

## 2015 I-Codes & Commercial Cooking Operations

Presented by  
Washington State Fire Marshals

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## Welcome

- Instructor
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- Exits
- Breaks and Schedule
- Cell Phones
- Student Introductions




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## Objectives

Upon completion of this seminar, the attendee will be better able to:

- Recognize where commercial cooking hoods are required
- Understand the difference between Type I and Type II exhaust hoods
- Identify hazards associated with commercial cooking operations
- Apply maintenance and testing requirements



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## Module 1 Hazards and Concepts




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## Commercial Cooking Operations

- There is no definition in the IMC or IFC for the term “cooking,” but there is a definition of “commercial cooking appliances” as follows:
  - **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... For the purpose of this definition, a food service establishment shall include any building or a portion thereof used for the preparation and serving of food.




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## Definitions

- **HOOD** – an air intake device used to capture by entrapment, impingement, adhesion or similar means, grease, moisture, heat and similar contaminants before they enter a duct system.
  - **Type I Hood** – a kitchen hood for collecting and removing grease vapors and smoke.
  - **Type II Hood** – a general kitchen hood for collecting and removing steam, vapor, heat, odors and products of combustion.

Fire-extinguishing system is required in Type I hoods





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## Fire Safety

- Restaurants pose unique fire risks
  - Large numbers of customers
  - Cooking activities being performed in the same building
- Cooking hazards
  - Flammable grease and effluents carried by exhaust system
  - Cooking equipment can be an ignition source





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## Flash Point & Ignition Temperature of Cooking Oils

Cooking Oil	Flash Point Temperature (°F)	Ignition Temperature (°F)
Canola Oil	450	626
Corn Oil	490	740
Cotton Seed Oil	486	650
Palm Oil	323	600
Peanut Oil	540	833
Soybean Oil	549	833
Sunflower Seed Oil	550	undetermined



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## Fire Hazards of Solid Fuels

- Solid fuels are typically hardwoods, such as mesquite or hickory, but can also be charcoal or briquettes
- Depending on the type of wood, the surface area and mass, most woods have ignition temperatures in the range of 500–700°F
- Woods have lower heats of combustion than oils but produce a greater amount of smoke because the cooking temperatures do not promote complete or clean combustion



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## Module 2 Exhaust Hoods



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## Commercial Kitchen Hoods IMC §507.1

- Commercial kitchen exhaust hoods shall be:
  - Type I or Type II
    - Exception 1 – UL 710 listed factory-built commercial exhaust hoods
    - Exception 2 – UL 710B listed factory-built commercial cooking recirculating systems
- Designed to capture and confine cooking vapors and residues
- Operate during the cooking operation



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## Where Required IMC §507.2

- A Type I or Type II hood shall be installed at or above all commercial cooking appliances
- Where any cooking appliance under a hood requires a Type I hood, then a Type I hood shall be installed
- Where a Type II hood is required, a Type I or Type II hood can be installed



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### Commercial Cooking Exhaust Hood IMC Ch 5

- Type I exhaust hood is required for:
  - Extra-heavy-duty cooking appliances
  - Heavy-duty cooking appliances
  - Medium-duty cooking appliances
- Type II exhaust hood is required for:
  - Where the cooking appliance produces products of combustion
  - All other cooking appliances that produce heat or moisture
    - Unless only producing heat and steam and those products are factored into the HVAC system



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### Extra-Heavy-Duty Cooking Appliance IMC §202

- Extra-heavy-duty cooking appliances are those utilizing open flame combustion of solid fuel at any time
  - Extra-heavy-duty cooking appliances include appliances utilizing solid fuel such as wood, charcoal, briquettes and mesquite as the primary source of heat



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### Heavy-Duty Cooking Appliance IMC §202

- Heavy-duty cooking appliances include:
  - Electric/gas under-fired broilers



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### Heavy-Duty Cooking Appliance IMC §202

- Heavy-duty cooking appliances include:
  - Electric/gas under-fired broilers
  - Electric/gas chain (conveyor) broilers



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### Heavy-Duty Cooking Appliance IMC §202

- Heavy-duty cooking appliances include:
  - Electric/gas under-fired broilers
  - Electric/gas chain (conveyor) broilers
  - Gas open-burner ranges

With or without oven




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### Heavy-Duty Cooking Appliance IMC §202

- Heavy-duty cooking appliances include:
  - Electric/gas under-fired broilers
  - Electric/gas chain (conveyor) broilers
  - Gas open-burner ranges
  - Electric/gas wok ranges




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### Heavy-Duty Cooking Appliance IMC §202

- Heavy-duty cooking appliances include:
  - Electric/gas under-fired broilers
  - Electric/gas chain (conveyor) broilers
  - Gas open-burner ranges
  - Electric/gas wok ranges
  - Smokers/smoker ovens




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### Heavy-Duty Cooking Appliance IMC §202

- Heavy-duty cooking appliances include:
  - Electric/gas under-fired broilers
  - Electric/gas chain (conveyor) broilers
  - Gas open-burner ranges
  - Electric/gas wok ranges
  - Smokers/smoker ovens
  - Electric/gas over-fired (upright) broilers and salamanders



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### Medium-Duty Cooking Appliance IMC §202

- Medium-duty cooking appliances include:
  - Electric discrete element ranges



With or without oven

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### Medium-Duty Cooking Appliance IMC §202

- Medium-duty cooking appliances include:
  - Electric discrete element ranges
  - Electric hot-top ranges



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### Medium-Duty Cooking Appliance IMC §202

- Medium-duty cooking appliances include:
  - Electric discrete element ranges
  - Electric hot-top ranges
  - Electric/gas griddles




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### Medium-Duty Cooking Appliance IMC §202

- Medium-duty cooking appliances include:
  - Electric discrete element ranges
  - Electric hot-top ranges
  - Electric/gas griddles
  - Electric/gas double-sided griddles



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### Medium-Duty Cooking Appliance IMC §202

- Medium-duty cooking appliances include:
  - Electric discrete element ranges
  - Electric hot-top ranges
  - Electric/gas griddles
  - Electric/gas double-sided griddles
  - Electric/gas fryers

Includes open deep fat fryers, donut fryers, kettle fryers and pressure fryers



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### Medium-Duty Cooking Appliance IMC §202

- Medium-duty cooking appliances include:
  - Electric discrete element ranges
  - Electric hot-top ranges
  - Electric/gas griddles
  - Electric/gas double-sided griddles
  - Electric/gas fryers
  - Electric/gas conveyor pizza ovens



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### Medium-Duty Cooking Appliance IMC §202

- Medium-duty cooking appliances include:
  - Electric discrete element ranges
  - Electric hot-top ranges
  - Electric/gas griddles
  - Electric/gas double-sided griddles
  - Electric/gas fryers
  - Electric/gas conveyor pizza ovens
  - Electric/gas tilting skillets (braising pans)



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### Medium-Duty Cooking Appliance IMC §202

- Medium-duty cooking appliances include:
  - Electric discrete element ranges
  - Electric hot-top ranges
  - Electric/gas griddles
  - Electric/gas double-sided griddles
  - Electric/gas fryers
  - Electric/gas conveyor pizza ovens
  - Electric/gas tilting skillets (braising pans)
  - Electric/gas rotisseries




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### Light-Duty Cooking Appliance IMC §202

- Light-duty cooking appliances include:
  - Electric/gas ovens

Includes standard, bake, roasting, revolving, re-therm, convection, combination convection/steamer, countertop conveyORIZED baking/finishing, deck or deck-style and pastry



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### Light-Duty Cooking Appliance IMC §202

- Light-duty cooking appliances include:
  - Electric/gas ovens
  - Electric/gas steam-jacketed kettles




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### Light-Duty Cooking Appliance IMC §202

- Light-duty cooking appliances include:
  - Electric/gas ovens
  - Electric/gas steam-jacketed kettles
  - Electric/gas pasta cookers



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### Light-Duty Cooking Appliance IMC §202

- Light-duty cooking appliances include:
  - Electric/gas ovens
  - Electric/gas steam-jacketed kettles
  - Electric/gas pasta cookers
  - Electric/gas compartment steamers

Atmospheric steamers and pressure steamers



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## Light-Duty Cooking Appliance IMC §202

- Light-duty cooking appliances include:
  - Electric/gas ovens
  - Electric/gas steam-jacketed kettles
  - Electric/gas pasta cookers
  - Electric/gas compartment steamers
  - Electric/gas cheese-melters



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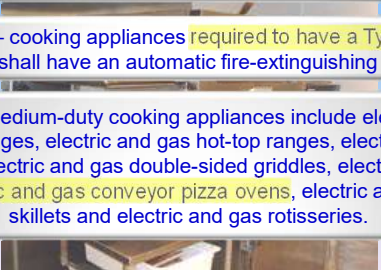
## Case Study Pizza Ovens

- Are pizza ovens required to be protected with an automatic fire-extinguishing system?

IFC §609.2 – Type I hood required where grease vapors are produced

IMC §509.1 – cooking appliances required to have a Type I hood by §507.2 shall have an automatic fire-extinguishing system

IMC §202 – Medium-duty cooking appliances include electric discrete element ranges, electric and gas hot-top ranges, electric and gas griddles, electric and gas double-sided griddles, electric and gas fryers, electric and gas conveyor pizza ovens, electric and gas tilting skillets and electric and gas rotisseries.



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## Case Study Pizza Ovens

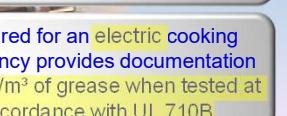
- Are pizza ovens required to be protected with an automatic fire-extinguishing system?

Appliance is not listed to UL 710B, but it has passed a test in UL 710B

IMC §507.2 – Type I hood is required over medium-duty, heavy-duty, and extra-heavy-duty cooking appliances

IFC §609.2 Exc – Type I hood not required for an electric cooking appliance where an approved testing agency provides documentation that the appliance effluent contains  $\leq 5 \text{ mg/m}^3$  of grease when tested at an exhaust flow rate of 500 cfm in accordance with UL 710B

IMC §507.2 Exc – Type I hood not required for an electric cooking appliance where an approved testing agency provides documentation that the appliance effluent contains  $\leq 5 \text{ mg/m}^3$  of grease when tested at an exhaust flow rate of 500 cfm in accordance with UL 710B

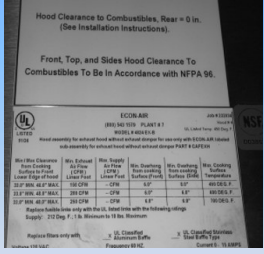


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## General Exhaust Hood Requirements IMC

- §301.7 – appliances and equipment must be listed and labeled
- §507.1.2 – Domestic cooking appliances utilized for commercial purposes shall be provided with Type I or Type II hoods as required for the type of appliances and processes



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### Wall-mounted Canopy Hood Size IMC §507.4.1

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### Wall-mounted Canopy Hood Size IMC §507.4.1

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### Commercial Cooking Exhaust Systems IMC §506

- Regulates exhaust ducts and equipment that serve commercial kitchen hoods
  - Exhaust fans
  - Fan motors
  - Grease reservoirs

There is a distinct difference between a Type I hood and a Type II hood

- Removes steam, heat, odors **PLUS** grease vapors and smoke
- Removes steam, heat and odors

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### Type I vs Type II Hoods

Type I Hood	Type II Hood
Heat, odors and steam	Heat, odors and steam
Grease or smoke	-
18 gage steel	22 gage steel
20 gage stainless steel	24 gage stainless steel
Secured in place by non-combustible supports	-
Adequate for the applied load of the hood and ductwork	Adequate for the applied load of the hood and ductwork
Minimum ventilation rate	-

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### Filter Mounting IMC §507.2.8.2

- 45° angle
- Grease trough
- Grease tray

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### Commercial Cooking Inspection

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### Module 3 Grease Ducts

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### Duct Joints for Type I Hoods IMC §506.3.2.1

- Seams, joints and penetrations shall have liquid-tight continuous external weld

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### Prevention of Grease Accumulation IMC §506.3.7

Horizontal duct work:

- ≤75' in length, then slope of ≥¼:12 toward grease reservoir
- >75' in length, then slope of ≥1:12 toward grease reservoir

NOTE:  
NO OBSTRUCTIONS WITHIN THAT WOULD COLLECT GREASE

≤20' between cleanouts

≤10' to change in direction

TYPE I HOOD

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### Grease Duct Test IMC §506.3.2.5

- Prior to use or concealment a leakage test shall be performed
- Light test shall be performed to determine that all welded and brazed joints are liquid tight
  - Pass a lamp through the entire section of ductwork to be tested
  - ≥100 watts
  - Test entire duct system, including the hood-to-duct connection
  - For listed factory-built grease ducts, test is performed on duct joints assembled in the field

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### Grease Duct Installation IMC §506.3.11

- Exhaust ducts for Type I hoods that penetrate concealed spaces must be enclosed in:
  - Fire-resistance-rated shaft, **OR**
  - Listed, fire-resistance-rated duct wrap
- Fire dampers not allowed

Fire-resistance rating must be equal or greater than assemblies penetrated, but not less than 1-HR

Enclosure **NOT** required for grease ducts that penetrate only a non-fire-resistance-rated roof/ceiling assembly

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### Grease Duct Enclosure IMC §506.3.11

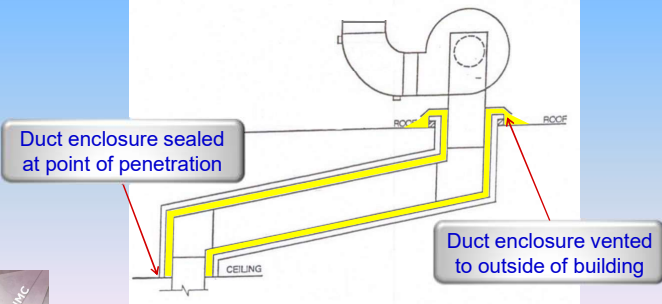
- Ducts shall penetrate exterior walls only at locations where unprotected openings are permitted by the IBC
- Each duct enclosure shall serve a single grease duct and shall not contain other ducts, piping or wiring systems
- Duct enclosures shall be:
  - Shaft enclosure in accordance with IBC
  - Field-applied enclosure assembly
  - Factory-built enclosure assembly

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### Grease Duct Enclosure IMC §506.3.11

- Duct enclosures shall be vented to the outside of the building through weather-protected opening



Duct enclosure sealed at point of penetration

Duct enclosure vented to outside of building

CEILING

ROOF


ROOF

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### Exhaust Fan Discharge IMC §506.5.2


- Exhaust fans shall be positioned so that the discharge will not impinge on the roof, other equipment or appliances or parts of the structure
- A vertical discharge fan shall be manufactured with an approved drain outlet at the lowest point of the housing to permit drainage of grease to an approved grease reservoir



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### Module 4 Fire-extinguishing System

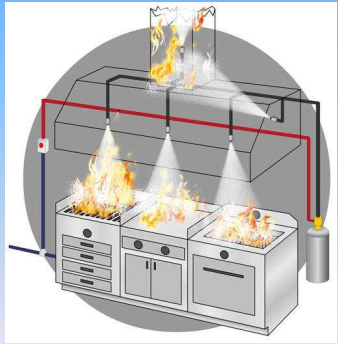


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### Fire-Extinguishing System IMC §509.1, IFC §904.2.2

- Commercial cooking appliances **required** to have a Type I hood shall be provided with an automatic fire-extinguishing system complying with IFC/IBC



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### Fire-Extinguishing System IFC §904.11, IBC §904.11

- Fire-extinguishing system for commercial cooking systems shall be of a type recognized for protection of commercial cooking equipment and exhaust systems of the type and arrangement protected
- Pre-engineered wet-chemical and dry-chemical fire-extinguishing systems shall meet UL 300
- Other types of fire-extinguishing systems shall be listed for protection of commercial cooking operations



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### Fire-Extinguishing System IFC §904.12

- Fire-extinguishing systems of the following types shall be installed in accordance with the referenced standard indicated
- Carbon dioxide extinguishing systems, NFPA 12
- Automatic sprinkler systems, NFPA 13
- Foam-water sprinkler system or foam-water spray systems, NFPA 16
- Dry-chemical extinguishing systems, NFPA 17
- Wet-chemical extinguishing systems, NFPA 17A



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### Fire-Extinguishing System IFC §904.12

- Fire-extinguishing system listed to UL 300



- Factory-built commercial cooking recirculating systems listed to UL 710B *Recirculating Systems* are listed without a fire-extinguishing system



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### UL 300

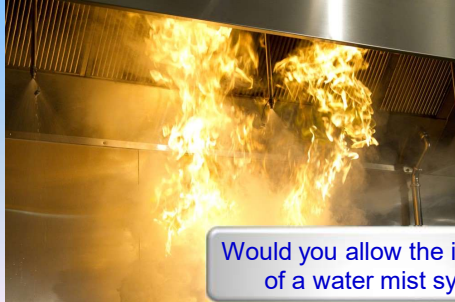
- Dry-chemical fire-extinguishing systems have not yet passed the UL 300 test
- The fire-extinguishing system in the hood does not replace fire sprinklers in the kitchen



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## Water Mist Extinguishing System

- Not recognized in 2015 IFC
- However, it is now listed under UL 300



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## Existing Fire-extinguishing Systems IFC §904.12.6.1

- Where changes in the cooking media, positioning of cooking equipment or replacement of cooking equipment occur in existing commercial cooking systems, the automatic fire-extinguishing system shall be required to comply with the applicable provisions of §904.12 through §904.12.4

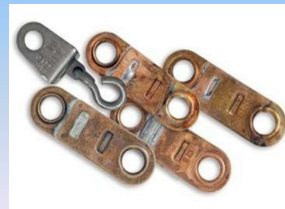
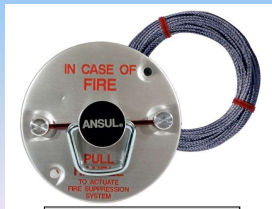
UL 300 fire-extinguishing system



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## Fire-extinguishing System Operation

- Activation must be manual and automatic
- Remote manual release located 42" to 48" above the floor in path of egress path from cooking area

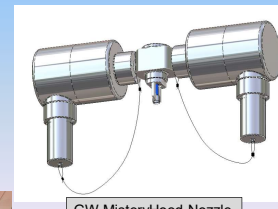


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## Fire Sprinkler System Operation

- Activation must be automatic
- Manual shut off valve is required for sprinklers in the hood
- Sprinklers listed to UL 199E

Manual activation is not required for sprinklers



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## Fire-extinguishing System Operation

- Operation of the manual or automatic devices shall shut-down gas and electrical power to the cooking equipment
- Shut-down devices must have only manual reset capability






Photo courtesy of Ansul Inc.

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## Portable Fire Extinguishers IFC §904.12.5

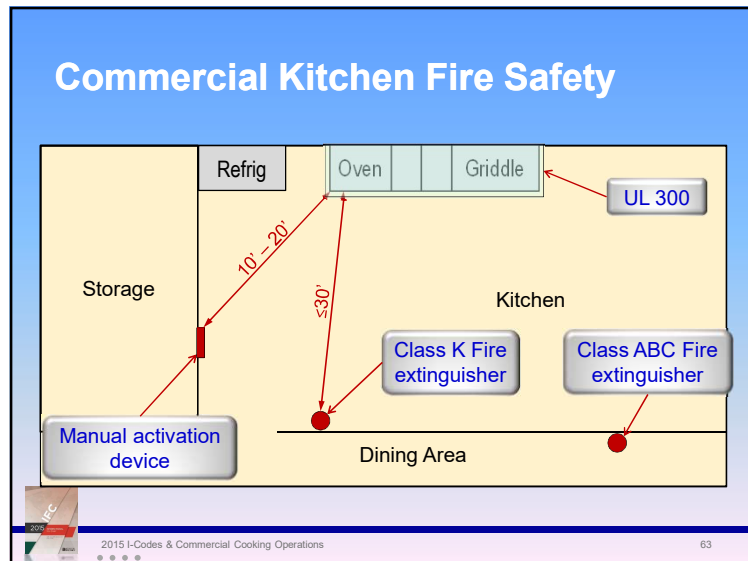
- Portable fire extinguishers are required for protection of commercial cooking systems
  - Installation of a listed Type K extinguisher
  - Travel distance to the extinguisher  $\leq 30'$
  - When protecting deep fat fryers, fire extinguisher size based on the number of fryers, the surface area, and quantity of cooking medium
  - Class K extinguishers do NOT replace extinguishers required for the facility



Photo courtesy of Amerex Inc.

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## CO<sub>2</sub> Fire-extinguishing System

- For CO<sub>2</sub> systems, there must be a nozzle at the top of the ventilation duct
- Vertical ducts >20' in length and horizontal ducts >50' in length must be equipped with additional nozzles that are symmetrically arranged to give uniform distribution of CO<sub>2</sub>
- Dampers are required at either the top or the bottom of the duct and operate automatically
- Ventilation system must shut-down upon activation

2015 IFC
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### Interconnection with Fire Alarm IFC §904.3.5

- **IF** a fire alarm system is **required** in the building, the fire-extinguishing system must be connected to the fire alarm system
  - Monitored status
  - Activation of fire alarm



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### Extinguishing System Acceptance Test IFC §904.12.6

- Installed per plans
- Interlocks with gas and/or electric
- Interlock with fire alarm system, if provided
- Piping integrity test
  - Compressed dry air or nitrogen
- Operation of manual release
  - Maximum pull of 14"
- Functional test of all components without discharging chemical

Service tag



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### System Service IFC §904.12.6

- Fire-extinguishing system serviced at least every 6 months and after activation of the system
- Fusible links and sprinklers replaced annually



Sprinklers and fusible links with a frangible bulb do not need to be replaced annually



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### Fire-extinguishing System Service IFC §904.12.6

- Qualified person
  - Has hazard changed?
  - Equipment charged and ready to operate?
  - Is system damaged or impaired?
    - Are nozzle caps in place?
  - Check releasing system and temperature elements
  - Verify adequate extinguishing agent and propellant
  - Hydrostatic test every 12 years
- Service tag



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## Module 5 Operations and Maintenance



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### Fryers NFPA 96 §12.1.2.4

- Fryer shall be separated  $\geq 16"$  from surface flames on adjacent appliances, **OR**
- Baffle plate  $\geq 8"$  shall be installed between the fryer and the adjacent surface flames
  - Steel or tempered glass baffle plate



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### Commercial Kitchen Cooking Oil Storage IFC §610

- Storage of cooking oil shall comply with Ch 57
- Indoor storage of cooking oil is allowed in tanks
  - Metallic tanks
    - Tanks  $>60$  gallon must be listed to UL 142 or UL 80



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### Commercial Kitchen Cooking Oil Storage IFC §610

- Storage of cooking oil shall comply with Ch 57
- Indoor storage of cooking oil is allowed in tanks
  - Metallic tanks
    - Tanks  $>60$  gallon must be listed to UL 142 or UL 80
  - Nonmetallic tanks
    - Tanks  $>60$  gallon must be listed for use with cooking oil
    - Maximum of 200 gallons



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## Cooking Oil Storage IFC §610

- Cooking oil is considered Class IIIB combustible liquid
- Normal vents and emergency vents are allowed to vent into the building
- Piping, pumps, tanks and all appurtenances must be
  - Designed for use with cooking oil
  - Metallic or nonmetallic
  - Suitable for pressures and temperatures



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## Cooking Oil Transfer

- Transfer of cooking oil shall comply with Ch 57



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## Cooking Oil Transfer

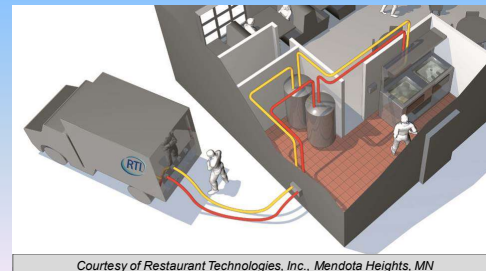
- Transfer of cooking oil shall comply with Ch 57



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## Cooking Oil Transfer

- Transfer of cooking oil shall comply with Ch 57
  - Delivery of fresh cooking oil
  - Retrieval of spent cooking oil



Courtesy of Restaurant Technologies, Inc., Mendota Heights, MN



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### Inspection of Hood System IFC Table 609.3.3.1

Type of Cooking Operations	Frequency of Inspection
High-volume cooking operations such as 24-hour cooking, charbroiling or wok cooking	3 months
Low-volume cooking operations such as places of religious worship, seasonal businesses and senior centers	12 months
Cooking operations utilizing solid fuel-burning cooking appliances	1 month
All other cooking operations	6 months

System is cleaned when inspection finds excess grease

Inspection tag  
Courtesy of Flue Steam, Inc. Culver City, CA

Inspection by qualified individuals, and a certificate shall be forwarded to FCO

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### Inspection of Exhaust Hoods IFC §609.3.3.2

Acceptable depth for surface after cleaning 0.002"

Depth Gauge Comb

For spot measurement in critical areas – if deeper, then cleaning is required 0.125"

Maximum depth of deposits along duct wall – if deeper, then cleaning is required 0.078"

1/8"

5/64"

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### Exhaust Duct above Solid-Fuel Cooking

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### Inspection of Commercial Kitchen

- Hood/duct recently inspected
- Hood/duct recently cleaned

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## Inspection of Commercial Kitchen

- Hood/duct recently inspected
- Hood/duct recently cleaned
- Extinguishing system serviced



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## Inspection of Commercial Kitchen

- Hood/duct recently inspected
- Hood/duct recently cleaned
- Extinguishing system serviced
- All appliances under the hood
- Changes in appliances, or relocation of appliances



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## Inspection of Commercial Kitchen

- Hood/duct recently inspected
- Hood/duct recently cleaned
- Extinguishing system serviced
- All appliances under the hood
- Changes in appliances, or relocation of appliances
- Relocated spray nozzles



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## Inspection of Commercial Kitchen

- Hood/duct recently inspected
- Hood/duct recently cleaned
- Extinguishing system serviced
- All appliances under the hood
- Changes in appliances, or relocation of appliances
- Relocated spray nozzles
- Protective covers on nozzles



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### Inspection of Commercial Kitchen

- Hood/duct recently inspected
- Hood/duct recently cleaned
- Extinguishing system serviced
- All appliances under the hood
- Changes in appliances, or relocation of appliances
- Relocated spray nozzles
- Protective covers on nozzles
- Fire extinguisher



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### Inspection of Commercial Kitchen

- Manual pull visible, identified and unobstructed
- Grease trays empty




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### Inspection of Commercial Kitchen

- Manual pull visible, identified and unobstructed
- Grease trays empty
  - Check the tray on the roof



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### Inspection of Commercial Kitchen

- Manual pull visible, identified and unobstructed
- Grease trays empty
  - Check the tray on the roof
- Ventilation in operation while cooking



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## Inspection of Commercial Kitchen

- Manual pull visible, identified and unobstructed
- Grease trays empty
  - Check the tray on the roof
- Ventilation in operation while cooking
- Cleanliness of floor beneath and behind appliances



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## Inspection of Commercial Kitchen

- Manual pull visible, identified and unobstructed
- Grease trays empty
  - Check the tray on the roof
- Ventilation in operation while cooking
- Cleanliness of floor beneath and behind appliances
- Cooking oil storage approved



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# Questions?

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## Thank you for participating

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