Chapter 4

Basics of Building Construction as it Relates to the Fire Investigator

Section A: True/False

Directions: Write True or False on the blanks provided; if False, write the correct statement on the lines provided.

1. _____ Wooden structural members are found in Type III, Type IV, and Type V construction. (101)

2. _____ Wood with a high moisture content does not ignite or burn as readily as dehydrated wood. (102)

3. _____ Glass often breaks due to the high pressures created during the incipient phase of a fire. (107)

4. _____ Artificial laminates typically burn faster than the individual substances they're composed of, and typically fail earlier than regular wood. (109-110)

5. _____ When one truss fails the ones next to it are likely to fail, leading to a total collapse. (115)

6. _____ Walls affect the spread and development of fire. (118)

7. _____ Interstitial spaces are usually only found in older construction (pre-1970s). (121)

8. _____ Building construction plays an important role in ventilation of a fire. (122)

Section B: Fill in the Blank

Directions: Write the correct answer on the blanks provided.

1. The _____ the dimension of wood, the easier it is to ignite and the faster it will lose structural integrity. (101)
2. Brick, stone, and concrete block are all types of _____ units. (102)
3. Concrete may _____ if water is applied and causes the concrete to rapidly cool. (105)
4. It is common to find melted _____ at fire scenes. (108)
5. The flooring in manufactured homes is often made of _____, which can often fail without warning when exposed to fire or water. (114)
6. Walls that support spanning elements in a building are called _____ walls. (118)
7. A lack of _____, such as walls and partitions, in a structure can lead to rapid vertical and horizontal flame spread in a building. (119)
8. A fire in a _____ compartment will develop toward flashover or full involvement more slowly than a fire in a _____ compartment. (121)
9. In multistory buildings, _____ and _____ are the main barriers to fire spread. (123)
10. Many _____ roofs contain bituminous materials that can liquefy and spread a fire rapidly across a roof. (127)
11. In wildland/urban interface areas, _____ are a huge contributor to fire spread, even when they are treated with fire retardant. (132)

Section C: Matching

Directions: Write the correct answers on the blanks provided.

Part I: Thermoplastic vs. Thermoset

Match the descriptions with the categories. Each category will be used more than once.

Categories:

A. Thermoplastic composite lumber

B. Thermoset plastic

Descriptions:

_____ 1. Used in circuit breakers and appliance housing (109)

_____ 2. Do not drip or flow when heated (109)

_____ 3. Wood-like product made from wood fiber and polyvinyl chloride (PVC) (109)

_____ 4. Will melt and flow when heated (109)

_____ 5. Sometimes used as architectural trim (109)

Part II: Types of Building Construction

Match each description with the type of building construction it describes. Types of building construction may be used more than once.

Types of Building Construction:

A. Type I construction

B. Type II construction

C. Type III construction

D. Type IV construction

E. Type V construction

Descriptions:

_____ 1. Similar to Type I construction, but the materials have a lower fire resistance (110)

_____ 2. Heavy timber construction (110)

_____ 3. Exterior walls, bearing walls, floors, and roofs made completely or partially of smaller-dimensioned wood (110)

_____ 4. Exterior protected (masonry) construction (110)

_____ 5. Referred to as ordinary construction (110)

_____ 6. Fire resistive construction (110)

_____ 7. Structural members are made of noncombustible or limited combustible materials with a specified degree of fire resistance (110)

Section D: Multiple Choice

Directions: Write the correct answers on the blanks provided.

_____ 1. Fire-resistance ratings are expressed as: (100)

A. pictograms.

B. units of time.

C. Greek letters.

D. colored symbols.

_____ 2. The fire resistance of a masonry wall depends on the thickness of the wall and the: (102)

A. age of the wall.
B. type of masonry units used.
C. orientation of the masonry units.
D. variety of mortar used to build it.

_____ 3. What would be a likely result if a mortared masonry wall is rapidly cooled using a water stream during suppression operations? (103)

A. The masonry wall would not be affected.
B. It would result in crazing of the masonry units.
C. The mortar can erode, causing the wall to collapse.
D. The masonry units would separate and become less stable.

_____ 4. What do steel structural members generally do when exposed to fire? (104)

A. Melt
B. Burn
C. Contract or shrink
D. Elongate or expand

_____ 5. Investigators should observe _____ structural members for evidence of bowing or thermal expansion at the joints. (104)

A. steel
B. wood
C. gypsum
D. concrete

_____ 6. Which type of building material is fire-resistive, noncombustible, and is a good insulator? (105)

A. Steel
B. Wood
C. Gypsum
D. Concrete

_____ 7. In which construction application is gypsum likely to be found? (108)

A. Trusses
B. Wallboard
C. Floor covering
D. Window frames

_____ 8. What concern do modular buildings present during fire conditions? (112)

A. Widespread structural instability
B. No adherence to model building codes
C. Domed ceilings that allow for unusually rapid fire spread
D. Unusual paths of fire travel that are not common in site-built structures

_____ 9. Due to their building materials, _____ homes are naturally well insulated, which can result in higher-than-expected temperatures during a fire. (112)

A. log
B. modular
C. geodesic
D. prefabricated

_____ 10. A fire investigator should be aware of the building foundation because: (113)

A. the building foundation impacts the flow path.
B. it retains evidence of ignitable liquids and incendiary devices.
C. foundation failure can create or aggravate structural problems.
D. fire effects such as burn patterns will be apparent on the foundation.

_____ 11. Before working under or on any steel flooring system, investigators should: (115)

A. call for a backup investigator to assist in the operation.
B. examine floor assemblies for warping or deformations.
C. set up an auxiliary lighting system to improve visibility.
D. use shoring to provide extra stability to the structural members.

_____ 12. What type of construction is characterized by exterior walls without fire stops? (118)

A. Type I Construction
B. Type II Construction
C. Balloon-frame construction
D. Platform frame construction

_____ 13. Buildings that have fire stops at each level are known as _____ construction. (119)

A. Type I Construction
B. Type II Construction
C. Balloon-frame construction
D. Platform frame construction

_____ 14. Heat that collects at the highest point of an arched ceiling, along with compressive forces, can: (125)

A. make collapse of the roof likely.
B. cause the arch to be even stronger.
C. make it appear that there were multiple points of origin.
D. cause fires to burn longer and hotter than in flat-roofed buildings.

_____ 15. Most building codes rate construction types according to: (129)

A. the cost of the construction materials.
B. the age of the materials used in construction.
C. how they maintain structural integrity over time.
D. how they produce products of combustion when heated.

_____ 16. The total quantity of combustible contents of an area is referred to as its: (130)

A. fire load.
B. heat flux.
C. combustibility rating.
D. compartmentation rate.

_____ 17. Interior finish materials: (132)

A. are of little concern to investigators.
B. can increase fire growth and intensity.
C. are fire-rated to stop fire growth and spread.
D. should be the first thing investigators examine on scene.

Section E: Short Answer

Directions: Write the correct answers on the lines provided.

1. List five basic properties that fire investigators should know about building materials. (99)

_____

_____

_____

_____

_____

2. What are five building characteristics that an investigator can find in preincident plans or inspection reports? (101)

_____

_____

_____

3. What are four variables that determine how steel will weaken in a fire? (104)

4. What are four variables that affect the fire-resistance of a concrete assembly? (105)

5. How do plastics used as construction materials increase the fire hazard in a building? (109)

6. What are four factors that affect how fire behaves within manufactured homes? (111)

7. How can chutes and hoistways negatively impact fire development? (122)

8. What is one hazard that can result from a new roof being added over an existing roof? (127)

9. What are three factors that influence the speed of flame spread over interior finish materials? (132)

4

Section F: Scenario

Directions: Answer the following questions based on the scenarios below.

Scenario 1 (130-131)

You are investigating a fire in a one-story single-family residence. As you are examining the structure, you notice that the tops of photo frames and the window coverings in several rooms have been melted or sustained considerable damage. Many of the contents near the floor were either barely burned or sustained far less damage.

1. Did these compartments reach flashover?

_____

_____

_____

_____

2. What could account for the higher level of damage near the ceiling than near the floor?

_____

_____

_____

_____

Scenario 2 (133)

You are sent to investigate a fire in two neighboring houses. House A is a one-story ranch style house built in the early 1960s. Much of its original interior has stayed the same. House B is a split-level house built in the late 1980s. Extensive remodeling has been done to make this house more modern.

1. How would you expect the interiors of these homes to differ?

_____

_____

_____

_____

_____

Scenario 3 (134)

You've been called to investigate a fire in a commercial building that is undergoing construction. The fire consumed a good portion of the first and second floor, but many areas of the building remained untouched. When you arrive on scene, the firefighters report that they didn't see any obvious signs of it being an intentionally set fire.

1. What are some potential hazards unique to buildings under construction that you should check for during your investigation?