe representative locations of structural systems, details and load paths for general conformance to the approved construction documents."*
  - Revised to now require for…
    - ***Risk Category III*** or IV structures

REVISED

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Precast Concrete

- ***IBC Table 1705.3: Concrete Construction***
  - Now requires continuous inspection of precast diaphragm connections in SDC 'C-F', and installation tolerances per ACI 550.5.

REVISED

TABLE 1705.3
REQUIRED SPECIAL INSPECTIONS AND TESTS OF CONCRETE CONSTRUCTION

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]	IBC REFERENCE
11. For precast concrete diaphragm connections or reinforcement at joints classified as moderate or high deformability elements (MDE or HDE) in structures assigned to Seismic Design Category C, D, E or F, inspect such connections and reinforcement in the field for:				
a. Installation of the embedded parts	X	—	ACI 318: 26.13.1.3	—
b. Completion of the continuity of reinforcement across joints.	X	—	ACI 550.5	
c. Completion of connections in the field.	X	—		
12. Inspect installation tolerances of precast concrete diaphragm connections for compliance with ACI 550.5.	—	X	ACI 318: 26.13.1.3	—

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Mass Timber

ADDED

- ***IBC 1705.5.3: Mass Timber Const.***
  - Now requires special inspections for Types IV-A, IV-B & IV-C per Table 1705.5.3…

TABLE 1705.5.3
REQUIRED SPECIAL INSPECTIONS OF MASS TIMBER CONSTRUCTION

TYPE		CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION
1.	Inspection of anchorage and connections of mass timber construction to timber deep foundation systems.	—	X
2.	Inspect erection of mass timber construction.	—	X
3.	Inspection of connections where installation methods are required to meet design loads.		
	Threaded fasteners: Verify use of proper installation equipment.	—	X
	Threaded fasteners: Verify use of pre-drilled holes where required.	—	X
	Threaded fasteners: Inspect screws, including diameter, length, head type, spacing, installation angle and depth.	—	X
	Adhesive anchors installed in horizontal or upwardly inclined orientation to resist sustained tension loads.	X	—
	Adhesive anchors not defined in preceding cell.	—	X
	Bolted connections.	—	X
	Concealed connections.	—	X

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Deep Foundations

- ***IBC 1705.10: Structural Integrity of Deep Foundation Elements***
  - Whenever there is reasonable doubt… an engineering assessment shall be required.
  - Shall include tests in accordance with…
    - ASTM D4945
    - ASTM D5882
    - ASTM D6760
    - ASTM D7949
    - Or other approved method

ADDED

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Storage Racks

- ***IBC 1705.13.7: Storage Racks***
  - Clarified that it applies to both steel ***storage racks*** and steel ***cantilevered storage racks.***
  - Added IBC Table 1705.13.7:

TABLE 1705.13.7
REQUIRED INSPECTIONS OF STORAGE RACK SYSTEMS

TYPE	CONTINUOUS INSPECTION	PERIODIC INSPECTION	REFERENCED STANDARD	IBC REFERENCE
1. Materials used, to verify compliance with one or more of the material test reports in accordance with the approved construction documents.	—	X	—	—
2. Fabricated storage rack elements.	—	X	—	Section 1704.2.5
3. Storage rack anchorage installation.	—	X	ANSI/MH16.1 Section 7.3.2	—
4. Completed storage rack system, to indicate compliance with the approved construction documents.	—	X	—	—

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Penetrations

- ***IBC 1705.18: Fire-resistant Penetrations***
  - Previously high-rise or Risk Category III or IV were the only to require these inspections.
  - Now includes ***Group R*** if ***> 250 occupants***.

REVISED

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Mass Timber

- ***IBC 1705.20: Sealing of Mass Timber***
  - Periodic inspection of sealants or adhesives applied to mass timber elements.
  - In accordance with approved construction documents.

ADDED

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Impact Protection

- ***IBC 1709.5.3: Windborne Debris Protection***
  - New glazing standards for windborne debris regions.
  - Testing by an "approved" testing agency:
    - ***Impact resistance*** per ASTM E1886/ASTM E1996
    - ***Wind pressure*** per ASTM E339
  - Labeling:
    - Must list manufacturer, product designation, performance characteristics, and approved inspection agency.

ADDED

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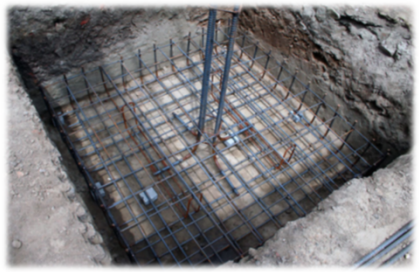
IBC Chapter 18



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Retaining Walls

- ***IBC 1807.2.4: Segmental Retaining Walls***
  - Requires conformance with ASTM C1372

ADDED

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Lateral Soil Loads

- ***IBC 1809.5.1: Frost Protection at Exits***
  - Frost protection required at landings of required exits.
  - Must be provided so as not to impeded outward swinging exit doors.

ADDED

"Frost Heaves", by Lori Greene, February 25, 2015, https://idighardware.com

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Precast Piles

- ***IBC 1810.3.8: Precast Concrete Piles***
  - Now simply refers to ***ACI 318-19***.
  - ***Two exceptions*** are included to revise ACI 318 spiral or hoop requirements in SDC 'C-F'.

REVISED

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IBC Chapter 19

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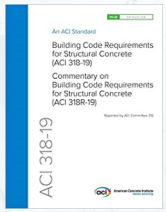
ACI 318-19

- ***IBC 1901.2: Plain & Reinforced Concrete***
  - Now references the 2019 version of ***ACI 318***
  - Several items ***removed*** from this chapter as the information is now simply located within ACI 318.

UPDATED STANDARD



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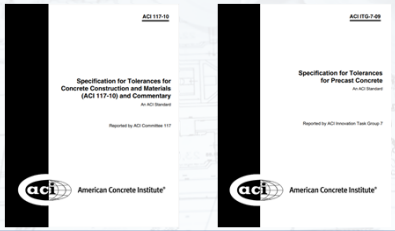
Tolerances

- ***IBC 1901.7: Tolerances for Structural Concrete***
  - Now refers to ACI 117 for cast-in-place, and…
  - ACI ITG-7 for precast tolerances.



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Terminology

- ***IBC 1902: Coordination of Terminology***
  - While "Definitions" are included in Chapter 2, this new section clarifies terms used in both the IBC and ACI 318.
  - Design Displacement (IBC 1902.1.1)
  - Special Structural Wall (IBC 1902.1.2)

ADDED

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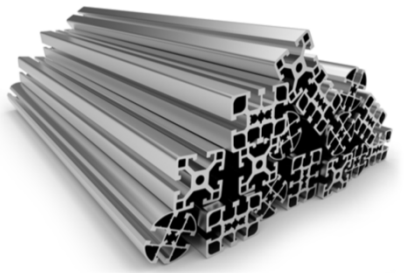
IBC Chapter 20



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ADM - 2020

UPDATED STANDARD

- ***IBC 2002.1: General***
  - Now references the 2020 version of ***AA ADM***
  - Change include:
    - Weld-affected tensile strengths
    - Pull-out strength of screw chases
    - Changes to flexural strength checks
    - Many, many more!

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IBC Chapter 21

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Adobe Construction

- ***IBC 2109.2.4.8: Exterior Finish***
  - Clarified to allow plaster as an exterior finish.
  - Differing requirements are provided for cement-lime, lime, and clay plaster.

"Earth Plaster for Strawbale and Adobe Homes", https://www.buildingwithawareness.com

REVISED

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IBC Chapter 22

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Design Standards

- ***Steel Joists & Girders***
  - SJI 100-20
- ***Cold-Formed***
  - AISI S202-20
  - AISI S220-20
  - AISI S230-19
  - AISI S240-20
  - AISI S400-20

UPDATED STANDARDS

https://steeljoist.org/ansi/

https://cfsei.memberclicks.net/free-publications

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ACI 358

- ***IBC 2205.2.1: Structural Steel SFRS***
  - ***SDC "B & C"*** now requires ***prequalified*** moment connections for…
  - ***Special*** or ***intermediate*** moment frames per…
    - Sections K1 or K2 of AISC 341, or…
    - Per AISC 358
  - Also required for SDC "D-F", but this was already inherently required.

REVISED

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Storage Racks

- ***IBC 2209.3: Certification***
  - Added requirements for racks ≥ 8-feet, and…
  - Located within SDC 'D-F'…
  - To provide a ***certificate of compliance*** to…
  - The owner?

ADDED

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IBC Chapter 23

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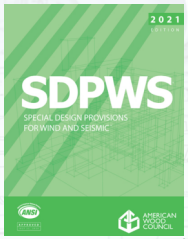
Design Standards

- ***ASD or LRFD Design***
  - 2021 version of ANSI/AWC SDPWS



American Wood Council, 2021 AWC SDPWS©

View-only:
http://www.awc.org/codes-standards/publications

UPDATED STANDARDS

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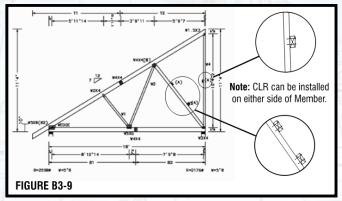
Truss Bracing

- ***IBC 2303.4.1.2: PITMR & PITMDB***
  - ***PITMR*** = Permanent Individual Truss Member Restraint
  - ***PITMDB*** = Permanent Ind. Truss Member Diagonal Bracing
  - Truss design drawings call for PITMR as shown…



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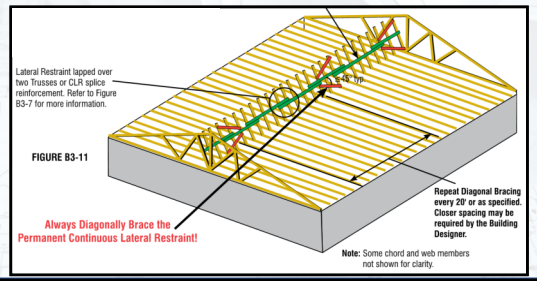
Truss Bracing

- ***IBC 2303.4.1.2: PITMR & PITMDB***
  - Diagonal bracing (PITMDB) at each PITMR in "***red***"



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Truss Bracing

- ***IBC 2303.4.1.2: PITMR & PITMDB***
  - When the truss plans call for PITMR, it must be provided by one of following…

1. PITMR & PITMDB shall be provided using standard industry lateral restraint and diagonal bracing details ***per TPI***, ***accepted engineering practice***, or ***Figures 2303.4.1.2(1), (3), and (5)***.
2. Buckling reinforcement is added to individual truss ***per truss drawings***, or ***per Figures 2303.4.1.2 (2) and (4)***.
3. ***Project-specific*** PITMR and PITMDB design by EOR.

ADDED

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Truss Bracing

- ***IBC – Option #1(a): One Row***

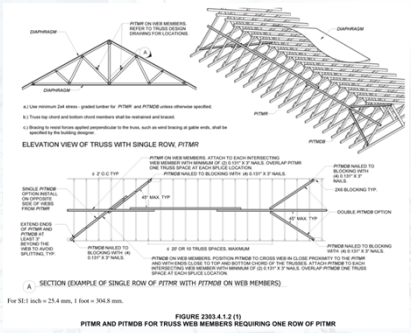

FIGURE 2303.4.1.2 (1)
PITMR AND PITMDB FOR TRUSS WEB MEMBERS REQUIRING ONE ROW OF PITMR

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Truss Bracing

- ***IBC – Option #1(b):Two Rows***

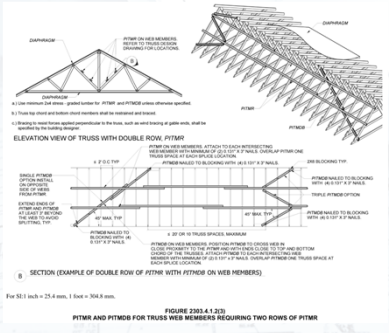

FIGURE 2303.4.1.2(3)
PITMR AND PITMDB FOR TRUSS WEB MEMBERS REQUIRING TWO ROWS OF PITMR

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Truss Bracing

- ***IBC – Option #1(c): Piggyback Bracing***

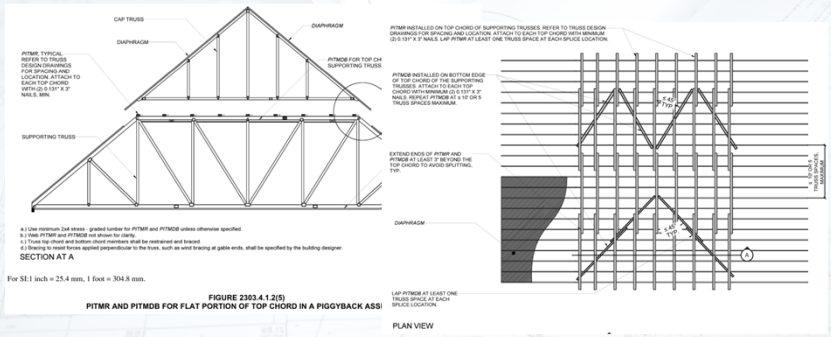

FIGURE 2303.4.1.2(5)
PITMR AND PITMDB FOR FLAT PORTION OF TOP CHORD IN A PIGGYBACK ASSI

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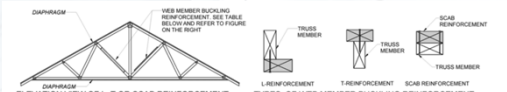
Truss Bracing

- ***IBC – Option #2(a): One Row***



NUMBER OF ROWS OF PITMR SPECIFIED ON WEB MEMBER	SIZE OF TRUSS WEB	TYPE AND SIZE OF WEB REINFORCEMENT[1] FOR T, L OR SCAB[2]	GRADE OF WEB REINFORCEMENT	MINIMUM LENGTH OF WEB REINFORCEMENT	MINIMUM CONNECTION OF WEB REINFORCEMENT TO WEB
ONE	2x4	2x4	Same species and grade or better than web member	90% of web or extend to within 6" of end of web member, whichever is greater	(0.131" x 3") nails at 6" on-center[3]
	2x6	2x6			
	2x8	2x8			

[1]Maximum allowable web length is 14'
[2]Attach Scab reinforcement to web with two rows of minimum 0.131" x 3" nails at 6" on-center

For SI:1 inch - 25.4 mm, 1 foot = 304.8 mm.

FIGURE 2303.4.1.2(2)
ALTERNATIVE INSTALLATION USING BUCKLING REINFORCEMENT FOR TRUSS WEB MEMBERS IN LIEU OF ONE ROW OF PITMR

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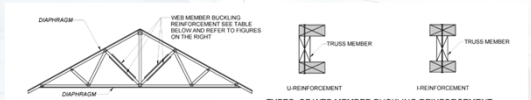
Truss Bracing

- *IBC – Option #2(b): Two Rows*



ELEVATION VIEW OF I OR U REINFORCEMENT

TYPES OF WEB MEMBER BUCKLING REINFORCEMENT

a.) Truss top chord and bottom chord members shall be restrained and braced.

b.) Bracing to resist forces applied perpendicular to the truss, such as wind bracing at gable ends, shall be specified by the building designer.

c.) Use the table below unless project specific web member reinforcement is provided on the truss design drawing or supplemental truss buckling reinforcement details are provided by the truss designer.

NUMBER OF ROWS OF PITMR SPECIFIED ON WEB MEMBER	SIZE OF TRUSS WEB	TYPE AND SIZE OF WEB FOR I OR U REINFORCEMENT*	GRADE OF WEB REINFORCEMENT	MINIMUM LENGTH OF WEB REINFORCEMENT	MINIMUM CONNECTION OF WEB REINFORCEMENT TO WEB
TWO	2x4	(2) -2x4	Same species and grade or better than web member	90% of web or extend to within 6" of end of web member, whichever is greater	(0.131" x 3") nails at 6" on-center
	2x6	(2) -2x6			
	2x8	(2) -2x8			

*Maximum allowable web length is 14'

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

FIGURE 2303.4.1.2(4)
ALTERNATIVE INSTALLATION USING BUCKLING REINFORCEMENT FOR TRUSS WEB MEMBERS IN LIEU OF TWO ROWS OF PITMR

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Fasteners

- *IBC 2304.10.1: Connection Fire-Resistance Rating*
  - For Type IV-A, IV-B & IV-C shall be determined by…

1. Testing (per IBC 703.2)
2. Engineering analysis
   - Avg. temperature rise = 250 degrees
   - Max. temperature rise = 325 degrees

ADDED

78

78

Fasteners

- *IBC Table 2304.10.2: Fastening Schedule*
  - **Sheathing Fasteners** → Tighter spacing required in several instances
  - Examples:
    - **Item 30** *(3/8"-1/2")*: 8d common → was 6:12, now 6:6
    - **Item 31** *(19/32"-3/4")*: 8d common → was 6:12, now 6:6
  - Added footnotes e, f & g
    - Wind speed limitations for select connections
    - Nails and staples assume carbon steel complying wit ASTM F1667, other connections or materials shall follow acceptable engineering practice.

REVISED

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Balconies

- *IBC 2304.12.2.5: Ventilation*
  - This applies to balconies and elevated walking surfaces. It states as follows…
  - *"Enclosed framing in exterior balconies and elevated walking surfaces that have* ***weather-exposed surfaces*** *shall be provided with openings that provide a net free cross-ventilation area not less than 1/150 of the area of each separate space."*

ADDED

80

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ASD Standards

- *IBC Table 2306.1: Standards for Design and Construction of Wood Elements in Structures Using Allowable Stress Design*

ADDED

TABLE 2306.1
STANDARDS FOR DESIGN AND CONSTRUCTION OF WOOD ELEMENTS IN STRUCTURES USING ALLOWABLE STRESS DESIGN

STANDARDS PROMULGATOR	STANDARD	TITLE
American Wood Council		
	ANSI/AWC NDS	National Design Specification for Wood Construction
	SDPWS	Special Design Provisions for Wind and Seismic
American Society of Agricultural and Biological Engineers		
	ASABE EP 484.3	Diaphragm Design of Metal-clad, Wood-Frame Rectangular Buildings
	ASABE EP 486.3	Shallow Post and Pier Foundation Design
	ASABE EP 559.1	Design Requirements and Bending Properties for Mechanically Laminated Wood Assemblies
APA—The Engineered Wood Association		
		Standard Specifications for Structural

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Rafter Ties

- *IBC Table 2308.7.3.1: Rafter Tie Connections*
  - Changed spans, spacing & connections reduced

TABLE 2308.7.3.1
RAFTER TIE CONNECTIONS[1]

RAFTER SLOPE	TIE SPACING (inches)	LIVE LOAD ONLY[2]			GROUND SNOW LOAD (pounds per square foot)					
					30 pounds per square foot			50 pounds per square foot		
		Roof span (feet)								
		12	24	36	12	24	36	12	24	36
		Required number of 16d common (3½" x 0.162") nails per connection[3, 4, 5, 6, 7, 8]								
3:12	12	3	5	8	3	6	9	5	9	13
	16	4	7	10	4	8	12	6	12	17
	19.2	4	8	12	5	10	14	7	14	21
	24	5	10	15	6	12	18	9	17	26
	32	7	13	20	8	16	24	12	23	34
	48	10	20	29	12	24	35	17	34	51

REVISED

TABLE 2308.7.3.1
RAFTER TIE CONNECTIONS[1]

RAFTER SLOPE	TIE SPACING (inches)	NO SNOW LOAD				GROUND SNOW LOAD (pound per square foot)							
						30 pounds per square foot				50 pounds per square foot			
		Roof span (feet)											
		12	20	28	36	12	20	28	36	12	20	28	36
		Required number of 16d common (3½" x 0.162") nails[3, 4, 5, 6, 7, 8] per connection[3, 4, 5, 6, 7]											
3:12	12	4	6	8	10	4	6	8	11	5	8	12	15
	16	5	7	10	13	5	8	11	14	6	11	15	20
	24	7	11	15	19	7	11	16	21	9	16	23	30
	32	10	14	19	25	10	16	22	28	12	27	30	40
	48	14	21	29	37	14	32	36	42	18	32	46	60

82

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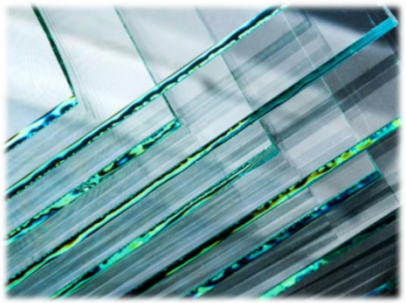
IBC Chapter 24



83

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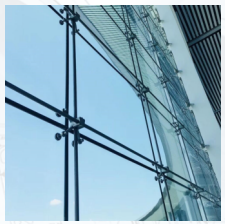
Glass Supports

- *IBC 2403.3: Glass Framing*
  - Revised to match requirements of IBC 1604.3.7
  - Deflection of glass support members is limited to…
    - l/175 for members ≤ 13'-6"
    - l/240 + ¼ inch for members > 13'-6"

REVISED



Alibaba.com, "Exterior buildings glass curtain wall system aluminum point support spider glass curtain wall"

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IBC Chapter 31

Yurts of Hawai'i, Mountainside Yurt, www.yurtsofhawaii.com

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Shipping Containers

- ***IBC 3115: Intermodal Shipping Containers***
  - Applies to shipping containers that are repurposed for use as buildings or structures.
  - Several exceptions → Very common to use these for relocatable buildings, ESS, hydrogen fueling, etc.

ADDED

86

86

Shipping Containers

- ***IBC 3115: Intermodal Shipping Containers***
  - Requirements provided for…
    - Construction documents
    - Data plate information
    - Health & safety
    - Fire-resistance
    - Structural

ADDED

87

87

Construction Safety Management, www.construction-safety-management.com

IBC Chapter 33

88

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Adjoining Property

ADDED

- ***IBC 3307.2: Excavation Retention Systems***
  - Retention systems are finally addressed in the code!
  - Clarifies the following:
    - Requires licensed design professional and shall consider both vertical and lateral loads.
    - Monitoring of the system and adjacent structures for both horizontal and vertical movement.
    - Should not be removed unless adequate support exists.

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Appendices

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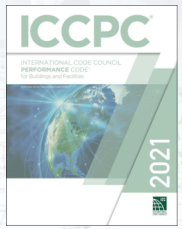
Appendix O

- ***Performance-Based Application***
  - Adds the use of the ICC Performance Code as an allowed alternate means and methods.

ADDED



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Any Questions?

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