

fire protection planning report



BUILDING CONSTRUCTION INFORMATION FROM THE CONCRETE AND MASONRY INDUSTRIES

NO. 4 OF A SERIES

Building Fire Protection Into Low-Rise Multifamily Homes



Occupants of this concrete and masonry apartment can rest assured they are protected by concrete floors, walls, and ceilings from the spread of fire.

Introduction

The loss of life and property from fire in garden apartments, townhouses, and other low-rise multifamily residences (buildings with up to three floors) can be reduced by upgrading codes and standards governing construction materials and methods.

Townhouses and low-rise multifamily residential buildings contribute heavily to current fire-loss statistics. In the United States alone, it is estimated that more than 6,600 people die annually from fires in residential buildings of all types. Corresponding property damages amount to over \$1 billion each year. A very high percentage of these fire losses can be attributed to housing facilities constructed under liberal building codes.

One way to promote greater fire safety to life and property is to require better fire-resistant construction through the upgrading of building regula-

tions. By strengthening code provisions, fire protection of low-rise buildings can be improved.

Residents Need More Protection

Residents of townhouses and low-rise apartments often are exposed to unnecessary fire hazards because they are not getting the necessary fire protection. Usually these residents are not aware of the hazards because they depend upon the community's building codes for protection.

Many codes allow the same combustible construction that is used in single-family residences to be used in the construction of multifamily housing. However, there should be a greater distinction made between the high percentage of fire risks inherent in multiple-dwelling units and the comparatively low percentage of fire risks inherent in single-family homes.



To be effective, a party wall must extend above the roof in a combustible building. Unless this concrete masonry wall is completed at least to the top of the roof, fire could spread from one unit to another by the igniting of the wood framing materials. When the wall is closed in, it will be assumed that it is noncombustible to the top. Building inspection is especially important in this type of construction.



This three-story apartment building under construction is compartmented with noncombustible floors, walls, and ceilings. This helps contain smoke and fire within a unit for a longer period of time than would be possible with combustible building materials.



This three-story apartment building has several fire-protective elements. Note the masonry firewall extending above the roof line and out from the building. The mansard roof sheathing is combustible, but is firestopped by a concrete masonry wall. It is not necessary to extend a firewall through a fire-resistive roof.

As the number of residents housed in a building increases, the potential fire hazards also increase and the necessity for adequate fire protection becomes considerably more acute. Shared walls, floors, and roofs increase the danger of fire. Fire in one unit or common area endangers all residents.

Consider Fire Safety Well In Advance

The possibility of fire in either a family unit or a common building area should be considered well in advance of the construction of the building. With this in mind, the first step is to design the structure to prevent the spread of a fire. The major requirement of low-rise multifamily construction is that the building be erected in such a way that the fire is confined to as small an area as possible and the number of affected dwelling units is kept to a minimum.

Build Fire Protection In

There are many ways to build fire protection into low-rise multifamily residences, but the following meet fundamental protection needs.

Compartmentation. Compartmentation will resist the spread of fire, but compartmentation alone is not adequate protection. The structural envelope comprising the compartment should be constructed of fire-rated assemblies using noncombustible materials. This type of construction provides the needed protection for structural integrity as well as for resisting the spread of fire from one unit to another. Concrete, concrete masonry, or brick walls will control and limit the spread of fire. Each dwelling unit should be enclosed with such noncombustible materials.

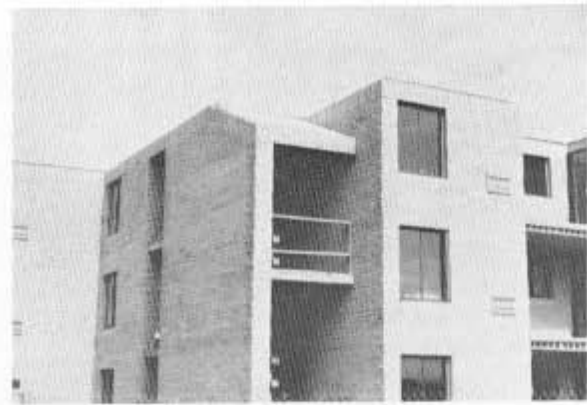
Walls. The building should have a minimum of 1-hour fire-rated construction for walls between the units and also for corridor walls. However, 2-hour fire-rated *noncombustible* assemblies are preferable. Fire spreads rapidly to adjoining units through common attics, floors, and walls made of combustible materials. Fire officials have noted some early failures in supposedly 1-hour fire-rated walls in apartments. This could be a result of using combustible materials in rated assemblies, or inadequate construction practices.

Firewalls—barriers intended to limit the spread of fire—are excellent for separating dwelling units. However, firewalls are sometimes terminated at the ceiling line. To be completely effective, firewalls should extend from the foundation up to and through the roof.

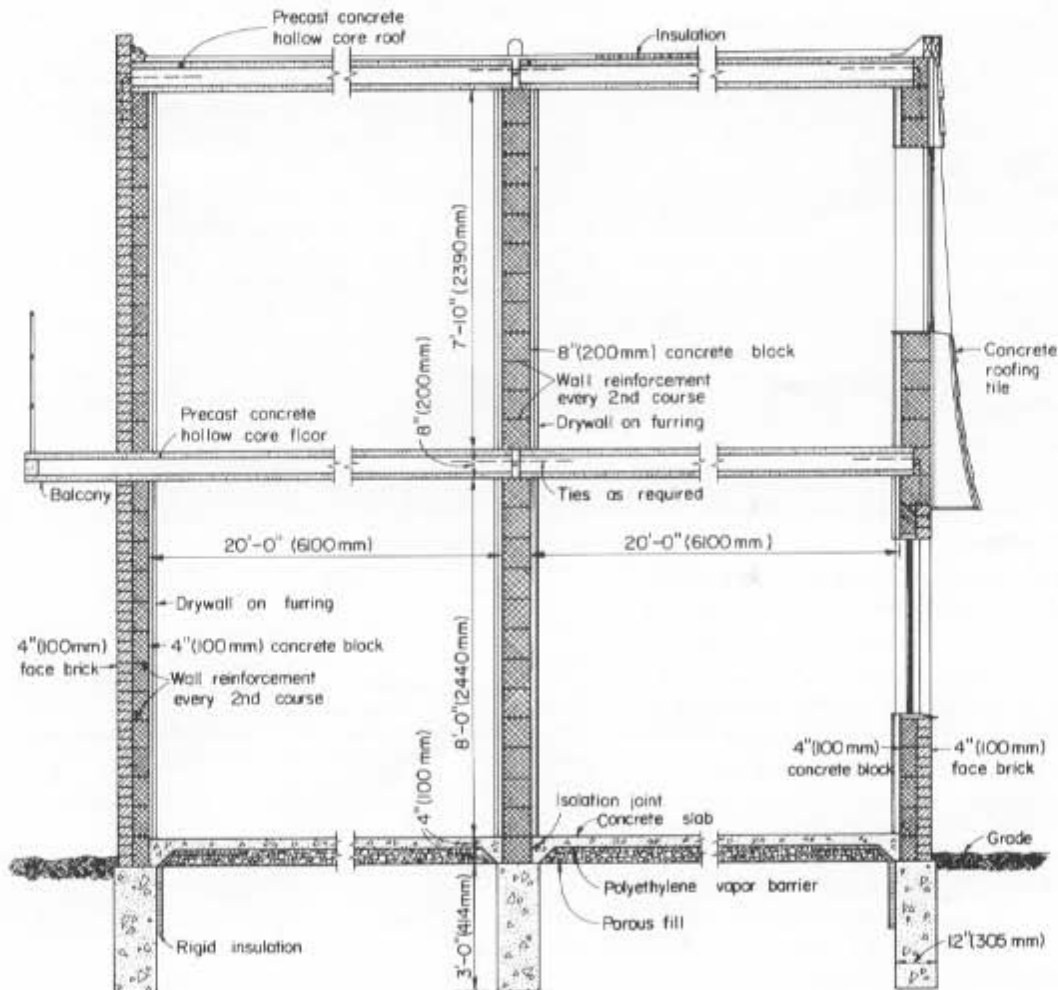
Firewalls should be continuous and of concrete, concrete masonry, or brick, parapeted through combustible roofs and projected through the exterior wall or joined tightly to an exterior concrete,



Small low-rise apartment buildings with concrete hollow-core floors forming balconies. Exterior walls are masonry. Buildings such as this will not prevent fire from starting in combustible furnishings, but fire-resistive structural elements can limit the fire to the area of origin.



The stairwells, roof, floors, walls, and balconies in this fire-resistive structure protect the property and occupants from fire.



Section through a two-story apartment building shows an example of the use of fire-resistive structural materials. This also would be appropriate for protecting occupants of houses aligned in a row. Balconies add to the marketing value of the project. This is an economical and practical method of construction in addition to providing fire protection. Also important is the fact that insurance premiums and maintenance are low.

concrete masonry, or brick wall. The firewall should be extended several feet beyond the wall of the building, where the exterior walls are combustible, to prevent fire passage around the wall.

Exterior walls should be fire resistive. Combustible wall materials and finishes add fuel that allows fire to climb vertically and spread along the entire wall of the building.

Floors. All floors in the building should have 1- or 2-hour fire-resistive ratings. This will prevent fire from spreading vertically in multilevel apartments, buildings, and townhouses where bedroom units are usually located on the second floor. Residents jumping from a second or third floor to escape fire can suffer death or serious injury.

Balconies. Buildings should have fire-resistive balconies. Balconies are standard design in many buildings. They can serve as places of refuge for persons trapped in burning or smoke-filled apartments. Balconies of combustible materials not only eliminate this advantage but add fuel to the fire and permit the flames to climb vertically on the exterior of the building.

Mansard Roofs. Mansard roofs—a popular exterior design for apartments and townhouses—are sometimes considered a wall because of the steep angle of application. The mansard is often backed by the same combustible sheathing and framing as an ordinary wall. Unfortunately, the common mansard roofing material and underlayment will spread fire to the exterior surfaces. A degree of fire protection can be maintained by backing the mansard with fire-resistive materials and firestopping any concealed areas with non-combustible materials.

Firestopping. Firestopping is the method of closing off cracks, holes, and crevices so fire cannot find its way from one area to another, and is generally required by building codes. It is far more difficult to firestop a combustible building because of the many concealed areas and because close supervision of construction personnel is required. Although firestopping is just as important for both

combustible and fire-resistive construction, there are fewer firestopping areas for fire resistive. This reduces the chances for error in construction methods.

Penetrations. Unsealed penetrations through floors and walls are often the source for major spread of flame, smoke, and hot gasses. Firestopping to close construction openings around ducts, piping and conduits is mandatory in order to form an effective fire barrier. Penetrations or passage of mechanical and electrical systems through fire-rated walls separating apartments or townhouse units should generally not be permitted.

Conclusion

This publication considers several construction practices and methods that can be readily achieved to increase firesafety in low-rise multifamily construction. Although these construction safety methods and materials are currently being used, there is an immediate need for more communities to upgrade building codes.

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BIA	Brick Institute of America
CRSI	Concrete Reinforcing Steel Institute
ESC&SI	Expanded Shale Clay and Slate Institute
NCMA	National Concrete Masonry Association
NRMCA	National Ready Mixed Concrete Association
PCA	Portland Cement Association
PCI	Prestressed Concrete Institute

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