

2006 International Mechanical Code With Wisconsin Amendments



⌘ **Training As Developed by**

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⌘ **WI Dept. of Commerce,
Safety & Buildings Division,
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⌘ **Web Site:**

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International Mechanical Code (IMC) Breakdown



- ⌘ Ch. 1 Administration
- ⌘ Ch. 2 Definitions
- ⌘ Ch. 3 General Regulations
- ⌘ Ch. 4 Ventilation
- ⌘ Ch. 5 Exhaust Systems
- ⌘ Ch. 6 Duct Systems
- ⌘ Ch. 7 Combustion Air

IMC Breakdown (Cont.)

- ⌘ Ch. 8 Chimneys and Vents
- ⌘ Ch. 9 Specific Appliances/Fireplaces & Solid Fuel Burning Equipment
- ⌘ Ch. 10 Boilers, Water Heaters & Pressure Vessels (NA-Not Applicable)
- ⌘ Ch. 11 Refrigeration (NA)
- ⌘ Ch. 12 Hydronic Piping (NA)
- ⌘ Ch. 13 Fuel Oil Piping & Storage (NA)
- ⌘ Ch. 14 Solar Systems (See also COMM 71)

HVAC Equipment Replacement

COMM 61.30(3)



- ⌘ If the **new** heating/cooling equipment Btu output is \geq the **old** htg/clg equipment Btu output of the same fuel & heating/cooling design, no submittal is required
- ⌘ If submittal is required, include info on both new/old manufacturer, model, btu input/output, efficiency, and heat loss calculations (to verify size decrease), site, owner & contractor information

Type I or II Commercial Kitchen Hood Installation or Replacement

COMM 61.30 & 61.31

- ⌘ If a Type I or Type II commercial kitchen hood or associated ductwork is newly installed or replaced:
 - ☑ HVAC New/Alteration/Addition Plans or “Miscellaneous Plans” shall be submitted and conditionally approved prior to work in the field as required by Comm 61.30.
 - ☑ Plans shall be stamped, signed & dated by a WI registered Professional Engineer, Architect, or HVAC Designer if the building is greater than 50,000 cubic ft. (not based on area of alteration)

Type I or II Commercial Kitchen Hood Installation or Replacement

Comm 61.30(3)

- ⌘ If a Type I or Type II commercial kitchen hood or associated ductwork is newly installed or replaced:
 - ☑ Plans are to define ductwork size, gauge, clearance to combustibles, sealing, slopes, access (inclusive of size & spacing), locations, etc.
 - ☑ Plans to define if hood assembly is listed or unlisted, hood type, size, gauge, clearance to combustibles, nearby wall assembly, grease duct wrap to be used or shaft construction, suppression system, location, etc.

Type I or II Commercial Kitchen Hood Installation or Replacement

Comm 61.30(3)

- ⌘ If a Type I or Type II commercial kitchen hood or associated ductwork is newly installed or replaced:
 - ☑ Plans to define exhaust & make-up air rates & equipment, location of equipment, clearances, access to equipment, sequence of operation, location of wall penetrations, etc.
 - ☑ Heat loss calculations are to be provided so as to demonstrate that the make-up air unit is properly sized, etc.

Type I or II Commercial Kitchen Hood Installation or Replacement

Comm 61.30(3)



⌘ If a Type I or Type II commercial kitchen hood or associated ductwork is newly installed or replaced:

- ☑ Balancing Report required to be on-site & available to a Dept. representative.
- ☑ Equipment installation & maintenance information to be on-site & available to a Dept. representative.

Type I or II Commercial Kitchen Hood Installation or Replacement

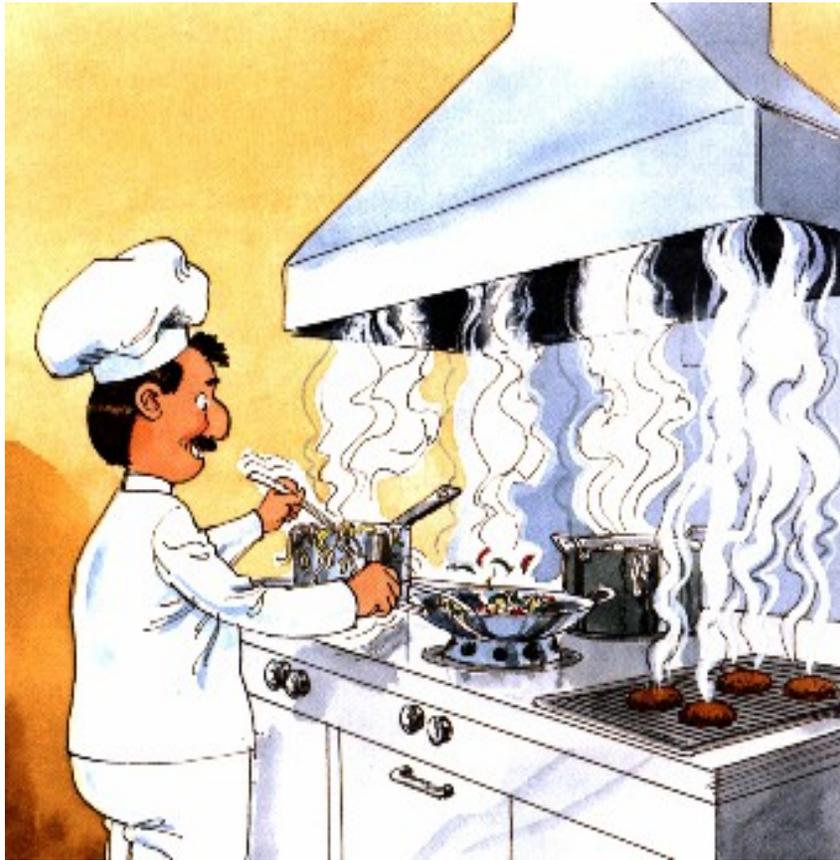
Comm 61.30(3)



- ⌘ If a Type I or Type II commercial kitchen hood or associated ductwork is newly installed or replaced:
 - ☑ Current code requirements shall be applied to all modified or new ductwork, hoods, suppression systems, exhaust fans, etc.
 - ☑ If the requirements of the code at the time of the original installation were never fulfilled, and are discovered during replacement, code deficiencies shall be corrected.

Type I Kitchen Hood Req'ts

IMC 507



⌘ **Type I-
Collects/Removes
Grease Vapors &
Smoke**

☒ **Independent System**

**Required Over a
Grease Source**

☒ **Suppression System**

**Required for
Commercial Food
Heat-Processing
Appliances**

IMC 507.2. When is a Commercial Kitchen Exhaust Hood required?

IMC 507



- ⌘ IMC 202 broadly defines a commercial food heat-processing appliance as producing "grease [laden] vapors, steam, fumes, smoke, or odors that are required to be removed "from" a food-processing establishment." And, a food-processing establishment is defined as including any building or portion thereof used for the processing of food.

IMC 507.2. When is a Commercial Kitchen Exhaust Hood required?

IMC 507



⌘ The definition of “commercial food heat-processing appliance?” Under IMC 202 & the Kitchen Hood provisions under IMC 507 do not answer this question for every situation and circumstance.

☑ **Whether a food heat-processing appliance requires a Type I or II hood depends upon several variables and factors, including: Nature of use, Frequency of use, Type of appliance, Type of food involved.**

IMC 507.2. When is a Commercial Kitchen Exhaust Hood required?

IMC 507

- ⌘ This still leaves a wide variety of occasions, situations, and operations in "commercial buildings" where food is prepared & sold:
 - ☑ **Concession stands serving high school gymnasiums**
 - ☑ **Domestic kitchen facilities in church basements**
 - ☑ **Convenience stores serving hot dogs, pizza & similar ready-to-eat foods. Warming trays & ovens for such items are not pre-determined to be "commercial food appliances", & a commercial kitchen hood may not be req'd**

When is a Commercial Kitchen Exhaust Hood required?

IMC 507.2

- ⌘ Appliances brought in temporarily, adjunct to another activity.
 - ☑ **A popcorn wagon or completely enclosed popcorn machine provided for a high school basketball game.**
 - ☑ **A “Sunday Brunch” served in a Restaurant Dining Room.**
- ⌘ These type of appliances and the frequency of use under these circumstances would not constitute a "commercial food heat-processing appliance."

IMC 507.2. When is a Commercial Kitchen Exhaust Hood required?

IMC 507

- ⌘ The following are examples of cooking areas that are not considered commercial:
 - ☑ **A dwelling unit, dorm room or hotel sleeping room with a stove, microwave, coffee maker, or toaster.**
 - ☑ **An employee break room or a motel breakfast bar with microwaves, coffee makers, and toasters does not constitute a food-processing establishment.**
- ⌘ None of these facilities are primarily in the business of preparing food for compensation, trade, or services rendered.

IMC 507.2. When is a Commercial Kitchen Exhaust Hood required?

IMC 507



- ⌘ "Commercial" cooking appliances, such as those used in Cafeterias, Restaurants, Dormitory, Institutional & School Kitchens, and Banquet Facility Kitchens, must be provided with a Type I hood.
- ⌘ These appliances include: deep fryers, griddles, tilting skillets or woks, braising and frying pans, charbroilers, salamander and upright broilers, infrared broilers, stoves and ranges, and barbecue equipment.

IMC 507.2. When is a Commercial Kitchen Exhaust Hood required?

IMC 507

- ⌘ Also, the type of food being prepared is a factor in whether grease-laden vapors are produced with the appliance.
- ⌘ Commercial cooking appliances which are used in such facilities and which produce steam, smoke, or fumes, but no grease-laden vapors, must be provided with at least a Type II hood.
- ⌘ These include steaming tables, completely enclosed ovens, and warming ovens.

Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 506 & 507

- ☒ Fire Rated Duct Enclosure Req'd / 18" from Combustibles (Gypsum board is considered combustible in the IMC)
- ☒ Ducts Liquid Tight, Min. 16 ga Steel, Required Cleanouts

⌘ Perhaps we should discuss this a little further....



Type I Kitchen Hood Operating Requirements

IMC 507.2.1.1

⌘ Type I hoods to be installed to **AUTOMATICALLY** activate the exhaust fan whenever cooking operations occur

☑ Activation may occur through:

- ☑ interlock with the cooking appliance,
- ☑ by means of heat sensors, or
- ☑ by other approved methods

Heat Sensors Installed Inside Type I Commercial Kitchen Hood



Type I Kitchen Hood/ Exhaust Duct Requirements IMC 506.3.10 / IBC 707.4

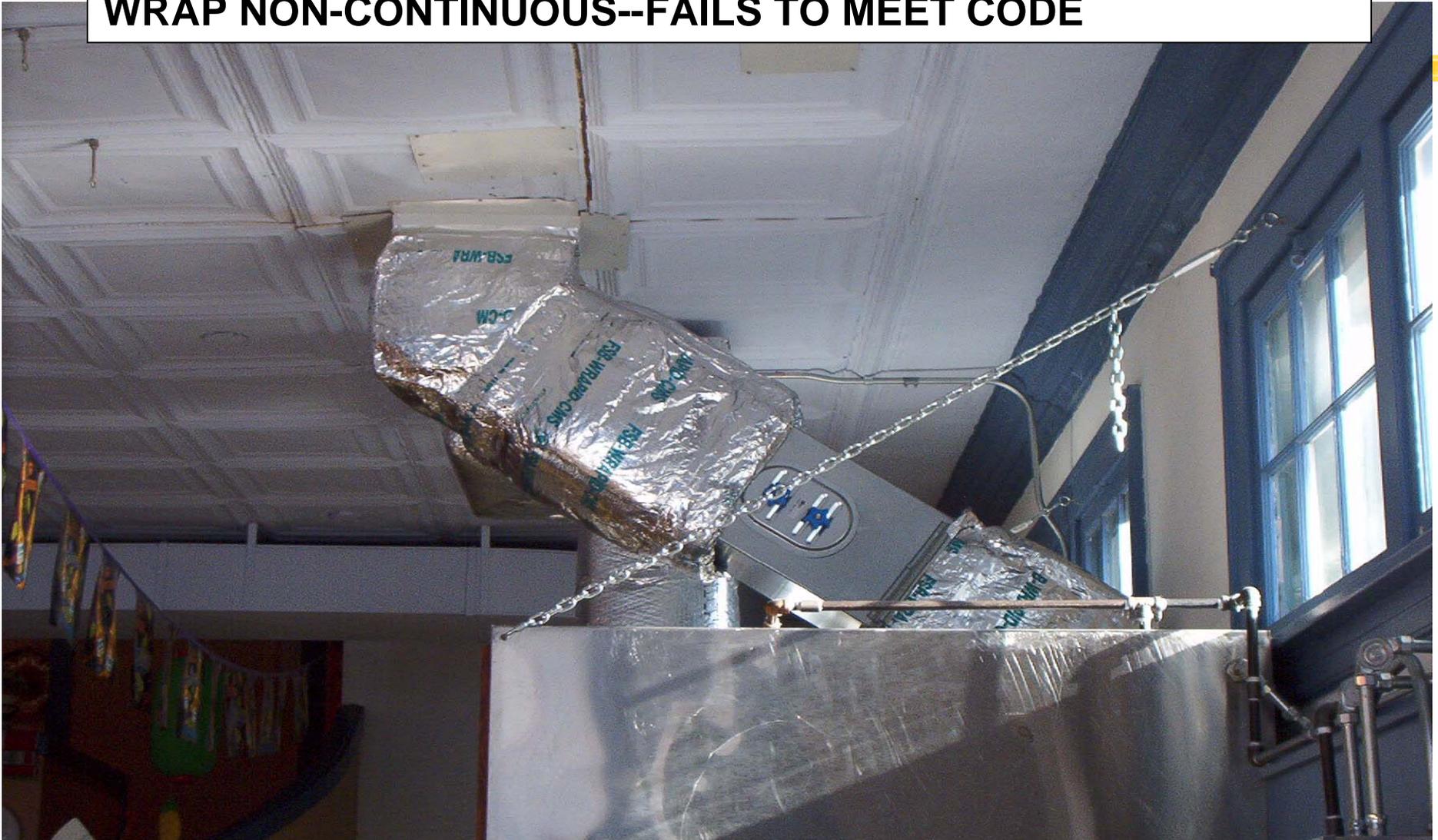
- ⌘ Duct Must be enclosed from point of roof/wall penetration to outlet terminal as allowed for by code for that location
- ⌘ Must meet IBC requirements for shaft construction, with required clearances
 - ☑ Exception: The Duct Enclosure can meet ASTM E814 and have the proper "F" & "T" ratings in accordance with ASTM E2336 or UL 2221.

Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 506.3.10 / IBC 707.4

- ⌘ 1 or 2 layers of wrap material may be required to attain a 1 or 2 hour fire enclosure rating --Refer to Material Listing
- ⌘ Many wraps are listed as allowing “zero’ clearance to combustibles”. The listing **MUST** be followed before this clearance reduction is recognized as acceptable.
 - ☑ Example: Some wraps can only be used with welded or brazed seams – not seams with sealants

**TYPE I COMMERCIAL KITCHEN HOOD EXHAUST DUCTS
ABOVE A SUSPENDED CEILING--GREASE DUCT ENCLOSURE
WRAP NON-CONTINUOUS--FAILS TO MEET CODE**



If the listing for installation requires “pins” can a band be used?---No



Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 506.3.5

- ⌘ Separate Duct System for each Type I hood unless ALL conditions are met:
 - ☑ Interconnected hoods are on the same story
 - ☑ Interconnected hoods are located within same or adjoining room
 - ☑ Interconnecting ducts do not penetrate fire-rated assemblies
 - ☑ Grease duct system does not serve solid fuel fire appliances

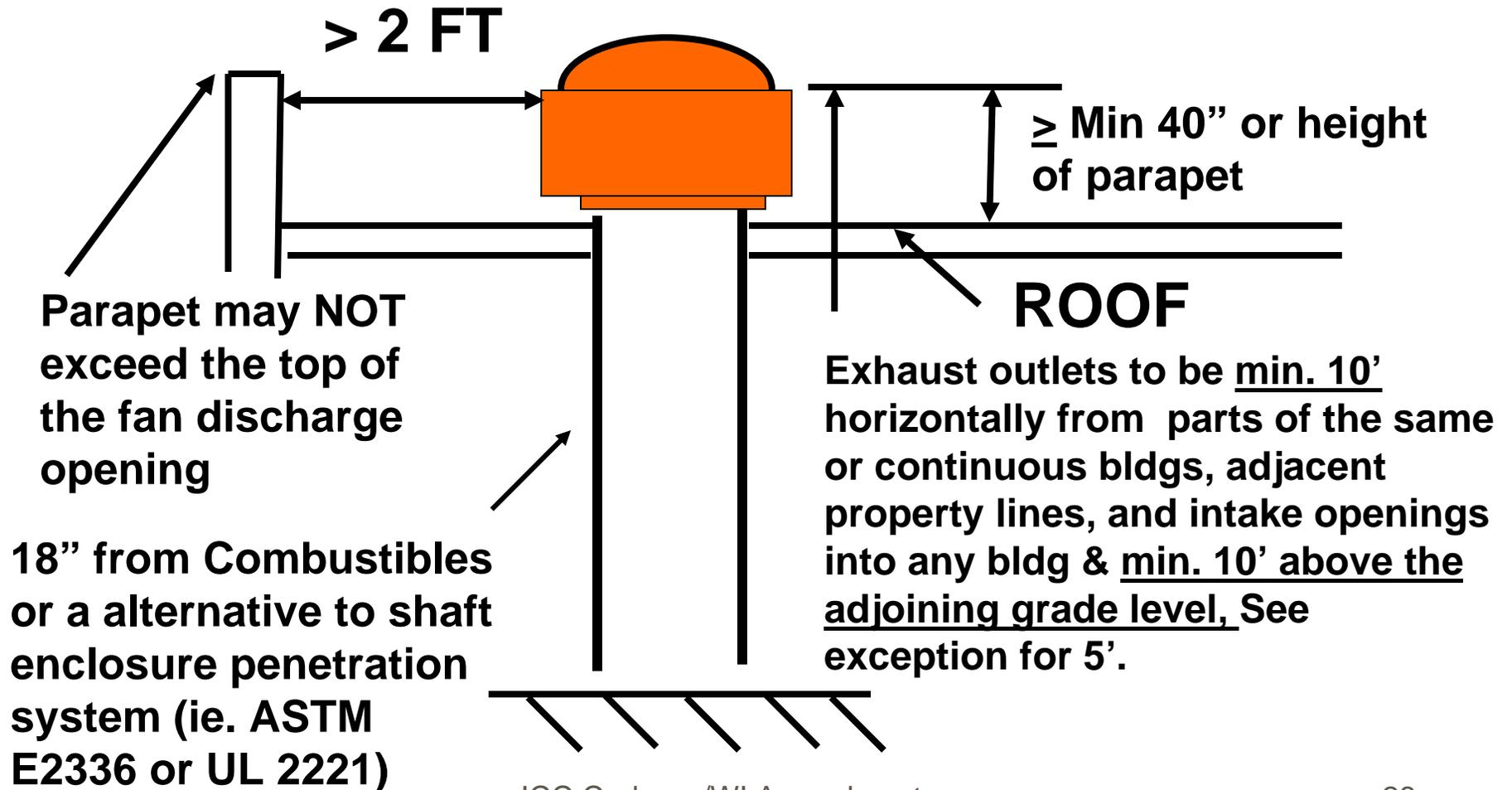
Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 506.3.12.1 & 3

- ⌘ Exhaust outlets terminating above the roof must have the discharge opening located no less than 40” above the roof surface
- ⌘ The minimum horizontal distance between vertical discharge fans & parapet type buildings structures is 2 ft assuming structures are not higher than the top of the fan discharge opening

Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 506.3.12.1 & 3



Clearance to wall....



Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 506.3.8.1 & 506.3.9

- ⌘ Horizontal Cleanouts must be < 20 Ft apart
- ⌘ Access Opening to be ≥ 1.5 " above the bottom of the duct, other options listed
- ⌘ Access Door Dimensions must be a minimum of 12"/side –Exceptions--
- ⌘ Personnel entry req'd if duct dimensions allows entry of personnel (min. access 20" x 20" with properly sized supports)

Type I Kitchen Exhaust Duct Requirements

IMC 506.3.2/Comm 64.0506(2)(a)

- ⌘ Joints/Seams/Penetrations of grease ducts require continuous liquid tight weld or braze
- ⌘ Or listed liquid tight seal good to 1500°F
- ⌘ NOTE: If listed caulk is used, wraps meeting ASTM E2336 & UL 2221 might not be able to be used around the grease duct due to conflict with the wrap listing

Type I Kitchen Exhaust Duct Requirements

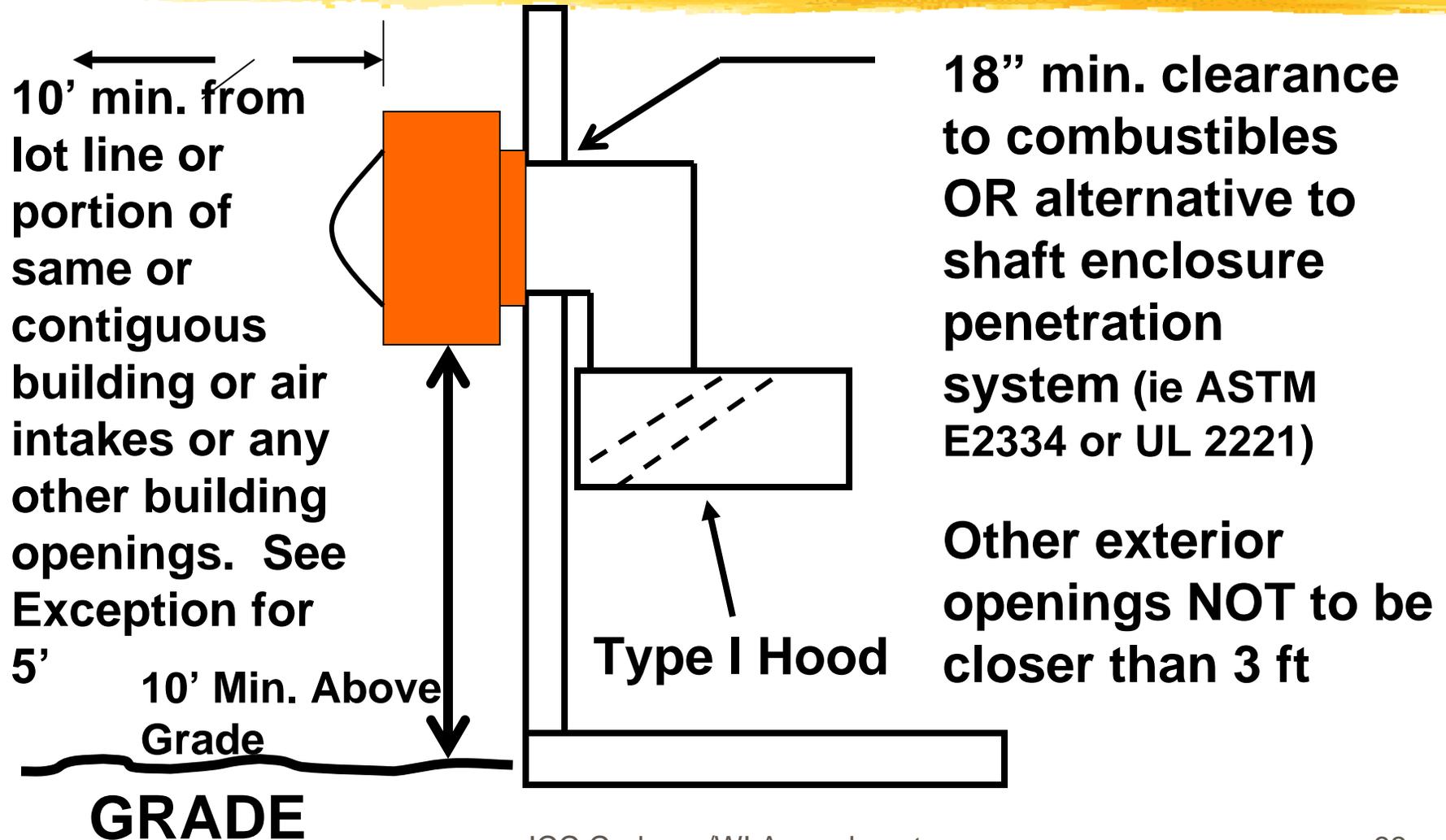
IMC 506.3.3



⌘ Air Velocity & Capacity of hoods is dependent on temperature of grease below hood--**MUST** meet code **OR** be designed through “engineering analysis”.

Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 506.3.12.2 & 3





IMC 506.3.12.3 10 ft above adjoining grade? IMC 501.2.1 Min. 10 ft from openable window? IMC 506.3.12.2 Nuisance/fire hazard to wood stairway?

Main bldg & walk-in cooler “building”. Are the exhausts 40” above roof, 10 ft from bldg(s), etc.?





Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 506.3.8

- ⌘ Horizontal System < 75' in length must be sloped $\geq 1/4:12$ (2% slope) toward hood or approved grease reservoir
- ⌘ Horizontal System > 75' in length must be sloped $\geq 1:12$ (8.3% slope) toward hood or approved grease reservoir

There's nothing like a coffee can for use in collecting grease....nothing...

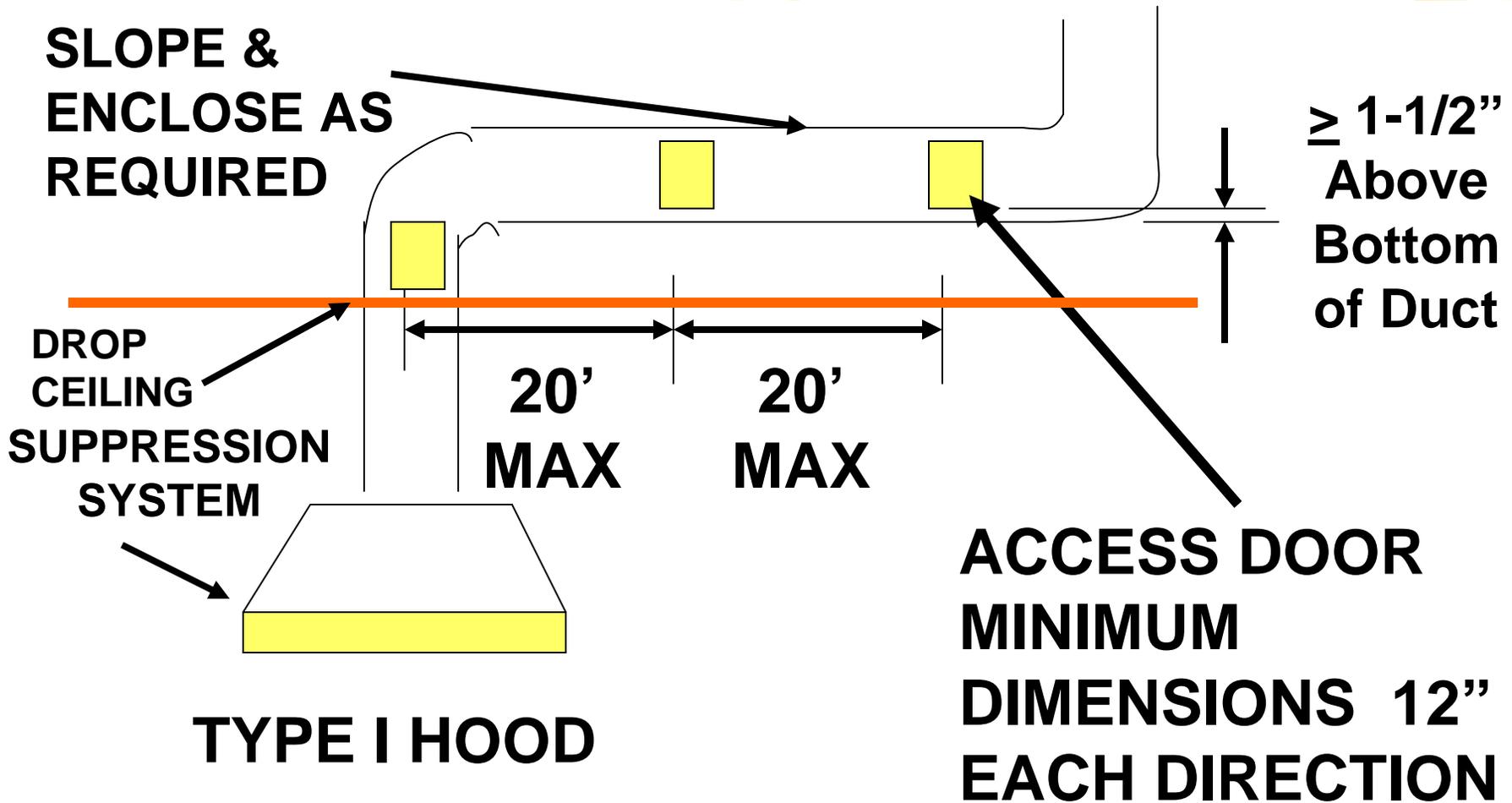


Just think of how much grease could be collected before having to empty the drum...



Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 506.3.7, 506.3.9 & 509, IBC 904.11



Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 507.9



- ⌘ A Type I hood to be 18" from combustibles
- ⌘ Exception: Clearance of 18" not req'd from gypsum wallboard if attached to non-combustible structures (steel studs, masonry), provided that a smooth, cleanable, nonabsorbent and non-combustible material (such as aluminum, stainless steel, etc) is installed between the hood & the gypsum wall board over an area extending not less than 18" in ALL directions from the hood.

Type I Kitchen Hood/ Exhaust Duct Requirements

IMC 308.4 & 507.9,

⌘ Additional exceptions to 18"

⏏ The allowable clearance reduction shall be based on an approved reduced clearance protective assembly that has been tested and bears the label of an approved agency.

⏏ Examples:

- Duct wrap listed and tested specifically for use with kitchen hood (this is separate from kitchen duct)
- "Spacer bar" included as part of kitchen hood assembly installed per manufacturer's listing & instructions.

Nearby Pegboard should be readily burnable in this high temperature grease area with no suppression system, and home-made hood





There is a hole in a commercial kitchen hood wall protection assembly, which causes containment discontinuity. Plover, WI

Type I Kitchen Hood Requirements

Comm 64.0507.1 Exception 2.



⌘ **Factory-built commercial cooking re-circulating systems** which are tested in accordance with UL 710B, listed, labeled & installed as defined by this code section are acceptable.

Type II Kitchen Hood/ Exhaust Duct Requirements

IMC 506.4 & 507.2.2 & 507.5

- ⌘ Type II- Collects/Removes steam, vapor, heat & odors typical of steamers, kettles & pasta cookers
- ⌘ Hood requires minimum 22 ga Steel
- ⌘ Independent of all other exhaust systems

Type II Kitchen Hood/ Exhaust Duct Requirements

IMC 506.4 & 507.2.2 & 507.5

⌘ Exceptions:

- ☒ Under-counter commercial type commercial dishwashing machines.
- ☒ Dishwashers & potwashers that are provided with heat and water vapor exhaust system that are supplied by the manufacturer.
- ☒ Single light duty electric convection, bread, retherm or microwave oven.
- ☒ Toasters, steam tables, popcorn poppers, hot dog cookers, coffee makers, rice cookers, egg cookers, holding/warming ovens.

Kitchen Hood Canopy Size and Location For Type I & II Hoods

IMC 507.12



- ⌘ Inside lower edge of canopy type commercial cooking hoods shall overhang or extend a horizontal distance of not less than 6" beyond the edge of the cooking surface, on all open sides.
- ⌘ Vertical distance between the front lower lip of the hood & the cooking surface to be \leq 4 ft.

Kitchen Hood Canopy Size and Location

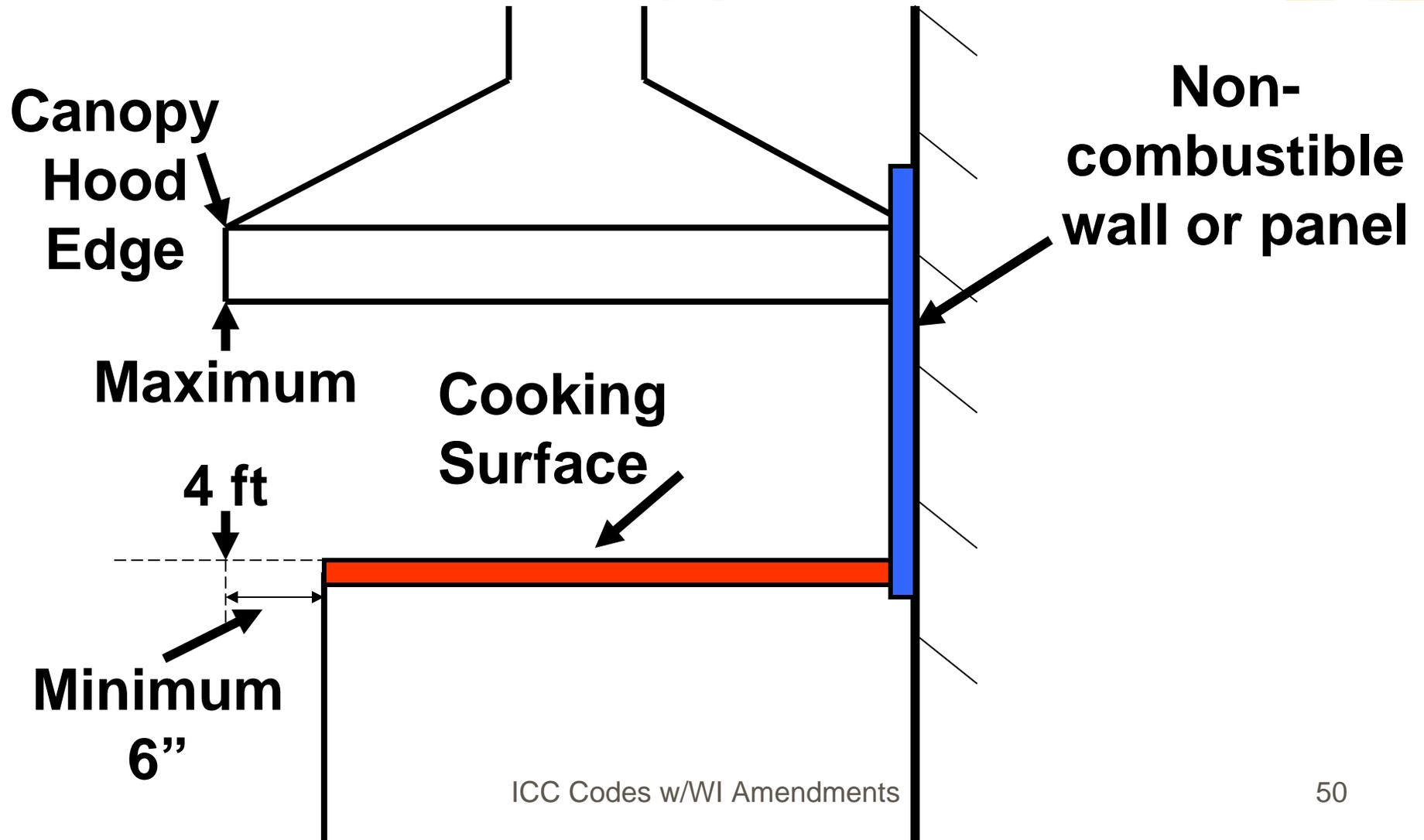
IMC 507.12



- ⌘ Exception – Hood will be permitted to be flush with the outer edge of the cooking surface where the hood is closed to the appliance side by a noncombustible wall or panel.

Kitchen Hood Canopy Size and Location

IMC 507.12



Attached is a “what’s wrong with this picture” quiz....sideways filters, wood on the right, backshelf hood hung too high, no side overhang)



Makeup Air

IMC 403.1 & 508.1.1 / COMM 64.0309(1),



⌘ The temperature differential between makeup air & the air in the conditioned space shall not exceed 10 deg. F

Exceptions:

- ☑ Makeup air that is part of the air conditioning system
- ☑ Make air that does not decrease the comfort conditions of the occupied space.



IMC 508 Make-up air required

**Brand new building -
\$1,000,000**

**Used non-listed short
circuit hood system -
\$1,000**

**Signs for doors –
\$100**

**Can't get in or out of the
restaurant.....
--priceless**

This is a new idea in building make-up air. The white framework is the base to a pedestal floor fan.



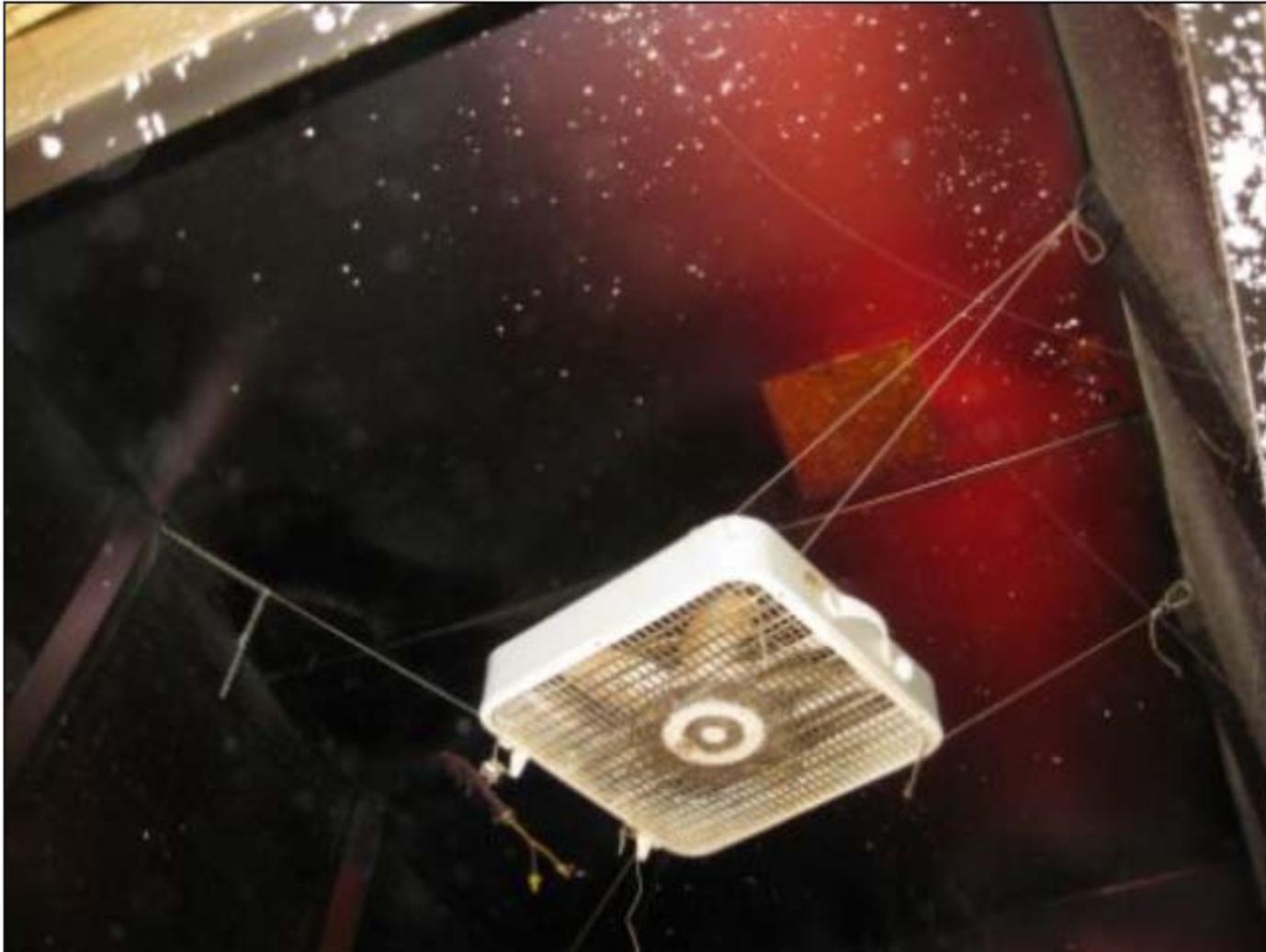
Plus you can save the need for an electrician Where's Ray when you need him?



Looks like a pretty typical kitchen hood--aye??



“Nice” Fan Located Inside....



Fuel Burning Appliances Require Venting IMC 801.2



- ⌘ **Every** fuel burning appliance shall discharge the products of combustion to a vent, factory built chimney or masonry chimney unless an exception can be met
- ⌘ IE gas or wood stoves may **NOT** vent combustion products via a kitchen hood unless the hood is listed (ie. tested) as a chimney or vent



Chippewa Falls, WI

The distance from the upper outside air intake and lower grating located above a generator exhaust stack is < 10 ft

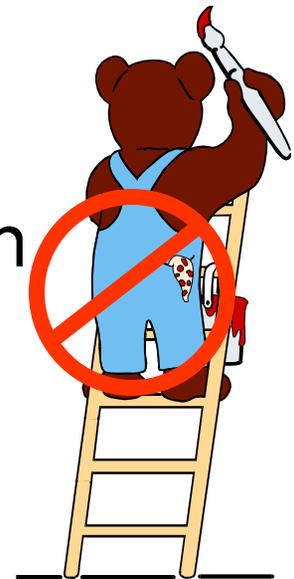
The distance from the openable door to the exhaust stack is also < 10 ft

HVAC on Roofs & Elevated Structures IMC 306.5

⌘ **Permanent approved means of access required** for equipment & appliances on roofs or elevated structures at heights >16 ft

⌘ Access may NOT involve:

- ☑ Climbing over obstructions > 30" high
- ☑ Walking on roofs w/> 4/12 pitch



Permanent Ladder Requirements

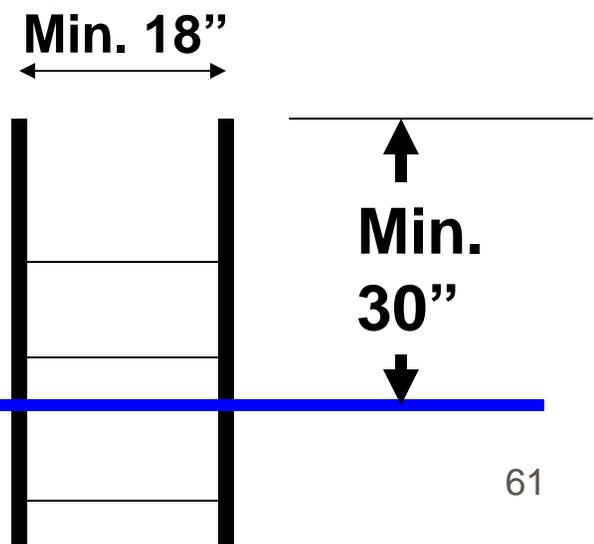
IMC 306.5

- ⌘ The side railing to extend above the parapet or roof edge $\geq 30''$
- ⌘ Ladders to have rung spacing not to exceed 14" on center, w/min. $\frac{3}{4}''$ diam.
- ⌘ Ladders to have a toe spacing not less than 6" deep

- ⌘ Min. 18" between rails, etc.

Roof Deck

ICC Codes w/WI Amendments



Access?



HVAC on Roofs & Elevated Structures IMC 306.5.1



- ⌘ **Permanent platform req'd** where equipment and appliances requiring access are installed on roofs or elevated structures
- ⌘ Platform not required if roof pitch is $< 3/12$



LET'S PLAY A GAME--WHERE'S THE ROOF TOP UNIT?

ICC Codes w/WI Amendments

HVAC on Roofs & Elevated Structures

Comm 64.0306/ IBC 1608.1 / ASCE 7-7.8

- ⌘ Need for platforms & access NOT applicable to fans
- ⌘ Snow loading for HVAC systems with a length or width of 15 ft or more, will require snow load/drift calculations to be submitted

HVAC Equipment Clearance to Grade IMC 304.8



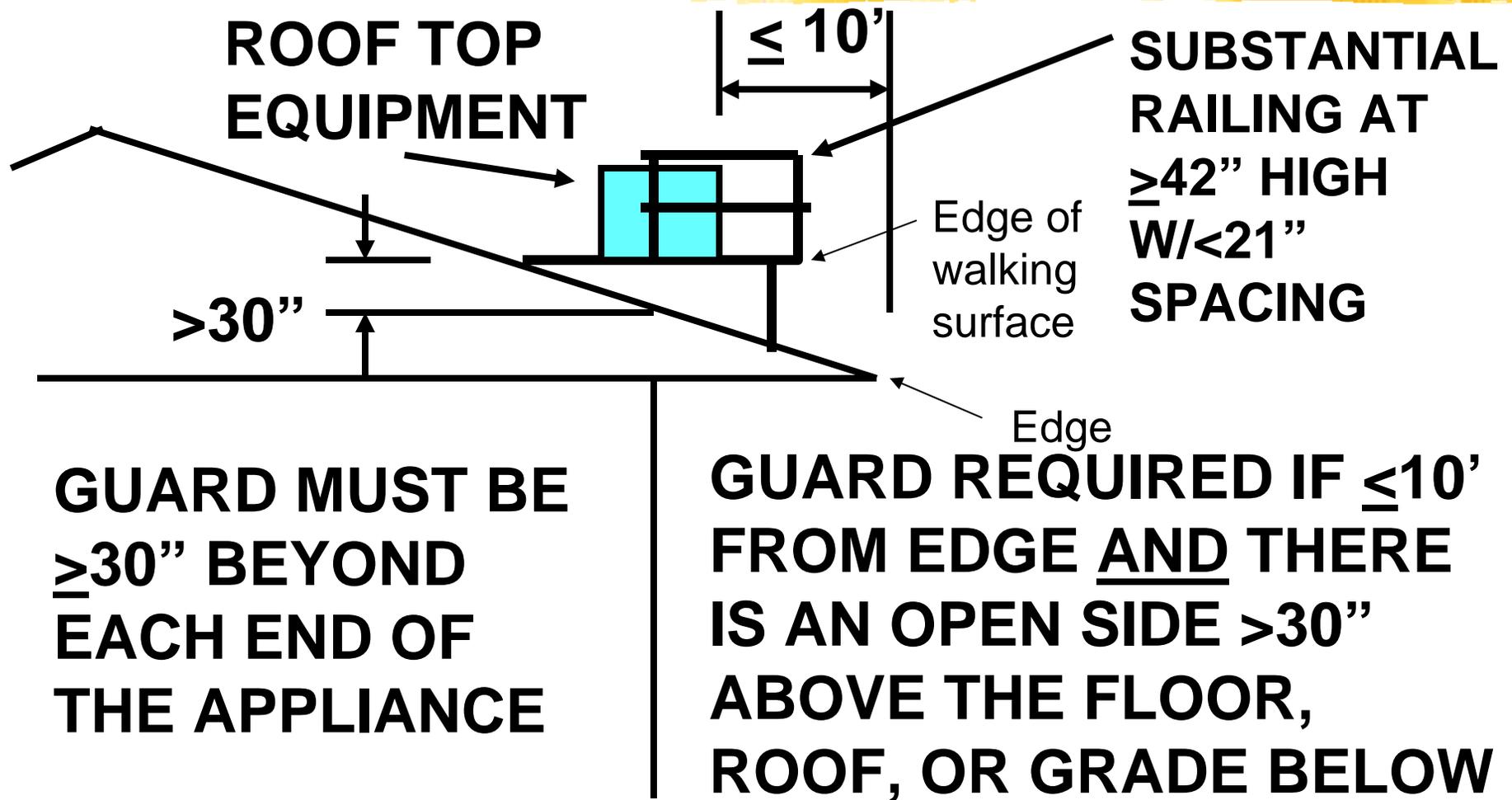
- ⌘ Equipment at grade level to be supported on a level concrete slab, **OR** other approved material, extending **above** adjoining grade; **OR**
- ⌘ Shall be suspended $\geq 6''$ above adjoining grade

**NOT
ACCEPTABLE**



Guards for HVAC Equipment & Roof Hatch Openings

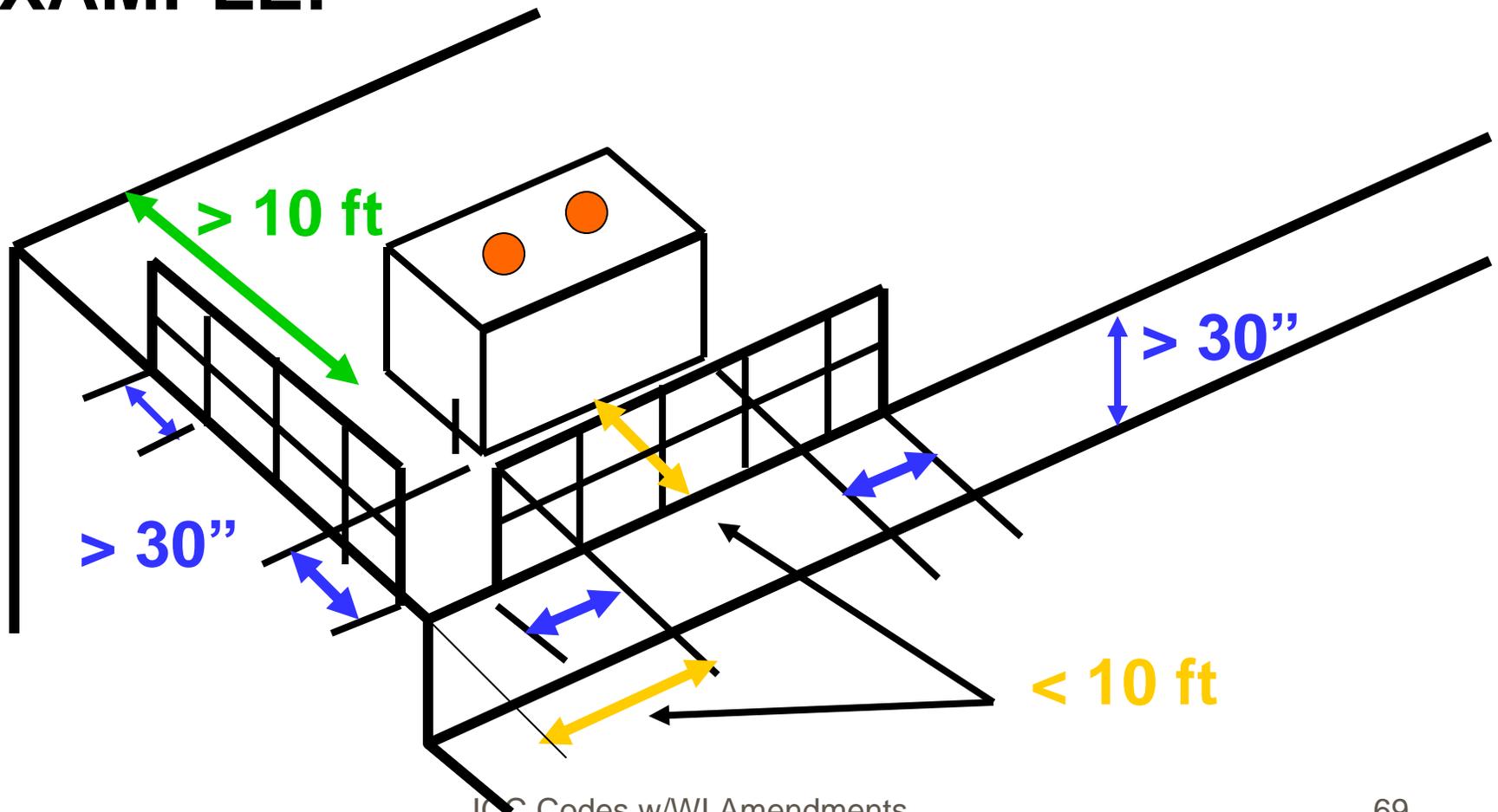
IMC 304.11, IBC 1009.11.2, 1013, 1607.7.1, IFGC 306.6



HVAC Equipment Guards

IMC 304.11, IBC 1009.11.2, 1013, 1607.7.1, IFGC 306.6

EXAMPLE:





Hmmm.....

ICC Codes w/WI Amendments

Metal Duct Construction

IMC 603.3, 603.15



- ⌘ Constructed as specified in the SMACNA HVAC Duct Construction Standards-Metal & Flexible
- ⌘ Requires the installation of volume dampers in all distribution ducts to permit accurate balancing of the system

Balancing, Operation & Maintenance

COMM 64.0313

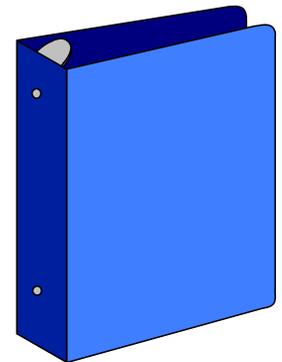


- ⌘ Balancing **MUST** be performed on every HVAC installation
- ⌘ Balancing report **MUST** be provided to owner & made available to Dept. Representative
- ⌘ Air systems & hydronic systems **SHALL** be balanced as outlined in the code
- ⌘ Operation & maintenance information **SHALL** also be provided

Balancing & Operations

COMM 64.0401

- ⌘ Outside air quantities, exhaust rates, etc. to be identified in balancing report
- ⌘ Control sequences, & calibrating Info also to be included



2006 International Existing Building Code With Wisconsin Amendments



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Additions, Alterations & Renovations

Comm 66.0300 (Ch. 3 Not adopted), 66.0607, IEBC/Comm 66.0711, & 66.0808



⌘ **Additions, alterations renovations or repairs**--Such actions in an existing building, building system or portion shall conform to the provisions of the IECC as they relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Such actions are not allowed to create an unsafe or hazardous condition or overload existing building systems. **Exceptions---**

Reconfigured or Converted Spaces

IEBC 709/Comm 66.0709



- ⌘ All reconfigured spaces intended for occupancy and all spaces converted to habitable or occupiable space in any work area shall be provided with natural or mechanical ventilation in accordance with the IMC

2006 International Energy Conservation Code With Wisconsin Amendments



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Thermostat



ICC Codes w/WI Amendments

HVAC System Controls

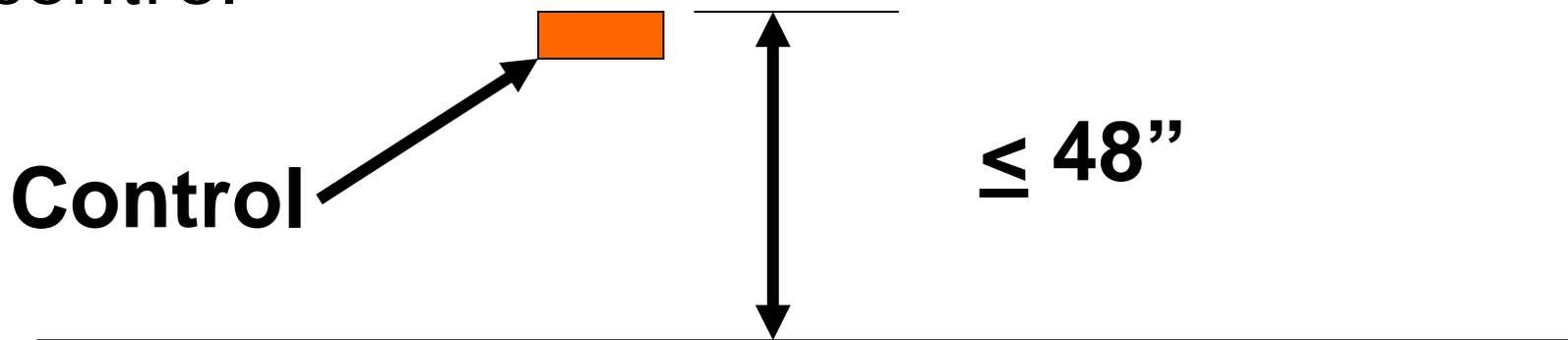
IECC 503.2.4.3.2

- ⌘ Commercial & high rise residential buildings require set-back controls
 - ☑ Exceptions
- ⌘ 5° F deadband capability requirements
 - ☑ Exceptions
- ⌘ Req'rs capability of 7 daily schedules, time setting for a power loss of ≥ 10 hrs, & a manual override of up to 2 hrs, or other listed means
- ⌘ Residential buildings (≤ 3 Stories) **DO NOT REQUIRE** setback controls—wait until 2009 IECC...

HVAC System Controls

COMM 62.1101.2 ICC A117.1 308.1 & 2

- ⌘ HVAC system controls (thermostat, humidistat) to be located ≤ 48 " above the finished floor for accessibility purposes.
- ⌘ Measurement is taken from "TOP" of the control



Sealing Examples



w/WI Amendments

Outdoor Intake, Exhaust Dampers & Vents NOT Integral to the Bldg Envelope

Comm 63.0403(3), IECC 503.2.4.4/Comm 63.0503(5)

⌘ Motorized dampers required on all outdoor air **supply & exhaust** (not relief) ducts that will automatically shut when the system or a space is not used, & to permit gravity dampers only under certain conditions.

☒ Gravity (barometric) dampers may be utilized in outside air or exhaust airflows in bldgs 2 stories in height or less

Outdoor Intake, Exhaust Dampers & Vents Integral to the Bldg Envelope

IECC 502.4.4



Air intakes & exhaust openings integral to the building envelope shall be equipped with a motorized damper, the damper shall meet:

- ☒ **AMCA test 500D for a Class 1 motorized leakage-rated damper**
 - ☒ **Maximum leakage rate \leq 4 cfm /ft² @ 1.0 inch w.g.**
- ☒ **Exception: Gravity dampers are permitted in bldgs 2 stories or less in height above grade**

Duct Sealing

IECC 503.2.7.1

⌘ Low ($\leq 2''$ w.g.), Medium ($> 2''$ but $< 3''$ w.g.), and High pressure ($\geq 3''$ w.g.) duct systems require:

☑ ALL longitudinal & transverse joints, seams and connections of **supply, return & exhaust ducts** to be securely fastened & sealed

☑ **Designation to be on the HVAC Plans as to the pressure classification of the duct system**

2006 International Fuel Gas Code With Wisconsin Amendments



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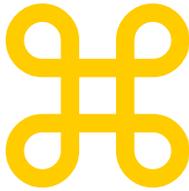
Commercial Cooking Appliances Vented by Exhaust Hoods

IFGC 505.1.1

- ⌘ Where (gas) appliances are vented by Type I or II kitchen exhaust hoods, exhaust systems shall be fan powered & the appliances shall be interlocked with the exhaust hood system to prevent appliance operation when the exhaust hood system is not operating-**See Exception**
- ⌘ Dampers shall **NOT** be installed in the exhaust system.

Questions -----



 ??????????