TYPES OF CONSTRUCTION

Chapter 6 covers five construction types which prescribe the fire-resistance rating of buildings and structures erected or to be erected, altered or extended in height or area.

Fire Resistance

Fire resistance prevents spread of fire from:

- One building to another
- One area to another
- One floor to another

It is defined through ASTM (American Society for Testing and Materials) E 119 Standard Test Methods for Fire Tests of Building Construction and Materials.

Non-Combustible

Non-combustible material is that of which no part will ignite and burn when subjected to fire, meets criteria of ASTM Standard E 136.

Combustible

Combustible material is that which is not non-combustible and is capable of undergoing combustion or burning.

Passive Fire Resistance

Passive fire resistance is based on construction of materials and assemblies which are expected to withstand exposure to fire without collapsing or exceeding certain temperature on side opposite the one of the fire location.

Active Fire Resistance

Active fire resistance is based on fire detection systems and sprinkler systems working in conjunction.

Major Building Elements

- Structural Frame
- Bearing Walls – Exterior and Interior
- Non-bearing Walls – Exterior and Interior
- Floor Construction
- Roof Construction

Fire Separation Distance

Fire separation distance is determined as distance to lot line, distance to centerline of public way or half of distance between buildings on the same site (unless they are treated as one building).

Type I Construction

Type I is the most restrictive type of construction using non-combustible materials and passive fire protection.

Type II Construction

Type II type of construction is using non-combustible materials and active fire protection.

Type III Construction

Type III type of construction is using non-combustible materials for the exterior and combustible materials for the interior construction.

Type IV Construction

Type IV type of construction is using heavy timber construction with non-combustible exterior.

Type V Construction

Type V is the least restrictive type of construction using any construction materials.

Type A and B Subdivisions

Type A subdivision provides higher level of protection while type B allows for lower level of protection.

SECTION 602 CONSTRUCTION CLASSIFICATION

602.1 General.

Buildings and structures erected or to be erected, altered or extended in height or area shall be classified in one of the five construction types defined in Sections 602.2 through 602.5. The building elements shall have a fire-resistance rating not less than that specified in Table 601 and exterior walls shall have a fire-resistance rating not less than that specified in Table 602.

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[e]	B	A[e]	B	HT	A[e]	B
Structural frame[a]	3[b]	2[b]	1	0	1	0	HT	1	0
Bearing walls									
Exterior[g]	3	2	1	0	2	2	2	1	0
Interior	3[b]	2[b]	1	0	1	0	1/HT	1	0
Nonbearing walls and partitions Exterior	See Table 602								
Nonbearing walls and partitions Interior[f]	0	0	0	0	0	0	See Section 602.4.6	0	0
Floor construction Including supporting beams and joists	2	2	1	0	1	0	HT	1	0
Roof construction Including supporting beams and joists	1½[c]	1[c, d]	1[c, d]	0[d]	1[c, d]	0[d]	HT	1[c, d]	0

For SI: 1 foot = 304.8 mm.

a. The structural frame shall be considered to be the columns and the girders, beams, trusses and spandrels having direct connections to the columns and bracing members designed to carry gravity loads. The members of floor or roof panels which have no connection to the columns shall be considered secondary members and not a part of the structural frame.
b. Roof supports: Fire-resistance ratings of structural frame and bearing walls are permitted to be reduced by 1 hour where supporting a roof only.
c1. Except in high-rise buildings, Group A, E, F-1, H, I, L, M, R-1, R-2 and S-1 occupancies, fire protection of structural members shall not be required, including protection of 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.
c2. For high-rise buildings, Group A, E, I, L, R-1 and R-2 occupancies and other applications listed in Section 111 regulated by the Office of the State Fire Marshal, fire protection of members other than the structural frame shall not be required, including protection of roof framing and decking where every part of the roof construction is 20 feet or more above any floor immediately below.
c3. One-story portions of Group A and E assembly occupancies the roof-framing system

of Type II A or Type III A construction may be of unprotected construction when such roof-framing system is open to the assembly area and does not contain concealed spaces.
d. In all occupancies, heavy timber shall be allowed where a 1-hour or less fire-resistance rating is required.
e. An approved automatic sprinkler system in accordance with Section 903.3.1.1 shall be allowed to be substituted for 1-hour fire-resistance-rated construction, provided such system is not otherwise required by other provisions of the code or used for an allowable area increase in accordance with Section 506.3 or an allowable height increase in accordance with Section 504.2. The 1-hour substitution for the fire resistance of exterior walls shall not be permitted.
f. Not less than the fire-resistance rating required by other sections of this code.
g. Not less than the fire-resistance rating based on fire separation distance (see Table 602).

TABLE 602 FIRE-RESISTANCE RATING REQUIREMENTS FOR EXTERIOR WALLS BASED ON FIRE SEPARATION DISTANCEa,e

FIRE SEPARATION DISTANCE = X (feet)	TYPE OF CONSTRUCTION	OCCUPANCY GROUP H, L	OCCUPANCY GROUP F-1, M, S-1	OCCUPANCY GROUP A, B, E, F-2, I, *R*[f], S-2, U[b,f]
× < 5[c]	All	3	2	1
5 ≤ × < 10	IA	3	2	1
	Others	2	1	1
10 ≤ × < 30	IA, IB	2	1	1[d]
	IIB, VB	1	0	0
	Others	1	1	1[d]
X ≥ 30	All	0	0	0

For SI: 1 foot = 304.8 mm.

a. Load-bearing exterior walls shall also comply with the fire-resistance rating requirements of Table 601.
b. For special requirements for Group U occupancies see Section 406.1.2
c. See Section 705.1.1 for party walls.
d. Open parking garages complying with Section 406 shall not be required to have a fire-resistance rating.
e. The fire-resistance rating of an exterior wall is determined based upon the fire separation distance of the exterior wall and the story in which the wall is located.
f. Group R-3, and Group U when used as accessory to Group R-3, shall not be required to have a fire-resistance rating where the fire separation distance is 5 feet or more.

602.1.1 Minimum requirements.

A building or portion thereof shall not be required to conform to the details of a type of construction higher than that type, which meets the minimum requirements based on occupancy even though certain features of such a building actually conform to a higher type of construction.

602.2 Types I and II.

Type I and II construction are those types of construction in which the building elements listed in Table 601 are of noncombustible materials, except as permitted in Section 603 and elsewhere in this code.

602.3 Type III.

Type III construction is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of any material permitted by this code. Fire-retardant-treated wood framing complying with Section 2303.2 shall be permitted within exterior wall assemblies of a 2-hour rating or less.

602.4 Type IV.

Type IV construction (Heavy Timber, HT) is that type of construction in which the exterior walls are of noncombustible materials and the interior building elements are of solid or laminated wood without concealed spaces. The details of Type IV construction shall comply with the provisions of this section. Fire-retardant-treated wood framing complying with Section 2303.2 shall be permitted within exterior wall assemblies with a 2-hour rating or less. Minimum solid sawn nominal dimensions are required for structures built using Type IV construction (HT). For glued-laminated members the equivalent net finished width and depths corresponding to the minimum nominal width and depths of solid sawn lumber are required as specified in Table 602.4.

TABLE 602.4 WOOD MEMBER SIZE

MINIMUM NOMINAL SOLID SAWN SIZE		MINIMUM GLUED-LAMINATED NET SIZE	
Width, inch	Depth, inch	Width, inch	Depth, inch
8	8	6¾	8¼
6	10	5	10½
6	8	5	8¼
6	6	5	6
4	6	3	$6^{7}/_{8}$

For SI: 1 inch = 25.4 mm

602.4.1 Columns.
602.4.2 Floor framing.

602.4.3 Roof framing.
602.4.4 Floors.
602.4.5 Roofs.
602.4.6 Partitions.
602.4.7 Exterior structural members.

602.5 Type V.

Type V construction is that type of construction in which the structural elements, exterior walls and interior walls are of any materials permitted by this code.

SECTION 603 COMBUSTIBLE MATERIAL IN TYPE I AND II CONSTRUCTION

603.1 Allowable materials.

Combustible materials shall be permitted in buildings of Type I or Type II construction in the following applications and in accordance with Sections 603.1.1 through 603.1.3:

1. Fire-retardant-treated wood shall be permitted in:
1.1. Nonbearing partitions where the required fire-resistance rating is 2 hours or less.
1.2. Nonbearing exterior walls where no fire rating is required.
1.3. Roof construction, including girders, trusses, framing and decking.
Exception: In buildings of Type I construction exceeding two stories in height, fire-retardant-treated wood is not permitted in roof construction when the vertical distance from the upper floor to the roof is less than 20 feet (6096 mm).

2. Thermal and acoustical insulation, other than foam plastics, having a flame spread index of not more than 25.

Exceptions:
1. Insulation placed between two layers of noncombustible materials without an intervening airspace shall be allowed to have a flame spread index of not more than 100.
2. Insulation installed between a finished floor and solid decking without intervening airspace shall be allowed to have a flame spread index of not more than 200.
3. Foam plastics in accordance with Chapter 26.
4. Roof coverings that have an A, B or C classification.
5. Interior floor finish and interior finish, trim and millwork such as doors, door frames, window sashes and frames.
6. Where not installed over 15 feet (4572 mm) above grade, show windows, nailing or furring strips and wooden bulkheads below show windows, including their frames, aprons and show cases.
7. Finished flooring applied directly to the floor slab or to wood sleepers that are fireblocked in accordance with Section 717.2.7.
8. Partitions dividing portions of stores, offices or similar places occupied by one tenant only and that do not establish a corridor serving an occupant load of 30 or more shall be

permitted to be constructed of fire-retardant-treated wood, 1-hour fire-resistance-rated construction or of wood panels or similar light construction up to 6 feet (1829 mm) in height.
9. Stages and platforms constructed in accordance with Sections 410.3 and 410.4, respectively.
10. Combustible exterior wall coverings, balconies and similar projections and bay or oriel windows in accordance with Chapter 14.
11. Blocking such as for handrails, millwork, cabinets and window and door frames.
12. Light-transmitting plastics as permitted by Chapter 26.
13. Mastics and caulking materials applied to provide flexible seals between components of exterior wall construction.
14. Exterior plastic veneer installed in accordance with Section 2605.2.
15. Nailing or furring strips as permitted by Section 803.4.
16. Heavy timber as permitted by Note d to Table 601 and Sections 602.4.7 and 1406.3.
17. Aggregates, component materials and admixtures as permitted by Section 703.2.2.
18. Sprayed fire-resistant materials and intumescent and mastic fire-resistant coatings, determined on the basis of fire-resistance tests in accordance with Section 703.2 and installed in accordance with Section 1704.10 and 1704.11, respectively.
19. Materials used to protect penetrations in fire-resistance-rated assemblies in accordance with Section 712.
20. Materials used to protect joints in fire-resistance-rated assemblies in accordance with Section 713.
21. Materials allowed in the concealed spaces of buildings of Type I and II construction in accordance with Section 717.5.
22. Materials exposed within plenums complying with Section 602 of the *California Mechanical Code.*

603.1.1 Ducts.
603.1.2 Piping.
603.1.3 Electrical.

Next week

Tue 09/13
- Exam 2 – Building Heights & Areas/Types of Construction/any previously covered topics may be included
- Intro to In-Class Assignment 1 – bring measuring tape
- Fire-resistive Construction

Thu 09/15
- Means of Egress – Components, pg. 151-200 (no guest lecture)
- Review Assignment