

**NEW YORK CITY FIRE DEPARTMENT  
BUREAU OF FIRE PREVENTION**



STUDY MATERIAL FOR THE  
CERTIFICATE OF FITNESS FOR:

COMMERCIAL COOKING WET CHEMICAL FIRE EXTINGUISHING SYSTEMS  
INSPECTION, TESTING AND SERVICING **TECHNICIAN** (Citywide)

**S-17**

COMMERCIAL COOKING WET CHEMICAL FIRE EXTINGUISHING SYSTEMS  
INSPECTION, TESTING AND SERVICING **PRINCIPAL** (Citywide)

**S-71**

***All applicants are required to apply and pay for an exam online before arriving at the FDNY. It can take about 30 minutes to complete.***

Simplified instructions for online application and payment can be found here:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf>

Create an Account and Log in to:

<http://fires.fdnyccloud.org/CitizenAccess>

## Contents

<b>EXAM SPECIFIC INFORMATION FOR S-17/S-71 CERTIFICATE OF FITNESS</b> .....	3
<b>STUDY MATERIAL AND TEST DESCRIPTION</b> .....	13
<b>CHAPTER 1. INTRODUCTION</b> .....	15
1.1. Approved Commercial Cooking Fire Extinguishing Systems .....	15
1.2. Illegal Commercial Cooking Fire Extinguishing Systems.....	16
1.3. COF Requirement .....	16
1.4. Wet Chemical Fire Extinguishing Systems .....	16
<b>CHAPTER 2. DEFINITION</b> .....	18
<b>CHAPTER 3. CASE FIRES DUE TO FAILURE OF FIRE SYSTEMS</b> .....	22
<b>CHAPTER 4. INSTALLATION AND THE REQUIRED INSTALLATION</b> <b>INSPECTION AND TESTING</b> .....	23
4.1. Hazard Analysis .....	23
4.2. Protected Areas.....	23
4.3. Installation.....	23
4.4. Pretest and Inspection .....	26
4.5. System Inspection Pre-Test.....	26
4.6. Releasing Control Panel (if applicable) .....	27
4.7. Installation Acceptance Testing.....	27
4.8. Return of System to Operational Condition .....	27
<b>CHAPTER 5. WET CHEMICAL EXTINGUISHING SYSTEM COMPONENTS</b> .....	28
5.1. Detectors .....	28
5.2. Discharge Nozzles .....	29
5.3. Actuator .....	30
5.4. Shutoff Devices.....	33
5.5. Pipe and Fittings, Tubing, Hose. ....	34
5.6. Wet Chemical.....	35
5.7. Assembly.....	35
<b>CHAPTER 6. WET CHEMICAL EXTINGUISHING SYSTEM REQUIREMENTS</b> .....	36
6.1. Location of Wet Chemical Containers (Cylinders) and Expellant Gas Assemblies .....	36
6.2. Protection of Common Exhaust Duct .....	36
6.3. User's Responsibility .....	37
6.4. Ignition Sources .....	38
6.5. Movable/Portable Cooking Equipment .....	38
<b>CHAPTER 7. PERIODICAL INSPECTION, TESTING AND RECORD</b> .....	39
7.1. Maintenance of Commercial Cooking Fire Extinguishing System .....	39
7.2. Monthly Visual Inspection .....	39
7.3. Semiannual Inspection .....	41
7.4. Hydrostatic Test.....	46
7.5. Tag and Recordkeeping .....	47
<b>CHAPTER 8. COMMON MISTAKES THAT RESULT IN SYSTEMS FAILURE OR</b> <b>FDNY SUMMONS</b> .....	48
8.1. Incorrectly Designed and Installed Systems.....	48
8.2. Poor Maintenance or Inspection .....	48
8.3. Common Installation/Maintenance Mistakes .....	49
<b>CHAPTER 9: LITHIUM-ION BATTERY SAFETY</b> .....	50

## EXAM SPECIFIC INFORMATION FOR S-17/S-71 CERTIFICATE OF FITNESS

### **Save time and submit application online!**

***All applicants are required to apply and pay for an exam online before arriving at the FDNY. It can take about 30 minutes to complete.***

Simplified instructions for online application and payment can be found here:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf>

Create an Account and Log in to:

<http://fires.fdnyccloud.org/CitizenAccess>

### **REQUIREMENTS FOR CERTIFICATE OF FITNESS APPLICATION**

#### **General requirements:**

Review the General Notice of Exam:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf>

#### **Special requirements for the S-17 Certificate of Fitness:**

- Applicant must be employed by an S-71 COF holder's company. The company list:

<http://www.nyc.gov/assets/fdny/downloads/pdf/business/approved-wet-chemical-systems-list.pdf>

- Applicant must provide a recommendation letter signed by an S-71 COF holder and the letter must specify what types of manufacture training this applicant has received.

Sample recommendation letter:

<http://www.nyc.gov/assets/fdny/downloads/pdf/business/s17-sample-letter.pdf>

#### **Special requirements for the S-71 Certificate of Fitness:**

- **AIP only**, please refer to the "REQUIREMENTS FOR ALTERNATIVE ISSUANCE PROCEDURE".

**--S17 Sample Recommendation Letter--**

**COMPANY NAME  
BUSINESS ADDRESS**

Date: \_\_\_\_\_

Fire Department  
Bureau of Fire Prevention  
9 Metro Tech Center  
Brooklyn, NY 11201-3857



To whom it may concern:

The purpose of this letter is to affirm that the applicant (full name of applicant) qualifications for a S-17 Certificate of Fitness. (Name of applicant) is currently employed by (name and address of employer). (Name of applicant) has been or will be trained and knowledgeable for all systems that he/she will install/inspect/maintain/test by complying with the requirements below:

- On or after 07/01/2023, this applicant will be assigned jobs related to the installation or tests witnessed by the Fire Department only for systems for which the technician holds a valid training certificate from the manufacturer. The manufacturer’s training certificate must be issued to the technician and under this company name.
- On or after 10/01/2023, this applicant will be assigned jobs related to the maintenance or service of systems for which the technician received proper training (manufacturer’s training or company internal training).

All trainings have been or will be followed the manufacturer’s recommendations which covered the entire instruction manual, hands-on training as well as incorporated installation, inspection, maintenance, and testing procedures for the system. I also understand that his/her training records/certificates must be readily available upon the FDNY representatives’ request. I will also be responsible to notify the FDNY COF unit if this applicant is no longer working in my company.

Applicant is of GOOD CHARACTER and is PHYSICALLY ABLE to perform the functions required by the holder of this Certificate of Fitness.

\_\_\_\_\_  
(Printed name of S71 COF holder)

\_\_\_\_\_  
(S71 COF number)

\_\_\_\_\_  
(Signature of S71 COF holder)

*Filled by the applicant*

I affirm that I understand that I can only install/inspect/maintain/test the wet chemical fire extinguishing systems that I have received proper training listed above. I also understand that my S-17 COF will be inactive if I am not employed by an FDNY approved wet chemical fire extinguishing system company.

\_\_\_\_\_  
(Printed name of Applicant)

\_\_\_\_\_  
(Signature of Applicant)

**Application fee (Cash is NO LONGER ACCEPTED):**

Pay the **\$25** application fee online or in person by one of the following methods:

- Credit card (*American Express, Discover, MasterCard, or Visa*)
- Debit card (*MasterCard or Visa*)
- In person: Personal or company check or money order (*made payable to the New York City Fire Department*)

A convenience fee of 2% will be applied to all credit card payments.

For fee waivers submit: ***(Only government employees who will use their COF for their work-related responsibilities are eligible for fee waivers.)***

- A letter requesting fee waiver on the Agency's official letterhead stating applicant full name, exam type and address of premises; **AND**
- Copy of identification card issued by the agency

**REQUIREMENTS FOR ALTERNATIVE ISSUANCE PROCEDURE (AIP)**

**The S-71 Certificate of Fitness can only be obtained by the alternative issuance procedure.** Qualified applicants should review and complete the S-71 Certificate of Fitness Alternative Issuance Procedure Application Affirmation Form:

S-71 AIP form:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-s71-aip.pdf>

The AIP applicants must submit the application, required documents and payment on FDNY Business:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/fdny-business-cof-individuals-short.pdf>

## **EXAM INFORMATION**

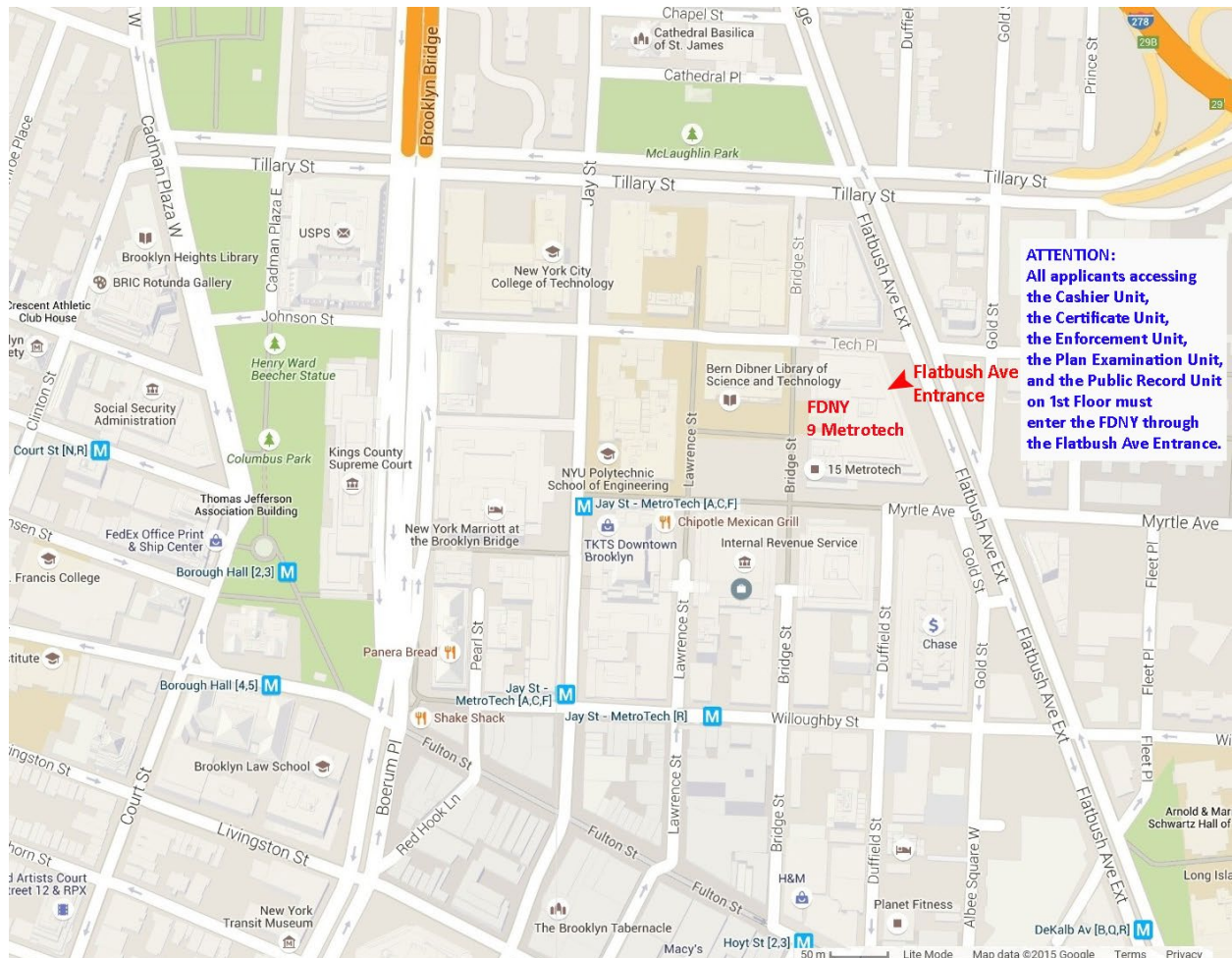
The **S-17** exam will consist of **40** multiple-choice questions, administered on a “touch screen” computer monitor. It is a time-limit exam. Based on the amount of the questions, you will have 60 minutes to complete the test. A passing score of at least 70% is required in order to secure a Certificate of Fitness.

Call (718) 999-1988 for additional information and forms.

Please always check for the latest revised booklet at FDNY website before you take the exam.

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-S17-noe-study-materials.pdf>

**EXAM SITE:**            **FDNY Headquarters, 9 MetroTech Center, Brooklyn, NY. Enter through the Flatbush Avenue entrance (between Myrtle Avenue and Tech Place).**



## **RENEWAL REQUIREMENTS**

### **General renewal requirements:**

Review the General Notice of Exam:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/general-notice-of-exam-cof.pdf>

### **Special renewal requirements for S-17 COF: None**

**The FDNY strongly recommends the S-17 COF holders to renew the COF on-line. To learn the simplified on-line renewal:**

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-simplified-renewal-short.pdf>

### **Special renewal requirements for S-71 COF:**

**Need to upload the following documents:**

- S-71 Application Form  
<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-s71-aip.pdf>
- The valid DOB Master Fire Suppression Contractor Licenses
- Valid manufacturer's training certificate(s) must be uploaded for renewing the S-71 COF.

Read the Quick Renewal Guide to learn the procedure:

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/cof-renewal-short.pdf>

## **FAQ for Alternative Fire Extinguishing Systems COFs**

### **1. Why are these Certificates and changes occurring now?**

FC904 of the 2022 New York City Fire Code requiring a new Certificate of Fitness for all fire protection systems became effective on April 15, 2022. However, FC102.2.2 permits to operate without such a certificate for a period of 1 year from the effective date of the amendment to the code.

### **2. What is a Certificate of Fitness?**

The FDNY issues Certificates of Fitness (COF) to be responsible for supervision of the operation or facilities for various types of dangerous occupations. We provide tests and/or qualification review processes to individual applicants to ensure they are familiar with the Fire Code and regulations governing the operation or the regulated material and to ensure the proper and safe performance of the duties as a COF holder.

### **3. What are the COF types for alternative agent Fire Extinguishing Systems?**

Wet Chemical Fire Extinguishing Systems: Principal: S-71 COF; Technicians: S-17 COF

Dry Chemical Fire Extinguishing Systems: Principal: S-81 COF; Technicians: S-18 COF

Gaseous Type Fire Extinguishing Systems: Principal: S-61 COF; Technicians: S-16 COF

### **4. As a technician, can I change my company?**

You can change company, but a new company letter must be submitted. The principal of the new company must hold a valid principal COF.

## **Principal's COF related issues**

### **5. How can principals apply COF?**

All principals must be DOB Master Fire Suppression Contractor (MFSPC) Type A or C license holders.

- (1) To apply Wet and Dry Chemical Fire Extinguishing System principal COFs (S-81 and S-71):

In addition to the DOB Master Fire Suppression Contractor (MFSPC) (A or C) license, every principal must provide documents showing that at least one representative has received the manufacturer's training for each system maintained/installed by the company. Such manufacturer's training certificate has to be issued for MFSPC company name.

The FDNY will use the manufacturers' training certificates submitted by each principal to create a list of companies with the names of specific manufacturers these companies are allowed to install and maintain.

- (2) To apply Gaseous Fire Extinguishing System principal COF (S-61):

Only DOB Master Fire Suppression Contractor (A or C) license is required since gaseous fire extinguishing systems are engineered systems.



**6. When can principals start to apply COFs? Will the principals need to pass an exam to obtain the principal COF?**

02/28/23

On or after **02/28/23**, the S71, S81 and S61 COFs will be available on FDNY Business online application. No exam is required. The principal COFs are issued based on the criteria listed above via the Alternate Issuance Procedure (AIP).

All application materials and payments will be required to submit online.

Please obtain the required AIP forms on the FDNY COF website.

**7. When will the company list be established and provided to the public?**

04/04/2023

After the FDNY receives and approves the S71, S81 and S61 applications, the FDNY will establish three company lists for three types of alternate agent fire extinguishing systems and publish them on the FDNY website for the public on **04/04/2023**. The lists will be updated every month.

Wet Chemical Fire Extinguishing List (S71):

<http://www.nyc.gov/assets/fdny/downloads/pdf/business/approved-wet-chemical-systems-list.pdf>

Dry Chemical Fire Extinguishing List (S81):

<http://www.nyc.gov/assets/fdny/downloads/pdf/business/approved-dry-chemical-systems-list.pdf>

Gaseous Fire Extinguishing List (S61)

<http://www.nyc.gov/assets/fdny/downloads/pdf/business/approved-gaseous-systems-list.pdf>

**8. When will the FDNY start to enforce all principals to have COFs?**

07/01/2023

The FDNY will start to enforce all companies' principals who install or maintain any alternate agent fire extinguishing systems must hold a valid COF. For wet chemical and dry chemical systems, the FDNY will only allow the companies to install or maintain the manufacturers that listed on the company lists.

**9. What happen if principals do not obtain their COFs by 07/01/2023?**

The FDNY personnel will use the FDNY-approved list to determine whether a company can file design and installation documents with Fire Department and/or is authorized to install or service systems from a specific manufacturer. If a company is not listed as approved for the installation and service of the particular manufacturer, then appropriate enforcement actions will be taken.

## Wet Chemical technician's COF related issues

### **10. How can wet chemical fire extinguishing systems technicians apply COF?**

The technicians must present a company letter and pass an COF exam.

(1) Company letter:

The letter must be on letterhead and signed by the principal holding principal COF.

The letter must state that effective 07/01/2023, the technician will be assigned jobs related to the installation or tests witnessed by the Fire Department only for systems for which the technician holds a **valid** training certificate from the manufacturer. Such manufacturer's training certificate has to be issued to the technician and under the MFSPC company name.

The letter must state that effective 10/01/2023, the technician will be assigned jobs related to the maintenance or service of systems for which the technician received proper training (manufacturer's training or company internal training).

Sample recommendation letter can be obtained via the link below:

<http://www.nyc.gov/assets/fdny/downloads/pdf/business/s17-sample-letter.pdf>

(2) COF exam:

Technicians for Wet chemical Fire Extinguishing System need to pass S-17 COF exam.

### **11. When can wet chemical fire extinguishing systems technicians start to apply COF?**

02/28/2023

The S-17 exam will be available to the public on or after 02/28/23.

### **12. When will the FDNY start to enforce all technicians performing installation and testing on wet chemical fire extinguishing systems to have COFs?**

07/01/2023.

These technicians must also hold a **valid** training certificate from the manufacturer for the specific system(s) that will be installing or testing on or after 07/01/2023.

Effective 07/01/2023, the FDNY inspector will be verifying presence of a valid manufacturer's training certification and COF before any tests.

### **13. How will FDNY verify that the installation of the wet chemical fire extinguishing systems on or after 07/01/2023 was conducted by a COF holder??**

For any wet chemical fire extinguishing system which the initial Project Authorization issued on or after 07/01/2023, as a part of the public request for any tests witnessed by the FDNY, the contractor will be required to submit

- Copy of S-17 COF for the technician who will perform the installation/testing, AND
- Copy of the valid manufacturer's training certificate issued to the technician who will perform the installation/testing.

**14. When will the FDNY start to enforce all technicians performing maintenance on wet chemical fire extinguishing systems to have COFs?**

10/01/2023.

Effective 10/01/2023, the service tag for a semi-annual inspection of a wet chemical fire extinguishing system must also include the information related to the COF holder who conducted the inspection, as required by FC904.5.2(10). The FDNY Rangehood Unit inspectors will verify if the system's inspection and/or maintenance was conducted by a person holding valid COF and may request proof for proper training of such COF holders.

The FDNY may require all technicians to hold a valid manufacturer training certificate for each system serviced in 2025.

**15. What actions will be taken by the FDNY if determined that maintenance or service of a wet chemical fire extinguishing system was conducted by a person without a valid COF on or after 10/01/2023?**

Appropriate enforcement actions will be taken for failure to comply with Section FC901.6.3(1).

**Dry Chemical and Gaseous technician's COF related issues**

**16. How will dry chemical and gaseous type fire extinguishing systems technicians apply COF?**

The S18 (dry chemical) and S16 (gaseous) exams are still under development. The procedure will be released when the exams are ready.

**Other General Questions**

**17. Why are there different enforcement deadlines to enforce the COF requirements for the technicians who perform installation and the technician who perform maintenance?**

Installation and service of a pre-engineered wet chemical fire extinguishing system shall be conducted by an individual who attended a training program run by the manufacturer for each specific system.

Fire Department recognizes that it may take time for all individuals responsible for installing, recharging, and maintaining the systems to undergo manufacturer training for each system that a company works with, while a large number of approved fire extinguishing systems needs to be properly maintained across New York City.

The installation of a system is more complicated than its maintenance. It involves many complex and interrelated tasks requiring an individual to have more profound knowledge and ability to navigate through the installation manual. Effective 07/01/2023, the installation and tests requiring an FDNY representative's presence will be conducted by a COF holder holding a valid training certificate from a manufacturer.

In contrast, the maintenance of a pre-engineered wet chemical fire extinguishing system is typically simpler and involves tasks specific to each manufacturer; however, overall, similar across all manufacturers.

It's important to note that regular maintenance by a trained and knowledgeable person is essential to ensure that the fire suppression system is always ready to operate when needed.

**18. Why is the FDNY requiring manufacturer's training in addition to having a COF for pre-engineering fire extinguishing systems (wet chemical and dry chemical)?**

The COF study materials and the exams will only focus on the general basic requirements of Fire Code and applicable NFPA.

The pre-engineering fire extinguishing systems made by different manufacturers are usually not identical in all characteristics and each manufacturer designs equipment for use with a specific chemical. Therefore, it is critical that the applicants are thoroughly trained and be familiar with the latest manufacturer's manual before they serve any pre-engineering fire extinguishing system.

**19. Can the technicians take the exams before he/she receives all required manufacturer's or company internal trainings?**

Yes. However, the company letter must be submitted stating that the technician will be assigned work for the installation and/or maintenance of the systems for which appropriate training was received.

**OTHER QUESTIONS?**

**FDNY Business Support Team:** For questions, call 311 and ask for the FDNY Customer Service Center or send an email to [FDNY.BusinessSupport@fdny.nyc.gov](mailto:FDNY.BusinessSupport@fdny.nyc.gov)

# STUDY MATERIAL AND TEST DESCRIPTION

## About the Study Material

This material will help you prepare for the examination for the Certificate of Fitness for COMMERCIAL COOKING WET CHEMICAL FIRE EXTINGUISHING SYSTEMS INSPECTION, TESTING AND SERVICING. The S-17 exam covers this entire booklet. **It will not be provided to you during the test. It is critical that you read and understand this booklet to help increase your chance of passing this exam. The reference material will be provided to you during exam.** The study material does not contain all of the information you need to know to install, inspect, test and service all wet chemical fire extinguishing systems. It is your responsibility to become familiar with all applicable rules and regulations of the City of New York, and the manufacturer's design, installation, and maintenance manuals even if they are not covered in this study material. In order to properly prepare for this exam, you need to be familiar with the 2022 New York City Fire Code sections FC112, FC609, FC901, FC904 and NFPA 17A, as modified by FC Appendix B, and UL 300.

## About the Test

The S-17 exam will consist of 40 multiple-choice questions, administered on a "touch screen" computer monitor. It is a time-limit exam. Based on the amount of the questions, you will have 60 minutes to complete the test. A passing score of at least 70% is required to secure a Certificate of Fitness. Read each question carefully before marking your answer. There is no penalty for guessing.

## Sample Questions

The following questions represent the "format" of the exam questions, not the content of the real exam.

**1. Which of the following are allowed to be used/displayed while taking a Certificate of Fitness examination at 9 Metro Tech Center?**

- I. cellular phone**
- II. Study material booklet**
- III. Reference material provided by the FDNY**
- IV. Mp3 player**

- A. III only
- B. I, II, and III
- C. II and IV
- D. I only

*Only reference material provided by the FDNY is allowed to be used during Certificate of Fitness examinations. Therefore, the correct answer would be A. You would touch "A" on the computer terminal screen.*

**2. If you do not know the answer to a question while taking an examination, whom should you ask for help?**

- A. the person next to you
- B. the firefighters
- C. the examiner in the testing room
- D. you should not ask about test questions since FDNY staff cannot assist applicants

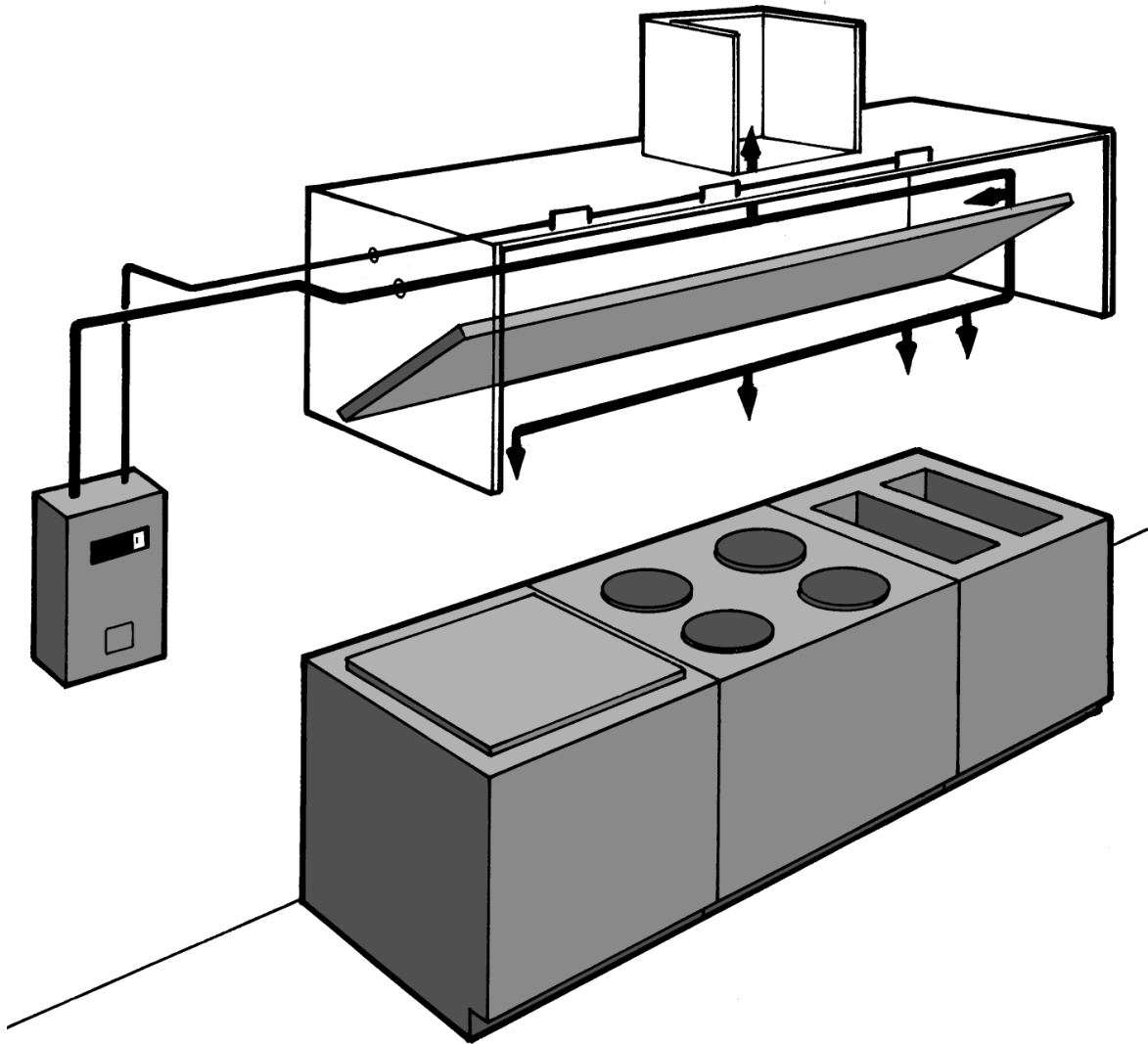
*You should not ask about examination questions or answers since FDNY staff cannot assist applicants with their tests. Therefore, the correct answer would be D. You would touch "D" on the computer terminal screen.*

**3. If the screen on your computer terminal freezes during your examination, whom should you ask for help?**

- A. the person next to you
- B. the firefighters
- C. the examiner in the testing room
- D. the computer help desk

*If you have a computer related question, you should ask the examiner in the testing room. Therefore, the correct answer would be C. You would touch C. You would touch "C" on the computer terminal screen.*

## CHAPTER 1. INTRODUCTION



### 1.1. Approved Commercial Cooking Fire Extinguishing Systems

Commercial cooking operations must be protected by one of the following types of fire protection systems, as listed for commercial cooking operations:

- Wet chemical fire extinguishing systems designed in accordance with NFPA 17A, as modified by FC Appendix B, and tested in accordance with UL 300.
- Foam-water sprinkler system or foam-water spray systems designed in accordance with NFPA 16, as modified by FC Appendix B.
- Water mist systems designed in accordance with NFPA 750, as modified by FC Appendix B.

**The S-17 or S-71 COF holders are only authorized to install, inspect, maintain and test wet chemical fire extinguishing systems.** For foam-water sprinkler systems, foam-water spray systems, or water mist systems, please refer to S15 or S12 Certificate of Fitness.

## **1.2. Illegal Commercial Cooking Fire Extinguishing Systems**

It is unlawful to install or continue to maintain total flooding carbon dioxide fire extinguishing systems within normally occupied areas, including commercial kitchens. The existing total flooding carbon dioxide fire extinguishing systems must be removed.

Dry chemical systems, wet chemical systems not listed to the UL 300 standard and carbon dioxide systems may not be used for commercial cooking operations and must be removed and replaced with a type of fire extinguishing system complying with the Fire Code.

## **1.3. COF Requirement**

The installation, inspection, testing, servicing, and other maintenance of the wet chemical fire extinguishing systems must be personally conducted by an S-17/S-71 COF holder. The S-17 COF holder must be under the direction of an S-71 COF holder.

## **1.4. Wet Chemical Fire Extinguishing Systems**

Wet chemical fire extinguishing systems are designed to discharge wet chemical from fixed nozzles and piping by means of expellant gas. The wet chemical fire extinguishing systems made by different manufacturers are usually not identical in all characteristics and each manufacturer designs equipment for use with a specific wet chemical. Therefore, it is critical that the S-71/S-17 COF holders are thoroughly trained and be familiar with the latest manufacturer's manual before they serve any wet chemical fire extinguishing system.

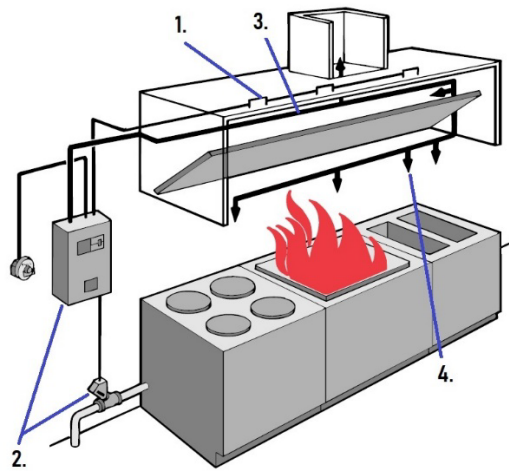
This study material and the exam will focus on the general basic requirements of Fire Code and NFPA 17A as modified by the Fire Code Appendix B. The S-71/S-17 COF holders must additionally receive separate and approved training in order to install, inspect, maintain or test any wet chemical fire extinguishing systems. The S-71/S-17 COF holders are limited to working to the manufacturer's listed under their own company name.

The list of approved manufacturers by each company:

<http://www.nyc.gov/assets/fdny/downloads/pdf/business/approved-wet-chemical-systems-list.pdf>

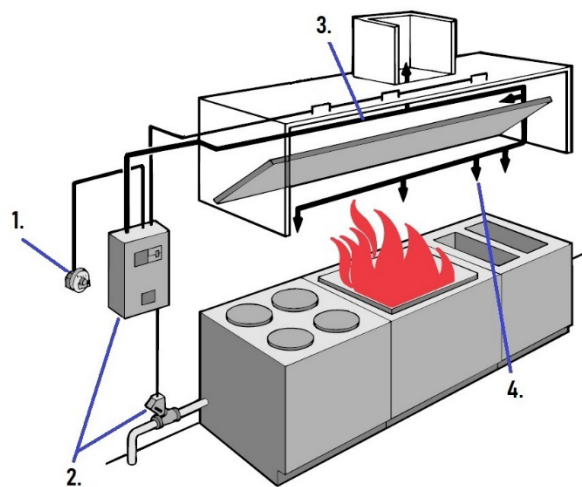


## How does a wet chemical fire suppression system automatically work for a range hood fire?



1. The detectors located in the ductwork or in the plenum above the protected cooking appliances sense the fire.
2. The detectors trigger the release mechanism which actuates the system. The system will either pressurize the agent storage cylinder or if it is stored pressure the cylinder will discharge shutting off any means of fuel and power under the protected hood.
3. The wet chemical (liquid fire suppressant) flows through the piping and is discharged into the plenum and duct areas and onto the cooking appliances.
4. The wet chemical will be discharged via the discharge nozzles. The wet chemical is applied directly on the fire in specific spray patterns. A foam blanket will be formed and seal off combustible vapors to prevent fire reflash.

## How does a wet chemical fire suppression system work manually to suppress a range hood fire?



1. The person who notices the range hood fire activates the manual activation device.
2. The manual activation device triggers the release mechanism which actuates the system. And then the system will perform the same functions as automatic activations listed above.

## CHAPTER 2. DEFINITION

**ALARM NOTIFICATION APPLIANCE.** A fire alarm system component, such as a bell, horn, speaker, light, text display or vibration device that issues an audible, tactile, and/or visual alert.

**ALARM SIGNAL.** A signal indicating an emergency requiring immediate action, such as a signal indicative of fire.

**APPROVED.** Acceptable to the FDNY commissioner.

**AUTOMATIC.** As applied to fire protection devices, any device, equipment or system that initiates emergency system function as a result of a predetermined temperature rise, rate of temperature rise, or combustion products, without the necessity for human intervention.

**Auxiliary Equipment.** Listed equipment used in conjunction with the wet chemical systems, for example, to shut down power, fuel, or ventilation to the hazard being protected

or to initiate signaling devices.

**BUILDING CODE.** The New York City Building Code in effect on and after July 1, 2008, and as amended thereafter.

**CENTRAL STATION.** A facility that receives alarm signals from a protected premises and retransmits or otherwise reports such alarm signals to the department.

**CERTIFICATE OF APPROVAL.** A written statement issued by the commissioner, certifying that an article, device or equipment, or type, class or kind thereof, has been examined, tested and approved for a specific purpose or use in conformity with the requirements of the construction codes, this code or the rules.

**CLEAN AGENT.** Electrically nonconducting, volatile, or gaseous fire extinguishant that does not leave a residue upon evaporation.

**COMMERCIAL COOKING APPLIANCES.** Appliances used in a commercial food service establishment for heating or cooking food and which produce grease vapors, steam, fumes, smoke or odors that are required to be removed through a local exhaust ventilation system. Such appliances shall include deep fat fryers; upright broilers; griddles; broilers; steam-jacketed kettles; hot-top ranges; under-fired broilers (charbroilers); ovens; barbecues; rotisseries; and similar appliances. For the purpose of this definition, a commercial food service establishment shall include any building or structure used for the preparation and serving of food, other than commercial cooking appliances in carts or other mobile stands operated by street vendors.

**COMMERCIAL COOKING SYSTEM.** A commercial cooking system consists of one or more commercial cooking appliances; one or more Type I hoods and/or downdraft hoods that exhaust the heat, smoke and grease-laden vapors generated by the appliances; and the fire extinguishing system that protects the appliances. Commercial cooking systems include grease removal devices and exhaust ducts (except for ductless hoods) and, when required, emission control devices.

**COMMERCIAL KITCHEN.** A commercial food service establishment, as defined by Section 81.03(s) of the New York City Health Code, in which one or more commercial cooking appliances has been installed for which the Mechanical Code requires a Type I hood and a fire extinguishing system.

**CONSTRUCTION CODES.** The New York City construction codes, consisting of the New York City Building, Fuel Gas, Mechanical and Plumbing Codes, and General Administrative Provisions, in effect on and after July 1, 2008, and as amended thereafter.

**CONTAINER.** For solid and liquid hazardous materials, a vessel of 60 gallons (227 L) or less in capacity used for storage or transportation. For compressed gases, a cylinder, pressure vessel or tank designed for pressures greater than one atmosphere at 68°F (20°C). Pipes, piping systems, engines and engine fuel tanks associated with solid or liquid hazardous materials or compressed gases, shall not be deemed to be containers if in active use.

**COOKING OIL.** Any plant, animal or synthetic fat used in cooking. Cooking oil is typically liquid at room temperature, although some cooking oils that contain saturated fat are solid. For purposes of this code, cooking oil will be deemed to be a Class IIIB combustible liquid unless otherwise demonstrated by approved documentation.

**DESIGN AND INSTALLATION DOCUMENTS.** Plans and specifications, or other written, graphic and pictorial documents or submissions, setting forth the location, design, arrangement and physical characteristics of the device, equipment, system, operation or facility for which approval by the commissioner is sought.

**DISCHARGE NOZZLE.** Device from which the extinguishing agent is discharged to provide for suppression of a fire in the designated hazard.

**DOMESTIC COOKING HOOD.** A hood serving a domestic cooking appliance as part of a domestic cooking system.

**DOMESTIC COOKING SYSTEM.** A system typically installed in residential and institutional occupancies that consists of one or more domestic cooking appliances designed and installed in accordance with the construction codes, including related exhaust and fire extinguishing systems.

**DOTn.** United States Department of Transportation.

**DUCT.**

*Branch Duct.* The duct work that contains the exhaust air from a single hood or hazard area.

*Common Duct.* The duct work containing the exhaust air from two or more branch ducts.

**DUCTLESS HOOD.** A Type I hood that collects the heat, smoke and grease-laden vapors generated by commercial cooking appliances without an exhaust duct system. Also known as a ventless hood or recirculating hood system.

**ELECTRICAL CODE.** The New York City Electrical Code in effect on July 1, 2008, and as amended thereafter.

**EMISSION CONTROL DEVICES.** Also known as Air Pollution Control Unit. When required by the Air Pollution Code, commercial cooking systems shall be equipped with a precipitator or other emission control device of a type for which a certificate of approval has been issued.

**EXPELLANT GAS.** The medium used to discharge extinguishing agent from its container.

**FIRE.** A rapid, persistent chemical reaction that releases heat and light, especially the burning of a combustible substance in the presence of oxygen. For purposes of this code, a flame used in any lawful, properly operating device, equipment or system or other controlled setting shall not be considered a fire.

**FIRE ALARM SYSTEM.** Any system, including any interconnected fire alarm sub-system, of components and circuits arranged to monitor and annunciate the status of fire alarm or supervisory signal-initiating devices.

**FIRE DETECTOR, AUTOMATIC.** A device designed to detect the presence of a fire signature and to initiate action.

**FIRE EXTINGUISHING SYSTEM.** An approved system of devices and equipment that discharges an approved fire extinguishing agent onto or in the area of a fire. The term includes (water-based) sprinkler systems and (water and non-water-based) alternative fire extinguishing systems, as those terms are used in the Building Code. An automatic fire extinguishing system incorporates a device that detects a fire and activates the system. A manual fire extinguishing system does not detect a fire and requires manual activation to discharge the fire extinguishing agent.

**GENERAL SUPERVISION.** Except as otherwise provided in this code, supervision by the holder of any department certificate who is responsible for performing the duties set forth in FC113.2 but need not be personally present on the premises at all times.

**HOOD.** An air-intake device used to capture by entrapment, impingement, adhesion or similar means, grease and similar contaminants before they enter a duct system.

*Type I.* A kitchen hood for collecting and removing grease vapors and smoke.

**INDICATOR.** A mechanical or electrical device that shows when an extinguishing system or critical component of it is ready to operate or if it has already operated.

**INITIATING DEVICE.** A system component that originates transmission of a change-of-state condition, such as in a smoke detector, manual fire alarm box, or supervisory switch.

**LABELED.** A material, device, equipment or system to which has been attached a label, symbol or other identifying mark of a nationally recognized testing laboratory or other approved organization, and whose labeling indicates compliance with nationally recognized standards and designates suitable usage.

**Listed.** A material, device, equipment or system included on a list published by a nationally recognized testing laboratory or other approved organization performing product evaluations that maintains periodic inspection of production of such listed material, device, equipment or system, and whose listing indicates compliance with nationally recognized standards and designates suitable usage.

**MASTER FIRE SUPPRESSION PIPING CONTRACTOR.** A licensed master fire suppression piping contractor, as that term is defined by the Building Code.

**MEANS OF EGRESS.** A continuous and unobstructed path of vertical and horizontal egress travel from any occupied portion of a building, structure or premises to a public way. A means of egress consists of three separate and distinct parts: the exit access, the exit and the exit discharge.

**MECHANICAL CODE.** The New York City Mechanical Code in effect on July 1, 2008, and as amended thereafter.

**OPERATING DEVICES.** Mechanical, electrical, or pneumatic devices involved in the operation of a system.

## **OPERATION.**

***Automatic Operation.*** Operation without human intervention. This operation includes, but is not limited to, heat, rate of heat rise, smoke, or pressure change.

***Manual Operation.*** Operation of a system or its components through human action.

**PIPE.** Pipe for conveying the extinguishing agent to the discharge nozzle(s).

**PORTABLE COOKING EQUIPMENT.** Commercial cooking equipment, provided with or installed with wheels.

**PRE-ENGINEERED SYSTEMS.** Those systems having predetermined flow rates, nozzle pressures, and quantities of extinguishing agent and having specific pipe size, maximum and minimum pipe lengths, flexible-hose specifications, number of fittings, and number and types of nozzles.

**PREMISES.** Any real property, including buildings and structures thereon, or any part thereof.

**RECHARGE.** The replacement of the extinguishing agent and expellant gas.

**SERVICING.** Performing maintenance, recharging, or hydrostatic testing.

**SHUTOFF DEVICES.** Devices that operate simultaneously with the extinguishing system to shut off fuel and power to appliances protected by the system and other appliances required to be shut off upon operation of the system.

**SIGNAL.** A status indication communicated by electrical or other means.

**SUPERVISORY SIGNAL.** A signal indicating the need for action in connection with the supervision of guard tours, fire extinguishing systems or equipment, fire alarm systems or the maintenance features of related systems.

**SYSTEM.** An assembly of devices, equipment, containers, appurtenances, pumps, compressors and connecting piping that is designed to perform a complex and/or complete function.

**TRAINED.** A person who has undergone the instructions necessary to safely design, install, and reliably perform the maintenance and recharge service in accordance with the manufacturer's design, installation, and maintenance manual.

**TROUBLE SIGNAL.** A signal initiated by the fire alarm system or device indicative of a fault in a monitored circuit or component.

**U.S. DEPARTMENT OF TRANSPORTATION (DOT).** The department that has jurisdiction over the design and transportation of compressed gas cylinders and cartridges in the United States.

**WATER MIST SYSTEM.** A fire extinguishing system which uses water mist as a fire extinguishing agent. Very fine droplets of water are generated and released under pressure as a mist.

**WET CHEMICAL/WET AGENT.** Normally an aqueous solution of organic or inorganic salts or a combination thereof that forms an extinguishing agent.

## **CHAPTER 3. CASE FIRES DUE TO FAILURE OF FIRE SYSTEMS**

### **1. Fast food restaurant fire, 2013, Bronx NY**

- Fire Started in one of the large fryers.
- Fusible Link melted.
- Control Head tripped.
- Gas and electrical shut down.
- Cylinders did not discharge, two 6-gallon cylinders, after recreating the system off site it was determined it was a failure of the actuation cartridge which had already been used or was never changed as there was no date on it.

### **2. Steakhouse fire, 2016, King of Prussia, PA**

- Fire Started in the broiler and was spread into the ductwork.
- The fire extinguishing systems was not activated. It was improperly inspected and the clogged nozzles did not allow suppressant to discharge.

### **3. Steakhouse fire, 2019, Manhattan NY**

- Fire started above a Double Upright broiler caused by restaurant cleaning personnel leaving cloth rag on top.
- Fusible Link Melted.
- Control Head tripped.
- Gas an electrical shut down.
- Cylinder #1 covering cooking appliances discharged all agent on appliances as designed.
- Cylinder #2 covering hood plenum and duct did not discharge, the servicing technician that performed service two weeks prior did not reconnect actuation hose for that cylinder.
- Fire in the plenum and duct was not suppressed and extensive damage occurred.

### **4. American restaurant and bar fire, 2019, Manhattan NY**

- Fire Started in the upright broiler.
- Fusible Link melted.
- Control Head tripped.
- Gas and electrical shut down.
- Cylinders did not discharge, three cylinders, after recreating the system off site it was determined it was a failure of the actuation cartridge which had already been used, as when the last service tech performed the AVOT, he mistakenly put the test cartridge back in instead of a new cartridge.
- The fire caused extensive damage.

## **CHAPTER 4. INSTALLATION AND THE REQUIRED INSTALLATION INSPECTION AND TESTING**

### **4.1. Hazard Analysis**

Before design and installation documents are prepared and submitted for the Fire Department review and approval, S17/S71 COF holders are required to conduct a hazard analysis of all hazards requiring protection in the kitchen. Such assessment will help to determine the type of system that needs to be installed, the total required nozzle flow numbers, quantity, and size of agent tanks and cartages, if applicable, and whether the manufacturer's Technical Support needs to be contacted for any further assistance. The hazard analysis shall include but not be limited to the following:

- Location, dimensions, and hazard areas that require protection
- Information about the exhaust system and associated equipment for each hazard area, including the presence of a secondary filtration system (emission control device)
- Number, location, dimensions, and type of fuel supply for all cooking appliances
- Presence of cooking equipment requiring special application protection
- Presence of cooking appliance and/or associated equipment requiring a non-UL listed application and/or Department of Buildings (OTCR) approval.
- Location, type, and manufacturers of the gas valves
- Presence of existing fire extinguishing systems that need to be interconnected to operate simultaneously
- All points of egress from the kitchen area
- Presence of a building fire alarm system

### **4.2. Protected Areas**

Protected areas must include

- Commercial cooking hoods
- Plenums, ducts, and filters with their associated cooking appliances
- Other related equipment, such as emission control and energy recovery devices installed as part of the exhaust systems
- Any devices listed in the FDNY Certificate of Approval.

### **4.3. Installation**

#### **4.3.1. Electrical equipment**

Electrical equipment and wiring systems must be installed in accordance with the New York City Electrical Code and the terms of their listing.

#### 4.3.2. Activation

Unless otherwise provided by this code or the rules, fire extinguishing systems must be designed and installed to activate automatically. Automatically activating fire extinguishing systems must additionally be provided with a manual means of activation.

The manual devices must be readily accessible and accurately identified.

#### 4.3.3. System interlocking

Automatic equipment interlocks with fuel and/or power shutoffs, ventilation controls, and other features necessary for proper operation of the fire extinguishing system must be provided as required by the New York City Construction Code, Fire Code, or other design and installation standard utilized for the hazard.

#### 4.3.4. Alarms and warning signs

All indoor fire extinguishing systems, except commercial cooking, domestic cooking and spray finishing fire extinguishing systems, installed after 04/15/2022 shall be monitored by an approved central station. Where a building fire alarm system is installed, all such indoor fire extinguishing systems, except domestic cooking systems (different from the commercial cooking system), shall be monitored by such fire alarm system.

#### 4.3.5. Special requirements for ductless/ventless hoods

Ductless range hoods are not equipped with any ducts or pipes to remove the contaminants outside the cooking area. They use exhaust fans to filter air and smoke before blowing it back into the room. All ductless hoods must obtain an FDNY Certificate of Approval. To install a wet chemical fire extinguishing system for ductless hoods, the S-17/S-71 COF holder must ensure the hoods have obtained the Certificate of Approval. The list is constantly updated and can be obtained below: <https://www.nyc.gov/assets/fdny/downloads/pdf/business/coa-prefabricated-hoods.pdf>

The COF holder must comply with all conditions listed in the Certificate of Approval. Unless otherwise approved by the FDNY, ductless hoods are **prohibited** to be installed in:

- the basement or cellar of any building.
- any non-fireproof buildings.
- any un-sprinklered buildings.
- in any open spaces such as shopping malls.



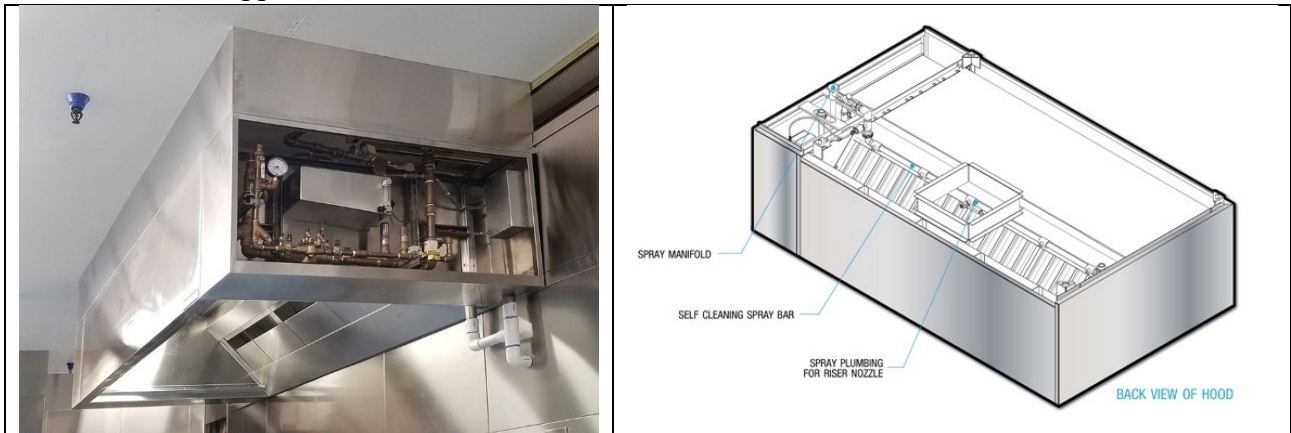
Examples of ductless hoods:



4.3.6. Water-wash hoods

The water-wash (or self-cleaning) hood is considered as a pre-fabricated UL710 hood. Before 2008, each of them required an MEA or BSA approval. It contains a spray bar that extends the full length of the hood. The spray bar is fitted with nozzles to spray water and/or water mist down of the plenum and back of the filters. A nozzle may spray water and/or water mist to clean the exhaust riser too. The water-wash hoods are designed to automatically clean the hood plenums after the cooking operations are completed via schedule.

The hoods must be installed and maintained in accordance with manufacturer’s specification and conditions of the approvals.



#### 4.3.7. Special requirements for precipitator installed outdoor or on rooftop

The emission control device (e.g. precipitators) must also be protected by an approved fire extinguishing system which must be factory-installed or field-installed meeting the intent of the fire extinguishing system manufacturer. They must be arranged for simultaneous automatic operation upon actuation of the commercial cooking fire extinguishing system. Each fire extinguishing system or emission control device manufacturers should provide their own guidelines to the S-17/S-71 COF holder and the emission control device installer. To ensure the fire extinguishing system can provide the right protection, the manufacturer's guideline must be followed.



If any emission control device is installed outdoors or on rooftop, the wet chemical fire extinguishing system protecting unit must be installed in an area (e.g. a heated enclosure) where the temperature will be within acceptable range specified in the manufacturer's design, installation, and maintenance manual.

#### **4.4. Pretest and Inspection**

Fire extinguishing systems must be inspected and tested upon completion of the installation **prior** to the installation acceptance testing.

**The fire extinguishing system must be inspected for the following conditions:**

- Hazard specification for consistency with design hazard.
- Type, location and spacing of automatic- and manual- initiating devices.
- Size, placement and position of nozzles or discharge orifices.
- Location and identification of audible and visible alarm devices, if applicable.
- Identification of devices with proper designations.
- Operating instructions, to ensure that the system is correctly operated during the acceptance testing.

#### **4.5. System Inspection Pre-Test**

System Inspection Pre-Test must be performed based on the manufacturer's manual. This test must include functional tests of the automatic detection system, the manual release devices, the gas shutoff, the shutoff of makeup air supplied internally to a hood, and the electrical power shutdown.

#### **4.6. Releasing Control Panel (if applicable)**

Where a releasing control panel is provided, the COF holder must verify that the panel is connected to a dedicated circuit and labeled properly. The panel must be readily accessible and restricted from unauthorized personnel.

#### **4.7. Installation Acceptance Testing**

All fire extinguishing systems must be subject to acceptance test conducted at the owner's risk by authorized company with S-71 COF before a representative of the FDNY. The authorized company must furnish with all necessary equipment and sufficient qualified staff requiring to conduct the test. A discharge test may be required as set forth in the applicable installation standard or as required by the FDNY when there is evidence that the system will not provide the necessary level of protection.

It must be verified that the appliances, hoods, and ducts are properly protected with nozzles and positioned in accordance with the manufacturer's design, installation, and maintenance manual.

##### 4.7.1. Mechanical components and appliances

The COF holder must verify that nozzle sizes and pipe sizes are in accordance with the manufacturer's design

##### 4.7.2. Piping integrity test

Piping must be physically checked for tightness and must not be hydrostatically tested. A test using nitrogen or dry air must be performed on the piping network at a pressure not to exceed the normal operating pressure of the extinguishing system. The quantity of the nitrogen or dry air must be sufficient to verify that the piping and each nozzle are unobstructed, and the air must be discharged out of each nozzle.

##### 4.7.3. Labeling

The labeling of devices with proper designation and instruction must be verified.

#### **4.8. Return of System to Operational Condition**

Once the installation, and satisfactory FDNY acceptance test is performed, the COF holder must ensure that each extinguishing agent storage containers (cylinders) is reconnected, and the system restored back to proper working order.

If the wet chemical fire extinguishing systems are monitored by a central station company, the central station company must be notified that the fire extinguishing systems is in full-service operational condition.

The COF holder must provide the restaurant or system owner the owner's guide developed by the manufacturer.

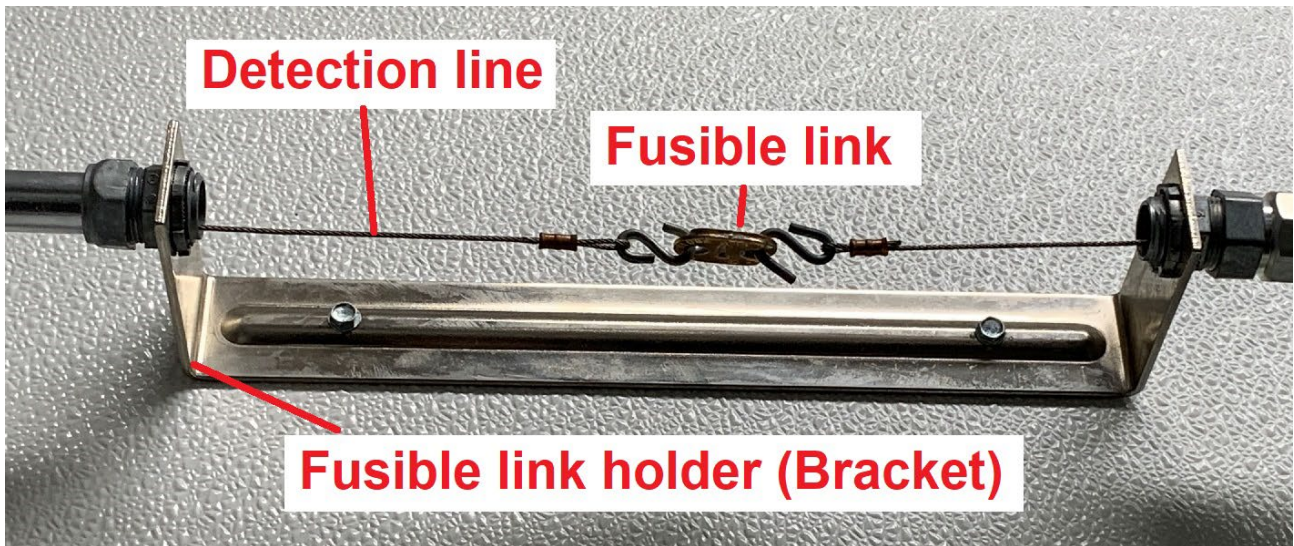
# CHAPTER 5. WET CHEMICAL EXTINGUISHING SYSTEM COMPONENTS

## 5.1. Detectors



Fusible link detectors are temperature sensitive fire protection devices designed to be part of a fire extinguishing system. The system is activated when the ambient temperature increases to the point that causes the fusible link to “break-apart”. The detector includes three major components:

- Fusible link
- Fusible link holder (Bracket)
- Detection line



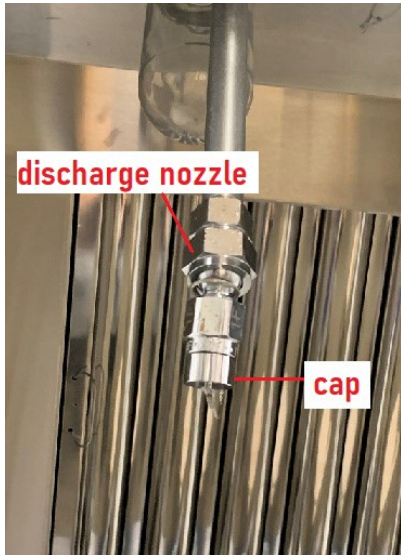
Links are employed to restrain the operation of the system until a fire occurs. Each link is connected by a cable to the restaurant system releasing mechanism. When a high temperature is reached, the two halves of the link separate. When the cable tension is released by the separation of the link, the system operates, and wet chemical flows out the discharge nozzles onto the fire area.

Fusible Links are one of the most critical components of a kitchen fire suppression system. Many factors can inhibit the fusible link from working properly. **Fire Code requires the fusible links to**

**be replaced in accordance with the manufacturer's specifications but at least annually.** Other factors such as grease build up could cause the need for them to be replaced sooner.

At least one fusible link or heat detector must be installed within each exhaust duct opening and must also be provided above each protected cooking appliance. The location of these fusible links or heat detectors must be allowed to be located at or within 12 in. into the exhaust duct opening and above the protected appliance.

## 5.2. Discharge Nozzles



The discharge nozzles are used for plenum, duct, cooking appliance, and when provided, emission control device coverage. They are designed to distribute agent to specific hazard areas and provide either a conical or flat discharge pattern. Different types of nozzles will provide different types of flow and/or pattern.

All discharge nozzles must be located to minimize damage or misalignment and be within the limitations and constraints of the manufacturer's design, installation, and maintenance manual.

Discharge nozzles must

- be provided with an internal strainer, or a separate listed strainer located immediately upstream of the nozzle;
- be of brass, stainless steel, or other corrosion-resistant materials or be protected inside and out against corrosion;
- made of noncombustible materials and must withstand the expected fire exposure without deformation;
- permanently marked for identification.

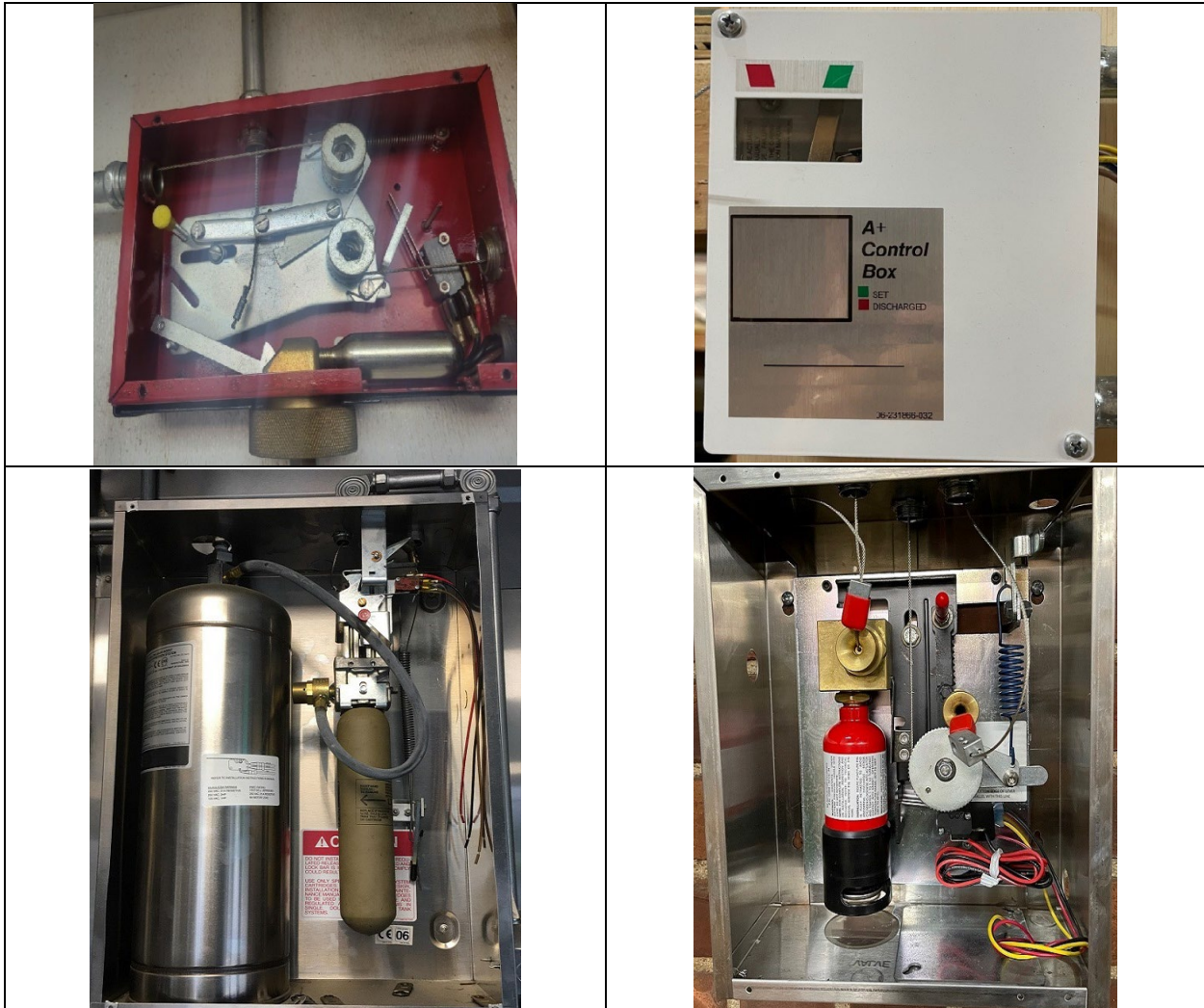
The nozzles must include a cap. The cap prevents contamination (e.g. grease vapors, moisture, or other foreign materials) from entering the pipe network and is designed to pop-off upon system discharge, allowing the agent to flow to the protected area. The cap or the protection device must blow off, blow open, or blow out upon agent discharge.



### 5.3. Actuator

The system operates either automatically if actuated by a detector or manually if actuated by a manual activation device. Most of the fire extinguishing systems are automatically tripped when they detect heat over a certain accepted temperature. While automatic actuation is necessary, it's also required to provide a manual actuation option.

#### Control Box Examples



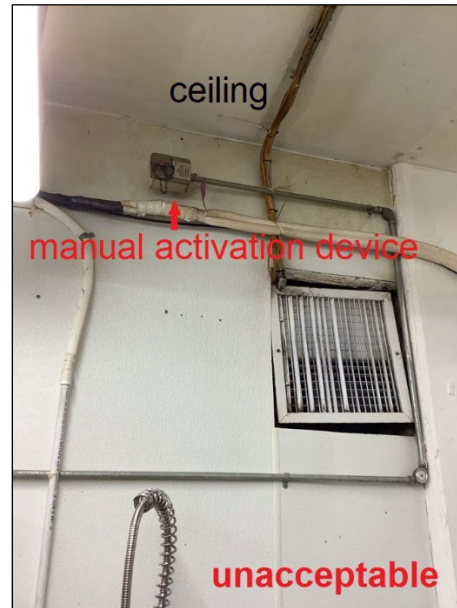
When actuation occurs, some systems will release compressed gas stored in the actuation cartridge through the actuation hose/piping, expel the liquid agent from the agent cylinders through the discharge valves and piping; however, some systems will release the wet chemical storage cylinder directly.

A manual activation device enables an operator to immediately activate the system, extinguishing the flames. The automatic and manual activation devices must be separate and independent of each other, so that a failure of one will not impair the operation of the other. When a listed releasing

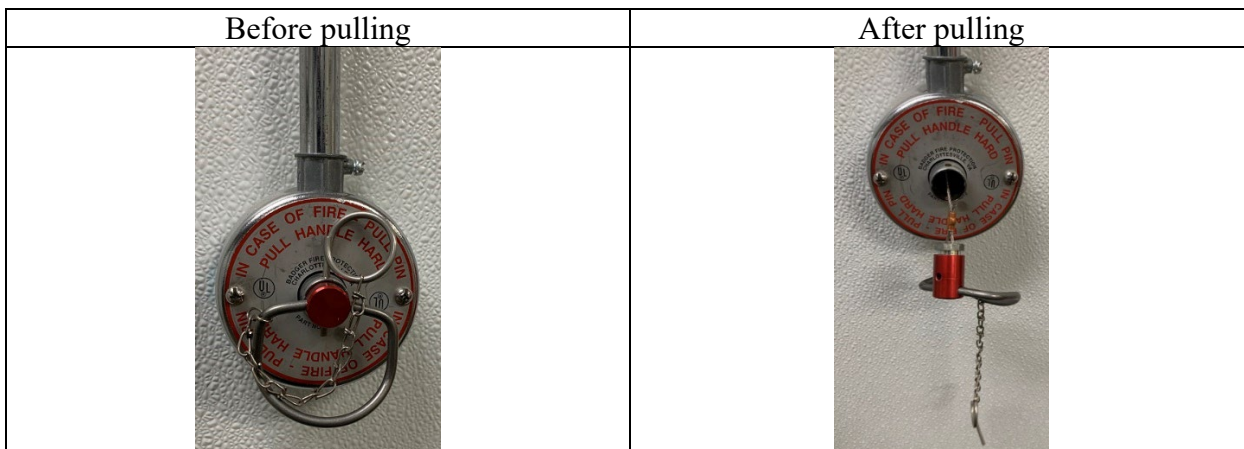
mechanism is used employing a single line for mechanical detection and remote manual control, the remote manual control must be installed inline, prior to all detection devices, so malfunction of one does not impede operation of the other.

**The requirements of the manual activation device:**

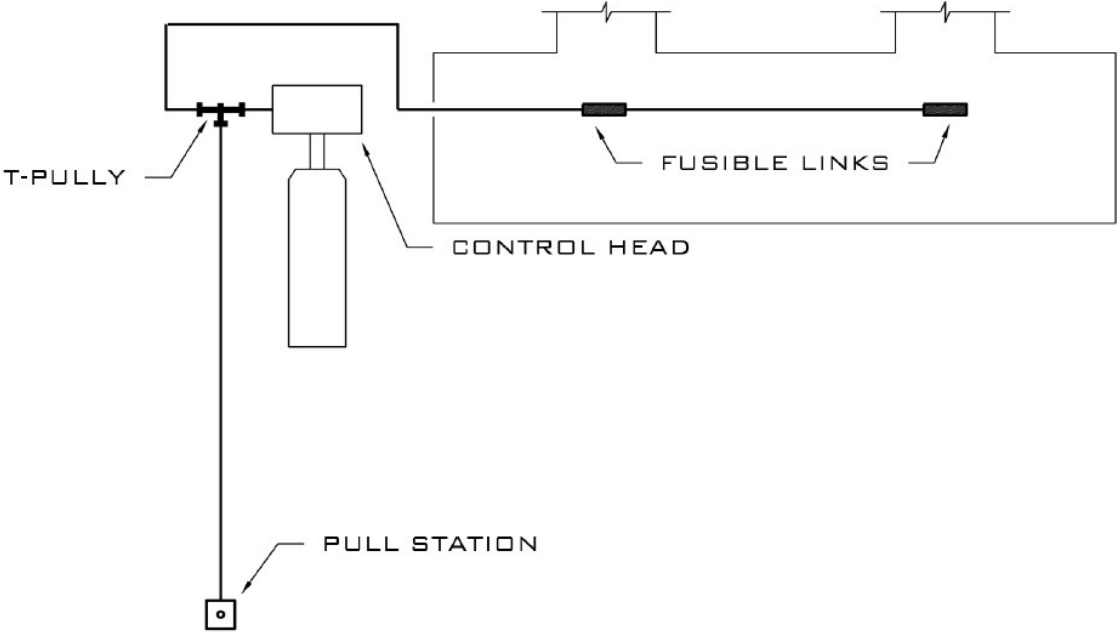
1. Manual activation device must be activated with reasonable force which must not exceed 40 lb.
2. Manual activation device must not require a movement of more than 14 in. to secure operation. When these actuators are used for cooking related protection, the device must be installed 42 to 48 inches above the floor at its center.



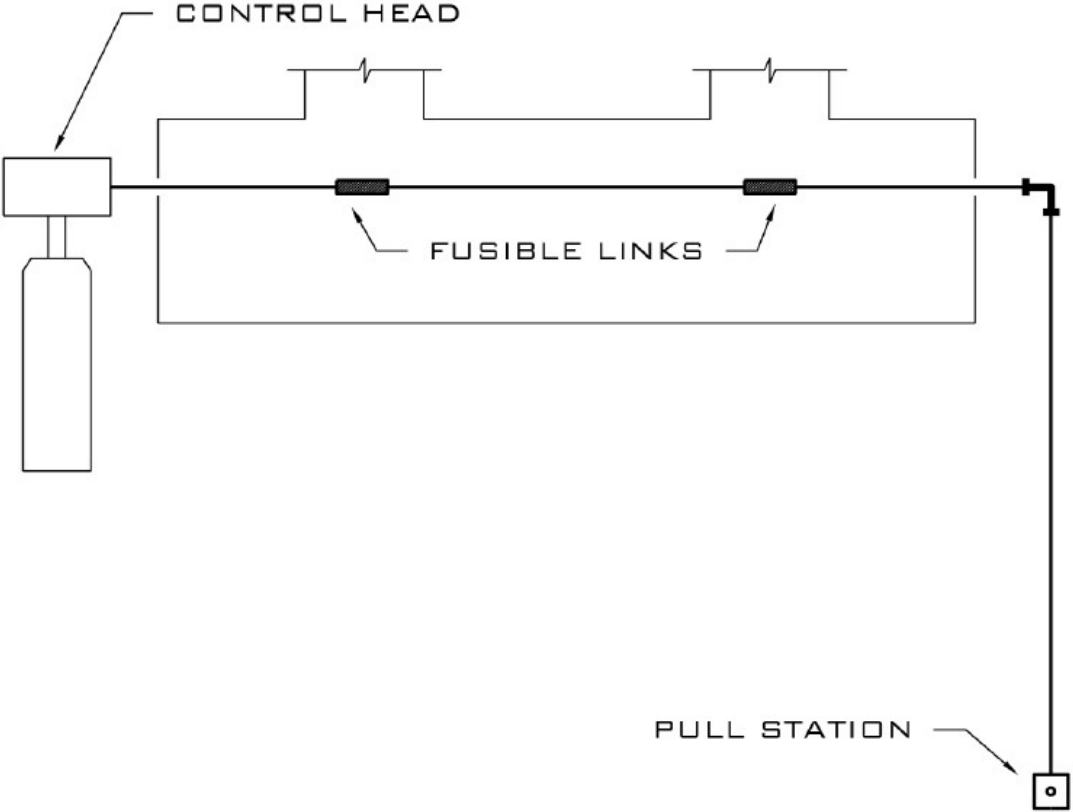
3. A readily accessible means for manual actuation must be located in a path of egress. The device must be readily accessible from the cooking area and not less than 10 feet nor more than 20 feet from the commercial cooking appliances protected by the fire extinguishing system, or other approved location.
4. At least one manual activation device must be provided for each system.
5. The means of manual actuation must not rely on electrical power for actuation unless electrical supervision and a reserve power supply are provided.



**Acceptable layout of the manual activation device:**



**Incorrect layout of the manual activation device (the manual activation device is located at the end line)**





### Instructions for fire extinguishing system manual activation

The manual operating devices must identify the hazards they protect. You must provide the user the operating instructions. These instructions must be permitted to include the use of pictographs and must have lettering at least 1/4 in. in height.

A 3" x 5" sign or marking that clearly identifies the commercial cooking appliances being protected must be posted on or adjacent to the manual activation device. The manual activation device must be kept unobstructed at all times.



Kitchen incident fires, especially grease fires, can spread quickly. As an S-17/S-71 COF, you must train the kitchen staff how to activate the manual activation device and you should also instruct the restaurant employees that **although the fire extinguishing system is designed to actuate automatically, it is highly recommended to manually activate the fire extinguishing system immediately when anyone notice a rangehood fire.**

### 5.4. Shutoff Devices

Shutoff devices are used to shut off the flow of any means of fuel and power to the appliances upon actuation of the releasing module. These devices can be mechanical or electrical activated.

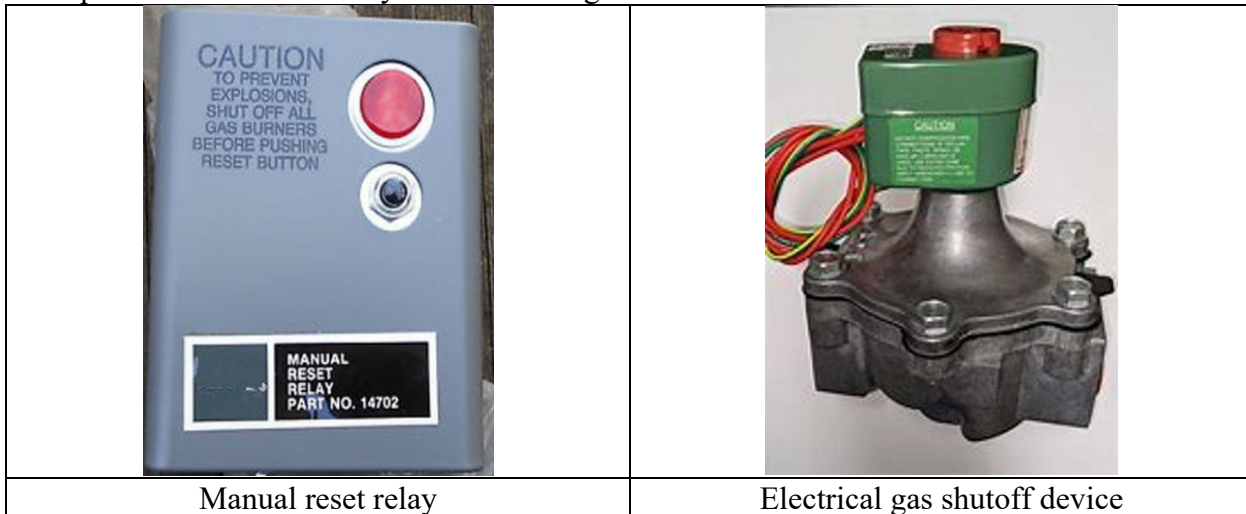
On actuation of any cooking equipment fire extinguishing system, all sources of fuel and electric power to all equipment (exception: listed lighting units in hoods) under the protected hood must be shut down automatically.

Shutoff devices must require manual resetting prior to fuel or power being restored.

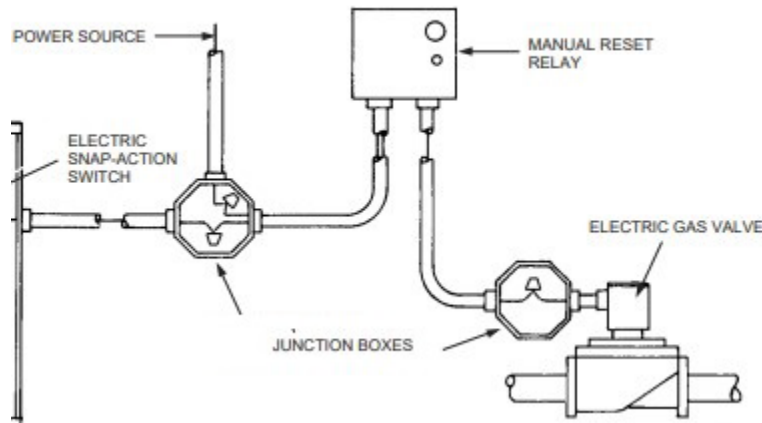


If the gas shutoff device is activated electrically, the manual reset relay must be provided. The relay must be approved by the manufacturer of the wet chemical fire extinguishing system.

Example of manual reset relay and electrical gas shutoff device:



Example of the setup of manual reset relay and shutoff device :



### 5.5. Pipe and Fittings, Tubing, Hose.

The pipes and fittings must be non-combustible material that is compatible with the wet chemical agent (e.g. black iron, chrome plated or stainless steel). The pressure rating of the pipe fittings and connection joints must withstand the maximum expected pressure in the piping system.

Pipe, tubing, hose and types of fitting materials (e.g. adaptors) must be in accordance with the manufacturer's design, installation, and maintenance manual. The installer or any person should not alter them.

Where the pipe or other conduit penetrates a duct or hood, the penetration must have a liquid tight continuous external weld or must be sealed by a listed device.

## 5.6. Wet Chemical

A wet chemical agent generally includes, but is not limited to, a potassium carbonate–based, potassium acetate-based, potassium citrate–based solution capable of being discharged through piping or tubing when under expellant gas pressure.

The agent’s effect on fires in common cooking oils and fats is to combine with these materials to form a vapor suppression foam that floats on a liquid surface, such as in deep fat fryers, effectively preventing re-ignition of the grease.

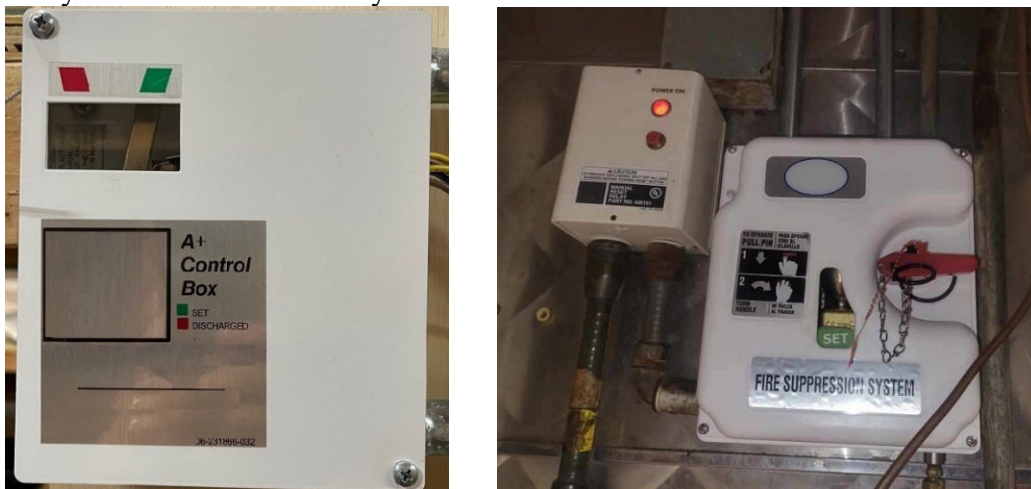
The wet chemical suppresses the flame by forming a barrier between the liquid fuel and oxygen. This barrier excludes oxygen from the fuel source and eliminates the release of flammable vapors from the fuel surface. The cooling effect of this agent also lowers the temperature of the flammable fuel, further decreasing fuel vapor release.

However, wet chemical, when discharged, is in the form of a fine spray. Some of the agent can settle on surrounding surfaces and can have a corrosive effect on electrical components and cooking equipment. Prompt cleanup will minimize staining or corrosion.

The wet chemical used in the system must be listed for the particular system as specified by the manufacturer of the wet chemical system. Wet chemical agents of different formulations or different manufacturers must not be mixed.

Wet chemical systems must be provided with an indicator to show that the system is in a ready condition or is in need of resetting and/or recharging.

Examples of systems that are in a ready condition:



## 5.7. Assembly

During assembly, the piping system must be examined internally to detect and remove contaminants or other foreign materials. Contaminants and foreign materials can affect the extinguishing agent distribution due to a reduction in the effective nozzle orifice area.

The COF holder must ensure that all extinguishing agent storage containers (cylinders) are fastened securely to their mounting brackets.

## CHAPTER 6. WET CHEMICAL EXTINGUISHING SYSTEM REQUIREMENTS

### 6.1. Location of Wet Chemical Containers (Cylinders) and Expellant Gas Assemblies

#### 6.1.1. In the correct temperature range

Wet chemical containers (cylinders) and expellant gas assemblies must be installed in an area where the temperature will not go below or exceed the temperature range specified in the manufacturer's design, installation, and maintenance manual. If the temperatures may be outside the range, the approved method must be provided to ensure the temperature can be maintain within the listed range. In other words, if equipment can be affected by freezing temperatures and located in an unheated area (e.g. outdoors or the areas are subject to high wind chill factors when transported to various locations), the equipment must be protected from freezing.

#### 6.1.2. Away from possible damage

Wet chemical containers (cylinders) and expellant gas assemblies must be installed away from ignition source, fire, mechanical, chemical, or other damage. If they are subjected to any potential damage, protective devices such as enclosures or guards acceptable to the FDNY must be provided.

#### 6.1.3. Access

Wet chemical containers (cylinders) and expellant gas assemblies must be installed and maintained to be accessible for inspection, maintenance, and recharge.

### 6.2. Protection of Common Exhaust Duct

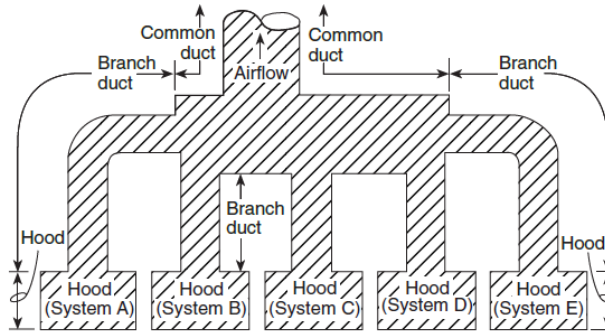
If a system is installed to protect two or more hazards that can be simultaneously involved in fire, the system must be designed and installed to protect all hazards that can be simultaneously activated.

Common exhaust ducts must be protected by one of the following methods: (The following scenarios and diagrams are cited from Section 5.6.2 of NFPA 17A (2013 Edition))

#### (1) Simultaneous operation of all independent hood, duct, and appliance protection systems.

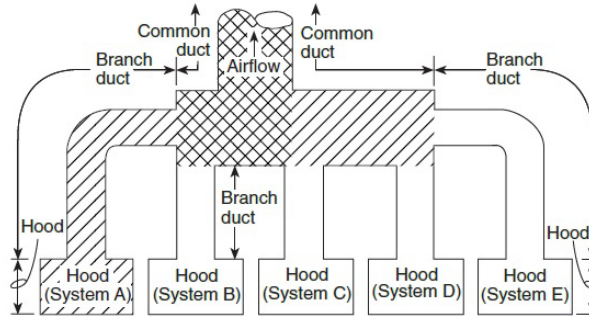
Scenario: A fire is detected by system A. The system A, protecting cooking appliances, a hood, and a branch duct, is actuated. Simultaneously, Systems B, C, D, and E are also actuated. All sources of fuel and electric power that produce heat to all equipment protected by these 5 systems must be shut down.

See the figure below:

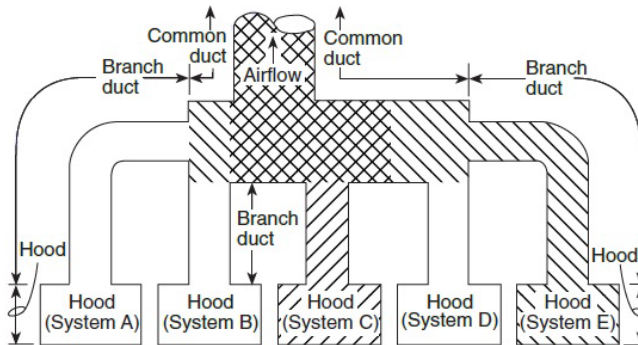


(2) Simultaneous operation of any hood, duct, and appliance protection system and the system(s) protecting the entire common exhaust duct.

Scenario (a): System 1 protecting the entire common exhaust duct is separate from Systems A, B, C, D, and E. A fire is detected in System A. System A and System 1 are operated simultaneously. Shutdown of all appliances protected by systems A, B, C, D, and E. See the figure below:



Scenario (b): System E also provides protection for the entire common exhaust duct. A fire is detected in System C. System C and System E operate simultaneously. Shutdown of all appliances protected by systems A, B, C, D, and E. See the figure below:



### 6.3. User's Responsibility

As a COF holder performing general supervision on the fire extinguishing system, you must ensure that the tenant is aware that they are responsible for the protection of any common exhaust ducts servicing hoods located within the tenant's space and up to the point of connection to the building owner's common exhaust duct. And the building owner or the owner's agent should know that they are responsible for the protection of any common exhaust ducts used by more than one tenant.

#### **6.4. Ignition Sources**

The ignition sources or a secondary filtration or emission control device, whether or not it includes an ignition source, must be protected by the same commercial cooking extinguishing system or a separate extinguishing system arranged for simultaneous automatic operation.

#### **6.5. Movable/Portable Cooking Equipment**

The designated location for movable/portable (wheeled) commercial cooking appliances must be outlined on the floor in durable 1-inch-wide yellow line markings or other approved means. Such location must be determined in relation to the location of the fire extinguishing system nozzle protecting such movable commercial cooking equipment. The COF holder must inform the owner or operator of a commercial cooking system that they must ensure that each movable appliance is positioned at its designated location before commencing cooking.

## **CHAPTER 7. PERIODICAL INSPECTION, TESTING AND RECORD**

### **7.1. Maintenance of Commercial Cooking Fire Extinguishing System**

Commercial cooking fire extinguishing systems must always be maintained in good working order. These systems must be periodically inspected, tested, and otherwise maintained in accordance with the NYC Fire Code, NFPA 17A, as modified by FC Appendix B standard, and the system manufacturer's design, installation, and maintenance manual.

Any system that is not in good working order must be repaired or replaced as necessary to restore such system to good working order, or, where authorized by the Building Code, removed from the premises. The corrective action must be conducted by an S-71/S-17 Certificate of Fitness holder.

The semiannual inspection, testing, servicing, and other maintenance of wet chemical fire extinguishing systems must be personally conducted by an S-71/S-17 certificate of fitness holder.

### **7.2. Monthly Visual Inspection**

As a Certificate of Fitness holder, you must advise that the owner of the restaurant or the owner of the commercial cooking systems to have at least one employee trained for performing the monthly inspection. The FDNY recommends that the personnel should be trained by an S-17/S-71 COF holder and be knowledgeable to confirm that the system is in good working order, including the following conditions:

1. The fire extinguishing system is in its proper location. It is intact and undamaged, including the extinguishing agent container (cylinders), system piping, nozzles, and protective nozzle caps.
2. Any fusible links or other fire detection devices are clean.
3. Access to each manual activation device, if required, for the fire extinguishing system is not obstructed and any tamper indicator is intact.
4. Check the pressure gauge, control panel or control unit, as applicable, to determine whether the fire extinguishing system is operational and whether there are any supervisory or trouble signals.
5. Ensure the water wash/self-cleaning hood is operational, if applicable.
6. The maintenance tag for the fire extinguishing system is in place and has not expired.

As a COF holder, you should provide the following monthly inspection check list to the owner or the check list provided by the manufacturer.

## Monthly Visual Inspection Check list

Location: \_\_\_\_\_

Inspection Date: \_\_\_\_\_

Name (Print): \_\_\_\_\_

Inspection Items	Check Mark	Description of The Issue (if check "No")
The extinguishing system is in its proper location.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
Extinguishing agent cylinder(s) is/are intact.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
System piping is intact.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
All nozzles are intact.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
All protective nozzle caps are intact and undamaged.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
No obvious physical damage or condition exists that might prevent operation.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
All fusible links or other fire detection devices are clean.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
Access to each manual activation device for the fire extinguishing system is not obstructed.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
The tamper indicators and seals are intact.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
The pressure gauge(s), if provided, has been inspected physically or electronically to ensure it is in the operable range.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
The protected equipment has not changed without FDNY's approval (e.g. no replacement, modification or relocation of the equipment).	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
Each movable appliance is positioned at its designated location (e.g. within the yellow line markings)	<input type="checkbox"/> Yes; <input type="checkbox"/> No	
The maintenance tag for the fire extinguishing system is in place and has not expired.	<input type="checkbox"/> Yes; <input type="checkbox"/> No	

I here certify that I have visually inspected the item listed above based on the training I received, and I have immediately notified the owner or the owner's representative to contact the responsible S-17 or S-71 COF holder to fix any issue listed above.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date



### 7.3. Semiannual Inspection

An S-17/S-71 COF holder must inspect, test, service and otherwise maintain commercial cooking fire extinguishing system in accordance with the following requirements and the manufacturer's specifications and servicing manuals at least on a semiannual basis.

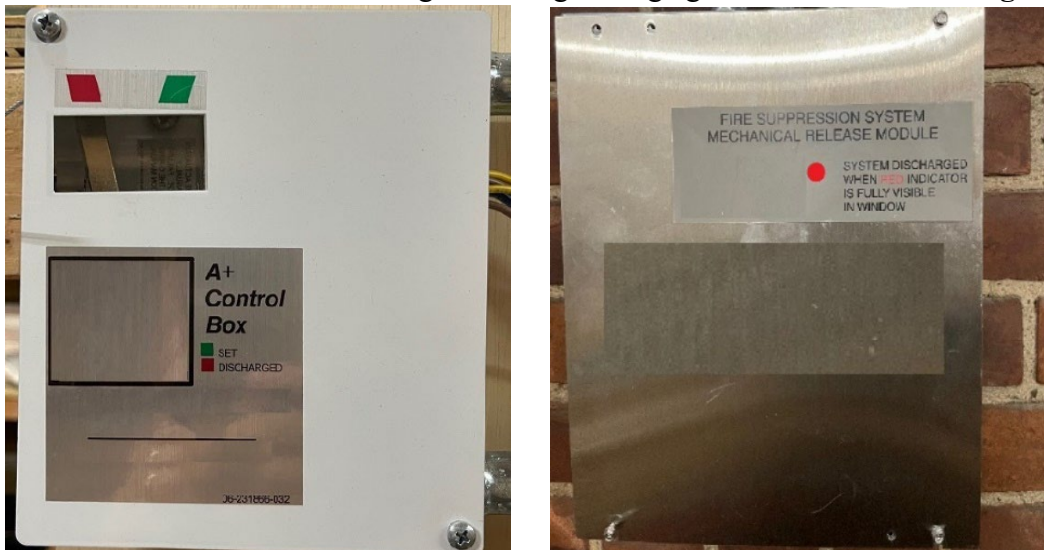
If the system access for inspection or maintenance requires opening panels in fire chases, ducts, or both, the appliance(s) or equipment protected by the fire extinguishing system must not be in operation.

Such semiannual inspection, testing and servicing must include all procedures necessary to determine that the system is in good working order, including the following actions:

1. Verification that the hazard has not changed.
2. Verification that the fire extinguishing system has not been altered.
3. Examination of all detection systems, alarms, manual stations, extinguishing agent containers (cylinders), releasing devices, piping, hose assemblies, nozzles, and all ancillary equipment.
4. Verification that the extinguishing agent has not been discharged.

Each system has its own method to indicate if the extinguishing agent has been discharged. You must follow the manufacturer's specifications and servicing manuals to verify.

Examples of different indicators showing the extinguishing agents have been **discharged**:





5. Verification that the agent distribution piping is not obstructed.
6. Verification that the extinguishing agent container (cylinder) and/or ancillary pressure containers (cylinders) have been, as applicable, inspected, retested and marked in conformance with the requirements of the United States Department of Transportation.

A method and instructions (e.g., regulator test kit) must be provided for checking the amount or the pressure of expellant gas to ensure that it is sufficient for proper operation of the system.

7. A test of the system's automatic and manual releasing devices, including any associated equipment. Fixed temperature-sensing elements must be maintained to ensure proper operation of the system.

Fusible links must be replaced in accordance with the manufacturer's specifications but at least annually.

8. A test of the gas and electric power source shut-off (interlock) devices (also known as Automatic Valve Operation Test, AVOT), if applicable.
9. Preparation and submission to the owner of a written inspection report. If there is any non-compliance issue that cannot be fixed immediately, the owner must be notified.
10. Upon satisfactory completion of the semiannual inspection and correction of all defects, providing the owner with an inspection, testing and service compliance tag. Such tag must indicate:

- the year and month issued;

- the name, the S71 COF number and DOB license number of the licensed Master Fire Suppression Piping Contractor issuing the tag;
- the name and the S17 COF number of the COF holder conducting the inspection;
- and if the system was found to be in compliance with the Fire Code and manufacturer’s specifications and servicing manual requirements. The FDNY recommends that any compliance tag should be any color other than red.

### 7.3.1 Wet chemical containers (cylinders)

If any wet chemical containers (cylinders) reveal conditions such as, but not limited to, corrosion or pitting more than the manufacturer’s limits; structural damage; fire damage; or repairs by soldering, welding, or brazing, the affected container (cylinder) must be replaced in accordance with the manufacturer’s specifications and servicing manual and the Fire Code.



← The wet chemical cylinder must not be repaired by welding.

### 7.3.2 Other system components

If any wet chemical system components reveal conditions such as, but not limited to, corrosion or pitting in excess of the manufacturer’s limits, structural damage, or fire damage, the affected part(s) must be replaced.

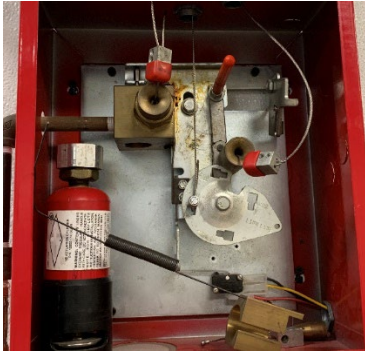
### 7.3.3 Impairment

If the COF holder notices that there is any defective part that **could cause an impairment or failure of proper operation of the system(s)**, the affected parts must be replaced or repaired in accordance with the manufacturer’s specifications and servicing manuals.

Until the impairment issue is resolved, the system must be tagged as impaired with a non-compliance tag (the FDNY recommends using red color), and the COF holder must notify the restaurant owner to discontinue all cooking covered by the impaired system. The FDNY also needs to be notified by emailing [FDNY.BusinessSupport@fdny.nyc.gov](mailto:FDNY.BusinessSupport@fdny.nyc.gov) and [rangehood\\_unit@fdny.nyc.gov](mailto:rangehood_unit@fdny.nyc.gov) including address, name of the business, description of the non-compliance issues within 24 hours.

The cooking should be stopped and FDNY notification should be made for the following major impairments:

- Defective control box



- Clogged/malfunctioned automatic detection line: link is cut, and cable/conduit are clogged with grease not allowing cable to release firing mechanism



- Improper placement of fusible link in link housing (bracket) or installing the wrong fusible link

Wrong fusible link may not activate the system correctly. Or fusible link will get stuck in the conduit upon activation if it is installed incorrectly.

- Incorrect size of link housing (bracket)  
It may create obstruction in travel distance.
- Loss of pressure in wet chemical containers (cylinders) or damaged wet chemical containers (cylinders)



- The fire suppression shut off valve is inoperable

- Completed clogged nozzles

Examples of clogged nozzle:



Examples of unobstructed nozzle:



- Defective agent hose or high-pressure actuation hose
- Incorrect expellant gas or wet chemical agent, not following the specification by the manufacturer
- Manual activation device is located at the end line (refer to Section 5.3 of this study material for examples) .

After proper repairs, when the system can be restored to full operating conditions, the restaurant owner and the FDNY must be notified, and the impairment tag must be removed and cooking can resume.

### 7.3.4 Recharging



You must follow the manufacturer's design, installation, and maintenance manual to confirm if the recharging is required. For stored pressure systems, you will need to check the pressure gauge on the agent container (cylinder) to verify if the cylinder is fully charged. For some systems, you may need to remove the agent cylinder valve to check the agent level is correct. All verification procedures must follow the manufacturer's manual.

If the recharging is found to be necessary after an inspection or maintenance procedure, the following procedures must be conducted in accordance with the manufacturer's design, installation, and maintenance manual:

- (1) The system must be recharged in accordance with the manufacturer's design, installation and maintenance manual.
- (2) The system must be placed in the normal operating condition.
- (3) Following a discharge, the piping shall be flushed and blown out with dry air or nitrogen in accordance with the manufacturer's design, installation, and maintenance manual.

It is very critical that use the wet chemical provided by the manufacturer of the system and the type of expellant gas specified by the manufacturer of the system.

Recharging supplies of wet chemical must be stored in the original closed shipping container (cylinder) supplied by the manufacturer and maintained within the manufacturer's specified storage temperature range. The containers (cylinders) must not be opened until the system is recharged.

### **7.4. Hydrostatic Test.**

The following parts of wet chemical extinguishing systems shall be subjected to a hydrostatic pressure test at intervals not exceeding 12 years:

- (1) Wet chemical containers (cylinders)
- (2) Auxiliary pressure containers (cylinders)
- (3) Hose assemblies

*Exception No. 1: Auxiliary pressure containers (cylinders) not exceeding 2 in outside diameter and less than 2 ft (0.6 m) in length.*

*Exception No. 2: Auxiliary pressure containers (cylinders) bearing the DOT "3E" marking.*

The hydrostatic test must ensure:

- Wet chemical containers (cylinders), auxiliary pressure containers (cylinders), and hose assemblies must be subjected to a hydrostatic test pressure equal to the marked factory test pressure or the test pressure specified in the manufacturer's design, installation, and maintenance manual.
- No leakage, rupture, or movement of hose couplings.
- The pressure in a hydrostatic test of a container (cylinder) must be maintained for a minimum of 30 seconds, but for no less time than is required for complete expansion of the container (cylinder) and to complete the visual examination of the container (cylinder).
- Wet chemical agent removed from the containers (cylinders) prior to hydrostatic testing must be discarded.

Prior to being refilled or transported, in accordance with DOT requirements, containers (cylinders) bearing DOT markings must be retested or replaced in accordance with the appropriate DOT requirements.

### **7.5. Tag and Recordkeeping**

Records of all system inspections, tests, servicing, and other maintenance required by the Fire Code or the referenced standards must be maintained.

#### **7.5.1 Tag**

Each wet chemical system must have a tag securely attached.

Such tag must indicate the information required in section 7.3, item 10 of this booklet.

Only the current tag shall remain in place.

#### **7.5.2 Recordkeeping**

The monthly inspection record must include the date the inspection is performed and the initials of the person performing the inspection.

The COF holder must provide the semiannual inspection reports, including any recommendations, to the restaurant owner or the owner's representative.

The owner or the owner's representative must keep all inspection, maintenance or repair record at the premises at least 3 years.

## CHAPTER 8. COMMON MISTAKES THAT RESULT IN SYSTEMS FAILURE OR FDNY SUMMONS

### 8.1. Incorrectly Designed and Installed Systems

It is critical that the system is designed for each unique kitchen and is installed correctly by well-trained COF holders. The system must be installed in accordance with the procedures detailed in the manufacturer's design, installation, and maintenance manual.

An inadequately installed wet chemical system will not provide the correct means for manual and automatic activation and will not automatically shut off all sources of fuel and electrical power to the equipment protected by that system.

The fire extinguishing system will also fail during a fire condition if the layout of the cooking equipment is expanded or changed without properly modified protection. The approval must be obtained from the FDNY.

### 8.2. Poor Maintenance or Inspection

The COF holder must ensure any required inspection or maintenance is properly conducted to minimize fire threats.

The monthly visual inspection matters too. One common issue with the fixed extinguishing systems includes the caps on discharge nozzles being taken off for day-to-day use. These caps prevent grease from getting into and clogging the nozzles and are designed to blow off when the system activates.

Some poor maintenances may be caused by the user or the cleaning company. The issues may include improper cleaning or disconnecting the cartridge while cleaning as the photos shown below. S-17/S-71 COF holder should inform the restaurant owner to hire W-64/P-64 COF holders who are employed by an FDNY approved Commercial Cooking Exhaust Systems Company to clean the commercial cooking exhaust systems.

List of Approved Commercial Cooking Exhaust Systems Companies

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/approved-companies-commercial-cooking.pdf>

List of Approved Commercial Cooking Exhaust Systems Companies Precipitator

<http://www1.nyc.gov/assets/fdny/downloads/pdf/business/approved-companies-commercial-cooking-precipitator.pdf>





### **8.3. Common Installation/Maintenance Mistakes**

#### **(1) During the acceptance test:**

- Failure to install the fire extinguishing system in accordance with the manufacturer's installation manual.
- Failure to properly interconnect automatic equipment interlocks with the fire extinguishing system.
- Install the manual activation device at the end line.

#### **(2) During the maintenance:**

- No changing of links.
- Performing a "Quick check" instead of Automatic Valve Operation Test (AVOT).
- Not replacing actuation cartridge(s) with new and dating it if required by manufacturer.
- Failure to report and document any discrepancies.
- Failure to replace all high-pressure actuation hoses or copper tubing.
- Failure to properly align cooking equipment requiring a dedicated protection.

## CHAPTER 9: LITHIUM-ION BATTERY SAFETY

### **Lithium-ion safety**

Lithium-ion batteries are rechargeable batteries found in electric bikes, scooters, cars, laptops, tablets, phones, and many other common household devices.


Lithium-ion battery fires have caused deaths, serious injuries, and devastating damage to property around the city. It's important to follow rules for safe storage, charging, and disposal for these types of batteries.

If you own a lithium-ion powered device or plan to buy one, the FDNY has important safety tips that you should follow. These tips apply to all devices powered by lithium-ion batteries, including phones, tablets, laptops, e-cigarettes, toys, high-tech luggage, and even robotic vacuum cleaners.

**Immediately stop** using or charging battery and call 911 if you notice:

- Fire or Smoke
- Overheating
- Change in color or shape
- Odd noises
- Leaking
- Strange smell

### **ALWAYS:**

- purchase and use devices certified by a Nationally Recognized Testing Laboratory (NRTL). 
- follow the manufacturer's instructions for:
  - charging and storage.
  - correct battery, cord, and power adapter
- **keep exit path clear at all times.**
- plug directly into a wall electrical outlet for charging.
- keep batteries and devices at room temperature.
- store and/or charge batteries away from anything flammable.
- keep away from heat sources.
- bring batteries to a **NYC Battery Recycling Center**. Visit [nyc.gov/batteries](http://nyc.gov/batteries) for more information.

### **NEVER:**

- use aftermarket batteries or chargers.
- use damaged or altered batteries
- plug into a power strip or overload an outlet.
- overcharge or leave battery charging overnight.
- charge a battery or device under your pillow, on your bed, or near a couch.
- leave e-bikes or e-scooters unattended while charging.
- block your primary way in or out of a room/space with e-bikes, e-scooters, wheelchairs, etc.
- place batteries in Trash or Recycling bin. **It is ILLEGAL.** Visit [nyc.gov/batteries](http://nyc.gov/batteries) for disposal locations and information.

**In the event of a Fire,  
Leave and CLOSE the door.  
Call 911 once you are in a safe location.**



## Charging Lithium Ion

Lithium-ion batteries do not have to be fully charged; partial charge is the most suitable.

When **charging more than five (5)** personal mobility devices or their removable batteries, it must be in a **dedicated room with ventilation** and a self-closing door.

For a total battery capacity of 20 kilowatt-hours (kWh), a 2-foot separation between charging batteries is required. For a total battery capacity up to 50 kWh, a 3-foot separation is needed.

Chargers must only be used with a compatible battery pack. The original equipment manufacturer (OEM) charger interplays with the battery pack using the battery management system (BMS). The wrong battery/charger combination may not work safely. For example, the 100% cutoff to prevent overcharging, which damages batteries, may not work which can easily create hazardous conditions such as fires, explosions and/or injuries.

Always check with the manufacturer or retailer of the personal mobility device, an authorized repair shop or a testing laboratory such as Underwrites Laboratories (UL) to see if replacement is recommended or listed and safe for use with that device. Using unauthorized parts, including batteries and/or chargers, may cause damage, fire and possibly void your warranty.

## Extinguishing Lithium-ion

Water may not prevent a battery from burning and spreading. Battery cells are known to explode and quickly spread to another battery. It can spread to another devices.



**Fire Extinguishers**  
**do not work**  
on lithium-ion batteries fires.

### **Unexpected Re-ignition.**

Reignition is common. Lithium-Ion Batteries are known to unexpectedly re-ignite (without warning) minutes, hours and even days after all visible fire has been put out.

Lithium-ion batteries can enter an uncontrollable, self-heating state. This can result in the release of gas, cause fire and possible explosion.

These batteries may continue to generate heat even when there is no visible sign of fire. Once heat reaches a certain level fire may reignite on the battery and surrounding area.

