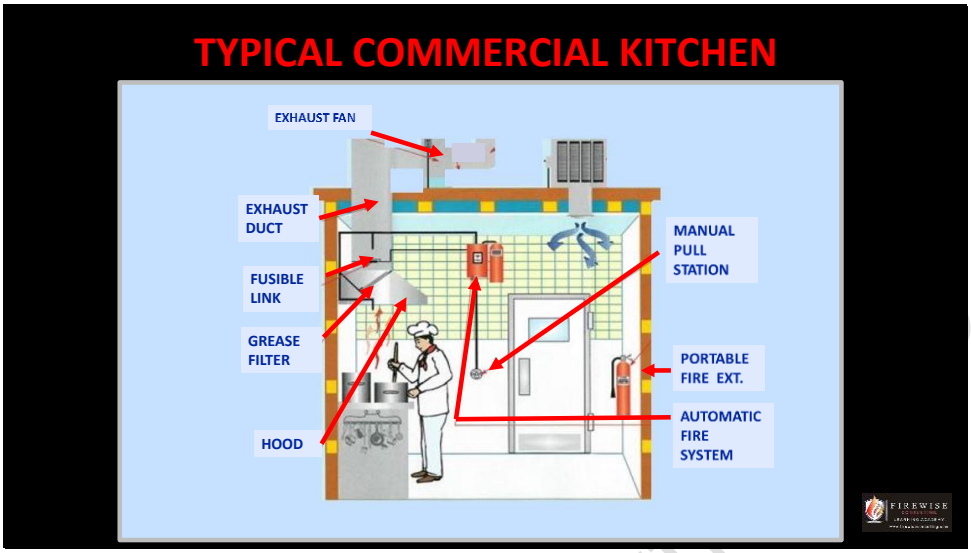
Welcome to Unit 9 Commercial Cooking Systems.

Kitchen fires are a significant problem which can be reduced by proper construction, installation and maintenance of commercial cooking systems. The accumulation of grease laden vapors is one of the most serious hazards to a commercial kitchen but proper management can greatly reduce the risk of fire.

NFPA 96: is the "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations". It provides the minimum fire safety requirements for commercial cooking operations. It addresses the capture and removal of grease-laden vapors and requires that exhaust hoods be equipped with listed grease removal devices and fire suppression systems.

This unit provides basic information about commercial cooking systems, identifies some of the common system components and hazards and provides information on system maintenance.

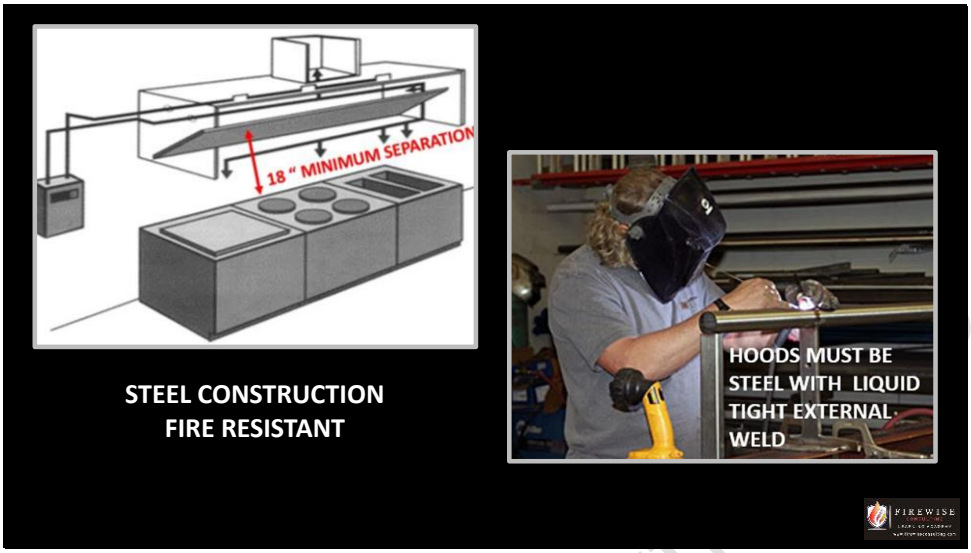


In this Unit we will discuss hood systems required over commercial cooking equipment, the purpose of grease filters and the various types, fusible links that melt to cause activation of the automatic fire suppression system, manual pull stations to activate the system, the exhaust duct and the exhaust fan and the “K” class portable fire extinguisher that is required in the kitchen.

NFPA 96 requires that exhaust hoods be equipped with listed grease removal devices such as baffles or filters. There are many types of devices used in restaurant kitchen ventilation systems depending on the size of the kitchen, the types of cooking appliances used and the amount of food preparation. For kitchens that use greasy cooking methods like frying and grilling, special filters are required that will remove smoke, heat, fumes, odors, vapors, moisture and grease as part of the ventilation system.

There are a variety of grease removal devices and grease filters on the market. In the last few years disposable filters have been introduced which claim to be more efficient and provide "green" technology. Whether the filter is disposable, like a charcoal filter, or re-usable like the aluminum mesh filter, they must be regularly inspected and either replaced or cleaned properly. When the filters are properly maintained, the life of the entire commercial kitchen ventilation system will be extended.

Grease removal devices must be listed for use with the cooking appliances. A regular schedule of cleaning should be established based on the accumulation of grease. The filters should be easily accessible and removable for cleaning and installed at an angle not less than 45 degrees from the horizontal. Any solutions used for cleaning must be non-flammable.



At least 18 inches of clearance is required between the grease filter and the cooking surface.

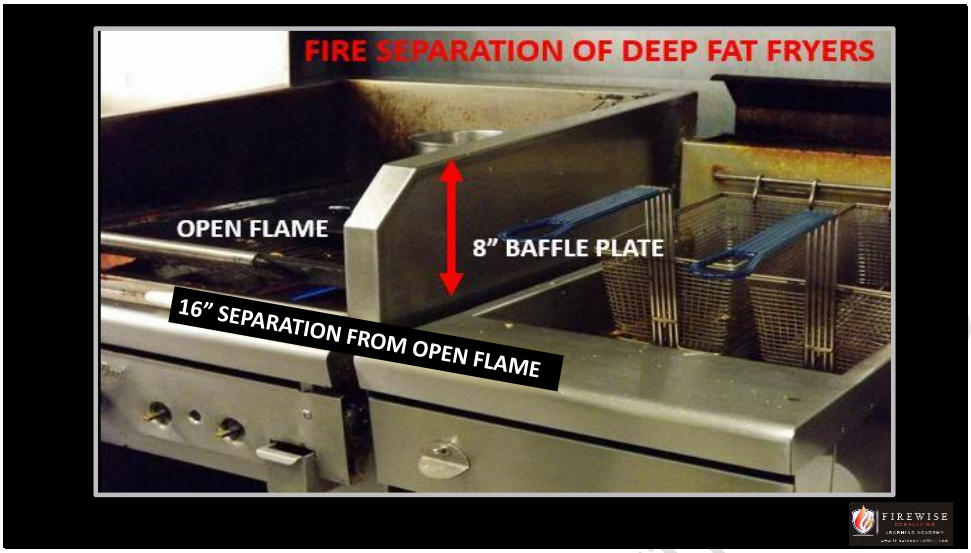
In addition the hoods over the cooking appliances must be constructed of steel and be fire and corrosion resistant. All joints and penetrations must be liquid tight continuous external weld.

Exhaust systems must be operating whenever the cooking appliances are on.

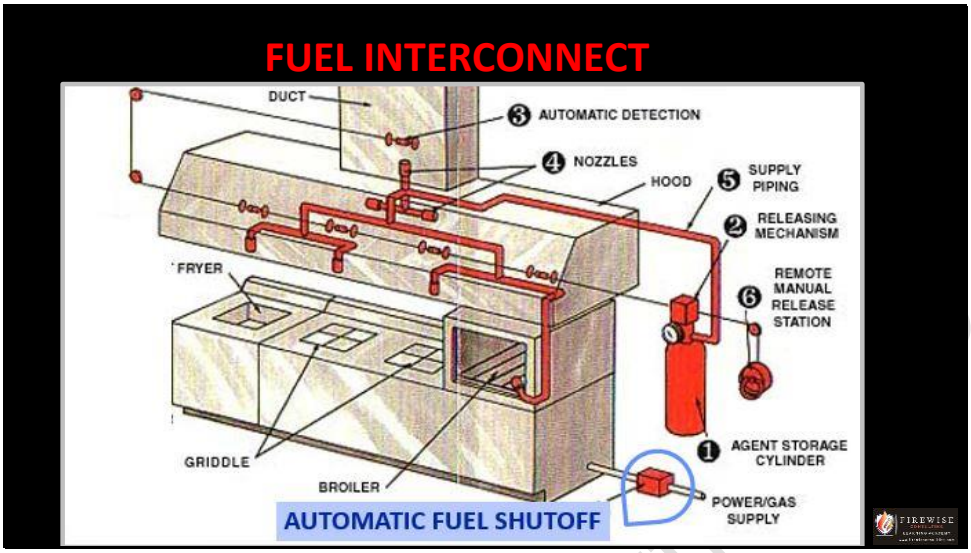
All exhaust system components including the fan must be accessible or have removable access panels for cleaning and inspection. Hinge kits allow the fan assembly to swing freely away from the duct to allow access to the duct and the fan for cleaning.

The exhaust system should never be operated with the filters removed or broken. This may be an indication of excessive grease in the filters or a lack of makeup air.

Exhaust fans must also be located so the exhausted grease-laden air does not create a hazard on the exterior of the building or to other buildings in close proximity.



All deep fat fryers must be separated from flames from adjacent cooking equipment by at least 16". If a steel or tempered glass baffle with a minimum height of 8" is installed between the fryer and the adjacent appliance the requirement for the 16" separation is waved.

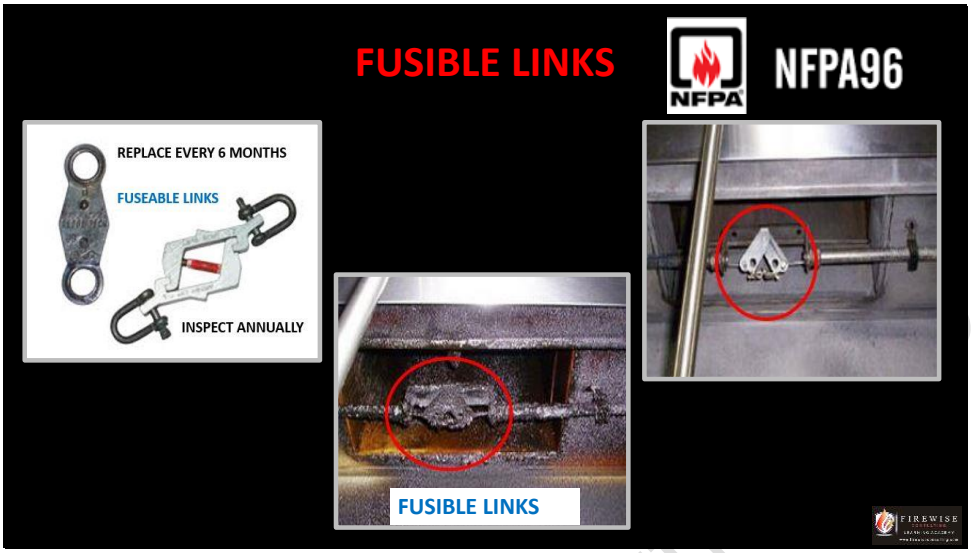


Another component of the system is the fuel and electric power shutoff. Upon activation of the fire extinguishing system the fuel supply and electric power to the cooking appliances must automatically shut off. The shutoff device must be manually reset after each activation.

Lighting used for hoods must be listed, approved and installed in accordance with the listing and manufacturer's instructions. Lighting units should be equipped with tight fitting protective globe lights with steel enclosures that are mounted on the outer surface of the hood. All electrical equipment should be installed in accordance with the electrical code by a licensed electrician with a permit from the electrical authority.

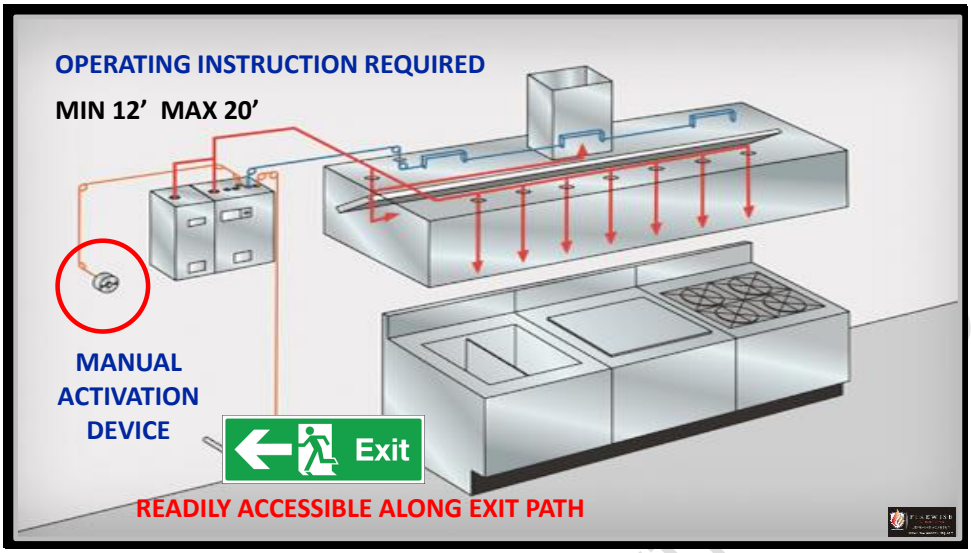
Lighting should be made of greaseproof, waterproof and heatproof construction with thermal and shock resistant tempered glass globes to eliminate hot spot browning and discoloration.

After market lights may be acceptable provided they are listed and approved for use with the hood. In many cases however unapproved lights are installed without due consideration of the hazards they present.



The most common method for automatic actuation of wet chemical fire protection systems in commercial cooking equipment is fusible links which are made of metal alloy materials. These devices are installed in the cooking equipment hoods and ducts subjecting them to contamination from grease that could adversely affect their operation unless periodic maintenance or replacement is performed. NFPA 96 and NFPA 17A, Standard for Wet Chemical Extinguishing Systems, requires metal alloy fusible links to be replaced at least every 6 months.
It is common practice for the date of manufacture to be marked on the fusible metal alloy links. The manufacture date does not relate to the replacement date as the links have unlimited shelf life. The year of manufacture on the link and the date of installation are used for enforcement as these dates are required to be marked on the system inspection tag by the installer.

NFPA 17A allows fixed temperature-sensing elements other than the fusible metal alloy type (bulb type) to remain continuously in service, provided they are inspected and cleaned every 12 months. Replacement is only necessary if they are damaged.



Manual activation of the automatic fire extinguishing systems must also be possible. At least one activation device must be located a minimum of 12’ and a maximum of 20’ feet from the kitchen appliance being protected. It must be readily accessible and should be located along the path of travel to an exit to prevent a person being trapped. Instruction must be provided to employees on the use of the manual activation device for the fire extinguishing system.

If the building is equipped with a fire alarm system activation of the kitchen fire extinguishing system must automatically activate the fire alarm. In buildings without a fire alarm system an audible alarm or visual indicator must provide notification that the system has activated.

The automatic kitchen fire suppression system protects the hood, duct, and appliances from fire. The combination of the kitchen fire suppression system and a Class "K" wet chemical extinguisher provides additional protection against a fire that could result in temporary or permanent loss of business.

When a fire starts, either the fusible link detection network will automatically detect the fire or the manual pull station can be used, releasing the wet chemical extinguishing agent throughout the hood, duct, and onto the appliances. Either method of actuation will shut off the gas and/or electrical power to the appliances. The wet chemical agent quickly extinguishes the fire by forming a foam layer on the surface which holds in the vapors and hot gasses, cools the fuel and smothers the fire.

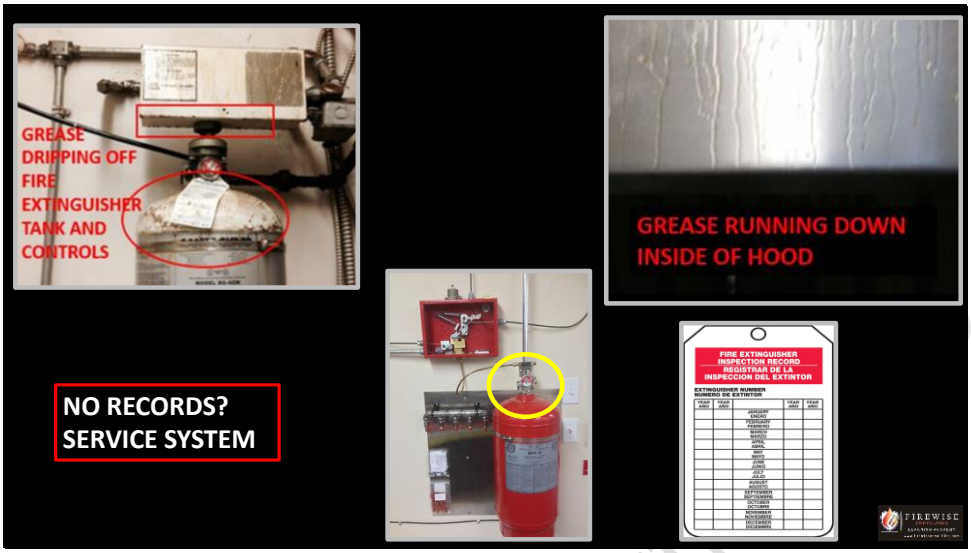
Most people are familiar with ABC class portable fire extinguishers. These extinguishers have proven to be very effective in extinguishing the types of fires they are designed for but they are not designed to be used on kitchen grease fires.

Only the Class "K" fire extinguisher is compatible with the wet chemical agent found in automatic kitchen fire suppression systems. Every commercial kitchen should have a class "K" portable fire extinguisher located in it to supplement the automatic fire suppression system. A sign must be conspicuously located near the portable extinguisher directing them to activate the automatic extinguishing system prior to using the portable fire extinguisher. The public area of the restaurant should have portable fire extinguishers which provide protection against fires in ordinary combustibles. These can be "A" class extinguishers or the more common multi-purpose ABC dry chemical units.

Some of the common issues found in commercial kitchen inspections include:

The owner doesn't think NFPA 96 should apply to them because of the nature of the food they are preparing or the equipment they are using. In fact NFPA 96 applies to all public and private cooking operations including mobile units and temporary concessions but does not apply to single dwelling units.

There are situations in which the Authority Having Jurisdiction may determine adequate fire and life safety can be established without applying all the requirements of NFPA 96. A good example would be where a hotel or motel has a small cafeteria that offers a continental breakfast (coffee, juice, toast, muffins etc.). When the only “cooking” that takes place involves toasting bread or re-heating buns and pastries the risk of fire is substantially reduced. In this case, the Authority Having Jurisdiction may wave the requirements of NFPA 96 but this should be done in writing.

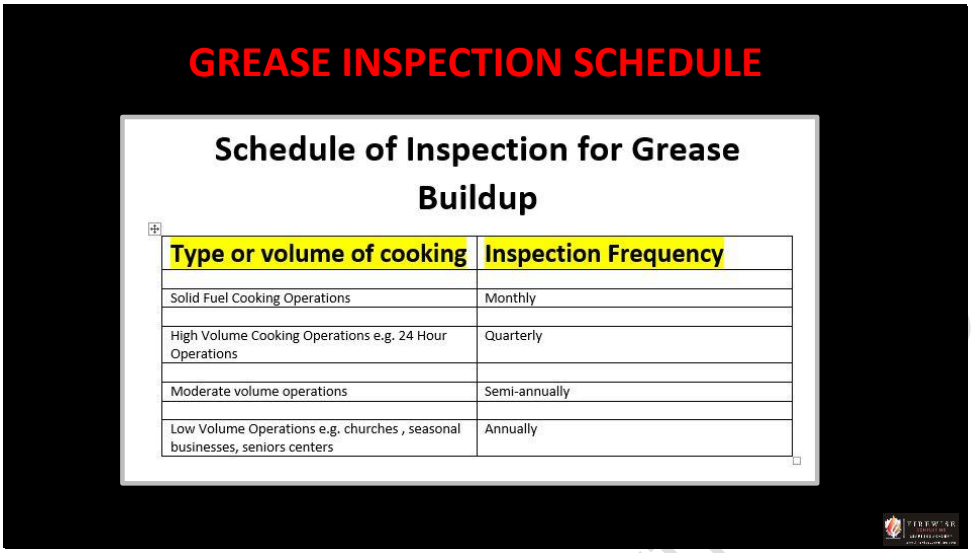


The automatic fire suppression system must be inspected, tested and maintained at least once every 6 months. Tags indicating who last inspected it and when the system was maintained must be available indicating when the next 6-month service is due. Inspection tags should be visible on the automatic fire extinguishing equipment and inspection reports completed by a qualified technician should be readily available. If acceptable records are not available the system should be serviced without delay.

The pressure gage on the tank should be checked regularly to ensure the system is operational.

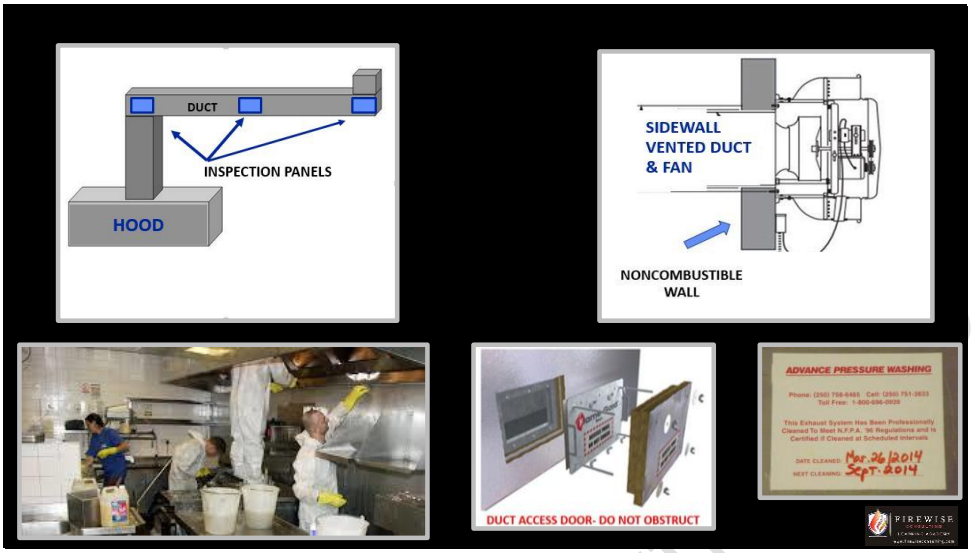
There is a noticeable accumulation of grease and dirt around and under the cooking appliances. In this case cleaning of the kitchen should be a priority. The grease filters should be cleaned on a regular schedule and many restaurants do them daily or weekly.

Some of the exits are obstructed by restaurant supplies and equipment because there is a lack of proper storage areas. It is important to provide a clear path of exit travel so occupants can easily get out of the building in the event of a fire. New codes require emergency lighting in kitchens to illuminate the exits in the event of an emergency or power failure. Depending on the jurisdiction this may be applied retroactively but in any case emergency lighting and exit signs in kitchens is a good idea.



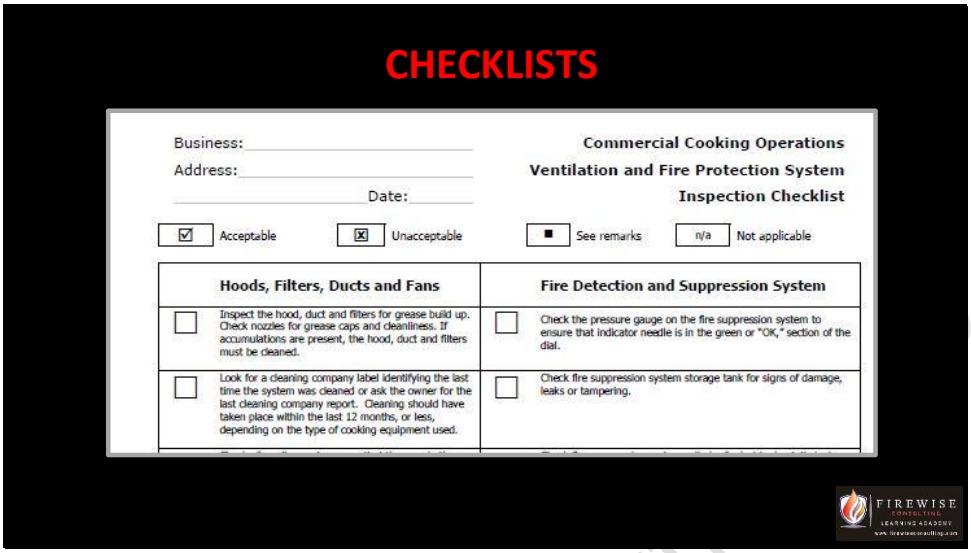
Not all commercial kitchens develop grease buildup at the same rate so they need to be regularly inspected. Solid fuel fire appliances should be inspected monthly. High volume cooking operations, like systems that are operated 24 hours per day need to be inspected every three months. Moderate volume operations need to be inspected every 6 months and low volume operations like those found in churches, community halls and seasonal businesses need annual inspection.

Whenever there is an accumulation of grease the contaminated portions of the system must be cleaned. The use of flammable solvents or other flammable cleaning agents is not permitted. The cleaning chemical should not be applied to the fusible links or other detection devices for the automatic extinguishing system.



Kitchen duct systems vent directly above the roof or through non-combustible side walls. If the duct is not straight inspection panels must be installed at each change in direction and at each floor level. The inspection panels should be marked “Access Panel-Do Not Obstruct” and be large enough to allow for proper cleaning. When the cleaning company removes access panels for cleaning a label or tag with the company name and date must be provided near the affected access panel.

When the hood is cleaned by a service company a certificate showing the name of the company, person performing the work and the date of cleaning must be available upon request. In many cases the service company will place a sticker on the hood with the date of service and when the next service is due. The service company must also provide the owner with a written report that specifies areas of the hood, duct or fan that were inaccessible or not cleaned. The AHJ may ask for copies of the report to be sent to them.



Checklists are a good tool to use when conducting fire safety self-assessments. They will assist you to ensure the system is properly installed and maintained. For your convenience, a checklist is provided in the additional resources section of this Unit.

In this unit we discussed:

NFPA 96 which is the "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations". It provides the minimum fire safety requirements for commercial cooking operations and addresses the capture and removal of grease-laden vapors.

Exhaust hoods must be equipped with listed grease removal baffles or filters depending on the size of the kitchen, the types of cooking appliances used and the amount of grease produced

Filters should be easily accessible and removable for cleaning and installed at an angle not less than 45 degrees from the horizontal

Hoods must be steel construction, corrosion resistant and must be made with liquid tight continuous external welding

Exhaust systems must be operating whenever the cooking appliances are on.
All exhaust system components including the fan must be accessible or have removable access panels for cleaning and inspection.
The exhaust system should never be operated with the filters removed or broken. This may be an indication of excessive grease in the filters or a lack of makeup air.
Exhaust fans should be located so they don't create a hazard on the exterior of the building or to other buildings
Deep fat fryers should be separated from flames from adjacent cooking equipment by at least 16" or have an 8" high baffle
Fuel supply and electric power to the cooking appliances must automatically shut off upon activation of the fire suppression system
Proper lighting is provided for the hood
Fusible links are replaced semi-annually
There is an emergency manual activation lever for the fire extinguishing system and signs required

UNIT REVIEW

OWNERS RESPONSIBLE TO MAINTAIN THE SYSTEM

CLEAN WHEN GREASE BUILDS UP

INSPECTED & MAINTAINED – 6 MONTHS

HIGH VOLUME COOKING – CLEAN EVERY 3 MONTHS

INSPECTION TAGS & REPORTS REQUIRED

It is important to remember that it is the owner's responsibility to inspect, test and maintain the commercial kitchen operations. Any time there is a grease buildup the system must be cleaned. In most cases regular cleaning should be done by a qualified person every 6 months. One exception is high volume cooking in 24 hour operations which need to be cleaned every 3 months.

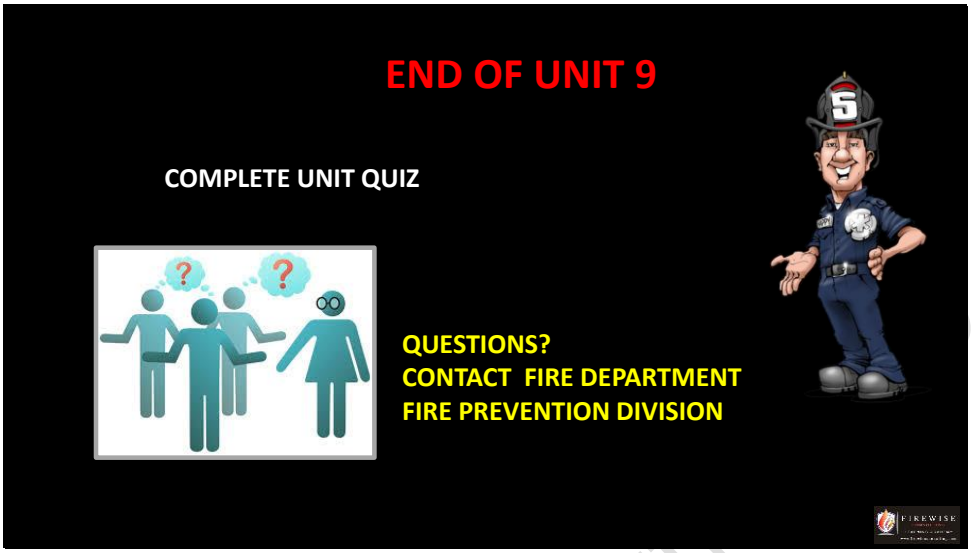
The automatic fire suppression system must be inspected, tested and maintained at least once every 6 months. Tags indicating who and when the system was maintained must be available indicating when the next 6 month service is due. Inspection tags should be visible on the automatic fire extinguishing equipment and inspection reports should be available upon request.

The pressure gage on the tank should be checked regularly to ensure the system is operational.

The “K” class portable extinguisher should be properly mounted, accessible and located along the path to an exit. Instructions stating that the automatic fire extinguishing system is to be activated prior to using the portable extinguisher must be clearly visible.

The grease filters should all be in place whenever the exhaust system is operating.

The fan motor should be easily removable for cleaning. Hinge kits provide easy access to the duct and fan blades.



Congratulations that is the end of Unit 9 which dealt with Commercial Kitchen systems. Please complete the Unit Quiz and then you will be ready to take the course exam.
If you have any questions now is a good time to contact your local fire department fire prevention division.