

By MARK EMERY

The “Anatomy & Physiology” Of the Structural Fireground

Part 2 – How to Quickly Identify and Classify Types of Construction



*What type of construction?
You may be surprised.*

An important feature of a pre-incident plan is the classification of building construction. Classifying the type of building should be simple, quick and strategically relevant. The classification of a building should capture important strategic information including a snapshot of characteristics that are germane to each type of construction.

This article will provide the reader with a simple method for quickly identifying and *strategically* classifying each of the five basic types of building construction:

- Type I – Fire Resistive
- Type II – Non-Combustible
- Type III – Ordinary
- Type IV – Heavy Timber
- Type V – Wood Frame

Command-O-Quiz

You are standing outside the big-box warehouse store similar to the one shown in the photo above. In one hand you hold a pencil, in the oth-

er hand a pre-incident plan form. After entering the date, name of the business, address, contact information and hydrant locations, there is a box that asks: Type of Building Construction? In this blank box you would enter “Type _”:

- a. I
- b. II
- c. III
- d. IV
- e. V

If you know building construction, you know that there are two possible answers – the big-box warehouse store is either Type II, Non-Combustible, or Type III, Ordinary. It is impossible to an-

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Building Construction Types Cross-Reference (provided for comparison)

NFPA 5000	I (442)	I (332)	II (222)	II (111)	II (000)	III (211)	III (200)	IV (2HH)	V (111)	V (000)
UBC	—	I FR	II FR	II 1-hr.	II N	III 1-hr.	III N	IV HT	V 1-hr.	V N
NBC	1A	1B	2A	2B	2C	3A	3B	4	5A	5B
SBC	I	II	—	IV 1-hr.	IV UNP	V 1-hr.	V UNP	III	VI 1-hr.	VI UNP
IBC	—	IA	IB	IIA	IIB	IIIA	IIIB	IV	VA	VB

UBC: Uniform Building Code
NBC: National Building Code
SBC: Standard Building Code
IBC: International Building Code

FR: Fire Rated
N: Non-sprinklered
HT: Heavy Timber
UNP: Unprotected

NFPA 5000 is the Building Construction and Safety Code

swer the Command-O-Quiz until you have stepped inside and viewed the roof.

Before diving into the strategic classification of building construction, let's first do a quick review of the five basic types of building construction according to National Fire Protection Association (NFPA) 220, Standard on Types of Building Construction (2006 edition).

NFPA 220 classifies the five basic types of building construction based on "...the combustibility and the fire resistance rating of a building's structural elements. Fire walls, nonbearing exterior walls, nonbearing interior partitions, fire barrier walls, shaft enclosures, and openings in walls, partitions, floors, and roofs are not related to the types of building construction and are regulated by other standards and codes, where appropriate."

The NFPA 220 system designates the five types of construction using Roman numerals (I, II, III, etc.) followed by three Arabic numbers (332, 211, etc.) that indicate the fire-resistance rating requirement for specific structural elements. Each number of the Arabic trio designates the following:

- **First Arabic number** – Exterior bearing walls
- **Second Arabic number** – Columns, beams, girders, trusses and arches that are supporting bearing walls, columns or loads from more than one floor
- **Third Arabic number** – Type of floor construction

Notice that Type II (Non-Combustible) and Type V ("unprotected combustible") each allow a building in your community with three zeros (000) of fire resistance. Fire officers and firefighters should under-

stand (and factor) that there is not a single fire code or building code that specifically provides for firefighter safety and survival. The codes are designed to get people out of the building, to prevent the passage of fire and to prevent collapse of the building. Granted, there are code citations intended to assist the firefighting effort (standpipes, emergency elevator operation, etc.); however, and I repeat with emphasis: *There is not a single fire code or building code specifically intended to provide for firefighter safety and survival.* That qualifies as an important size-up consideration.

Strategic Classification Of Building Construction

OK, enough with the code stuff. (I'm an operations guy, not a fire marshal.) Although it is important that you possess a fundamental understanding of how buildings are code classified, it is more important to classify buildings *strategically* during pre-incident planning and when executing a master craftsman size-up at 3 o'clock in the morning. Let's begin the transition to the strategic classification of building construction by linking the NFPA 220 classifications with what the Arabic numbers mean operationally:

- **Type I (442 or 332)** – "Shall be those types in which the fire walls, structural elements, walls, arches, floors, and roofs are of approved noncombustible or limited-combustible materials?"

Author comments: This type of construction is referred to as "Fire Resistive." The three-digit numbers refer to hours of fire resistance. The first number of the three-digit series refers to exterior bear-

ing walls; the second number refers to columns, beams, girders, trusses and arches, supporting bearing walls, columns or loads from more than one floor; and the third number refers to floor construction. For example, in a 442 building, columns that support more than one floor must be protected with four hours of fire resistance and the floor assembly with two hours of fire resistance. Of strategic significance is the fact that non-load-bearing walls within a Type I (442) building are not required to have any degree of fire resistance.

- **Type II (222, 111 or 000)** – *Author comments: The same NFPA 220 description as Type I (above), but as you can see the fire resistance requirements (222, 111 or 000) are less rigorous. This means that unprotected structural components can fail when exposed to high temperatures during a contents fire.*

- **Type III (211 or 200)** – "Shall be that type in which exterior walls and structural elements that are portions of exterior walls are of approved noncombustible or limited-combustible materials, and in which fire walls, interior structural elements, walls, arches, floors and roofs are entirely or partially of wood of smaller dimensions than required for Type IV construction or are of approved noncombustible, limited-combustible or other approved combustible materials."

Author comments: Keep things simple: Type III usually features a non-combustible exterior (walls) and a combustible interior (roof and floors).

- **Type IV (2HH)** – "Shall be that type in which fire walls, exterior walls, and interior bearing walls and structural

TYPES OF CONSTRUCTION

Strategic Classifications for Fire Officers

This is important! Listed in descending order of fire resistance, thus the out-of-sequence numbering. Remember, fire resistance equals time. For detailed descriptions of building construction classifications, refer to the NFPA Fire Protection Handbook, “NFPA 220, Standard on Types of Building Construction,” or your local building code.

Type I Fire Resistive

Structure will not contribute fuel to fire; load-bearing structural members protected; fire collapse not a strategic consideration; anticipate rapid fire growth due to *big* Btu fire load; large open areas; vertical voids; letting an entire floor (or floors) burn can be a prudent confinement strategy.

Type II Non-Combustible

Structure will not contribute fuel to fire; due to unprotected load-bearing structural members, fire load and possible early collapse are key strategic considerations; high-rack storage, unprotected steel columns and steel bar-joint trusses are primary considerations; know location of suspended loads; fire load will vary widely by occupancy use.

Type IV Heavy Timber (Mill)

Basically, a Type III building on steroids; exterior walls will not contribute fuel to fire; interior load-bearing members will contribute considerable fuel to fire; more mass equals more time; scrutinize connections; timber trusses are not uncommon; multiple interconnected voids will contribute to fire growth; unprotected steel, suspended loads and open stairwells must be considered; identify self-releasing floor systems at columns.

Type III Ordinary (Conventional and Lightweight)

Exterior walls will not contribute fuel to fire; how walls are tied to interior of unreinforced masonry is critical information; interior load-bearing members and partitions will contribute considerable fuel to fire; less mass equals less time; identify unprotected steel columns; combustible lightweight floor and roofing systems are common; open stairwells and attic voids are confinement considerations; beware bearing walls removed and replaced by unprotected support systems; multiple interconnected voids will contribute to rapid fire growth; fire load varies by occupancy use; tilt-up with panelized roof system equals ordinary construction.

Type V Wood Frame

Entire structure can contribute fuel to fire; if not conventional, expect lightweight combustible floor and roof systems; open stairwells and large open attics are primary considerations for confinement and rapid fire growth; create a door for rapid rescue and alternative access/egress (no permit needed); understand fire behavior in older balloon frame; lightweight floor systems can create horizontal balloon frame; offensive benefit from defensive position can be easy.

—Mark Emery

FREE STUFF

For your convenience, I've captured on a single page the key strategic considerations for each of the five types of building construction. Send me an e-mail request and I'll reply with a Strategic Classification of Building Construction PDF: mark.fci@comcast.net. You can also find the Strategic Classification PDF, as well as other strategic information, available for download at www.imsalliance.com/ITAC.



Non-combustible building elements are atop fire-resistant elements in this high-rise tower under construction.

elements that are portions of such walls are of approved noncombustible or limited-combustible materials. Other interior structural elements, arches, floors and roofs shall be of solid or laminated wood without concealed spaces and shall comply with the allowable dimensions of 4.5.5."

Author comments: The letter H represents "heavy timber members." Examples: timber columns supporting a floor must be eight inches in their smallest dimension. However, timber columns supporting a roof are allowed

to be somewhat smaller, six inches in their smallest dimension.

• **Type V (111 or 000)** – "Shall be that type in which structural elements, walls, arches, floors, and roofs are entirely or partially of wood or other approved material."

Author comments: In other words, the entire load-bearing structural system can contribute fuel to the fire (burn).



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