Technical Principles and Practices of Fire Prevention

Module Special Occupancies

MODULE OBJECTIVES

The students will be able to:

- *Identify occupancies in special structures, unique occupancies, and uses that have special requirements.*
- *Identify the unique fire and life safety considerations of occupancies in special structures.*
- *Recognize the limitations of enforcement in existing buildings and vacant buildings.*

INTRODUCTION

Most inspections take place in buildings constructed and maintained in accordance with building codes. Most buildings house some common occupancy such as business, apartment, store, or warehouse. Occasionally, the nature of the structure or the occupancy requires special fire safety considerations. Examples of these types of structures include

- an observation tower at the Gettysburg Battlefield;
- a ship or boat permanently moored and converted to a hotel or gambling casino;
- a subway transit system;
- highrise buildings; and
- a construction site.

The special circumstances may require increased fire and life safety protection, or may permit exceptions to typical fire and life safety protection. It is not practical to add a second exit stairway to the Washington Monument. Airport control towers also have a single exit stairway, and this deviation from what normally would be required is permitted because of the special circumstances. Some structures are so specialized that they are regulated by other agencies. For example, offshore oil platforms are regulated by the U.S. Coast Guard.

TYPES OF OCCUPANCIES IN SPECIAL STRUCTURES

Special Structure Occupancies

When an occupancy's use does not fit into a standard category because of the type of structure in which it is located, it is considered a special structure occupancy according to National Fire Protection Association (NFPA 101, *Life Safety Code*). The Model Building Codes also have requirements for these types of occupancies noted in a special use chapter. The following are examples of special structure occupancies:

- Windowless structures that lack outside openings for rescue or ventilation.

- Underground structures built below the level of exit discharge.

- Structures completely surrounded by water.

- Vessels are ships or barges permanently fixed or unable to move under their own power, and used for purposes other than navigation.

- Towers are independent structures used for the support of equipment or for observation, control, or signaling; they are not open for general use.

- Immobilized vehicles are, for example, trailers, railcars, buses, or similar conveyances that are not mobile, but fixed to a foundation or attached to a building.

- Open structures support equipment and operations not enclosed by building walls. Often these structures are found at oil refineries, power plants, and chemical processing plants.

Open structures and towers are excepted from most requirements related to egress. Single ladders are permitted in place of stairways. Fire alarms, exit markings, and exit illumination are not required. Other special structures generally must meet the same requirements as a standard building for the same occupancy. For example, vehicles and vessels occupied for assembly use must have the correct number and size of properly marked and illuminated exits. Underground and windowless buildings, depending on the number of occupants, have additional requirements for fire suppression systems and emergency lighting.

Special Conditions

A variety of special conditions are covered by the codes. NFPA 130, *Standard for Fixed Guideway Transit Systems,* includes all requirements for portions of the transit system, including exiting. Tents, air-supported structures, and membrane structures for temporary use require a permit. They must have adequate egress for the intended use and, if they are for extended use, they generally must be noncombustible or flame resistant. (There are some exceptions such as a plastic greenhouse that is not open to the public.) They must provide the same level of life safety as conventional buildings.

Codes frequently have special provisions or exceptions for treatment plants, generating/power plants, refineries, and chemical manufacturing plants containing large areas with little or no human occupancy.

Vacant structures attract young people and vagrants. Most fire prevention and building codes define vacant structures as unsafe buildings. The buildings become dilapidated, and the owners are unable or unwilling to maintain them. Correction of problems in vacant structures is difficult.

Most **highrise buildings** constructed after the mid-1970s have features designed to ensure fire safety. Not all jurisdictions require all items, but the following list of features is typical of those generally required for highrise buildings:

- automatic sprinklers;
- voice alarm and communications;
- two-way fire department communication;
- emergency lighting and standby power;
- smoke control and removal;
- elevators large enough for stretchers; and
- central control station for fire emergency system monitoring and communication.

The added safety provided by these systems can be effective only when the systems are fully operational.

Existing buildings cannot be rebuilt each time the building code changes, but they must be maintained to the original level of construction. Older buildings also may be required to be improved as their use changes. Communities may impose some retroactive requirements on existing buildings, but all retroactive requirements must have a valid health or safety justification.

In conclusion, most fire prevention and building codes have chapters that contain special requirements for selected occupancies. You should check your local code for the occupancies discussed above as well as for lumberyards, woodworking plants, junk yards, dry cleaning plants, or bowling establishments.

FIRE AND LIFE SAFETY CONSIDERATIONS IN BUILDINGS UNDER CONSTRUCTION, DEMOLITION, OR ALTERATION

Construction and demolition operations create some unique challenges. Fortunately, many of the primary ignition sources are present only during the time the site is occupied. Unfortunately, the sites can be very tempting targets for arson fires. The demolition site is frequently an even more tempting target. In addition, there is generally a much lower level of

concern for fire safety at demolition sites. The problem at building expansion and alteration sites can be even more difficult when you add all the problems of a construction site to a partially occupied structure.

Frequently the fire safety staff overlooks the construction and demolition site. One of the most tragic incidents occurred in November of 1988. A fire at a road construction site involved two semitrailers filled with ammonium nitrate, fuel oil, and aluminum. The original call was for a pickup truck on fire. Arriving firefighters found a second fire and requested assistance. The firefighters did not know the contents of the trailers. The resulting explosion killed six Kansas City firefighters. This was a case of arson that was not closed until 1997.

A very serious demolition site fire occurred on Thanksgiving Day in 1982 in Minneapolis, Minnesota. At the time, it was the costliest fire in Minneapolis history. The damage was not to the department store being demolished, but to the adjacent highrise bank building. The site was unsecured. Together the department store and the bank building filled a city block. At the time of the fire, demolition activity was moving from the street toward the bank. Combustible debris was piled high, and the ends of all six stories of the department store were open. The fire department responded and quickly applied four 1,000-gpm master streams with no visible effect. The heat from the fire went up the lightwell in the bank building like a chimney. Windows failed, and several floors of the bank building were ignited.

In suburban Washington, DC, a Federal security guard reported an early morning fire across the interstate highway from his/her post. Responding firefighters found all 21 townhouses on the construction site involved when they arrived. One of the characteristics of fires in unfinished wood-frame construction is a very intense, fast-moving fire. High levels of radiant heat have damaged more than one piece of fire apparatus.

While construction, demolition, and alteration make up only a very small part of a community's fire problem, it is an important segment that cannot be ignored.

The major problems encountered with buildings under construction, demolition, or alteration include

- reduced fire protection features;
- hazardous materials and processes; and
- lack of access.

Reduced Fire Protection Features

In these structures, the fire sprinkler systems often are not operational. The standpipe system may not be operational. Critical fire-resistive components are not installed, or may have been breached, including

- gypsum board not installed, or broken;
- stairway doors not installed, or removed;
- firestopping not installed;
- drop ceilings not in place, or removed;
- spray-on fire protection not installed, or removed; and
- water supplies not connected.

Hazardous Materials and Processes

Construction or demolition may require the use of explosives, cutting and welding, and the use of torches. Temporary heating devices, temporary wiring, and temporary structures present special hazards. Flammable liquids and refueling activities may be common. In the alteration of occupied buildings, one or more of the exits may be blocked temporarily.

Lack of Access

During construction, all-weather access roads may not have been constructed. In other cases, access roads may have been blocked by debris and equipment. Interior firefighter access may be incomplete; the only access may be by crane bucket.

Important Standards

NFPA 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations.*

NFPA 395, *Standard for the Storage of Flammable and Combustible Liquids on Farms and Isolated Construction Projects.*

NFPA 495, *Code for the Manufacture, Transportation, Storage, and Use of Explosive Materials.*

SUMMARY

Special structures and occupancies present an extremely variable set of fire and life safety conditions. The same level of fire and life safety protection should be provided to special structures and occupancies as is provided for common structures and occupancies. The methods for achieving this level of protection may be different.

Activity SO.1

Identify Special Occupancies and Special Structures

Purpose

To identify the various types of occupancies in special structures.

Directions

1. Generate a list of any special occupancies or occupancies in special structures with which you are familiar.

2. Describe some of the things that are unique about the structures or occupancies listed.

Activity SO.2

Hazards in Buildings Under Construction/Alteration/Demolition

Purpose

To list the fire and life safety issues in buildings being constructed, demolished, or altered.

Directions

1. You will be divided into four groups.

2. Each group will prepare a list of fire and life safety issues for the building assigned.

Activity SO.3

Report Writing

Purpose

To formulate code-based findings from an inspection into a properly formatted report document.

Directions

1. Working individually and using the code applicable to your jurisdiction, review the inspection scenario.

2. Complete the attached inspection report form or an inspection report form from your jurisdiction, citing the hazards identified in the scenario.

3. Write a report on the occupancy. Be sure to cite specific code references.

4. You have 60 minutes to complete this activity. You will turn in all completed forms to the instructor.

Scenario

You are a fire inspector who has been sent to inspect the construction site for Phase 1 of the Hidden Valley retirement community. The first phase includes two four-story apartments and an eight-story condominium. Other phases include townhouses, detached cottages, golf club, clubhouse, nursing home, swimming pool, and other facilities. The general contractor is Barnsville Construction, Inc., Box 1313, Barnsville, PA. The project owner is Hidden Valley Limited Partnership, 1111 Valley Road, Hidden Valley, PA.

The four-story buildings in Phase 1 are of ordinary construction and will be fully protected with automatic fire sprinklers. The eight-story building is protected noncombustible and also will have automatic fire sprinklers.

A good quality gravel road extends from the public street to a gravel parking and storage lot. There are two storage trailers and one office trailer in addition to vehicle parking and construction on the lot. A Type 2 explosives magazine containing 20 pounds of explosives, blasting agents, and detonators is located behind the office trailer. A 660-gallon diesel tank is located on the right side of the office trailer. The area between the gravel lot and the buildings is dirt with deep ruts and an open trench for a water line.

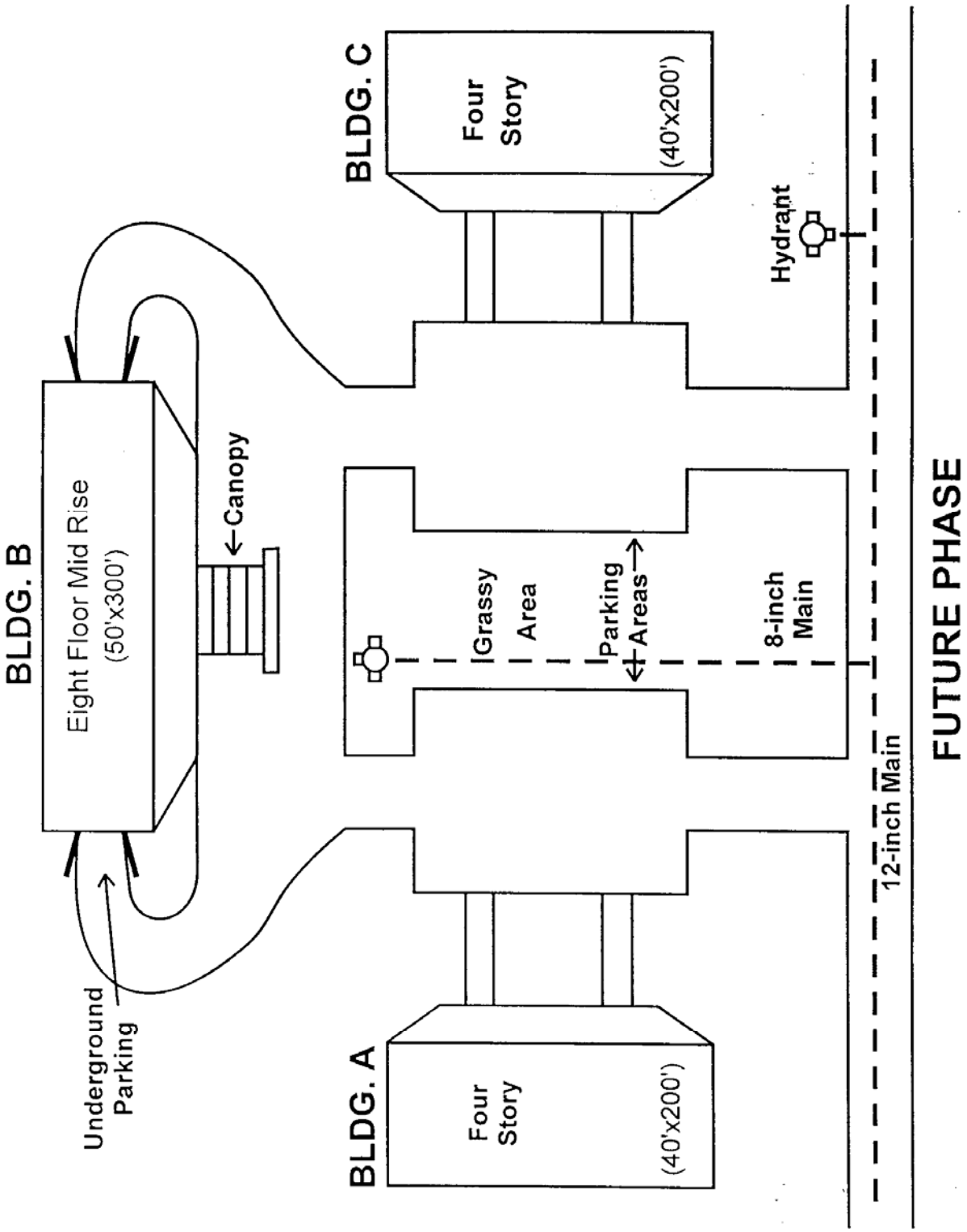
In the office trailer, you find building, electrical, zoning, sanitation, and water connection permits. No other permits have been issued. All necessary approved drawings are on site.

Building A is a four-story apartment of ordinary construction that is under roof. The automatic sprinkler system is 75-percent complete. No standpipes are required. A moderate amount of building materials and trash is present. No fire extinguishers are found on the third or fourth floors.

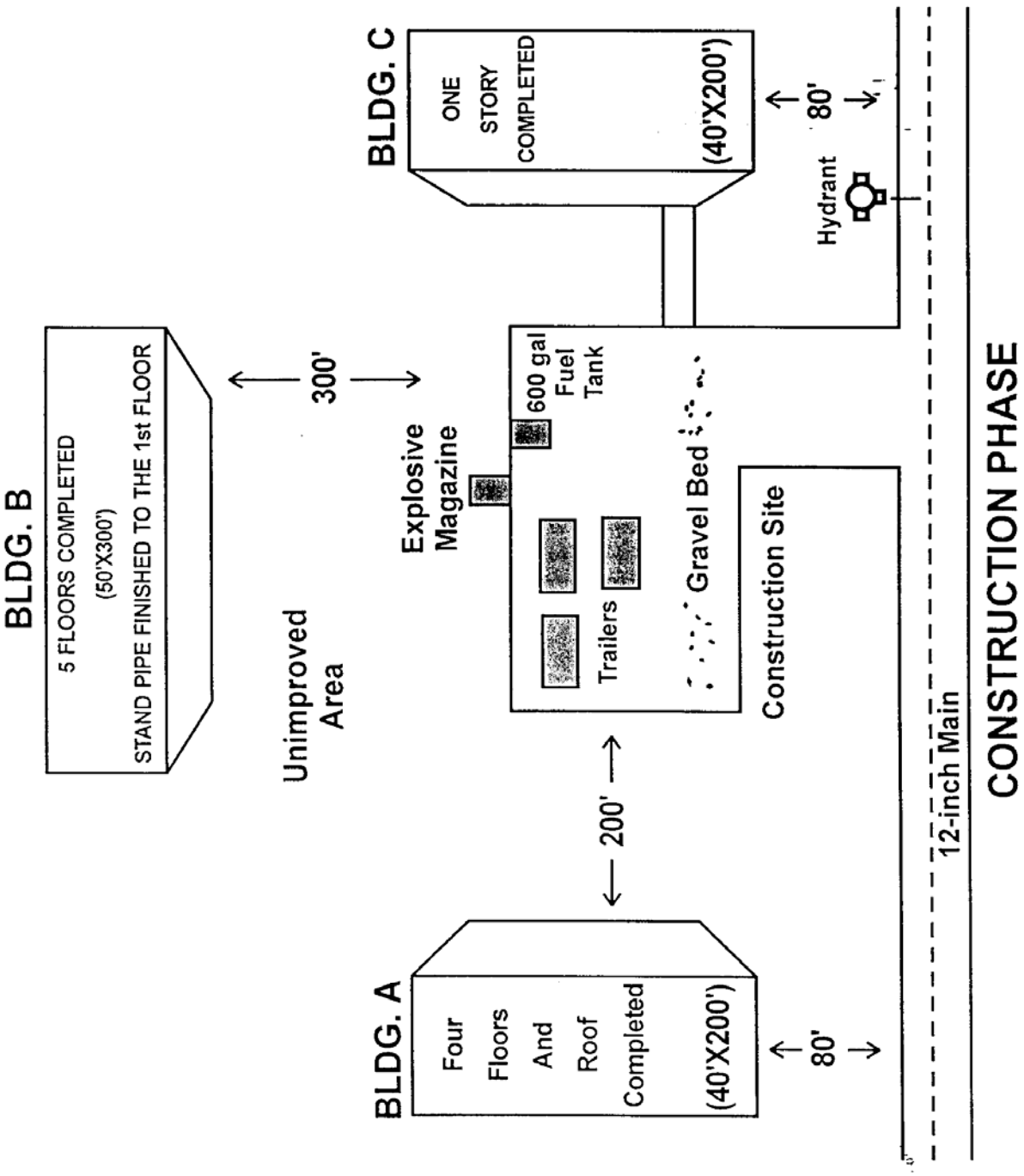
Building B is a noncombustible building with poured-in-place concrete floors and steel columns that is constructed to the fifth-floor level. The standpipe is constructed to the second-floor level but is not in service. The building contains a large amount of combustible form work. Fire extinguishers are present on all floors.

Building C is the same as building A except construction has just begun. Framing of the first floor is underway.

Plot Plan


BLDG. B
Eight Floor Mid Rise
(50'x300')
Canopy
Underground
Parking
BLDG. C
Four
Story
(40'x200')
BLDG. A
Four
Story
(40'x200')
Grassy
Area
Parking
Areas
8-inch
Main
Hydrant
12-inch Main
FUTURE PHASE

Plot Plan


BLDG. B
5 FLOORS COMPLETED
(50'X300')
STAND PIPE FINISHED TO THE 1st FLOOR
300'
Unimproved Area
Explosive Magazine
BLDG. C
ONE STORY COMPLETED
(40'X200')
80'
Hydrant
600 gal Fuel Tank
Trailers
Gravel Bed
Construction Site
200'
BLDG. A
Four Floors And Roof Completed
(40'X200')
80'
12-inch Main
CONSTRUCTION PHASE

FIRE-SAFETY SURVEY REPORT

FIRE PREVENTION…
FOR YOUR SAFETY

Building _____ Owner/Mgr. _____
Address _____ Phone _____
_____ Type of Occupancy _____

☐ New Occupant

The _____ Fire Department has conducted a fire safety survey of your property. The knowledge gained through this survey will enable the Fire Department to attack and extinguish fire that might occur in the building quickly and efficiently.

During this inspection, conditions affecting fire safety throughout the premises were also noted. It is requested that the items listed below be given your immediate attention in the interest of fire safety.

FIRE HAZARDS FOUND TO EXIST: ☐ NONE OBSERVED THIS INSPECTION

☐ Fire Extinguishers	☐ Housekeeping	☐ Flammable Liquids	☐ Electrical
☐ Trash	☐ Utilities	☐ Fire Protection Equip.	☐ Fire Lanes
☐ Exits	☐ Fire & Smoke Doors	☐ No Smoking Signs	☐ Other

_____

_____

_____

_____

_____

_____

_____

_____

_____

If at any time questions regarding fire safety arise, do not hesitate to contact the Fire Department at _____. For an emergency call _____. In case of fire in your building, call the FIRE EMERGENCY NUMBER.

_____	_____	_____
Property Representative	*Reporting Officer*	*Date*

Reinspection Due _____ Made By _____ Date _____ Notified FM # _____

WHITE – Owner/Manager
YELLOW – Station File
PINK – Fire Marshal

FIRE HAZARDS CORRECTED # _____
FIRE HAZARDS NOT CORRECTED # _____

10/75

Notice of Violation Page _____ of _____

Building _____ Date _____

Address _____ Owner/Mgr. _____

PROPERTY REPRESENTATIVE

REPORTING OFFICER

WHITE – Owner/Manager
YELLOW – Station File
PINK – Fire Marshal

FIRE HAZARDS CORRECTED _____
FIRE HAZARDS NOT CORRECTED _____

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