ABOUT CODE CORNER

CCFS would like to remind you to check with your local "Authority Having Jurisdiction (AHJ)" for questions and opinions concerning your local Fire and Building Codes. The information contained in this article is supplied as a courtesy by the International Code Council (ICC) and is based on the International Fire and Building Codes and their respective commentaries. Your local codes or ordinances may vary.

SECTION 903 AUTOMATIC SPRINKLER SYSTEMS PART 2

About the 2012 Edition … CCFS will be publishing sections of the 2012 IFC for your review and comparison. Please note that CCFS is not suggesting you adopt this new regulation. Any regulations used in your state/ organization should be in accordance with the recommendations set forth by your local Building Regulations Organization and State Fire Marshal's Office.

903.2.5.2 Group H-5 occupancies. An *automatic sprinkler system* shall be installed throughout buildings containing Group H-5 occupancies. The design of the sprinkler system shall not be less than that required under the *International Building Code* for the occupancy hazard classifications in accordance with Table 903.2.5.2.

Where the design area of the sprinkler system consists of a *corridor* protected by one row of sprinklers, the maximum number of sprinklers required to be calculated is 13.

▫ *Group H-5 occupancies are structures that are typically used as semiconductor fabrication facilities and comparable research laboratory facilities that use hazardous production materials (HPM). Many of the materials used in semiconductor fabrication present unique hazards. Many of the materials are toxic, while some are corrosive, water reactive or pyrophoric. Fire protection for these facilities is aimed at preventing incidents from escalating and producing secondary threats beyond a fire, such as the release of corrosive or toxic materials. Because of the nature of Group H-5 facilities, the overall amount of hazardous materials can far exceed the maximum allowable quantities given in Tables 5003.1.1(1) and 5003.1.1(2). Although the amount of HPM material is restricted in fabrication areas, the quantities of HPM in storage rooms normally will be in excess of those allowed by the tables. Additional requirements for Group H-5 facilities are located in Chapter 27 of the code and Section 415.10 of the IBC.*

This section also specifies the sprinkler design criteria, based on NFPA 13, for various areas in a Group H-5 occupancy (see commentary, Table 903.2.5.2). When the corridor design area sprinkler option is used, a maximum of 13 sprinklers must be calculated. This exceeds the requirements of NFPA 13 for typical egress corridors, which require a maximum of either five or seven calculated sprinklers, depending on the extent of protected openings in the corridor. The increased number of calculated corridor sprinklers is based on the additional hazard associated with the movement of hazardous materials in corridors of Group H-5 facilities.

TABLE 903.2.5.2
GROUP H-5 SPRINKLER DESIGN CRITERIA

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LOCATION	OCCUPANCY HAZARD CLASSIFICATION
Fabrication areas	Ordinary Hazard Group 2
Service corridors	Ordinary Hazard Group 2
Storage rooms without dispensing	Ordinary Hazard Group 2
Storage rooms with dispensing	Extra Hazard Group 2
Corridors	Ordinary Hazard Group 2

▫ *Table 903.2.5.2 designates the appropriate occupancy hazard classification for the various areas within a Group H-5 facility. The listed occupancy hazard classifications correspond to specific sprinkler system design criteria in NFPA 13. Ordinary Hazard Group 2 occupancies, for example, require a minimum design density of 0.20 gpm/ft2 (8.1 L/min/m2) with a minimum design area of 1,500 square feet (139 m2). An Extra Hazard Group 2 occupancy, in turn, requires a minimum design density of 0.40 gpm/ ft2 (16.3 L/min/m2) with a minimum operating area of 2,500 square feet (232 m2). The increased overall sprinkler demand for Extra Hazard Group 2 occupancies is based on the potential use and handling of substantial amounts of hazardous materials, such as flammable or combustible liquids.*

903.2.5.3 Pyroxylin plastics. An *automatic sprinkler system* shall be provided in buildings, or portions thereof, where cellulose nitrate film or pyroxylin plastics are manufactured, stored or handled in quantities exceeding 100 pounds (45 kg).

▫ *Cellulose nitrate (pyroxylin) plastics pose unusual and substantial fire risks. Pyroxylin plastics are the most dangerous and unstable of all plastic compounds. The chemically bound oxygen in their structure permits them to burn vigorously in the absence of atmospheric oxygen. Although these compounds produce approximately the same amount of energy as paper when they burn, pyroxylin plastics burn at a rate as much as 15 times greater than comparable common combustibles. When burning, these materials release highly flammable and toxic combustion byproducts. Consequently, cellulose nitrate fires are very difficult to control. Although this section specifies a sprinkler threshold quantity of 100 pounds (45.4 kg), the need for additional fire protection should be considered for pyroxylin plastics in any amount.*

Although the code includes cellulose nitrate "film" in its requirements, cellulose nitrate motion picture film has not been used in the United States since the 1950s. All motion picture film produced since that time is what is typically called "safety film." Consequently, the only application for this section relative to motion picture film is where it may be used in laboratories or storage vaults that are dedicated to film restoration and archives. The protection of these facilities is addressed in Sections 306.2 and 6504.2.

903.2.6 Group I. An *automatic sprinkler system* shall be provided throughout buildings with a Group I *fire area*.

Exceptions:

1. An *automatic sprinkler system* installed in accordance with Section 903.3.1.2 shall be permitted in Group I-1

facilities.

2. An *automatic sprinkler system* installed in accordance with Section 903.3.1.3 shall be allowed in Group I-1 facilities when in compliance with all of the following:

2.1. A hydraulic design information sign is located on the system riser;

2.2. Exception 1 of Section 903.4 is not applied; and

2.3. Systems shall be maintained in accordance with the requirements of Section 903.3.1.2.

3. An *automatic sprinkler system* is not required where day care facilities are at the *level of exit discharge* and where every room where care is provided has at least one exterior *exit* door.

4. In buildings where Group I-4 day care is provided on levels other than the *level of exit discharge*, an *automatic sprinkler system* in accordance with Section 903.3.1.1 shall be installed on the entire floor where care is provided and all floors between the level of care and the *level of exit discharge*, all floors below the level of exit discharge, other than areas classified as an open parking garage.

▫*The Group I occupancy is divided into four individual occupancy classifications based on the degree of detention, supervision and physical mobility of the occupants. The evacuation difficulties associated with the building occupants creates the need to incorporate a defend-in-place philosophy of fire protection in occupancies of Group I. For this reason, all such occupancies are to be protected with an automatic sprinkler system.*

Of particular note, this section encompasses all Group I-3 occupancies where more than five persons are detained. There has been considerable controversy concerning the use of automatic sprinklers in detention and correctional occupancies. Special design considerations can be taken into account to alleviate the perceived problems with sprinklers in sleeping units. Sprinklers that reduce the likelihood of vandalism as well as the potential to hang oneself are commercially available. Knowledgeable designers can incorporate certain design features to increase reliability and decrease the likelihood of damage to the system.

Group I-4 occupancies would include either adult only care facilities or occupancies that provide personal care for more than five children, 21/2 years of age or younger, on a less than 24-hour basis. Because the degree of assistance and the time needed for egress cannot be gauged, an automatic sprinkler system is required.

There are four exceptions to this section. Exception 1 permits Group I-1 occupancies to be protected throughout with an NFPA 13R system instead of a NFPA 13 system.

Exception 2 allows the use of an NFPA 13D sprinkler system instead of a standard NFPA 13 sprinkler system, but with several conditions specified. The conditions noted basically relate the system more closely to an NFPA 13R system with requirements for monitoring and maintenance and availability documents describing the hydraulic design for the system. The exception recognizes the perceived mobility of the occupants in a Group I-1 facility, as well as the basic life-safety intent to protect the main occupiable areas. However, use of this exception would result in the building not qualifying as a fully sprinklered building in accordance with NFPA 13 for any applicable code alternatives.

Exception 3 exempts sprinkler systems completely if the day care center is at the level of exit discharge and every room has at least one exterior exit door. Note that day cares to which this section applies are considered by Section 308.6.1 to be Group E occupancies. An automatic sprinkler system would not be required unless dictated by the requirements in Section 903.2.2 (see commentary, Section 308.6.1 of the IBC).

Exception 4 is also related to day cares that are still classified as Group I-4 by nature of the location in the building. In that case, an NFPA 13 system would be required on the floor where the center is located and all floors between and including the level of exit discharge. This is less stringent than the main requirement in Section 903.2.6 that requires the entire building to be sprinklered. As defined in Section 202, a Group I-4 child care facility located at the level of exit discharge and accommodating no more than 100 children, with each child care room having an exit directly to the exterior, would be classified as a Group E occupancy.

903.2.7 Group M. An *automatic sprinkler system* shall be provided throughout buildings containing a Group M occupancy where one of the following conditions exists:

1. A Group M *fire area* exceeds 12,000 square feet (1115 m2).

2. A Group M *fire area* is located more than three stories above grade plane.

3. The combined area of all Group M *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m2).

4. A Group M occupancy used for the display and sale of upholstered furniture or mattresses exceeds 5,000 square feet (464 m2).

▫ *The sprinkler threshold requirements for Group M occupancies are identical to those of Group F-1 and S-1 occupancies (see commentary, Section 903.2.4). The one exception is that Group M occupancies are provided with an increased area for display of upholstered furniture and mattresses of 5,000 square feet (464 m2) versus 2,500 square feet (232 m2) required for Group F-1 and S-1 occupancies. As noted in the commentary for Group F-1 occupancies, upholstered furniture and mattresses have the potential for rapid growing and high-heat-release fires. This hazard is increased substantially when there are numerous upholstered furniture items or mattresses on display. Such fires put the occupants and emergency responders at risk. This requirement exists regardless of whether the upholstered furniture has passed any fire-retardant tests.*

The code does not specifically address what constitutes upholstered furniture, but by simple dictionary definition, upholstered furniture has seats, covered with padding, springs, webbing and fabric or leather covers. The code does not make any distinction between levels of padding and upholstery provided on furniture, which was intentional. The proponent's reason statement for code change F135-07/08 stated, in part, that "the American Home Furnishings Alliance (AHFA) and the National Home Furnishings Association (NHFA) have examined proposals for exempting vendors of certain constructions of furniture and concluded that such exemptions would be impractical for local code officials to enforce. This is the case because the internal construction of furniture cannot be established reliably without deconstructing it."

Note that, as with Group F-1 occupancies, the criteria is written such that any Group M occupancy, not the fire area, over 5,000 square feet (464 m2) used for the display and sale of upholstered furniture and mattresses shall be sprinklered throughout. This is regardless of how much upholstered furniture and mattresses are actually available for purchase.

Automatic sprinkler systems for mercantile occupancies are typically designed for an Ordinary Hazard Group 2 classification in accordance with NFPA 13. If high-piled storage (see Section 903.2.7.1) is anticipated; however, additional levels of fire protection may be required. Also, some merchandise in mercantile occupancies, such as aerosols, rubber tires, paints and certain plastic commodities, even at limited storage heights, are considered beyond the standard Class I through IV commodity classification assumed for mercantile occupancies in NFPA 13 and may warrant additional fire protection.

903.2.7.1 High-piled storage. An *automatic sprinkler system* shall be provided as required in Chapter 32 in all buildings of Group M where storage of merchandise is in high-piled or rack storage arrays.

▫ *Regardless of the size of the Group M fire area, an automatic sprinkler system may be required in a high-piled storage area. High-piled storage includes piled, palletized, bin box, shelf or rack storage of Class I through IV combustibles to a height greater than 12 feet (3658 mm) and certain high-hazard commodities greater than 6 feet (1829 mm). Chapter 23 provides a package of requirements that may include sprinkler protection depending upon the size of the high-piled storage area. The design standard for the sprinkler protection of high-piled storage is NFPA 13. NFPA 13 addresses the many different types and configurations of high-piled storage.*

903.2.8 Group R. An *automatic sprinkler system* installed in accordance with Section 903.3 shall be provided throughout all buildings with a Group R *fire area*.

▫ *This section requires sprinklers in any building that contains a Group R fire area. This includes uses, such as hotels, apartment buildings, group homes and dormitories. There are no minimum criteria and no exceptions.*

It should be noted that buildings constructed under the International Residential Code® (IRC®) are not included in Group R and would not, therefore, be subject to these particular requirements. However, the 2009 IRC requires sprinklers in all new townhouses and beginning January 1, 2011 all one- and two-family dwellings must be protected with sprinklers. The IRC is a stand-alone code for the construction of detached one- and two-family dwellings and multiple single-family dwellings (townhouses) no more than three stories in height with a separate means of egress and addresses the requirements for sprinklers in a different way. That is, all of the provisions for new construction that affect those buildings are to be covered exclusively by the IRC and are not to

be covered by another International Code. Buildings that do not fall within the scope of the IRC would be classified in Group R and be subject to these provisions. This is stated clearly in IFC Committee Interpretation No. 29-03.

With respect to life safety, the need for a sprinkler system is dependent on the occupants' proximity to the fire and the ability to respond to a fire emergency. Group R occupancies could contain occupants who may require assistance to evacuate, such as infants, those with a disability or who may simply be asleep. While the presence of a sprinkler system cannot always protect occupants in residential buildings who are aware of the ignition and either do not respond or respond inappropriately, it can prevent fatalities outside of the area of fire origin regardless of the occupants' response. Section 903.3.2 requires quick response or residential sprinklers in all Group R occupancies. Full-scale fire tests have demonstrated the ability of quick-response and residential sprinklers to maintain tenability from flaming fires in the room of fire origin.

Where a different occupancy is located in a building with a residential occupancy, the provisions of this section still apply and the entire building is required to be provided with an automatic sprinkler system regardless of the type of mixed-use condition considered. This is consistent with the mixed-use provisions in Chapter 5.

903.2.8.1 Group R-3 or R-4 congregate residences. An automatic sprinkler system installed in accordance with Section 903.3.1.3 shall be permitted in Group R-3 or R-4 congregate living facilities with 16 or fewer residents.

▫ *This section allows Group R-3 and R-4 congregate residences to use a NFPA 13D system. This would not be appropriate for all Group R occupancies, but only for small congregate residences. While not technically a single-family dwelling, such occupancies are permitted to use NFPA 13D systems. This is consistent with NFPA 13D requirements and was permitted specifically for Group R-4 in the 2000 edition of the International Building Code▫▫ (IBC▫). This would also be consistent with Fair Housing Act (FHA) court cases based on nondiscrimination for group homes.*

903.2.8.2 Care facilities. An automatic sprinkler system installed in accordance with Section 903.3.1.3 shall be permitted in care facilities with 5 or fewer individuals in a single- family dwelling.

▫ *This section is similar to Section 903.2.8.1 and allows the use of an NFPA 13D system in place of an NFPA 13 or 13R system. In this case, it is specific to smaller care facilities with five or fewer residents. Again, while not technically a single family-dwelling, they are very similar in nature based upon the type and actual use of the building.*

903.2.9 Group S-1. An *automatic sprinkler system* shall be provided throughout all buildings containing a Group S -1 occupancy where one of the following conditions exists:

1. A Group S-1 *fire area* exceeds 12,000 square feet (1115 m2).

2. A Group S-1 *fire area* is located more than three stories above grade plane.

3. The combined area of all Group S-1 *fire areas* on all floors, including any mezzanines, exceeds 24,000 square feet (2230 m2).

4. A Group S-1 *fire area* used for the storage of commercial trucks or buses where the *fire area* exceeds 5,000 square feet (464 m2).

5. A Group S-1 occupancy used for the storage of upholstered furniture or mattresses exceeds 2,500 square feet (232 m2).

▫ *An automatic sprinkler system must be provided throughout all buildings where the fire area containing a Group S-1 occupancy exceeds 12,000 square feet (1115 m2), where more than three stories in height, where the combined fire area on all floors, including mezzanines, exceeds 24,000 square feet (2230 m2) or where the Group S-1 fire area used for the storage of commercial trucks or buses exceeds 5,000 square feet (464 m2).*

The first three sprinkler threshold requirements for Group S-1 occupancies are identical to those of Group F-1 and M (see commentary, Sections 903.2.4 and 903.2.7). Group S-1 occupancies, such as warehouses and self-storage buildings, are assumed to be used for the storage of combustible materials. While high-piled storage does not change the Group S-1 occupancy classification, sprinkler protection, if required, may have to comply with the additional requirements of Chapter 23. High-piled stock or rack storage in any occupancy must comply with the code. The fourth sprinkler threshold is the same as for Group F-1 except that, in this case, uphol-

stered furniture and mattresses are being stored and not manufactured. Group M has a similar threshold, but is required for larger occupancies containing such items with an area of 5,000 square feet (464 m2) versus what is required for Group S-1 and F-1 of 2,500 square feet (232 m2). See the commentary for Group M and Group F-1 definitions for more discussion on this issue. Again, it is important to note that the threshold is based upon the square footage of the occupancy and not upon the size of the fire area. Also the code does not discern between the storage of one mattress or many. The requirements are based solely on the square footage of the occupancies containing upholstered furniture or mattresses.

903.2.9.1 Repair garages. An *automatic sprinkler system* shall be provided throughout all buildings used as repair garages in accordance with Section 406.8 of the *International Building Code*, as shown:

1. Buildings having two or more stories above grade plane, including *basements*, with a *fire area* containing a repair garage exceeding 10,000 square feet (929 m2).

2. Buildings no more than one story above grade plane, with a *fire area* containing a repair garage exceeding 12,000 square feet (1115 m2).

3. Buildings with repair garages servicing vehicles parked in *basements*.

4. A Group S-1 *fire area* used for the repair of commercial trucks or buses where the *fire area* exceeds 5,000 square feet (464 m2).

▫ *Automatic sprinklers may be required in repair garages, depending on the quantity of combustibles present, their location and floor area. In addition any Group S-1 fire area intended for the repair of commercial buses or trucks that exceeds 5,000 square feet (464 m2) would require sprinklers. This is the same criteria as Group S-1 occupancies and Group S-2 enclosed parking garages storing commercial buses and trucks. Repair garages may contain significant quantities of flammable liquids and other combustible materials. These occupancies are typically considered Ordinary Hazard Group 2 occupancies as defined in NFPA 13. Portions of repair garages used for parts cleaning using flammable or combustible liquids may require automatic sprinkler protection. If quantities of hazardous materials exceed the limitations in Chapter 50 for maximum allowable quantities per control area, the repair garage would be reclassified as a Group H occupancy.*

903.2.9.2 Bulk storage of tires. Buildings and structures where the area for the storage of tires exceeds 20,000 cubic feet (566 m3) shall be equipped throughout with an *automatic sprinkler system* in accordance with Section 903.3.1.1.

▫ *This section specifies when an automatic sprinkler system is required for the bulk storage of tires based on the volume of the storage area as opposed to a specific number of tires. Even in fully sprinklered buildings, tire fires pose significant problems to fire departments. Tire fires produce thick smoke and are difficult to extinguish by sprinklers alone. NFPA 13 contains specific fire protection requirements for the storage of rubber tires.*

Whether the volume of tires is divided into different fire areas or not is irrelevant to the application of this section. If the total for all areas where tires are stored is great enough that the resultant storage volume exceeds 20,000 cubic feet (566 m3), the building must be sprinklered throughout. See the commentary to Section 202 definition of "Tires, bulk storage of" for further information.

903.2.10 Group S-2 enclosed parking garages. An *automatic sprinkler system* shall be provided throughout buildings classified as enclosed parking garages in accordance with Section 406.6 of the *International Building Code* as follows:

1. Where the *fire area* of the enclosed parking garage exceeds 12,000 square feet (1115 m2); or

2. Where the enclosed parking garage is located beneath other groups.

Exception: Enclosed parking garages located beneath Group R-3 occupancies.

▫ *Fire records have shown that fires in parking structures typically fully involve only a single automobile with minor damage to adjacent vehicles. An enclosed parking garage, however, does not allow the dissipation of smoke and hot gases as readily as an open parking structure, which is also considered a Group S-2 occupancy. If the enclosed parking garage has a fire area greater than 12,000 square feet (1115 m2) or is located beneath another occupancy group, the enclosed parking garage must be protected with an automatic sprinkler system. This requirement that the enclosed parking garage located beneath other occupancy groups is*

required to be sprinklered is based on the potential for a fire to develop undetected, which would endanger the occupants of the other occupancy. The 12,000 square foot (1115 m2) threshold is similar to other occupancies such as Groups M and S-1.

It should be noted that while open parking garages are considered a Group S-2 occupancy, they are not required by the provisions of this section to be equipped with an automatic sprinkler system.

The exception exempts enclosed garages in buildings where the garages are located below a Group R-3 occupancy. The exception is essentially moot since the code requires all buildings with a Group R occupancy to be sprinklered throughout. Because the entire building with the residential occupancy is required to be sprinklered according to Sections 903.2.8, the garage would be sprinklered as well. It should be noted that if the Group R-3 was protected with an NFPA 13D system that the enclosed parking garage would not require sprinklers.

903.2.10.1 Commercial parking garages. An *automatic sprinkler system* shall be provided throughout buildings used for storage of commercial trucks or buses where the *fire area* exceeds 5,000 square feet (464 m2).

▫ *Because of the larger-sized vehicles involved in commercial parking structures, such as trucks or buses, a more stringent sprinkler threshold is required. Bus garages may also be located adjacent to passenger terminals (Group A-3) that have a substantial occupant load. Commercial parking requires only a single vehicle in order to be classified as commercial parking.*

The criterion for sprinkler protection is based on the size of the fire area and not the size of the commercial parking. If the commercial parking involves only 1,000 square feet (93 m2) but the fire area exceeds 5,000 square feet (464 m2), sprinkler protection is required.

Next Month:

Part 3 — Section 903.2.11
Specific buildings areas and hazards.

NFPA and ICC have formed a coalition to advance safety.

Formed June 5th, 2012, the Coalition for Current Safety Codes (CCSC) is aimed at advancing safety by advocating for the adoption of current building, sustainability, electrical and life safety codes.

This coalition will serve to create more public awareness and broader support for the adoption of the codes that protect the health and welfare of our society.

All participants in the coalition will endeavor to explain the benefits of public/private sector partnerships that provide the United States with a robust system of codes and standards development involving industry, manufacturers, code administration professionals, and the public.

For More info or to Join:

http://www.coalition4safety.org