



Concord Department of Fire and Life Safety

FIRE MARSHAL'S OFFICE

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Fire Suppression Operations in Residential Occupancies equipped with Residential Fire Sprinkler Systems.

Since human beings learned to extinguish fires by using water and began to form bucket brigades to shuttle water from a water source to a fire, fire suppression methods have been constantly evolving. Methods employed by today's fire service utilize trucks, personnel, strategy and tactics and modern technology to provide fire protection. As the fire service proceeds into the future, new methods will be developed and employed.

Through the years the fire service has begun to realize that in order to offer a complete fire protection program, fire prevention strategies must be implemented. Community fire problems must be identified and programs must be developed and implemented.

One particular fire problem identified by the National Fire Protection Association (NFPA) is the majority of structure fires occur in residential structures. In the year 2000, 73 percent of structure fires occurred in residential structures. Additionally, 85 percent of civilian deaths occurred in residential fires with two-thirds of these fatalities occurring in one and two family dwellings. According to NFPA, the majority of fires occur in the kitchen area of the home and half of the fatalities occurred in rooms beyond the room of fire origin. Cooking and heating were found to be the leading causes of fires.



To reduce these losses, Code making organizations have come to realize that residential fire sprinklers save lives. Residential Building Codes have been updated to require residential fire sprinkler systems be installed in certain types of residential occupancies. Exceptions are given to one and two family dwellings. This exclusion of one and two family dwellings in the Code falls far short of reducing the number of fatalities in residential dwelling fires. In order to close this short fall, municipal governments such as San Clemente, California; Sarasota,

Florida; Chapel Hill, North Carolina; and Scottsdale, Arizona have enacted residential fire sprinkler ordinances to further reduce the number of fatalities and property damage resulting from residential structure fires.

Another issue that directly affects fire protection are current trends in residential building projects. Common types of developments being proposed and built are projects with structures built close together in an effort to maximize lot spaces and increase profit margins. One particular type of development concept is known as TND (Traditional Neighborhood Development). This type of development embraces the concept of traditional neighborhoods built during the 1950's and earlier years. The socio-logical concept behind this type of development is that people living in close-knit fashion with a mixture of business and residential development will gladly walk to neighborhood stores and activities rather than drive to other areas of the city. This design concept instills a sense of neighborhood and belonging to the Occupants of the neighborhood.



Characteristics of this type of development are: houses and structures are built on narrow lots with minor separation from other buildings. Structures are placed on lots using short set back requirements from the street and sidewalks extend throughout the development. Modern trend items such as traffic calming devices are installed (Round-About pictured left). These devices include narrow street width;

curbing restrictions; speed humps and offset road intersections are employed. These methods are instituted in an effort to slow motorist and encourage occupants to park vehicles on neighborhood streets. Beautification and esthetics are issues. These are employed with tree and shrub lined streets and utilities placed underground.

Problems facing fire department response and operations in these areas coincide with the advantages of this type of development. Structures built close to the street as well as other structures provide for rapid-fire advancement from structure to structure. Traffic calming devices used hamper and slow fire department response allowing for fire growth. Narrow, tree lined streets discourage use of Truck Company Tower Ladders and limit ground ladder maneuverability. When responding to this type of development thoughts of "Conflagrations" and other severe fires of the past come to mind.



If this type of “retro” development becomes mainstream, modern residential building codes must address the importance of Residential Sprinkler Systems and the advantages to having these types of systems used as a direct component of construction. Other forms of fire resistive elements must be installed but the Residential Sprinklers should be the main focus of construction.

NFPA 13-D and 13-R Residential sprinkler systems should be viewed as the “First Responder” in residential construction. The application of water on fires at or slightly above incipient phase could save countless lives and property. Even with water damage losses factored in, sprinklers could save insurance companies unknown amounts of money.

Fire department operations and tactics must be revisited to include residential fire sprinklers. Firefighters must understand that when attacking a fire in a sprinklered residential structure, tactics similar to those employed in sprinklered commercial buildings are applicable. Fire containment and control must be achieved before sprinklers are shut down. A special precaution when shutting down a domestic water supply to a sprinklered



structure involves the use of a single control valve arranged to shut off both the domestic system and the sprinkler system. This valve arrangement can be utilized for systems with common sprinkler/domestic water supplies. Fire units turning off utilities to a structure could mistakenly contribute to fire growth and endanger interior crews if this type of valve configuration is used to supply a sprinkler system. This problem reinforces the need for proper preplanning to be conducted in residential sprinklered structures.

Differences in the design, piping, and valves of residential sprinkler systems are important areas of concern and must be understood. Traditional NFPA 13 Fire Sprinkler Systems are designed with the concept of “Property Conservation”. The design method of residential fire sprinkler systems utilizes the concept of “Life Safety”. The differences between these design methods are emphasized in the



Sprinkler Piping – Orange

installation of the types of heads and the required locations of heads. In NFPA 13 installations, all areas of the building are required to be sprinklered with no exceptions being granted by the Code. Examples of this include; interior construction creating an obstruction of more than 4-feet in width, rack storage units, machine and ovens, spray booths, and in some instances exterior overhangs.

Sprinkler heads used in these types of systems are UL Listed Standard Orifice Heads, Extra Large Orifice and Early Suppression Fast Response (ESFR) Heads. Types of systems installed are Wet, Dry, Pre-action, ESFR (Early Suppression Fast Response) and Deluge Systems.

Residential fire sprinkler systems utilize the concept of “Life Safety”. The design of these systems requires the installation of heads in “inhabitable” spaces of a structure. Exceptions are given to this rule in bathrooms with an area that does not exceed 55 square feet. Sprinklers are not required in clothes closets, linen closets, and pantries that do not exceed 24 square feet. With this exception, walls and ceilings, including walls and ceilings behind fixtures, must be made of noncombustible or limited-combustible materials that provide a 15-minute thermal barrier.



Installation - Bracing and T

Sprinkler heads are not required in attics, penthouse equipment rooms, elevator machine rooms, concealed spaces dedicated exclusively to and containing only dwelling unit ventilation equipment, crawl spaces, floor/ceiling spaces, elevator shafts, and other concealed spaces that are not used or intended for living purposes or storage and do not contain fuel-fired equipment. Heads are also not required in any porches, balconies, corridors, and stairs that are open and

attached to the building. Fire department tactical operations must include the protection of these vital elements to ensure occupant escape paths and firefighter entry/exit corridors are maintained.

Listed residential quick response type sprinkler heads and other types of residential heads are installed. Types of systems utilized are Wet, antifreeze systems, dry pipe systems, and pre-action systems.



Quick Response Sprinkler Heads

These systems may use metallic or nonmetallic pipe and components designed for working pressures of not less than 175 psi with an 1½” FDC Connection (In some rare cases due to inaccessibility by the fire department or single story construction, a FDC may not be installed on the system). Fire Departments must either require 2½” connections to be installed during plan review on systems or modify company tactics to include 1-½” hose to be used as “Supply Line” in sprinkler support operations. When pumping a residential



Non-metallic components

system, pump pressures must be adjusted downward to offset lower system operating pressures. Excessive pump pressures may damage the system and at worst-case scenario, cause piping to burst rendering the system inoperative. Preplanning once again will identify the correct pump pressures needed to properly support these systems. Valve sizes incorporated are smaller and require minimal effort to shut off utilities. Some common components utilized in both NFPA 13 and 13-R/D systems include among others, system and supply pressure gauges, inspector test valves and main drain valves.

The Codes require these systems to have audible warning devices installed such as bells or horn/strobes. If a fire alarm system is present in the structure, the Codes require the sprinkler system to be connected to the fire alarm system. But in both cases but the Codes fall short of having system activation monitored by a 24-hour central station agency. This delay in notification can allow for fire growth and excessive water damage to the structure.



Alarm Bell (Center)



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Understanding the design aspect of residential sprinkler systems is critical in attacking and controlling fires in structures utilizing these systems. Knowing where sprinklers are and are not located is critical in the positioning of initial attack crews. Coordination between system components and attacklines must be maintained to control fire advancement in these structures. Once the fire is under control, overhaul operations must include a thorough examination of voids and all unsprinklered areas affected by the fire. Sprinklers should not be shut down until all areas have been thoroughly investigated.

Fire departments must be aware of the locations that contain these systems and personnel must be trained in the operation of these systems. Once training has been conducted, pre-incident planning must take place to properly control and extinguish an incident involving an occupancy containing a residential sprinkler system.

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