Course Learning Outcomes for Unit II

Upon completion of this unit, students should be able to:

2. Classify major types of building construction in accordance with a local/model building code.
   2.1 Explain the effects of model building code on the types of construction.
   2.2 Describe the hazards to firefighters of the different types of materials used in the construction of buildings.

7. Classify occupancy designations of the building code.
   7.1 Describe the hazards to firefighters during the construction, renovation, and demolition of a building.
   7.2 Identify the types of occupancies defined by building code.

Reading Assignment

Chapter 3: Methods and Materials of Construction, Renovation, and Demolition

Chapter 4: Building and Fire Codes

Unit Lesson

Welcome to Unit II.

As we begin this unit, we will start by discussing the methods and materials of construction, renovation, and demolition. As you can imagine, the materials with which a building is constructed will each react differently to fire, and as firefighters, this knowledge is imperative to suppression efforts as well as safety. The second half of this unit will focus on building and fire codes. These codes determine the materials and construction for various occupancy types. As with everything else, fire codes were not created until a major fire brought the need for such codes to the public’s attention. Many organizations and fire departments were behind these early codes and the efforts to gain a national standard for use in building construction. These codes have been around since 1904, following the Great Baltimore Fire of 1904 (Corbett & Brannigan, 2015) and regulate the activities that take place in existing buildings, including the maintenance of fire protection features. As you can imagine, fire codes play a critical role in the safety of the community as well as the safety of firefighters.

Both the National Fire Protection Association (NFPA) and the International Code Council (ICC) produce building codes, but they also produce fire codes. Building codes regulate a building as it is being constructed, while fire codes regulate the building after it is built. For additional information and research from the NFPA, please refer to its website. There is information and research about building codes and fire codes as they relate to fire service throughout this site as they update to NFPA 5000, Building Construction and Safety Code as its model building code. It is important to note that until recently, codes have been designed more for general fire safety and egress and less for the safety of firefighters; however, this is changing thanks, in part, to the efforts of the NFPA and the ICC.

The ICC develops the International Building Code, which has been adopted by the majority of municipalities throughout the United States since 1994, when it was created. The ICC develops model codes and standards used in the design and build, and ensures the compliance process during the construction of structures. Corbett & Brannigan (2015) states that 75% of the building code deals with fire safety, and that begins with the type of construction. A thorough understanding of the five types of construction and their features is not only critical for this course but also for your fire service career. The NFPA states that the five classifications
are fire resistive, non-combustible, ordinary, heavy timber, and wood frame, while the ICC assigns numeral designations based on the amount of fire resistance provided by each type of construction.

Take some time to review the building types in depth and ensure that you understand the features associated with each classification. While one unit in this text is dedicated to codes, it is only the tip of the iceberg, and it is important for firefighters to understand the code process as it applies to the construction process. Now, let's take a look at Chapter 3 of your textbook to discuss the processes and hazards of construction, renovation, and demolition.

Although firefighters usually have little interaction with a building until construction, the process begins with a number of regulations. An architect is usually involved during the design process and oversees a large group of regulations: building codes, fire codes, zoning regulations, insurance regulations, the Americans with Disabilities Act (ADA), and plumbing, mechanical, and electrical codes. The architect uses a variety of engineers to determine what a building will be constructed of and how the building will perform under a variety of conditions. Most often, the architect is the point of contact as the building is designed, and plans are drawn and submitted throughout the local requirement and approval process.

After the plans for the structure have been approved, a general contractor will be utilized to oversee a multitude of individuals who will each have an area of responsibility during the construction of the building. These individuals and engineers will come together to ensure that the building is constructed to code and meets all of the requirements for their particular specialty. As you can imagine, this is no small undertaking, and it applies to small structures that are utilized for storage as well as high-rise buildings. Although the number involved may vary, the need to adhere to the building and fire codes is critical for the long term safety of the building itself, not to mention any firefighters that may respond in the event of an emergency.

Each stage of building has its own hazards that firefighters must be well prepared for. Once again, the importance of pre-planning cannot be emphasized enough as the hazards change in and around a structure over time, and the safety of firefighters is based on preparation. It is easy to realize that the safety features of the building may not be in place or active during construction. It is imperative to understand that buildings during this stage of construction are not as stable, and are more likely to collapse when exposed to fire. In addition, access to the structure itself may be limited. Oftentimes, the parking lot is the last step in the construction process, and you can only imagine the issues that extended hoselays or dirt parking lots may pose to suppression efforts. It is also important to realize that water supply, often in the form of private hydrants, may not be accessible or ready for use. As a result, fire in these structures may travel fast, depending upon the stage of construction and limited water supply. These are some of the basic hazards associated with buildings under construction; now let’s turn our attention to buildings under renovation.

Similarly to buildings under construction, buildings under renovation have many of the same hazards that were discussed previously, but may often contain one more significant hazard that firefighters must be aware of, occupants. During any of these processes, there are a numbers of ways that fires can be started, (including welding and cutting) but arson threats are also present. During construction, there may be workers present, but during renovation, workers as well as building occupants may be present and increase the hazard for firefighters significantly. Often, during the renovation process, fire protection measures may be disabled while work is being conducted, and paths of normal egress may be inaccessible. The National Institute of Standards and Technology (NIST) has conducted numerous studies that indicate that many people have been killed during a fire performing activities that delayed their evacuation and affected their safety including fighting the fire, attempting to rescue others in the building, and moving to safety under untenable conditions inside the building (U.S. Department of Commerce, 2008). This report contains other information that firefighters may find relevant as they perform initial rescue efforts for occupants of a structure. The entire report is located on the National Institute of Standards and Technology (NIST) website. Take your time and explore, as this website has numerous reports and information that you may find beneficial.

Buildings that are about to be demolished may appear to pose little threat, but, in reality, these can often present some of the most significant dangers to firefighters. Collapses and rapid fire spread due to a lack of fire protection and measures such as abatement that remove fire protection coverings can increase the dangers significantly for firefighters. What is the point of entering a building that is to be demolished? That is a controversial topic in the fire service, but many department leaders will argue that every building must be searched due to the possibility of of homeless people occupying the structure. However, good preplanning can
increase a department’s awareness of a structure and decrease the exposure to the hazards, limiting entry, if at all possible, so that firefighters can utilize defensive operations for suppression.

As with each of the aforementioned hazards while under construction, it is important for firefighters to be aware of how different materials react when exposed to fire and other stresses. Remember the different loads discussed during Unit I, and remember that each type of material is designed to react differently to withstand stresses. Wood is one of the most common construction materials and varies in compressive strength depending upon the way in which force is applied. It is important to understand that wood is utilized in many forms other than as simply dimensional lumber. For example, oriented strand board (OSB) is becoming more common as it is much cheaper than plywood. Manufactured trusses and joists are becoming more common, but they can be hazardous to firefighters due to their reaction under fire, even at low temperatures. These two engineering methods have cost many firefighters their lives as each one costs structural integrity and structural strength.

There are many other materials discussed in Unit II; however another important one to mention is steel. Although many people consider this the strongest material, in fact, it has inherent dangers associated with it such as its ability to conduct heat. This will be discussed in the next unit. If a material conducts heat, the risk of fire spread is increased, and is an obvious threat to occupants and firefighters alike. In addition, steel elongates when heated and will fail at temperatures as low as 1,000 to 1,100 degrees Fahrenheit. Steel is becoming more and more common as trusses and beams are often steel, especially in concrete work; however, it must be realized that these will melt and lose strength when heated.

Firefighters must be aware of the construction materials, the stage of construction, and even the shape of construction, well before arrival. As we have discussed, there are numerous hazards and we only mentioned a few in this brief lecture. Please take your time to carefully read the chapters for this unit so that you will have an understanding as we move forward in this course.

References


Learning Activities (Nongraded)

Nongraded Learning Activities are provided to aid students in their course of study. You do not have to submit them. If you have questions contact your instructor for further guidance and information.

For further review of the concepts discussed in Unit II, review and respond to the Challenging Questions listed on pages 90 and 109 of your textbook.

Key Terms

1. Americans with Disabilities Act (ADA)
2. Area of refuge
3. Building code
4. Construction safety regulations
5. Egress
6. Fire code
7. Legacy code
8. Model code
9. Structural steel
10. Wood
11. Zoning regulations