



# Property Risk Consulting Guidelines

## DEFINITIONS OF TYPES OF CONSTRUCTION

### INTRODUCTION

AXA XL Risk Consulting uses various terms for describing types of building construction. Generally building construction falls into one of three basic types: fire resistive; noncombustible; and combustible. These are defined as follows:

- Fire Resistive construction uses materials that resist fire for a specified period of time according to standard fire test procedures such as ASTM E119, ISO 834-1, EN 1363-1, and AS/NZ 1530. Materials must withstand the effects of heat without losing structural integrity.
- Noncombustible construction uses materials that do not ignite burn or support combustion. A building material is considered to be noncombustible if it has been tested successfully in accordance with either ASTM E 136 or ISO 1182. Even though materials are considered noncombustible, they may collapse during a fire. If the construction material might not withstand the heat generated by a fire involving the combustibles in the area, the material might require additional protection to prevent the building from collapsing.
- Combustible construction consists of materials that will ignite and burn.

AXA XL Risk Consulting classify building construction into sixteen types. Fire resistive (FR) and heavy noncombustible (HNC) construction is the most fire resistive types of construction where the structural elements have a fire resistance rating. Light noncombustible (LNC), metal deck noncombustible (Met. Dk.-NC), and metal deck combustible (Met. Dk.-C ) cover the types of buildings that are noncombustible but less massive in construction design than FR and HNC. Masonry plank on timber or steel (MPT or MPS), heavy frame (HF), and frame plank on timber (FPT) includes combustible buildings that are partly or wholly of wood in the form of heavy timbers and planks. Frame joist (FJ), masonry joist (MJ), and masonry, berkeley roof (MBR) construction consists of lightweight wood and metal as well as special construction. Noncombustible – Other includes the space frame construction and those buildings with a 1 hr fire rated exterior wall covered with intact, listed EIFS system. Combustible – Other classification are those buildings that have exposed foamed plastics on the interior wall, ceiling or roof assemblies, and those exterior walls covered with nonlisted EIFS systems. For buildings with foamed plastics in their construction, refer to PRC.2.0.2.

### Fire Resistive

For a building to be considered fire resistive (FR), the main structural members and bearing walls must have a fire resistance rating of not less than 3 h. The secondary members, those not affecting the stability of the structure, and nonbearing walls must have a fire resistance rating of not less than 2 h.

These ratings could be achieved either by the type of material used (reinforced concrete, prestressed concrete or concrete blocks) or by the application of a listed fireproofing material to the structural

members. The application of the fireproofing must be in accordance with the manufacturer's specifications and the listing.

### **Heavy Noncombustible**

Buildings are considered to be heavy noncombustible (HNC) if the main structural members are heavy rolled steel, structural shapes or composite structural steel units. A composite unit can be a plate girder or heavy truss fabricated from "I" or "H" shapes with channel and angle shapes for bracing. The floors are of noncombustible construction, normally concrete on steel beams. The roof is noncombustible, constructed of concrete or gypsum plank on steel beams and girders, or a metal deck without a covering or with a listed noncombustible covering. Walls are of noncombustible construction.

### **Light Noncombustible**

Light noncombustible (LNC) construction must have noncombustible floors, walls and roof. The majority of the roof supporting members is lightweight, prefabricated elements, such as bar joists and "I" beams. The roof could be lightweight concrete, gypsum or a metal deck without a built-up covering on steel joists. The exterior walls could be concrete block, tilt-up concrete panels, or other noncombustible panels.

### **Metal Deck Noncombustible and Combustible**

Metal deck, noncombustible and combustible construction is similar to light noncombustible where the floors and walls are noncombustible. This would also include those structures that have noncombustible, minimum 1 h fire rated, exterior walls covered with a listed EIFS or listed foamed plastic insulation.

The main difference between light noncombustible and metal deck (Met. Dk.-NC and Met. Dk.-C) is the construction of the roof. Metal deck construction has a built-up roof covering system over the metal deck.

Metal deck, noncombustible construction has a nationally recognized testing laboratory listed noncombustible roofing system. The system has been tested for internal and external fire exposure. The tests should be comparable to the following:

- ANSI/UL 1256 internal fire test for the roof deck assembly. And
  - ASTM E 108 external fire test for the roof covering (same as UL 790).
- Or
- FM Standard 4470 internal fire test for the roof deck assembly and external fire test for the roof covering.

Assemblies that have been tested to ANSI/UL 1256 have a "Fire Classified" designation. Roof coverings tested to ASTM E 108 have a designation of Class A, B or C Roof Covering. Assemblies and coverings tested to FM Standard 4470 have a Class 1 designation.

Metal deck, combustible construction does not have a listed roof system.

### **Masonry Plank on Timber or Steel**

Masonry plank on timber or steel buildings have 2 h fire rated bearing walls and noncombustible nonbearing walls. Structural supports are either wood or steel. Steel structural supports are heavy rolled steel, structural shapes or composite structural steel units. A composite unit can be a plate girder or heavy truss fabricated from "I" or "H" shapes with channel and angle shapes for bracing. Wood structural supports must have the following nominal dimensions:

- Columns at least 8 in. × 8 in. (200 mm × 200 mm).
- Beams and girders at least 6 in. × 10 in. (150 mm × 250 mm).
- Floor planking at least 4 in. (100 mm) thick.
- Roof planking at least 2 in. (50 mm) thick.

- Truss members at least 4 in. × 6 in. (100 mm × 150 mm).

### Heavy Frame

Heavy frame (HF) buildings have exterior walls wholly or partly of wood. Floors, roofs, columns, beams and girders are of solid, glue laminated timber (Glulam), laminated veneer lumber (LVL) or Cross Laminated Timber (CLT). The following nominal dimensions for the components are required:

- Columns supporting floor loads or roof loads shall not be less than 6 in. (150 mm) in least dimension.
- Wood beams and girders or purlins shall not be less than 3 in. (75 mm) in least dimension.
- Framed or glue-laminated trusses or arches for roof construction shall have members not less than 4 in. (100 mm) in least dimension.
- Roof decks shall be of not less than 2 in. (50 mm) splined, tongue and grooved, or laminated planks, or of 1 in. (25 mm) thick exterior grade plywood.

### Frame Plank on Timber

Frame plank on timber (FPT) construction is similar to masonry plank on timber, but with exterior walls of wood.

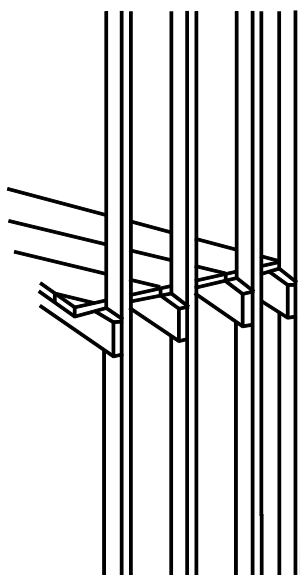


Figure 1. Balloon Construction.

### Frame Joist

Frame joist (FJ) construction has wooden exterior walls, and the floors and roof are supported by joists. This type of construction is most prevalent in one- and two-family homes in the United States and Canada. There are two types of construction, balloon and platform.

- Balloon construction (see Figure 1) has openings between floors in the exterior walls. This type of construction is generally found in older houses. Its major problem is if a fire gets into the wall, it could extend up to the upper floors without notice.
- Platform construction (see Figure 2) has firestops on each floor. Fire cannot travel to the upper floors through the walls.

Walls constructed of wood with the exterior covered with insulated metal panels, brick veneer or stucco are considered frame joist construction.

## Masonry Joist

Masonry joist (MJ) construction has exterior walls of masonry, and the floors and roof are supported by wood joists with the following nominal dimensions.

Joists are beams less than 4 in. (100 mm) thick or beams spaced less than 3 ft (0.9 m) on centers. There are numerous types of joists. A 2 in. × 6 in. (50 mm × 150 mm) or larger board is a joist. A composite truss utilizes 2 in. × 4 in. (50 mm × 100 mm) or larger boards in an arrangement where they form triangles, held in place by gusset plates (see Figure 3). A composite truss is considered a joist.

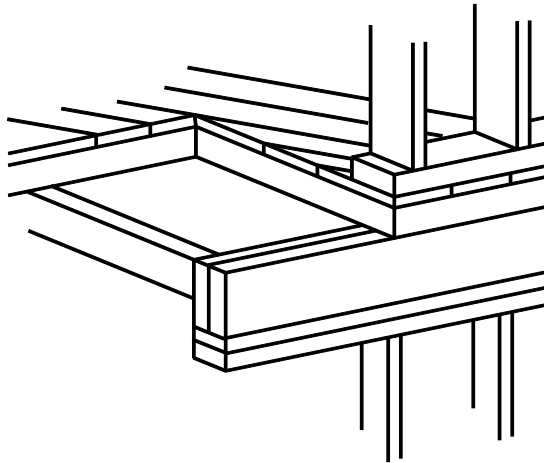


Figure 2. Platform Construction.

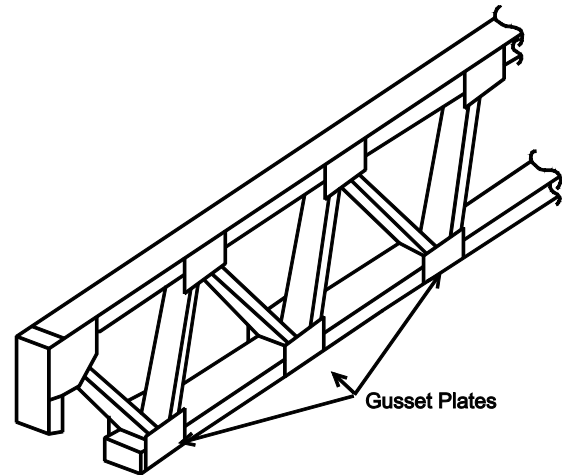


Figure 3. Composite Truss.

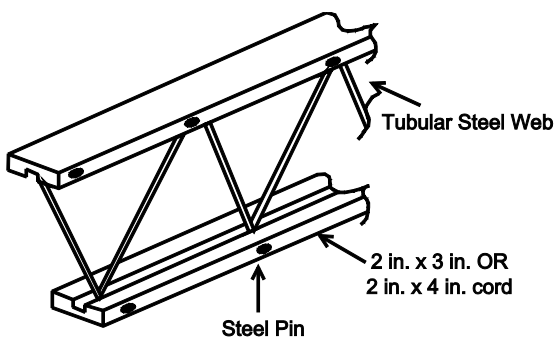


Figure 4. Lightweight Truss.

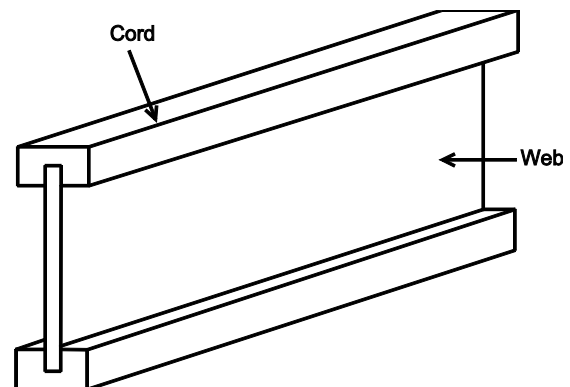


Figure 5. Composite Joist (Wooden "I" Beam).

A lightweight truss (also known as open web truss) is constructed of minimum 2 in. × 3 in. (50 mm × 75 mm) boards for the top and bottom cords and a minimum 1 in. (25 mm) diameter tubular steel for the webs. The webs are held in place with either bolts or pins (see Figure 4). The composite joist (also known as a wooden "I" beam) uses plywood or particle board as webbing with 2 in. × 2 in. (50 mm × 50 mm) or larger boards or laminated plywood as cords (see Figure 5).

## Masonry, Berkeley Roof

Masonry, Berkeley roof construction originated in California for areas susceptible to earthquakes. Berkeley construction has masonry exterior walls, typically tilt-up concrete panels. The roof is constructed of plywood decking ½ in. (12 mm) thick on wood purlins not less than 4 in. (100 mm) thick spaced, approximately 8 ft (2.5 m) on center. The purlins are secured to glue-laminated beams that

are not less than 5 in. (125 mm) thick. Wood joist stiffeners of 2 in. × 4 in. (50 mm × 100 mm) are framed between the purlins. Figures 6 and 7 shows the Berkeley roof construction.

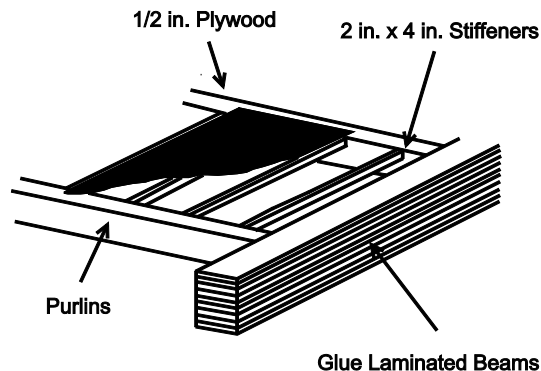


Figure 6. Berkeley Roof Construction.

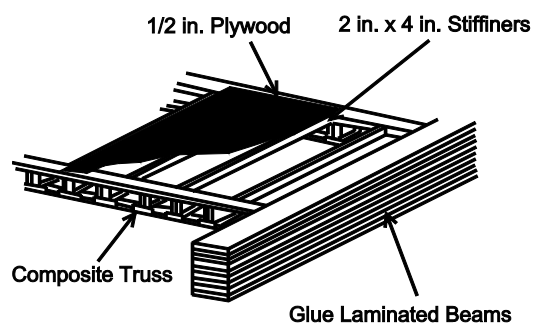


Figure 7. Berkeley Roof Construction.

### Noncombustible – Other

This category covers the unique types of structures that have noncombustible roof construction that cannot be classified as “Fire Resistive,” “Heavy Noncombustible,” “Light Noncombustible,” “Metal Deck Noncombustible,” or “Metal Deck Combustible.” This would include space frame structures, suspended structures, domed-roof structures, prestressed sheet-metal assemblies or any other designs susceptible to unusual damage from fire exposure.

This category also includes those structures that have noncombustible roofs and have noncombustible, minimum 1 h fire rated, exterior walls covered with an intact, listed EIFS or listed foamed plastic insulation.

### Combustible – Other

This category includes combustible construction other than those described in the previous categories. This would include air inflated structures, foam plastic structures, structures with exterior walls covered with nonlisted or severely damaged listed EIFS, and exposed foam plastic on the interior walls. This would also include walls with window and door openings covered with intact listed EIFS systems where there is an overhang or projection more than 1/3 the length of the wall extending at least 3 ft (1 m) from the wall.

### Insulated Metal Panel

There are three types of insulated metal panels:

**Insulated panels with noncombustible fill** – those with a fiberglass or rockwool insulation

**Insulated panels with listed foam plastic insulation** – those with a foam plastic insulation where the **entire** panel is tested to a **full scale** fire exposure.

**Insulated panels with nonlisted foam plastic insulation** – those with a foam plastic insulation that has not been tested to a **full scale** fire exposure.