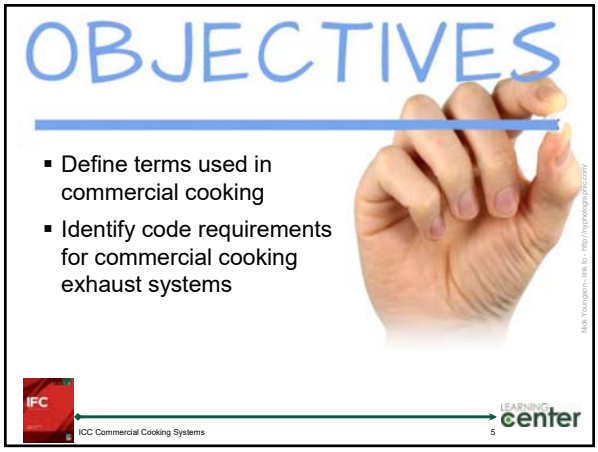
Presenter Instructions

- Many of these slides contain animation
  - When reviewing this presentation, you should use the "presenter view" to be prepared for the animation and appearance of graphics on the slides.
  - Slides that contain animation have one or more dots at the bottom left corner of the slide. For example, there are 6 dots at the bottom of this slide.
  - Each dot represents a 'click' which is needed for animation on the slide before the next slide will appear
  - With each 'click', as an animation occurs, a dot will also disappear
  - When all the dots are gone, the next 'click' will take you to the next slide
  - You will also see a "U-Turn" at the bottom right corner. You can use U-turn to jump back to the previous slide rather than having to click back through all of the animation. You will need to click on the U-Turn with the cursor
- Also note, "CO" is used to designate the Code Official

IFC ICC Commercial Cooking Systems 3 LEARNING center



Tips

Guide to a successful class:

- Slides contain some text and iconic images to help you learn.
- Text and commentary is in the handout.
- Follow along in the course handout.
- Ask Questions, ask questions, ASK QUESTIONS!!!!

IFC ICC Commercial Cooking Systems 7 LEARNING center

Course Outline

	Introduction and Definitions
Module 1	Hazards and Applicable Codes
Module 2	Mechanical Ventilation Requirements
Module 3	Commercial Kitchen Exhaust Duct Details
Module 4	Commercial Kitchen Hood Details (Type I)
Module 5	Fire Protection, Fuel Gases and Environmental Controls

IFC ICC Commercial Cooking Systems 8 LEARNING center

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. Such hoods are equipped with a fire suppression system.

Type II Hood. A general kitchen hood for collecting and removing steam, vapor, heat, odors and products of combustion.

IFC ICC Commercial Cooking Systems 9 LEARNING center

Definition

DUCT SYSTEM. A continuous pathway for the transmission of air that, in addition to ducts, contains duct fittings, dampers, plenums, fans and accessory air handling equipment and appliances.

SMOKE POINT. The temperature at which a cooking oil (vegetable or animal fat) will begin to emit visible smoke. It is generally a few degrees below the oil's ignition temperature.

Definition

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.

Definition (continued)

For the purpose of this definition, a commercial food service establishment *is where food is prepared for sale or prepared on a scale that is by volume and frequency not representative of domestic household cooking*.

Definition

Extra-Heavy-Duty Cooking Appliance

- Appliances using solid fuel as the primary heat
  - Wood, charcoal, briquettes and mesquite

Note:
Cooking appliance "service types" are used to determine ventilation requirements.

Definition

Heavy-Duty Cooking Appliance

- Includes:

- Electric under-fired broilers
- Electric chain (conveyor) broilers
- Gas under-fired broilers
- Gas chain (conveyor) broilers
- Gas open-burner ranges
  - With or without oven
- Electric and gas wok ranges
- Electric and gas over-fired (upright) broilers and salamanders

Definition

Medium-Duty Cooking Appliance

- Includes:

- Electric discrete element & hot top ranges
- Electric and gas griddles
- Electric and gas double sided griddles
- Electric and gas fryers
- Electric and gas pasta cookers

- Electric and gas conveyor pizza ovens
- Electric and gas tilting skillets (braising pans)
- Electric and gas rotisseries

Definition

Light-Duty Cooking Appliances

- Include:
  - Electric and gas ovens
  - Electric and gas steam-jacketed kettles
  - Electric and gas compartment steamers
  - Electric and gas cheesemelters

IFC

ICC Commercial Cooking Systems 16

LEARNING center

Knowledge Check

1. A general kitchen hood for collecting and removing steam, vapor, heat, odors and products of combustion is an example of a Type __II__ hood.
2. Electric and gas ovens are examples of __light -duty__ -duty cooking appliances.
3. Cooking appliances the employ wood or other solid fuels are examples of __extra heavy duty__ -duty equipment.
4. 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" is a __hood__ .

IFC

ICC Commercial Cooking Systems 17

LEARNING center

Knowledge Check

5. Medium-duty cooking appliances do **not** include which of the following:
   a) Electric and gas-double-sided griddles.
   b) Electric and gas conveyor pizza ovens.
   c) Electric under-fired broilers.
   d) Electric and gas rotisseries
6. A kitchen hood for collecting and removing grease vapors and smoke is an example of a Type __I__ hood.
7. Cooking appliance "service types" are used to establish ventilation requirements. True or False.
8. A cooking oil's "smoke point" generally is at a temperature above its ignition temperature. True or False.

IFC

ICC Commercial Cooking Systems 18

LEARNING center

Module #1

Hazards and Applicable Codes

19

KEY LEARNING

Key Concept

- Mechanical commercial kitchen hoods remove combustion products produced by cooking
  - Maintain comfort and safety for kitchen personnel
  - Provide controlled environment for food preparation

IFC

ICC Commercial Cooking Systems 20

LEARNING center

Kitchen Personnel Safety

- Safety and comfort can be adversely affected by excess heat, humidity, smoke and grease-laden cooking effluents

- Scientific studies suggest that exposure to cooking fumes can result in breathing-related disorders:
  - Chronic obstructive pulmonary disease (COPD)
  - Lung cancer

IFC

ICC Commercial Cooking Systems 21

LEARNING center

Cooking Oils

Flash-, Smoke-Point & Ignition Temperature

Cooking Oil	Flash Point Temperature (°F)	Smoke Point (°F)	Ignition Temperature (°F)
Canola Oil	450	375-450	626
Corn Oil	490	352	740
Cottonseed Oil	486	420	650
Palm Oil	323	455	600
Peanut Oil	540	320	833
Soybean Oil	549	350-460	833
Sunflower Seed Oil	550	320-450	undetermined

Food Safety

- Properly designed mechanical ventilation system provides supply, makeup and exhaust air to limit temperature and humidity
  - Reduces pathway for allergens and food-borne pathogens growth and spread

Commercial Cooking Fire Hazards

- Restaurants pose significant fire risks
- Large occupant load
  - Unfamiliar surroundings
- Little or no fire resistive separation
  - Kitchen to adjacent spaces
- Combustible construction and storage
- Combustible decorations and furnishings

Commercial Cooking Fire Hazards

- Ignitable grease and effluent vapors
  - Exhaust duct fires: 1452-2000ºF
- Equipment or processes as ignition source
  - Open flame
    - Flammable liquids
      - Cooking oils and additives
    - Combustible solids
  - Heated surfaces
  - Electrical arcs
  - Overheated refrigeration equipment

IFC

ICC Commercial Cooking Systems 25

LEARNING center

Solid Fuel Fire Hazards

- Hardwoods
  - Mesquite or hickory
  - Charcoal or briquettes
- Ignition temperatures 500–700°F
- Produce more smoke than oils
  - Cooking temperatures too low for clean combustion
  - Creosote build-up in chimneys
- Solids require cooling when ignited

IFC

ICC Commercial Cooking Systems 26

LEARNING center

Applicable ICC Codes

- Commercial kitchen exhaust systems must meet these correlated codes, where adopted

Building construction | Ventilation equipment | Fire protection equipment and housekeeping | Fuel gases | Environmental air management

IFC

ICC Commercial Cooking Systems 27

LEARNING center

ACTIVITY

Knowledge Check

1. Mechanical commercial kitchen hoods remove combustion products produced by dish washing equipment. True or False
2. The I-Code that regulates exhaust system design and installation is the International Mechanical Code .
3. The I-Code that regulates gases used to supply cooking appliances is the International Fuel Gas Code .
4. The ignition temperatures of solid cooking fuels range from
5. 500 °F. to 750 °F.

IFC

ICC Commercial Cooking Systems 28

LEARNING center

ACTIVITY

Knowledge Check

5. Fire temperatures in Type I commercial kitchen exhaust duct systems can range from 1452 °F to 2000 °F.
6. Safety and comfort can be adversely affected by excess heat, humidity, smoke and Grease-Laden cooking effluents.
7. The smoke point of corn oil is approximately _____°F.
   a) 225
   b) 250
   c) 350
   d) 460
8. A properly designed kitchen mechanical ventilation system provides supply, makeup and exhaust air to limit temperature and humidity.

IFC

ICC Commercial Cooking Systems

LEARNING center

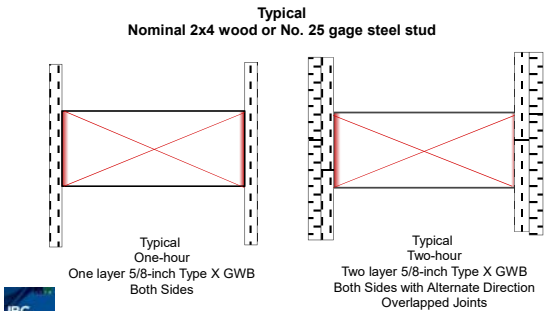
IBC Requirements

- IBC Chapter 7
  - Fire-resistive or non-combustible construction requirements
    - Shafts
    - Shaft enclosure
    - Fire barrier construction standards
- IBC Chapter 28
  - Cross-references to *International Mechanical Code*

Shaft Construction IBC §713.4

- If required
  - Constructed as fire barriers
    - Fire-resistant rated assembly
    - Tested per UL 263 or ASTM E119
  - Rating
    - Two-hour for 4 or more stories
    - One-hour less than 4 stories
  - Openings/penetrations only for purpose of the shaft (e.g. cleanout access)

Shaft Construction IBC §713.4



Opening Protectives IBC §716

- Shaft enclosure openings must be protected Table 716.1(2)

Fire Suppression IBC §904.12

- Type I hood and duct system must be protected
  - See also IMC §509.1 and IFC §904.12

Fire Suppression IBC §904.12

- UL 300 *Commercial Cooking Protection*
- Equipment must be listed and labeled
- Automatic and manual release
- Cooking equipment fuel/electrical shut down
- Special provisions for
  - Carbon dioxide systems
  - Automatic sprinkler systems

Hood System Exception

- Factory-built "recirculating" systems
- Tested, listed and labeled per UL 710B *Standard for Recirculating Systems*
- Installed per manufacturer and *International Mechanical Code* §301
  - Built-in fire actuated damper and fire extinguishing system

Photo courtesy of Wells Bloomfield

IBC

ICC Commercial Cooking Systems 37 learning center

REFER TO CODE BOOK

NEW 2018 IBC 904.13

Domestic Cooking

- Group I-1
- Group I-2, Condition 1
- Group R-2 college dormitories
- Cooktops and ranges
  - Protected to UL 300 A
  - Tested and listed burners
- Aerosol agents

Image courtesy: Aero-K Fire Suppression Systems

IBC

ICC Commercial Cooking Systems 38 learning center

ACTIVITY

Knowledge Check

1. A shaft enclosure around a commercial kitchen exhaust duct in a three-story building must have a fire-resistance rating of **One** hour(s).
2. Openings in shafts around a commercial kitchen exhaust duct may be installed for access to other electrical and mechanical equipment. True or False
3. Fire barriers used as shaft enclosures may be installed with gypsum wallboard on only the face nearest the exhaust duct. True or False
4. The *International Building Code* requires all commercial cooking systems to be covered by a Type I hood and duct system. True or False

IBC

ICC Commercial Cooking Systems 39 learning center

Module #2

Mechanical Ventilation

40

International Mechanical Code

International Mechanical Code

- Design, installation, maintenance and alteration of mechanical appliances and building mechanical systems for environmental control
  - Chapters 3-5 for commercial cooking

IMC

ICC Commercial Cooking Systems

42

learning center

IMC Chapter 3: Equipment

- General requirements
  - IMC §301.6 – fuel gas equipment and piping per *International Fuel Gas Code*
  - IMC §301.7 – appliances and equipment must be listed and labeled
  - IMC §301.10 – electrical installations per the *National Electrical Code* (NPFA 70).
  - IMC §302.1 – structural integrity not to be compromised by mechanical equipment

ICC Commercial Cooking Systems 43

IMC Chapter 4: Ventilation

- Establishes the minimum means for protecting the health of the building occupants
  - Controls the quality of the indoor air
  - Removes harmful contaminants
- Minimum outside air ventilation rate of 0.7 cfm/ft^2 of net occupiable floor area
- Captured air in the hood exhaust must be discharge to the exterior and not recirculated

ICC Commercial Cooking Systems 44

IMC Chapter 4: Ventilation

- IMC §401 – general ventilation requirements for occupied structures
- IMC §401.4 – air intake opening locations must be
  - At least 10 feet from
    - lot lines/adjacent buildings
    - hazardous or noxious contaminant sources
  - At least 3 feet below
    - contaminant sources within 10 feet of building

ICC Commercial Cooking Systems 45

IMC Chapter 5: Exhaust Systems

- IMC §506 – Ventilation ducts and equipment
  - Distinguishes Type I and Type II exhaust systems

Type I

- Continuous, confined path to outdoors for fire control
  - Grease or smoke
  - Heat, odors and steam
- Independent systems
- Heavy-duty duct materials
  - Leak-proof joints
  - Cleanouts
- Clearance from combustibles
- Minimum air flow rates

Type II

- Human comfort
  - Heat, odors and steam
- Lightweight duct materials
  - Rigid metallic materials
- No minimum air flow rate
- Construction per IMC Chapter 6

IMC

ICC Commercial Cooking Systems 46

learning center

ACTIVITY

Knowledge Check

1. Air intake openings for commercial kitchen make-up air must be at least **10** feet from property lines.
2. Minimum outside air ventilation for make-up must be at a rate of at least 0.7 cfm/ft^2. True or False
3. According to IMC §301.7, all commercial cooking appliances must be **Listed** and **Labeled** .
4. A Type I hood and duct ventilation system is intended to be used for
   a. Smoke and grease-laden vapors
   b. Heat, steam and odors
   c. Grease and steam alone
   d. Both a and b

IMC

ICC Commercial Cooking Systems 47

learning center

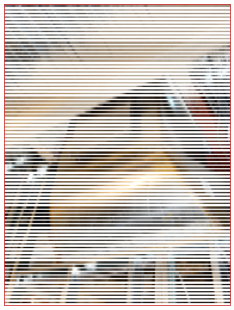
Module #3

Commercial Kitchen Exhaust Duct Systems

48

Exhaust Duct Systems

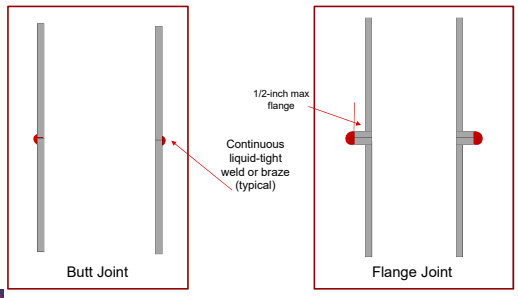
- Construction
  - Materials
  - Joints
  - Connections
  - Supports
- Clearances and enclosures
- Maintenance features
- Ventilation rates



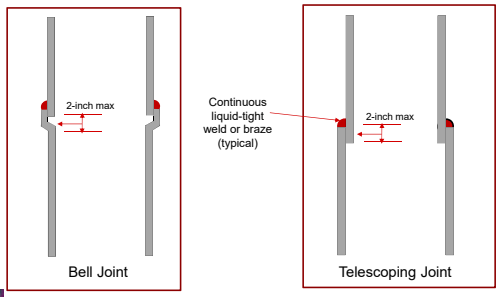
Duct Construction IMC §506.3.1

- Grease ducts
  - No. 16 gage steel (0.0575-inch)
  - No. 18 gage stainless steel (0.0450-inch)
- Non-combustible supports
- Make-up air ducts
  - Connected or within 18 inches of Type I hood
    - See IMC §603
- Joints
  - Continuous liquid-tight weld or braze, or,
  - Factory built, listed, labeled per UL 1978

Duct Joint Types IMC §506.3.2.1



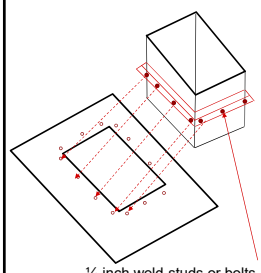
Duct Joint Types IMC §506.3.2.1

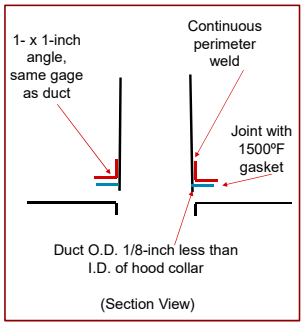


Duct-to-Hood Connection

- IMC § 506.3.2.2
  - Liquid-tight
    - Welded or brazed
  - Exception for duct-to-hood collar connection
    - Prescriptive
    - Listed/labeled

Prescriptive Duct-to-Hood Collar





Grease Duct Test IMC §506.3.2.5

- Duct integrity checked by light test
  - ≥ 100 watt light bulb passed through duct to be tested
    - Entire duct system must be tested, but may be checked in sections
      - All joints checked

IMC

ICC Commercial Cooking Systems 55 learning center

Ventilation Rate IMC §506.3.4

- Minimum air velocity of 500 fpm for ducts serving Type I hoods
  - No corresponding velocity for ducts serving Type II hoods

IMC

ICC Commercial Cooking Systems 56 learning center

Duct Separation IMC §506.3.5

- Type I systems must be independent from all other exhaust systems except when:
  1. All interconnected hoods within the same story,
  2. All interconnected hoods within the same room or adjoining rooms
  3. Interconnecting ducts do not penetrate assemblies required to be fire-resistance rated, and,
  4. Grease duct system does not serve solid-fuel-fired appliances

IMC

ICC Commercial Cooking Systems 57 learning center

Duct Clearances IMC §506.3.6

- When enclosure not required, grease duct clearance:
  - ≥18" from combustible construction
  - ≥ 3" from noncombustible construction and gypsum wallboard attached to noncombustible structures
    - Exception: Listed and labeled factory built commercial kitchen grease ducts and exhaust equipment

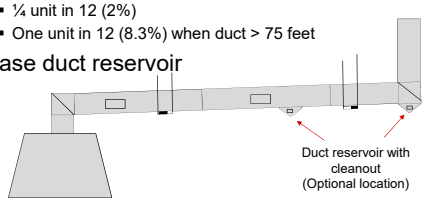
IMC

ICC Commercial Cooking Systems 58

learning center

Grease Control IMC §506.3.7

- Duct slope:
  - No traps
  - Slope toward hood
    - ¼ unit in 12 (2%)
    - One unit in 12 (8.3%) when duct > 75 feet
- Grease duct reservoir



IMC

ICC Commercial Cooking Systems 59

learning center

Clean-outs IMC §506.3.9

- Horizontal duct work:
  - Not more than 20 feet apart
  - Not more than 10 feet from directional changes >45º
  - No closer than one inch to duct edge
  - At least 12 x 12 inches for access
  - Gaskets/sealants rated ≥ 1500ºF

IMC

ICC Commercial Cooking Systems 60

learning center

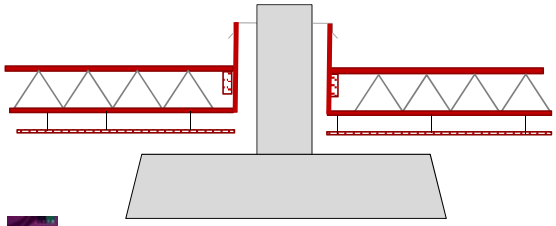
Enclosures IMC §506.3.11

- Grease ducts serving Type I hoods that penetrate a ceiling, wall or floor:
  - enclosed from the point of penetration to the outlet terminal
  - exterior walls only at locations where unprotected openings are permitted by the IBC
  - sealed around the duct at the point of penetration
  - vented to the outside of the building through a weather-protected opening

IMC ICC Commercial Cooking Systems 61 center

Non-rated Roof/Ceiling Exception

- Enclosure not required for a grease duct that penetrates only a non-fire-resistance rated roof/ceiling assembly



IMC ICC Commercial Cooking Systems 62 center

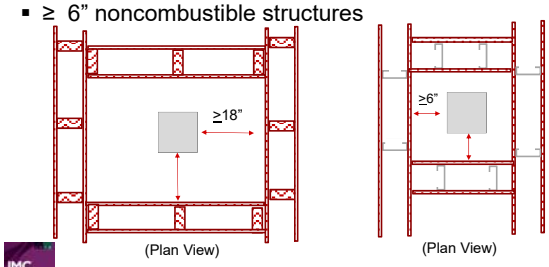
Duct Enclosure Options

- IMC §506.3.11
  - Fire-resistance-rated shaft,
  - Fire resistance-rated duct wrap, or,
    - ASTM E 2336
    - UL 1479
    - "F" and "T" rating matching assembly
  - Factory-built enclosure assembly
    - ASTM E 814
    - UL 1479

IMC ICC Commercial Cooking Systems center

Shaft Enclosure IMC §506.3.11.1

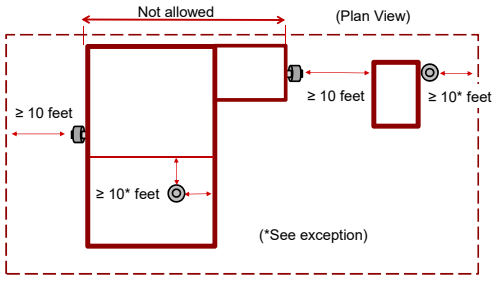
- ≥ 18”combustible construction
- ≥ 6” noncombustible structures



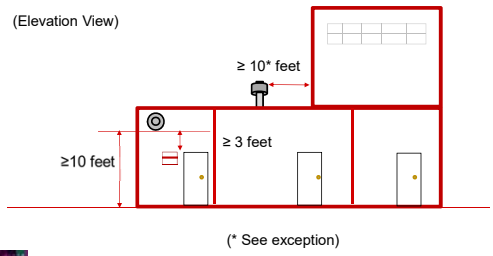
Termination Point IMC §506.3.13

- Vertical discharge
  - At least 40 inches above roof surface
- Horizontal discharge
  - Not where protected openings required by IBC
  - No other exterior openings within three feet

Termination Point IMC §506.3.13.3



Termination Point IMC §506.3.13.3



(* See exception)

Type II Ducts IMC § 506.4

- Rigid metal
  - See IMC Chapter 6
- Termination
  - ≥ 3 feet from any opening
  - ≥ 10 feet property lines or buildings on same lot
  - ≥ 10 feet above grade
  - ≥ 30 inches above roof or exterior vertical walls
  - Not directed to walkways
  - Exterior wall opening protectives

Type I Upblast IMC §506.5.4

- Duct: ≥ 18 inches above roof
  - Discharge point: ≥ 40 inches above roof
  - Discharge not to impinge on:
    - roof,
    - other equipment/appliances, or,
    - parts of the structure
  - Vertical discharge fan to have low point grease drain and reservoir

Pollution-Control Units

REFER TO CODE BOOK

New 2018

IMC 506.5.2

- Where installed,
  - Listed and labeled per UL 726 and 1978
  - ≥ 18 inches from combustible material
  - Factory-installed fire suppression system
  - Wash down drains through a grease interceptor

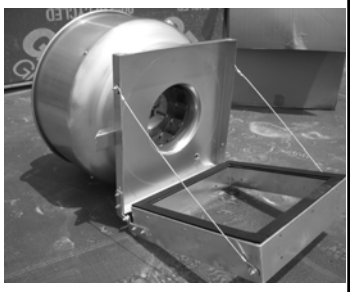
Image courtesy of CaptiveAire

IMC

ICC Commercial Cooking Systems 70 LEARNING center

Exhaust Fan Mounting §506.5.4

- Up-blast fan:
  - Hinged for inspection and cleaning, and,
  - flexible, weatherproof electrical cable



IMC

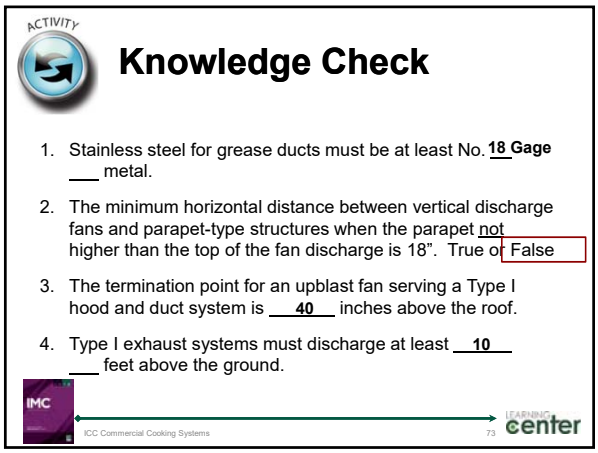
ICC Commercial Cooking Systems 71 LEARNING center

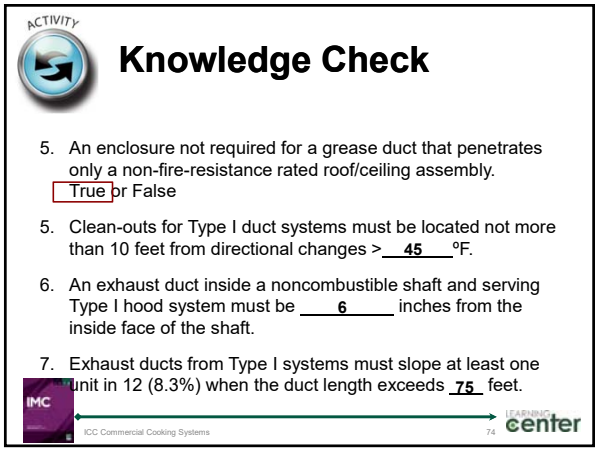
Exhaust Fan Mounting §506.5.6

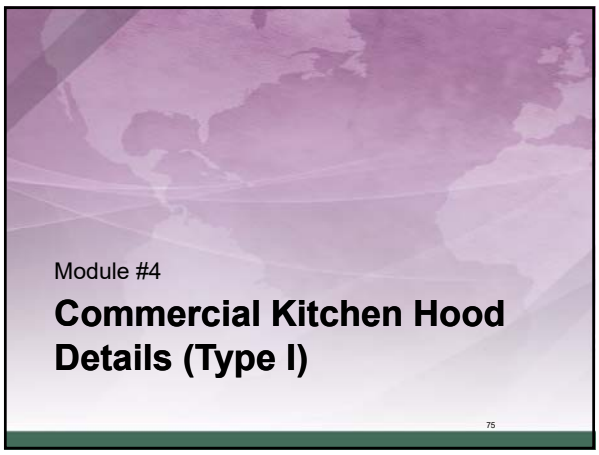
- Exception to 506.3.13:
- Minimum distance may be 24" between vertical discharge fans and parapet-type structures when parapet not higher than the top of the fan discharge.

IMC

ICC Commercial Cooking Systems 72 LEARNING center


ACTIVITY
Knowledge Check
1. Stainless steel for grease ducts must be at least No. 18 Gage ___ metal.
2. The minimum horizontal distance between vertical discharge fans and parapet-type structures when the parapet not higher than the top of the fan discharge is 18". True or False
3. The termination point for an upblast fan serving a Type I hood and duct system is 40 inches above the roof.
4. Type I exhaust systems must discharge at least 10 ___ feet above the ground.
IMC
ICC Commercial Cooking Systems
73
center


ACTIVITY
Knowledge Check
5. An enclosure not required for a grease duct that penetrates only a non-fire-resistance rated roof/ceiling assembly. True or False
5. Clean-outs for Type I duct systems must be located not more than 10 feet from directional changes > 45 ºF.
6. An exhaust duct inside a noncombustible shaft and serving Type I hood system must be 6 inches from the inside face of the shaft.
7. Exhaust ducts from Type I systems must slope at least one unit in 12 (8.3%) when the duct length exceeds 75 feet.
IMC
ICC Commercial Cooking Systems
74
center


Module #4
Commercial Kitchen Hood Details (Type I)
75

Kitchen Hoods

- Hood types and configurations dependent on:
  - Cuisine/cooking style
  - Production rates and traffic patterns
  - Owner/staff preference
  - Kitchen space configuration

Commercial Hoods IMC §507.1

- Type I or Type II
- Exceptions:
  - UL 710 listed factory-built commercial exhaust hoods
  - UL 710B listed factory-built commercial cooking recirculating systems
  - Down-draft *appliances* listed and labeled with NFPA 96
- Designed to capture and confine cooking vapors and residues
  - Operate during cooking

Kitchen Hoods IMC §507.2

- Addresses where Type I and Type II hoods are required
  - construction,
  - installation, and,
  - operation

"Canopy" or "Non-canopy"

- Canopy hood
  - Access to all sides
  - ≥ 6 inches beyond edge of all appliances
  - ≤ 4 feet above cooking surface
- Non-canopy hood
  - Access to three sides
  - ≤ 3 feet above cooking surface

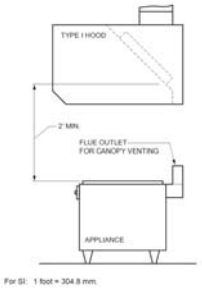
IMC ICC Commercial Cooking Systems 79 LEARNING center

Single Island Canopy Hood

- **Single Island Canopy Hood:**
  - Placed over a single appliance or appliance line
  - Open on all sides
  - Overhangs the front, rear, and sides of the appliances
  - Susceptible to cross drafts
    - requires greater exhaust air flow than an equivalently sized wall-mounted canopy for effluent capture

IMC ICC Commercial Cooking Systems 80 LEARNING center

Single Island Canopy Hood

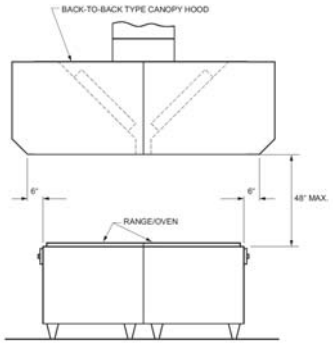


IMC ICC Commercial Cooking Systems 81 LEARNING center

Double Island Canopy Hood

- Installed over back-to-back appliances
- Open on all sides
- Overhangs front and all sides of appliances
- May have a wall panel between the backs of the appliances

Double Island Canopy Hood

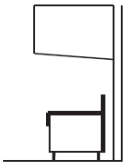


For SI: 1 inch = 25.4 mm.

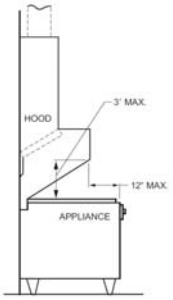
Wall-mount Non-canopy Hood

- Mounted against a wall above a single appliance or line of appliances
  - Could be free-standing with a back panel at the rear of the appliances
  - Overhangs the front and sides of the appliances
- Wall acts as a back panel, forcing the makeup air to be drawn across the front of the cooking equipment, increasing effluent capture effectiveness

Wall-mounted Non-canopy Hood



Wall Canopy



For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm.

Figure 507.4.2
NONCANOPY-TYPE HOOD
(LOW-WALL OR BACKSHELF)

Backshelf Non-canopy Hood

- Also known as a *low-proximity* or *sidewall* hood
  - front lower lip is low over the appliances and is "set back" from the front of the appliances
- Always closed at rear of appliances
- Height above cooking surface varies
- May be constructed with partial end panels to increase effluent capture

Backshelf Non-canopy Hood

Pass-over Non-canopy Hood

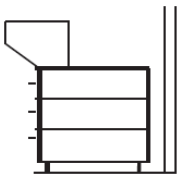
- Free-standing form of a backshelf hood
- Constructed low enough to pass food over the top

Passover

IMC

ICC Commercial Cooking Systems 88

Eyebrow Non-Canopy Hood



Eyebrow

- Mounted directly to the face of appliance
  - Extends past the sides
  - Overhangs the front of the opening

IMC

ICC Commercial Cooking Systems 89

Type I Hood Details IMC §507.2

- Labeled for flow in CFM/lineal foot
  - Cooking appliance duty classification
- Materials
  - No. 18 gage steel
  - No. 20 gage stainless steel
- Non-combustible supports
- Clearances
  - 18 inches from combustibles
  - 0 inches from wallboard on noncombustible support

IMC

ICC Commercial Cooking Systems 90

Grease Filters IMC §507.2.8

- Filters listed per UL 1046
  - Installed at least 45º from horizontal
  - Drip tray beneath

Type of Cooking Appliances	Lowest Edge Above Cooking Surface (in.)
Without exposed flame	6
Exposed flame and burners	24
Exposed charcoal and charbroil type	30'

IMC ICC Commercial Cooking Systems 91 learning center

Type II Hood Details IMC §507.3

- Installed above non-grease or smoke producing appliances
  - Steam or moisture producers
- Materials
  - No. 22 gage steel
  - No. 24 gage stainless steel
- Supports adequate for loads

IMC ICC Commercial Cooking Systems 92 learning center

Ventilation Rates IMC §507.5

Minimum Net Airflow for Hoods Serving Commercial Cooking Appliances

(cfm per linear foot of hood)

Hood Type	Extra-heavy-duty Type I Only	Heavy-duty Type I Only	Medium-duty Type I Only	Light-duty Type I or Type II
Backshelf/pass-over	Not allowed	400	300	250
Double Island Canopy	550	400	300	250
Eyebrow	Not allowed	Not allowed	250	250
Single Island Canopy	700	600	500	400
Wall-mounted Canopy	550	400	300	200

IMC ICC Commercial Cooking Systems 93 learning center

Performance Test IMC §507.6

- Conducted before ventilation system final approval
- Test verifies
  - Exhaust airflow
  - Makeup airflow
  - Proper operation

- Permit holder provides test equipment and devices required to perform the tests

IMC
ICC Commercial Cooking Systems 94 learning center

Makeup Air IMC §508.1.1

- Makeup air to be supplied during the operation of commercial kitchen exhaust systems
  - For mechanical makeup air systems, the exhaust and makeup air systems shall be electrically interlocked
- Temperature differential between makeup air and the conditioned space not to exceed 10ºF

IMC
ICC Commercial Cooking Systems 95 learning center

Air Balance Plan IMC §508.1.2

- Produced at design phase:
  - Show design outdoor air balance
    - Exhaust/replacement plus et air leakage, if any
  - Total make-up air must equal exhaust flow plus leakage

IMC
ICC Commercial Cooking Systems 96 learning center

Fire Suppression IMC §509.1

- Fire suppression system required for Type I hood and duct systems
  - Refer to IBC and IFC

ACTIVITY

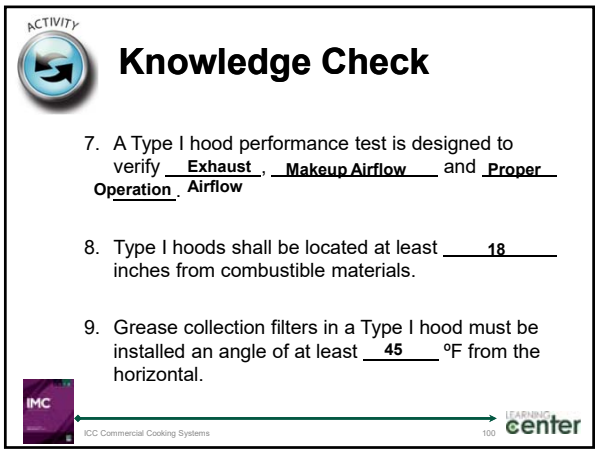
Knowledge Check

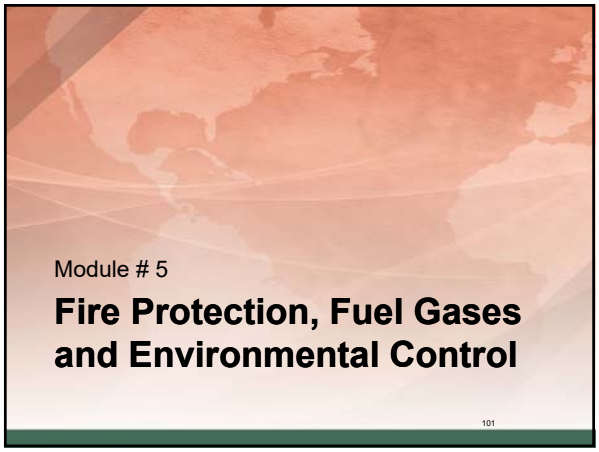
1. Type I hoods shall be constructed of a minimum No. **18** gage steel or No. **20** gage stainless steel.
2. The minimum distance between an exposed flame appliance and the lowest edge of a grease filter is **24** inches.
3. Type I hoods must be installed so they are at least **3** inches from gypsum wallboard on noncombustible structures.

ACTIVITY

Knowledge Check

4. Type I grease filters must be listed and labeled in accordance with **UL 1046**.
5. Type II hood shall be connected to the structure by non-combustible materials capable of supporting the imposed loads. True or False
6. An air balance design report must show the make-up air must **Equal** exhaust flow plus leakage.


ACTIVITY
Knowledge Check
7. A Type I hood performance test is designed to verify Exhaust, Makeup Airflow and Proper Operation Airflow.
8. Type I hoods shall be located at least 18 inches from combustible materials.
9. Grease collection filters in a Type I hood must be installed an angle of at least 45 ºF from the horizontal.
IMC
ICC Commercial Cooking Systems
100
center


Module # 5
Fire Protection, Fuel Gases and Environmental Control
101


International Fire Code

Kitchen Hoods IFC §607

- Type I for commercial operations
- Operational requirements
  - Ventilation system operated at required air flow
  - Grease extraction devices in place
  - Inspection frequency and cleaning
    - Records maintenance
    - Cleaning tags

Hood System Exception §607.2

- Factory-built "recirculating" systems
- Tested, listed and labeled per UL 710B *Standard for Recirculating Systems*
- Installed per manufacturer and *International Mechanical Code* §301
  - Built-in fire actuated damper and fire extinguishing system

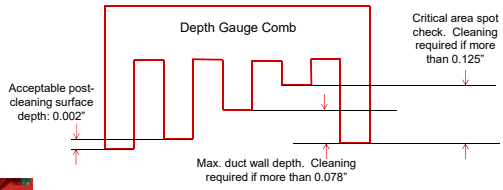
Photo courtesy of Wells Bloomfield

System Inspection IFC §607.3.3.1

Cooking Operations	Examples	Inspection Frequency
High-volume	24-hour cooking, charbroiling or wok cooking	3 months
Low-volume	Places of religious worship, seasonal businesses and senior centers	12 months
Using solid fuel-burning cooking appliances		1 month
All other		6 months

Cleaning Standard

- International Kitchen Exhaust Cleaning Association
  - C10-2011 “Cleaning Commercial Exhaust Systems”



Service Tag IFC §607.3.3.3

Fire Extinguishing IFC §904.12

- Must meet UL 300 *Commercial Cooking Protection*
  - Exception for UL 710B listed and labeled “recirculating” cooking systems
- Equipment must be listed and labeled
- Automatic and manual release
- Cooking equipment fuel/electrical shut down

Fire Extinguishing IFC §904.12

- Systems installed in accordance with the referenced standard indicated:
  - NFPA 12, Carbon dioxide
  - NFPA 13, Automatic sprinklers
  - NFPA 16, Foam-water sprinkler or foam-water spray
  - NFPA 17, Dry-chemical
  - NFPA 17A, Wet-chemical
  - NFPA 750, Automatic water-mist

IFC ICC Commercial Cooking Systems LEARNING center

System Activation IFC §904.12

- Activation must be available by automatic and manual means
  - Except automatic sprinklers

IFC ICC Commercial Cooking Systems 110 LEARNING center

System Activation IFC §904.12

- Fuel gas and/or electrical power interlock to shut down all appliances

IFC ICC Commercial Cooking Systems 111 LEARNING center

Portable Equipment IFC §904.12.5

- Portables required
- Listed Type K extinguisher
  - Travel distance to the extinguisher ≤30'
  - For solid fuel cooking
    - One 2.5-gallon or two 1.5-gallon portables

Photo courtesy of Amerex

Portable Equipment IFC §904.12.5

Fryers	Max. Cooking Medium Capacity (Each Fryer)	Class K Extinguishers
Group of 4	80	1 each 1.5 gallon
Each additional group of 4	80	1 additional 1.5 gallon
Individual fryers > 6 ft² surface	--	See manufacturer's recommendations

Domestic Cooking

REFER TO CODE BOOK

NEW 2018

IFC 904.13

- Group I-1
- Group I-2, Condition 1
- Group R-2 college dormitories
- Cooktops and ranges
  - Protected to UL 300 A
  - Tested and listed burners
- Aerosol agents

Image courtesy: Aero-K Fire Suppression Systems

Maintenance IFC §904.12

- Fire suppression system adjusted when:
  - cooking media changes,
  - cooking equipment re-positioned, or,
  - cooking equipment replacement
- Serviced by qualified individuals
  - every 6 months and
  - after activation
- Fusible links and sprinklers replaced annually

Cooking Oil Storage § 608

- Cooking oil treated as Class III-B combustible liquid
  - Indoor tanks > 60 gallons must meet NFPA 30.
- Tank standards
  - Metallic: UL 80 or 142
  - Non-metallic: UL 2152
    - Non-metallic not to exceed 200 gallons
- Normal and emergency venting

ACTIVITY

Knowledge Check

1. A single group of four deep fat fryers, each having 80 lb. capacity, must be protected by ___One___ Class K fire extinguisher(s) of ___1.5___ gallons each.

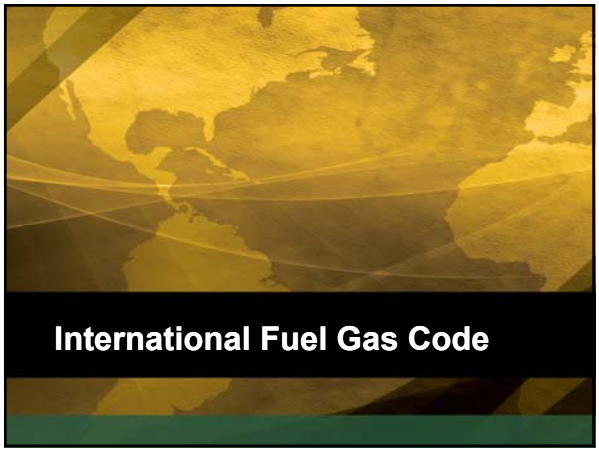
2. Which of the following does not require manual operation for commercial cooking protection?
   a. Automatic sprinklers
   b. Dry chemical
   c. Wet chemical
   d. Foam-water

Knowledge Check

3. Low volume cooking hood and duct systems must be inspected every __12__ months.

4. Recirculated air systems meeting UL 710B are not required to have separate fire suppression systems. True or False

5. A domestic range hood in a nursing or foster care facility must have a fire suppression system meeting the requirements of UL __300A__.



International Fuel Gas Code

- Installation of
  - natural gas and LP-gas systems,
  - fuel gas utilization equipment/appliances
  - extends from the utility company's point of delivery to the appliance shutoff valve
  - covers pipe sizing and arrangement, approved materials, installation, testing, inspection, operation and maintenance
- Includes
  - combustion and ventilation air,
  - approved venting
  - connections to the fuel gas system

General Regulations

Chapter 3

- Requires listing and labeling of equipment and appliances
- Addresses cutting, notching and boring of structural elements of the building
- Provides criteria for combustion air

ICC Commercial Cooking Systems 121

Fuel Gas Piping

Chapter 4

- IFGC §402 – specifies the piping system size
  - Contains sizing tables and equations for determining minimum pipe diameters
- IFGC §403 –material requirements
  - Identifies the national standard governing pipe and fitting design and construction
  - Regulates the type of joints based on the piping material

ICC Commercial Cooking Systems 122

Cooking Appliances

Chapter 6

- IFGC §623 requirements for cooking appliances, including the standards to which they must be listed and labeled.
  - Same restriction as the IMC on commercial cooking appliances being used in domestic kitchens.
- IFGC §623.6
  - commercial cooking appliances connected to a vent or chimney to remove combustion products.

ICC Commercial Cooking Systems 123

International Energy Conservation Code

- Effective energy use in new construction, additions, and alterations
  - Conditioned air discharged from kitchen system represents large percentage of energy loss in commercial cooking
  - Kitchen designers bring unconditioned makeup air as close as possible to the hood to exhaust minimum amount of conditioned air

IECC §403.2.7

- See also IMC Section 603.9
- All joints, seams and connections must be sealed
  - Unlisted duct tape specifically prohibited
- Exterior envelope sealed to prevent air leakage
  - Duct penetrations
  - Ventilation equipment

Summary

- Define terms used in commercial cooking
- Identify code requirements for commercial cooking exhaust systems
- Locate requirements for commercial cooking exhaust systems
- Locate requirements for commercial cooking hood systems

Questions/Comments?

A Final Look

Final Reflection

- **What?** What happened and what was observed in the training?
- **So what?** What did you learn? What difference did this training make?
- **Now what?** How will you do things differently back on the job as a result of this training?

International Code Council is a Registered Provider with The American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of Completion for non-AIA members are available on request.

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

Copyright Materials

ICC INTERNATIONAL CODE COUNCIL®

ACTIVITY

Thank you for participating!

To schedule a seminar, contact:
The Learning Center™
1-888-ICC-SAFE (422-7233) Ext. 33821
or
E-mail: learn@iccsafe.org