



ABOUT CODE CORNER

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Your local codes or ordinances may vary.

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SECTION 904 ALTERNATIVE FIRE EXTINGUISHING SYSTEMS, PART 2

904.11 Commercial cooking systems.

The automatic fire extinguishing system for commercial cooking systems shall be of a type recognized for protection of commercial cooking equipment and exhaust systems of the type and arrangement protected. Pre-engineered automatic dry- and wet-chemical extinguishing systems shall be tested in accordance with UL 300 and *listed* and *labeled* for the intended application. Other types of automatic fire-extinguishing systems shall be *listed* and *labeled* for specific use as protection for commercial cooking operations. The system shall be installed in accordance with installation instructions. Automatic fire-extinguishing systems of the following types shall be installed in accordance with the referenced standard indicated, as follows:

1. Carbon dioxide extinguishing systems, NFPA 12.
2. Automatic sprinkler systems, NFPA 13.
3. Foam-water sprinkler system or foam-water

spray systems, NFPA 16.

4. Dry-chemical extinguishing systems, NFPA 17.

5. Wet-chemical extinguishing systems, NFPA 17A.

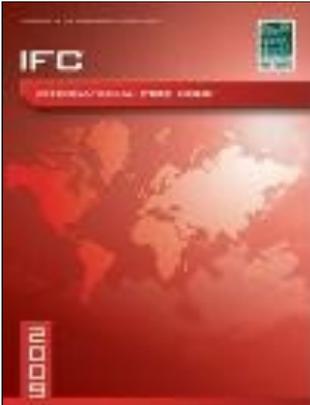
Exception: Factory-built commercial cooking recirculating systems that are tested in accordance with UL 710B and *listed, labeled* and installed in accordance with Section 304.1 of the *International Mechanical Code*.

▫ *The history of commercial kitchen exhaust systems shows that the mixture of flammable grease and effluents carried by such systems and the potential for the cooking equipment to act as an ignition source contribute to a higher level of hazard for kitchen exhaust systems than is normally found in many other exhaust systems. Furthermore, fire in a grease exhaust duct can produce temperatures of 2,000°F (1093°C) or more and heat radiating from the duct can ignite nearby combustibles. As a result, the code requires exhaust systems*

servicing grease-producing equipment to include fire suppression to protect the cooking surfaces, hood, filters and exhaust duct to confine a fire to the hood and duct system, thus reducing the likelihood of it spreading to the structure.

In addition to the general requirements of this section, five industry standards are referenced for the installation of fire-extinguishing systems protecting commercial food heat-processing equipment and kitchen exhaust systems. Design professionals should specify and design fire-extinguishing systems to comply with these referenced standards. Only the installation of fire-extinguishing systems is regulated by these references. Where pre-engineered automatic dry- and wet-chemical extinguishing systems are installed, they must be listed and labeled for the specific cooking operation and tested in accordance with UL 300. Design and construction requirements for the specific types of fire-

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extinguishing systems are found in the respective sections of the referenced standards.

Regulatory requirements for the approval and installation of fire-extinguishing systems are the same as the approval required for all mechanical equipment and appliances. This section, therefore, requires extinguishing systems to be listed and labeled by an approved agency and installed in accordance with their listing and the manufacturer's installation instructions.

The exception allows factory-built commercial cooking recirculating systems to be installed if they have been tested and listed in accordance with UL 710B. It is important that they be installed in accordance with the manufacturer's installation instructions so that the listing requirements are met. An improper installation could result in hazardous vapors being discharged back into the kitchen.

Commercial cooking recirculating systems consist of an electric cooking appliance and an integral or matched packaged hood assembly. The hood assembly consists

of a fan, collection hood, grease filter, fire damper, fire-extinguishing system and air filter, such as an electrostatic precipitator. These systems are tested for fire safety and emissions. The grease vapor (condensable particulate matter) in the effluent at the system discharge is not allowed to exceed a concentration of 5.0 mg/m³. Recirculating systems are not used with fuel-fired appliances because the filtering systems do not remove combustion products. Kitchens require ventilation in accordance with Chapter 4 of the IMC.

Although the provisions in Section 904.11 address many of the specifics for commercial kitchens, additional information regarding commercial cooking suppression systems is located in Sections 904.2 and 904.3. This information is supplemental to that and should be considered together in developing the design for commercial cooking suppression systems.

A question that is often asked about this section is whether it requires existing commercial

cooking pre-engineered fire extinguishing systems to comply with UL 300. Generally, neither this section nor the retroactivity provisions contained in the referenced NFPA standards indicate that retroactive application is intended. The application of this section is subject to the applicability provisions of Section 102.1 of the code. As such, where an existing, previously approved, listed pre-engineered fire extinguishing system installed for the protection of commercial cooking operations has been, and continues to be, maintained in accordance with the manufacturer's installation and maintenance requirements and the applicable NFPA standard referenced on the extinguishing system unit and continues to comply with Sections 609.3.4, 901.4 and 901.6, no change to the system would be required. In the event, however, that a system can no longer comply with the provisions noted above, or if the changes described in Section 904.11.6.1 have taken place, it would then need to be brought into compliance with the applicable provisions of

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Section 904.11 and the referenced standards. Note that some extinguishing system manufacturers no longer provide service support, either directly or through their authorized agents, for certain older-model systems (e.g., replacement parts, etc.). Continuing manufacturer maintenance and service support of existing systems would be a key element in the determination of whether a system continues to meet the above requirements and should be investigated on a case-by-case basis with the respective system manufacturer (see Section 904.11.6.2).

Another question that is often asked is whether the requirements of this section apply to grease-producing appliances installed in a mobile commercial vending cart or catering truck. This section is not a “where required” section but, rather, contains “how-to” criteria once it is determined that a hood and a commercial kitchen hood and duct fire suppression system is required. Where a hood and duct fire suppression system is required depends on the type of cooking operation being conducted and the type

of hood that is required to be installed, as indicated in Section 609.2 of the code. That section is specific in requiring a Type I hood above all commercial cooking appliances as they are defined in Chapter 2. That definition limits the term to only appliances used in a commercial food service establishment and goes on to define such establishments as “...any building or portion thereof used for the preparation and serving of food.” Accordingly, a typical food vendor’s cart, catering truck with on-board cooking, or any other mobile or temporary food concessions, would not be included in that definition and as such, would be outside the scope of Section 101.2 of the IMC, or Section 609.2 or this section of the code.

904.11.1 Manual system operation. A manual actuation device shall be located at or near a means of egress from the cooking area a minimum of 10 feet (3048 mm) and a maximum of 20 feet (6096 mm) from the kitchen exhaust system. The manual actuation device shall be installed not more than 48 inches (1200 mm) nor less than 42 inches (1067 mm) above the floor and shall clearly

identify the hazard protected. The manual actuation shall require a maximum force of 40 pounds (178 N) and a maximum movement of 14 inches (356 mm) to actuate the fire suppression system.

Exception: *Automatic sprinkler systems shall not be required to be equipped with manual actuation means.*

- *The manual device, usually a pull station, mechanically activates the suppression system. The typical system uses a mechanical circuit of cables under tension to hold the system in the armed (cocked) mode. Melting of a fusible link or actuation of a manual pull station causes the cable to lose tension, which, in turn, starts the discharge of the suppression agent. The manual actuation device must be readily and easily usable by the building occupants; therefore, the device must not require excessive force or range of movement to cause actuation.*

In order to allow the actuation device to be used most effectively, the specified mounting height is intended to be consistent with the NFPA 17A standards and be

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handicapped accessible. This includes the requirement to identify the actuation device with the hazard protected. Where multiple kitchen appliances are provided, properly identifying which device relates to which appliance is very important. Required signage should be readily visible in the hazard area and capable of conveying information quickly and concisely.

Manual actuation is not required for automatic sprinkler systems because the typical system design will employ closed heads and wet system piping. A manual actuation valve would serve no purpose because sprinkler heads are already supplied with pressurized water and will discharge water only when the individual fusible elements open the heads.

904.11.2 System interconnection. The actuation of the fire extinguishing system shall automatically shut down the fuel or electrical power supply to the cooking equipment. The fuel and electrical supply reset shall be manual.

- The actuation of any fire suppression system

must automatically shut off all sources of fuel or power to all cooking equipment located beneath the exhaust hood protected by the suppression system. This requirement is intended to shut off all heat sources that could reignite or intensify a fire. Shutting off a fuel and power supply to cooking appliances will eliminate an ignition source and allow the cooking surfaces to cool down. This shutdown is accomplished with mechanical or electrical interconnections between the suppression system and a shutoff valve or switch located on the fuel or electrical supply.

Common fuel shutoff valves include mechanical type gas valves and electrical solenoid-type gas valves. Contactor-type switches or shunt-trip circuit breakers can be used for electrically heated appliances. The fuel or electric source must not be automatically restored after the suppression system has been actuated.

Chemical-type fire-extinguishing systems discharge for only a limited time and can discharge only once before recharge and reset;

therefore, precautions must be taken to prevent a fire from reigniting. After a fire is detected and the initial suppressant discharge begins, the fuel and power supply will be locked out, thereby preventing the operation of the appliances until all systems are again ready for operation. Fuel and power supply shutoff must be manually restored by resetting a mechanical linkage or holding (latching)-type circuit.

904.11.3 Carbon dioxide systems. When carbon dioxide systems are used, there shall be a nozzle at the top of the ventilating duct. Additional nozzles that are symmetrically arranged to give uniform distribution shall be installed within vertical ducts exceeding 20 feet (6096 mm) and horizontal ducts exceeding 50 feet (15 240 mm). Dampers shall be installed at either the top or the bottom of the duct and shall be arranged to operate automatically upon activation of the fire-extinguishing system. When the damper is installed at the top of the duct, the top nozzle shall be immediately below the damper. Automatic carbon dioxide fire-extinguishing systems shall be sufficiently sized to

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protect all hazards venting through a common duct simultaneously.

- This section states specific design requirements for nozzle locations, dampers and ducts for carbon dioxide extinguishing systems that may be used to protect commercial cooking systems. These requirements are intended to supersede similar, more general provisions in NFPA 12. Because carbon dioxide (CO₂) is a gaseous suppressant, dampers are required in the ductwork to define the atmosphere where the fire event would be. A specific concentration of CO₂ is necessary and dampers are required to define and contain the suppressant. The discharge cools exposed surfaces in addition to depriving the fire of oxygen. Although not mentioned specifically in this section, the applicable provisions of NFPA 12 should also be applied because the system is a CO₂ system as referenced in Section 904.8.

904.11.3.1 Ventilation system. Commercial-type cooking equipment protected by an automatic carbon dioxide extinguishing system shall be arranged to shut off the ventilation system upon activation.

▫ *Shutting down the ventilation system upon activation of the CO₂ extinguishing system maintains the desired concentration of carbon dioxide to suppress the fire. Leakage of gas from the protected area should be kept to a minimum. Where leakage is anticipated, additional quantities of carbon dioxide must be provided to compensate for any losses.*

904.11.4 Special provisions for automatic sprinkler systems. Automatic sprinkler systems protecting commercial type cooking equipment shall be supplied from a separate, readily accessible, indicating-type control valve that is identified.

- *This section requires a separate control valve in the water line to the sprinklers protecting the cooking and ventilating system. The additional valve allows the flexibility to shut off the system for repairs or for clean-ups after sprinkler discharge without taking the entire system out of service.*

904.11.4.1 Listed sprinklers. Sprinklers used for the protection of fryers shall be tested in accordance with UL 199E, *listed*

for that application and installed in accordance with their listing.

- *Sprinklers specifically listed for such use must be used when protecting deep-fat fryers. These specially listed sprinklers use finer water droplets than standard spray sprinklers. The water spray lowers the temperature below a point where the fire can sustain itself and reduces the possibility of expanding the fire. UL 199E addresses these special sprinklers and includes performance tests for deep-fat fryer extinguishment and also deep-fat fryer cooking temperature splash. The selection of inappropriate sprinklers for deep-fat fryer protection can increase the hazards during water application rather than suppressing the fire.*

904.11.5 Portable fire extinguishers for commercial cooking equipment. Portable fire extinguishers shall be provided within a 30-foot (9144 mm) travel distance of commercial type cooking equipment. Cooking equipment involving solid fuels or vegetable or animal oils and fats shall be protected by a Class K rated portable extinguisher in accordance with Section 904.11.5.1 or 904.11.5.2,

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as applicable.

□ *To combat a fire in its incipient stage, access to a manual means of extinguishment is critical. Although a 30-foot (9144 mm) maximum travel distance is specified, the location of the extinguisher should be a safe distance from the cooking equipment so that it will not become involved in the fire. Only Class K rated extinguishers that have been tested on commercial cooking appliances can be used.*

904.11.5.1 Portable fire extinguishers for solid fuel cooking appliances.

All solid fuel cooking appliances, whether or not under a hood, with fireboxes 5 cubic feet (0.14 m³) or less in volume shall have a minimum 2.5-gallon (9 L) or two 1.5-gallon (6 L) Class K wet-chemical portable fire extinguishers located in accordance with Section 904.11.5.

□ *The fuels used in solid fuel-fired cooking appliances present significantly more potential burning surface area than the flat surface of a grill or deep fat fryer. This surface area is also often shielded by other solid fuel elements. As a result, a large extinguisher or two moderate*

-sized extinguishers are required. The 2 1/2-gallon (9 L) extinguisher roughly equates to a 2A rating. The K-rating is necessary rather than using a water-based agent because the discharge from water-based extinguishers is usually in the form of a straight stream rather than a less concentrated, flooding type of coverage. A straight stream can dislodge the burning solid fuel material and possibly spread the burning coals to other areas where they could pose both a secondary fire risk, as well as a life safety hazard. The same travel distance to an extinguisher is required for solid fuel extinguishers as for deep fat fryer extinguishers so that manual suppression can be provided if necessary in a reasonable time. See the commentary to Section 904.11.5.2 for further discussion of Class K extinguishers.

904.11.5.2 Class K portable fire extinguishers for deep fat fryers.

When hazard areas include deep fat fryers, listed Class K portable fire extinguishers shall be provided as follows:

1. For up to four fryers having a maximum cooking

medium capacity of 80 pounds (36.3 kg) each: one Class K portable fire extinguisher of a minimum 1.5-gallon (6 L) capacity.

2. For every additional group of four fryers having a maximum cooking medium capacity of 80 pounds (36.3 kg) each: one additional Class K portable fire extinguisher of a minimum 1.5-gallon (6 L) capacity shall be provided.

3. For individual fryers exceeding 6 square feet (0.55 m²) in surface area: Class K portable fire extinguishers shall be installed in accordance with the extinguisher manufacturer's recommendations.

□ *In recent years, commercial cooking operations have begun to use improved, more efficient deep fat fryer type cooking appliances and more healthful, unsaturated cooking oils that require a much higher cooking temperature than the former saturated oils. The Class K extinguishing agent and extinguishers were developed to deal with this new hazard. Class K extinguishers use a wet-chemical, potassium acetate based agent that has proven to be more effective in the deep fat fryer hazard. Though primarily in-*

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tended for cooking fires, many Class K extinguishers can also be effectively used on Class A, B and C hazards. Class K fire extinguishers do not have letter ratings similar to other types of extinguishers. The capacity of the Class K extinguisher becomes the effective rating. Based on the extinguishing capability of a moderate sized Class K extinguisher the maximum quantity of typical fat frying medium can be determined. This quantity is determined by weight based on the typical deep fat fryer. A fryer capacity of 80 pounds (36 kg) can provide a surface area between 4 1/2 to 6 square feet (0.42 to 0.56 m²), depending on the manufacturer. When the surface area exceeds 6 square feet (0.56 m²), guidelines for Class K extinguishers are no longer applicable. Consequently, for the larger surface area fryers the size of Class K extinguisher should be based on the manufacturer's recommendations. Although not specifically indicated in the code text, the understanding is that if the weight capacity of the fryer exceeds 80 pounds (36 kg) but the surface area is

less than 6 square feet (0.56 m²), the manufacturer's recommendations should be applied for those conditions as well.

904.11.6 Operations and maintenance. Automatic fire extinguishing systems protecting commercial cooking systems shall be maintained in accordance with Sections 904.11.6.1 through 904.11.6.3.

- *Most fires in commercial kitchens involve the cooking appliance and exhaust system in some way. Proper operation of the system in accordance with the IMC, as well as routine maintenance can reduce the hazards related to the collection and removal of smoke and grease-laden vapors.*

904.11.6.1 Existing automatic fire-extinguishing systems. Where changes in the cooking media, positioning of cooking equipment or replacement of cooking equipment occur in existing commercial cooking systems, the automatic fire extinguishing system shall be required to comply with the applicable provisions of Sections 904.11 through 904.11.4.

- The provisions of Section 904.11 have long required new commercial cooking system pre engineered fire extinguishing

systems to be tested in accordance with UL 300 and listed and labeled for that use. The question has often arisen, however, as to whether or how those provisions should be applied to existing systems. This section, new in the 2009 edition, provides guidance and adds clarity as to when existing automatic fire extinguishing systems protecting commercial cooking operations need to be modified, upgraded or replaced to meet UL 300 requirements. These provisions are thought to be consistent with provisions adopted by some states and local jurisdictions on this topic.

904.11.6.2 Extinguishing system service. Automatic fire extinguishing systems shall be serviced at least every six months and after activation of the system. Inspection shall be by qualified individuals, and a certificate of inspection shall be forwarded to the fire code official upon completion.

- *Range hood fire-extinguishing systems must be inspected and serviced at regular intervals to determine that they are ready to perform the intended function. Obviously, service is required after the sup-*

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pression system discharges. The extent of service and maintenance depends on the type of fire-extinguishing system installed. The NFPA standard corresponding to the installed extinguishing agent should be consulted for additional service requirements (see commentary, Section 904.11).

904.11.6.3 Fusible link and sprinkler head replacement. Fusible links and automatic sprinkler heads shall be replaced at least annually, and other

protection devices shall be serviced or replaced in accordance with the manufacturer's instructions.

Exception: Frangible bulbs are not required to be replaced annually.

□ Because of the potential accumulation of grease or other contaminants that could adversely affect proper operation, fusible links and automatic sprinkler heads must be replaced at least annually. The sensing elements of the

fusible link devices as well as the sprinkler heads must be routinely visually inspected and replaced as needed, at least annually.

The exception allows frangible bulb-type sprinklers to not be replaced as long as the annual examination shows no accumulation of grease or other contaminants.

Next Month: SECTION 905 STANDPIPE SYSTEMS

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