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.
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- 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.
Assist code officials, design professionals, contractors and builders understand the ICC® codes regulating commercial cooking exhaust hood systems.

**OBJECTIVES**

- 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
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!!!!

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

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.
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:
  - 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
  - Electric under-fired broilers
  - Electric chain (conveyor) broilers

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 fyers
  - 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

**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 ____ 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 entrainment, impingement, adhesion or similar means, grease, moisture, heat and similar contaminants before they enter a duct system is a ____.

**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 ____ 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.
Module #1
Hazards and Applicable Codes

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

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

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### Cooking Oils

**Flash-, Smoke-Point & Ignition Temperature**

<table>
<thead>
<tr>
<th>Cooking Oil</th>
<th>Flash Point Temperature (°F)</th>
<th>Smoke Point (°F)</th>
<th>Ignition Temperature (°F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canola Oil</td>
<td>450</td>
<td>375-450</td>
<td>626</td>
</tr>
<tr>
<td>Corn Oil</td>
<td>490</td>
<td>352</td>
<td>740</td>
</tr>
<tr>
<td>Cottonseed Oil</td>
<td>486</td>
<td>420</td>
<td>650</td>
</tr>
<tr>
<td>Palm Oil</td>
<td>323</td>
<td>455</td>
<td>600</td>
</tr>
<tr>
<td>Peanut Oil</td>
<td>540</td>
<td>320</td>
<td>833</td>
</tr>
<tr>
<td>Soybean Oil</td>
<td>549</td>
<td>350-450</td>
<td>833</td>
</tr>
<tr>
<td>Sunflower Seed Oil</td>
<td>550</td>
<td>320-450</td>
<td>undetermined</td>
</tr>
</tbody>
</table>

### 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: 1452-2000°F
- Equipment or processes as ignition source
  - Open flame
  - Flammable liquids
  - Cooking oils and additives
  - Combustible solids
  - Heated surfaces
  - Electrical arcs
  - Overheated refrigeration equipment

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

Applicable ICC Codes

- Commercial kitchen exhaust systems must meet these correlated codes, where adopted
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 500 °F to 750 °F.

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 ________.
**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**

Typical Nominal 2x4 wood or No. 25 gage steel stud

- Typical One-hour
  - One layer 5/8-inch Type X GWB
  - Both Sides
- Typical Two-hour
  - Two layer 5/8-inch Type X GWB
  - Both Sides with Alternate Direction
  - Overlapped Joints
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

- 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

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

Knowledge Check

1. A shaft enclosure around a commercial kitchen exhaust duct in a three-story building must have a fire-resistance rating of ___ 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
Module #2

Mechanical Ventilation

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 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

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/ft² of net occupiable floor area
- Captured air in the hood exhaust must be discharge to the exterior and not recirculated

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
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

---

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/ft². 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

---

Module #3
Commercial Kitchen Exhaust Duct Systems
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

- Butt Joint
- Flange Joint

Continuous liquid-tight weld or braze (typical)
Duct Joint Types  IMC §506.3.2.1

- Bell Joint
- Telescoping Joint

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

- ½-inch weld studs or bolts, each corner and 4-inch max O.C.
- 1 x 1-inch angle, same gage as duct
- Continuous perimeter weld
- Joint with 1500°F gasket
- Duct O.D. 1/8-inch less than I.D. of hood collar

(Section View)
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

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

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
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

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

Clean-outs IMC §506.3.9

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

Non-rated Roof/Ceiling Exception

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

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
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
- Not allowed
  - ≥ 10 feet
  - ≥ 10° feet
  -≥ 10° feet
  -(“See exception)
Termination Point
IMC §506.3.13.3

(Elevation View)

≥ 10' feet

≥ 3 feet

(* 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

- 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

Exhaust Fan Mounting §506.5.4

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

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.
Knowledge Check

1. Stainless steel for grease ducts must be at least No. \textbf{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 \textbf{40} inches above the roof.

4. Type I exhaust systems must discharge at least \textbf{10} feet above the ground.

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. > \textbf{45} °F.

6. An exhaust duct inside a noncombustible shaft and serving Type I hood system must be \textbf{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 \textbf{75} feet.
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

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
**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

---

**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

- 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

- 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
Pass-over Non-canopy Hood

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

Eyebrow Non-Canopy Hood

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

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
Grease Filters IMC §507.2.8

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

<table>
<thead>
<tr>
<th>Type of Cooking Appliances</th>
<th>Lowest Edge Above Cooking Surface (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without exposed flame</td>
<td>6</td>
</tr>
<tr>
<td>Exposed flame and burners</td>
<td>24</td>
</tr>
<tr>
<td>Exposed charcoal and charbroil type</td>
<td>30</td>
</tr>
</tbody>
</table>

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

Ventilation Rates IMC §507.5

Minimum Net Airflow for Hoods Serving Commercial Cooking Appliances
(cfm per linear foot of hood)

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

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 10°F

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
Fire Suppression IMC §509.1

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

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.

4. Type I grease filters must be listed and labeled in accordance with UL 1946.

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.
Knowledge Check

7. A Type I hood performance test is designed to verify Exhaust, Makeup Airflow, and Proper Operation.

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 at an angle of at least 45° from the horizontal.
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

System Inspection IFC §607.3.3.1

<table>
<thead>
<tr>
<th>Cooking Operations</th>
<th>Examples</th>
<th>Inspection Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>High-volume</td>
<td>24-hour cooking, charbroiling or wok cooking</td>
<td>3 months</td>
</tr>
<tr>
<td>Low-volume</td>
<td>Places of religious worship, seasonal businesses and senior centers</td>
<td>12 months</td>
</tr>
<tr>
<td>Using solid fuel-burning cooking appliances</td>
<td></td>
<td>1 month</td>
</tr>
<tr>
<td>All other</td>
<td></td>
<td>6 months</td>
</tr>
</tbody>
</table>
**Commercial Hoods**

**Cleaning Standard**

- International Kitchen Exhaust Cleaning Association
  - C10-2011 "Cleaning Commercial Exhaust Systems"

![Depth Gauge Comb Image]

- Critical area spot check. Cleaning required if more than 0.125"
- Max. duct wall depth. Cleaning required if more than 0.078"

**Service Tag IFC §607.3.3.3**

![Service Tag Image]

**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

System Activation IFC §904.12

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

System Activation IFC §904.12

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

Portable Equipment IFC
§904.12.5

<table>
<thead>
<tr>
<th>Fryers</th>
<th>Max. Cooking Medium Capacity (Each Fryer)</th>
<th>Class K Extinguishers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group of 4</td>
<td>80</td>
<td>1 each 1.5 gallon</td>
</tr>
<tr>
<td>Each additional group of 4</td>
<td>80</td>
<td>1 additional 1.5 gallon</td>
</tr>
<tr>
<td>Individual fryers &gt; 6 ft² surface</td>
<td>--</td>
<td>See manufacturer’s recommendations</td>
</tr>
</tbody>
</table>

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
**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

**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 _1.2_ 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____.
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

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

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.
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?
Thank You For Attending