A Luncheon Chat on the WI Commercial Bldg Code - 2009

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- **WI Dept. of Commerce, Safety & Buildings Division, Madison, WI**
- **Web Site:**
- **COMMERCE.WI.GOV/SB/**

Past Year "Highlights"....

- The 2006 ICC Suites with WI Amendments Implemented as of March 1, 2008
- New Fee Schedule for Plan Submittal & Inspections Implemented as of December 1, 2008

Past Year "Highlights"....

- WI Statutes, 101.149, now requires CO sensors to be installed in residential occupancies if there are atmospheric combustion appliances (ie. furnaces, water heaters, clothes dryers, stoves, ovens, etc.) Emergency rules have been issued by the Dept for immediate application to the field to new buildings & additions. ***Existing buildings must be addressed by 4/1/2010***

Past Year "Highlights"....

- Code modifications on the CO sensors under Comm 62.1200 have been solicited for comment.
- The sensor must meet UL 2034

Past Year "Highlights"....

- New Bldgs, bldg additions or change in use--CO sensors must be continuously powered by the buildings electrical service, & must have battery back-up
- Existing Bldgs--CO sensors may be battery powered, electrical outlet plug-ins or building electrical service

Past Year "Highlights"....

- CO Required:
  - In basement, if it has fuel burning appliance
  - Within 15 ft of each sleeping area of unit that has sleeping area with fuel burning appliance
  - Within 15 ft of each sleeping area of unit that is immediately adjacent to a unit that has fuel burning appliance

Past Year "Highlights"....

- CO Required:
  - In each room that has a fuel-burning appliance & that is not used as a sleeping area. A carbon monoxide detector shall be installed under this subdivision not more than 75 ft from the fuel-burning appliance.

Past Year "Highlights"....

- CO Required:
  - In each hallway leading from a unit that has a fuel-burning appliance, in a location that is within 75 ft from the unit, except that, if there is no electrical outlet within this distance, the owner shall place the carbon monoxide detector at the closest available electrical outlet in the haliway

Past Year "Highlights"....

- Under the Federal Americans with Disabilities Act, ADA, and the Federal Fair Housing Law, certain CO alarms may be required to have both audible & visual alarm features

Past Year "Highlights"....

- Exceptions
  - If a unit is not part of a multi-unit building, the owner of the residential building need not install more than 1 CO detector in the unit.
  - Except as provided, the owner of a residential building shall comply with the requirements of this subsection BEFORE the building is occupied

Future "Highlights"....

- Emergency Lighting (IBC Ch. 10) & General Lighting (IECC Ch. 5) plans required to be submitted for review & conditional approval starting in winter/early spring 2009
- Efforts to review of the 2009 ICC codes by the various Dept. Committees will begin in anticipation of implementation in WI in late 2009/early 2010

Future "Highlights"....

- Final Commerce rules are expected to be implemented within the WI Commercial Building & Uniform Dwelling Codes (UDC) on the need for the installation of CO sensors in residential occupancies in the late spring, 2009.

Additions, Alterations & Renovations

Comm 66.0300 (Ch. 3 Not adopted), 66.0607, IEBC 711, & 808

- **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---**

Ch. 5 Commercial Bldgs (Any Height) & High Rise Residential Buildings (≥ 4 Stories) IECC 501 & Comm 63.0501

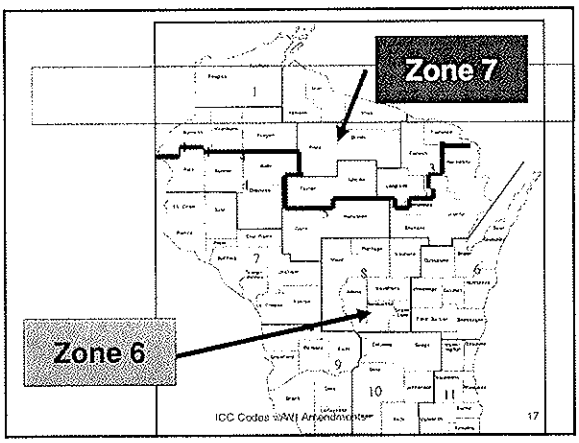
- ASHRAE 90.1-2004 may be used in place of the 2006 IECC requirements for satisfying the following topics on an individual basis:
  - IECC 502 Building Envelope
  - IECC 503 Building Mechanical Systems
  - IECC 504 Service Water Heating
  - IECC 505 Lighting

Ch. 5 Commercial Bldgs (Any Height) & High Rise Residential Buildings (≥ 4 Stories) IECC 501 & Comm 63.0501

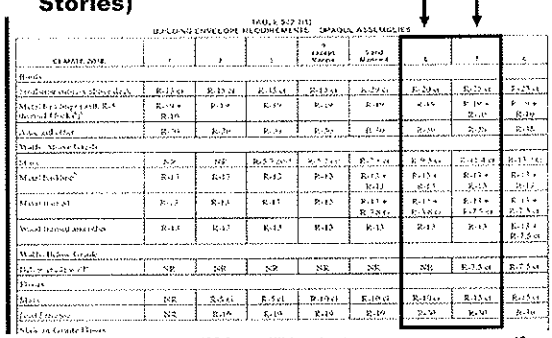
- Designer's may NOT mix & match—ie. lighting controls from ASHRAE, lighting allowances from IECC. The design must be COMPLETELY based on either the IECC or ASHRAE for that 1 topic.
  - Designer to clearly designate on plans. Dept. review will default to IECC, unless designer indicates otherwise.

Ch. 5 Commercial Bldgs (Any Height) & High Rise Residential Buildings (≥ 4 Stories) IECC 501 & Comm 63.0501

- **ALL** of the following rules shall apply regardless of whether the IECC ch. 5 or ASHRAE 90. 1 Standard is used to determine compliance:
  - Comm 63.0503 (1) relating to design loads
  - Comm 63.0503 (7) & (8) relating to economizers
  - Comm 63.0505 relating to lighting systems
  - IECC 505.2.2.1 relating to duel switching



Ch. 5 Commercial Bldgs (Any Height) & High Rise Residential Buildings (≥ 4 Stories)

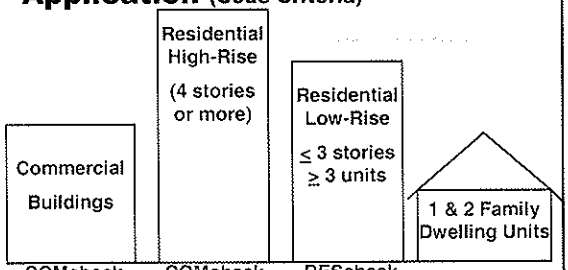


Prescriptive Requirements

IECC 502.1.1, Table 502.3

- For buildings ≤ 40% glazing to gross wall area; and skylight area ≤ 3% of the roof area
- Minimal calculations

Computerized Compliance Application (Code Criteria)



Building Envelope Calculations Must be Submitted with Building Plans

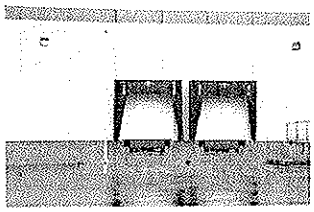
COMM 61.31(2)(e)

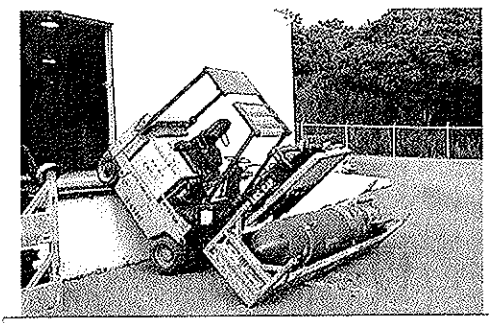
- Signed Printout from ***COMcheck,*** *or*
- Signed Printout from ***REScheck*** for Residential Buildings (≤ 3 stories), or
- Signed comparison of R-values, U-Factors, or UA Totals.
- **Ensure that calculations PASS**
- ***Professional Stamp Req'd if bldg is > 50,000 cubic ft (Architectural or Professional Engineer ONLY)***

Loading Dock Weather Seals

IECC 502.4.5

- Cargo doors & loading dock doors shall be equipped with weather seals to restrict infiltration when vehicles are parked in the doorway. Not req'd if adjacent to unconditioned spaces w/insulated separations





Always think ahead..... It's easier than dealing with difficulties after the fact.....

Vestibules

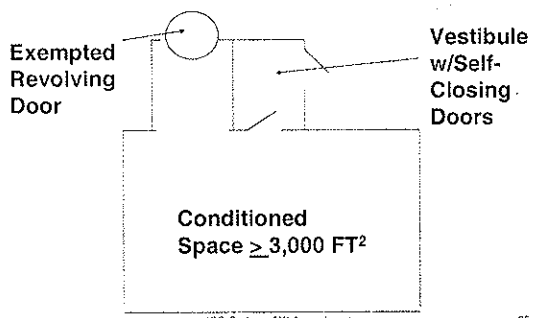
IECC 502.4.6, Comm 63.0002

Vestibules on "**Primary**" Entrance Doors

- Req'd to reduce infiltration into spaces
- Req'd on entrance doors leading into spaces ≥ 3,000 ft^2
- Doors **MUST** have self-closing devices
- Exceptions
  - Doors from a guest room or dwelling unit
  - Doors used primarily for vehicular movement, materials handling & adjacent personnel doors
  - Not req'd if adjacent to unconditioned spaces w/insulated separations to conditioned spaces

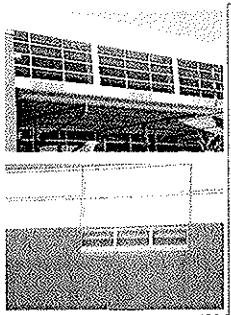
Vestibules

IECC 502.4.6



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 a motorized damper, the damper shall meet:

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

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

Pool Requirements

IECC 504.7

- Pool heaters to have on/off switch. Heaters using natural gas shall NOT have continuously burning pilot lights.
- Time switches req'd that can be used on heaters and pumps to turn equipment on/off based on a preset schedule—Exceptions

Mechanical Equipment Efficiencies

IECC 503.2.2.3 (1) through (11), Table 504.2

- Minimum efficiencies for air conditioners & heat pumps, furnaces, boilers, condensing units, centrifugal chillers, heat rejection equipment, & water heaters must be met
- Efficiencies are based on AFUE, HSPF, SEER, EER, COP, IPLV, etc.
- NOTE: Any "new" equipment placed in a commercial building must meet these minimum requirements (alteration)

Mechanical Equipment Efficiencies

IECC 503.2.2.3 (1) through (11), Table 504.2

TABLE 503.2.3(1)
UNITARY AIR CONDITIONERS AND CONDENSING UNITS, ELECTRICALLY OPERATED, MINIMUM EFFICIENCY REQUIREMENTS

EQUIPMENT TYPE	SIZE CATEGORY	SUBCATEGORY OR RATING CONDITION	MINIMUM EFFICIENCY[1]	TEST PROCEDURE[1]
Air Conditioners, Air Cooled	< 65,000 Btu/h[2]	Split system	13.0 SEER	AHRI 210/240
		Single package	13.0 SEER	
	≥ 65,000 Btu/h and < 135,000 Btu/h	Split system and single package	11.3 EER[3] (before Jan 1, 2010)	
	≥ 135,000 Btu/h and < 240,000 Btu/h	Split system and single package	9.7 EER[3] (before Jan 1, 2010)	
			11.0 EER[3] (as of Jan 1, 2010)	
	≥ 240,000 Btu/h and < 760,000 Btu/h	Split system and single package	9.5 EER[3] 9.7 IPLV (before Jan 1, 2010)	
			10.0 EER[3] 9.7 IPLV (as of Jan 1, 2010)	
	≥ 760,000 Btu/h	Split system and single package	9.2 EER[3] 9.4 IPLV (before Jan 1, 2010)	
			9.7 EER 9.4 IPLV (as of Jan 1, 2010)	

Note 13.0 SEER Requirements, etc.

Requires higher efficiencies for unitary AC & condensing units in Table (1)

Energy Recovery Ventilation

IECC 503.2.6

- Required to be installed for individual fan systems w/supply air ≥ 5,000 cfm **AND** minimum outside air supply ≥ 70% are required to have an energy recovery system.
- Exceptions
- **NOTE**—Use of a energy recovery system will NOT be recognized as having met the Economizer requirements of the code.

Energy Recovery Ventilation

IMC 514, Comm 64.0514

- Prohibited Applications:
  - Hazardous exhaust system per IMC 510
  - Dust, stock & refuse that convey explosive/flammable vapors, fumes or dust
  - Smoke control systems covered in IMC 513
  - Commercial kitchen exhaust systems serving Type I & Type II hoods
  - Clothes dryer exhaust systems covered in Section 504
    - Exception: An engineered energy recovery ventilation system design may be used in the systems specified in IMC section 514.2 provided that corrosion, cross contamination & fouling are addressed by the engineered system

Duct Insulation Requirements

Comm 63.0403(2), Comm 63.0503(5), IECC 503.2.7

- Ducts outside the building envelope or within a building envelope assembly require a minimum of R-8 insulation (inclusive of underground ducts)
- Ducts in unconditioned spaces, shall be insulated to minimum of R-4

Duct Sealing

IECC 503.2.7.1

- Low (≤ 2" w.g.), Medium (> 2" but < 3" w.g.), and High pressure (≥ 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**

Duct Sealing

IECC 503.2.7 (Commercial bldgs & residential > 3 stories)

- Labeling for approved mastics and tapes

Sealant/ Duct Connection Type	UL Listing
Pressure Sensitive Tape	181A-P
Mastic	181A-M
Heat Sensitive Tape	181A-H
Flexible Air Ducts - Pressure Sensitive Tape	181B-FX
Flexible Air Ducts - Mastic	181B-M

Piping Insulation

IECC 503.2.8

Table redone with R-values = (1/k value) x minimum pipe insulation thickness (inches)

Commercial: All piping serving heating or cooling system must be insulated in accordance with Table 503.2.8 shown

MINIMUM PIPE INSULATION[a]
(thickness in inches)

FLUID	NOMINAL PIPE DIAMETER ≤ 1.5"	NOMINAL PIPE DIAMETER > 1.5"
Steam	R- 5.5	R-11
Hot water	R- 3.7	R- 7.4
Chilled water, brine or refrigerant	R- 3.7	R- 5.5

Economizers
IECC/COMM Table 63.0503

- Unless a listed exception is met, Economizers are required for
  - Split systems & groundwater source systems **≥ 54,000 Btu/h**
    Split Systems (furnace & condensor similar to those found in homes, small businesses)
  - All other systems **≥ 33,000 Btu/h**
    - Rooftop units, built-up VAV reheat/single fan dual duct, etc.

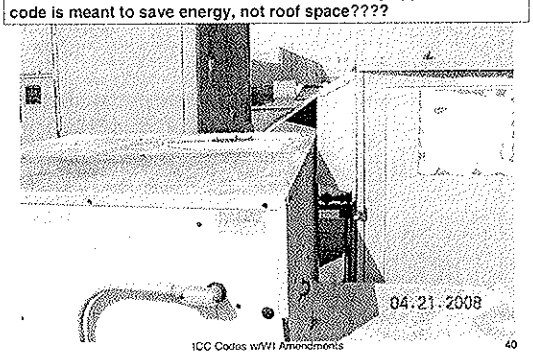
Economizers
IEBC/COMM 66.0300, 66.0607, 66.0711, 66.0808
IECC/COMM Table 63.0503

- Rooftop fan systems that replace existing fan systems shall be provided with economizers that comply with Ch. 63 requirements for new construction (per International Existing Building Code)
- **NOTE**—Use of an energy recovery system will NOT be recognized as having met the Economizer requirements of the code.

Economizers
IEBC/COMM 66.0300, 66.0607, 66.0711, 66.0808
IECC/COMM Table 63.0503

- "Where a single room or space is supplied by multiple air systems, the **aggregate** capacity of those systems shall be used in applying the requirement" (ie. for economizers)
  - If the room is served by 2 split furnace/condensor systems, the total cooling capacity for the aggregate systems are referenced when determining when an economizer is required to be installed

Service clearance problem??? Nice "custom" economizer hood field cut so it could be installed next to the nearby appliance. The code is meant to save energy, not roof space????



Hydronic Systems Controls
IECC 503.4.3

- Multiple-staged boilers require automatic controls capable of sequencing operation.
- Systems comprised of a single boiler >500,000 Btu/h input design capacity shall include either a multi-staged or modulating burner.

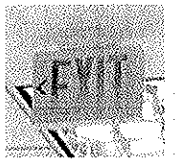
Hydronic Systems Controls-- Part Load Controls IECC 503.4.3.4

- Hydronic systems ≥ 300,000 btu/hr in design output capacity supplying heated/chilled water to have special controls.
  - Temperature to be capable of being reset, by 25% of the design supply-to-return water temperature difference.
  - Capable of reducing system pump flow by 50% of design flow utilizing adjustable speed drives on pumps where 1/3 of total horsepower is automatically turned off or modulated

Exit Signs

IECC 505.4

This Sign Uses ¼ Watt!!



- Internally illuminated exit signs shall not exceed ***5 watts.***
  - The code is requiring use of LED assemblies (Energy Star Listed Units)
  - The requirement essentially eliminates fluorescent & incandescent type units.

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-See Comm 41)
- Ch. 11 Refrigeration (NA-See Comm 45)
- Ch. 12 Hydronic Piping
- Ch. 13 Fuel Oil Piping & Storage
- Ch. 14 Solar Systems (See also COMM 71)

HVAC on Roofs & Elevated Structures

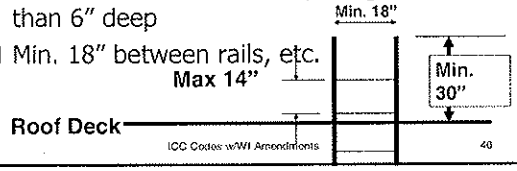
IMC 306.5

- 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 shall extend above the parapet or roof edge ≥ 30"
- Ladders shall have rung spacing not to exceed 14" on center, w/min. ¾" diam.
- Ladders shall have a toe spacing not less than 6" deep
- Min. 18" between rails, etc.



Design Requirements

IMC 309.1 & 312.1 / COMM 63.0302 & 64.0309

- Minimum Exterior Design Temperatures found in Comm Table 63.0302
- Minimum Inside Temperature for Winter Design to be 60, **68**, or 70°F (Based on Occupancy) See Comm Table 64.0309
- Maximum Inside Temperature for Summer Design to be no lower than 75°F (**Only** if Lowering Air Changes)
- No Maximum on Equipment Size

Intake Opening Locations

COMM 64.0401(4)

- Outside air intakes minimum 10' HORIZONTALLY from hazardous or noxious contaminant source, except where the opening is ≥ 2 ft below the contaminant source;
  - Exception: Exhaust from bathrooms or kitchens in residential dwellings shall not be considered to be hazardous or noxious contaminant

Intake Opening Locations
IMC 202, 401.4

- Exhaust outlets for "environmental air" exhaust openings shall be located ≥ 3 ft from property lines and > 3 ft from openings into the building
  - "Environmental air" –Air that is conveyed to from occupied areas through ducts which are not part of the heating or air-conditioning system, such as ventilation for human usage, domestic kitchen range exhaust, bathroom exhaust and domestic clothes dryer exhaust

Intake Opening Locations
COMM 64.0401(4)(a) & (b)(2)

- *Exception involving a minimum 12" if the exhaust is ≤ 100 cfm is* ***REMOVED***
- Air intake to be a minimum 12" above adjoining grade, roof surface or areaway

Exhaust Requirements
IMC 401.3, 501.3, Comm Table 64.0403

- Table 64.0403
- Ventilation (inclusive of exhausts) shall be provided during the periods that the room or space is occupied.

Enclosed Parking Garage
IMC 404 / COMM Table 64.0403 Footnote d, 64.0404

- Must be < 30% open area in total wall area
- Min. 0.5 cfm/sf continuous Intermittent--
  - Operate min. of 5 hrs/day
  - Maintain < **35** ppm CO & < 1 ppm NO_2
  - Maintain Negative/Neutral Pressure

Enclosed Parking Garage
IMC 404, Comm 64.0404

- New Option:
  - Continuously exhaust 0.05 cfm/sf during non-occupied times of the enclosed parking garage
  - Increase exhaust rate to 0.5 cfm/sf during vehicle operation or the presence of occupants.
  - Plans shall be explicate on method by which the system will automatically operate.

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 "Grease Duct Enclosure" can meet ASTM E 2336 and have the proper "F" & "T" ratings (UL YYET listing is no longer viable)

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

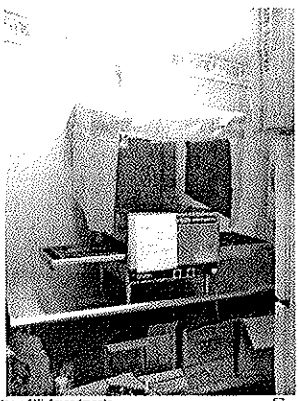
- BEWARE: **2 layers** of wrap material may be required to attain a 1 or 2 hour fire enclosure rating --Refer to material listing
- Many wraps are listed as allowing "'zero' clearance to combustibles". The listing MUST be followed before this clearance reduction is recognized as acceptable. ***DESIGNER/Contractor responsible for information distribution!!***

Type I Kitchen Hood Operating Requirements

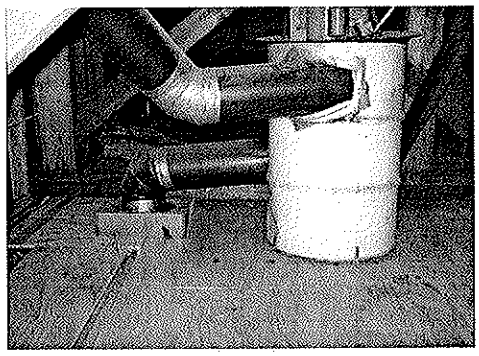
IMC 507.2.1.1

- 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

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



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



Metal Duct Construction

IMC 603.17, IBC 1210.1

- Diffusers, registers and grilles shall be **PROHIBITED** in the floor or its upward extension (ie 6" above the floor) within toilet and bathing room floors required by the International Building Code to have smooth hard, nonabsorbent surfaces.
- Exception: Dwelling units.

Hydronic Piping

IMC Ch. 12

- Acceptable pipe, fittings, joints & connections, pipe insulation, valves, general piping installation, transfer fluid, tests, & embedded piping requirements are now addressed.

International Fuel Gas Code (IFGC) Breakdown

- Ch. 1 Administration
- Ch. 2 Definitions
- Ch. 3 General Regulations
- Ch. 4 Gas Piping Installations
- Ch. 5 Chimneys and Vents
- Ch. 6 Specific Appliances
- Ch. 7 Gaseous Hydrogen Systems
- Ch. 8 Referenced Standards

Combustion Air From Inside the Building

IFGC 304.5

- Two (2) Methods for Combustion Air from within the Building are acceptable:
  - **Standard Method**
  - **Known Air-Infiltration Rate Method** (Req'd to be used with bldgs with a known infiltration rate ≤ 0.40 air changes per hour)
- Both methods address the sum of required air volume calculated for all appliances located within the space.

Combustion Air From Inside the Building

IFGC 304.5.1

- **Standard Method**
  - The minimum required volume shall be 50 cubic ft/1,000 Btu/h of the appliance input rating.

Elevation of Ignition Sources

IFGC 305.3

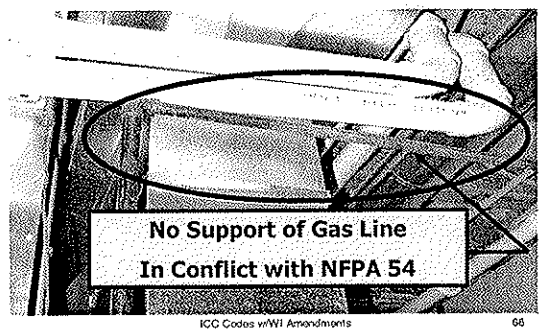
- Equipment & appliances w/ ignition sources shall be elevated ≥ 18" above the floor. **Exception** if appliance is listed as **flammable vapor ignition resistant** (This is NOT necessarily a Direct Vent Sealed Combustion Appliance)
- Locations include hazardous areas, public/private garages, repair garages automotive service stations & parking garages
- All designs have a *temperature sensor to shut down the heating unit.* An abnormal situation, creating a "shut down" condition, can be caused by the accumulation of LDO, ignition of flammable vapors, inadequate make-up air for combustion, or inadequate exhaust venting.

Chimney Vents

IFGC 501.15, 503.5.6

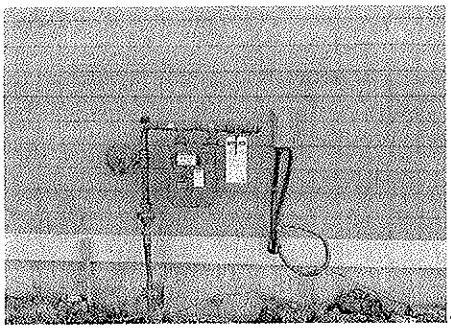
- Cleanouts required
- Must be in good working order. Inspection required by contractor/designer.
  - If an appliance is **added** to, or **removed** from, an existing chimney or vent, the process of the "new" installation for the chimney or vent shall comply with IFGC 501.14.1 through 501.15.4 **(ie. the chimney liner shall be replaced as applicable to the change of use)**

Gas Piping Support IFGC 407



Gas Meter to be Located at Least 3 ft from Sources of Ignition

IFGC Ch. 4 / NFPA 54-5.7.2.3



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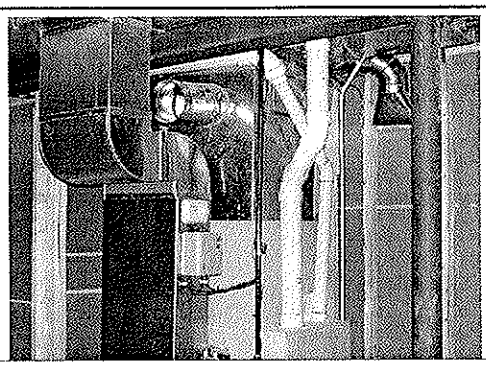
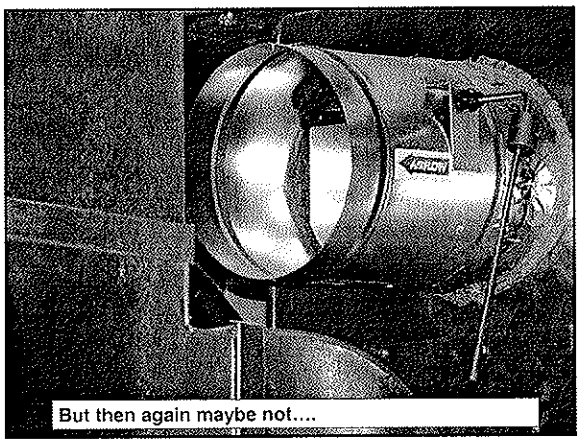
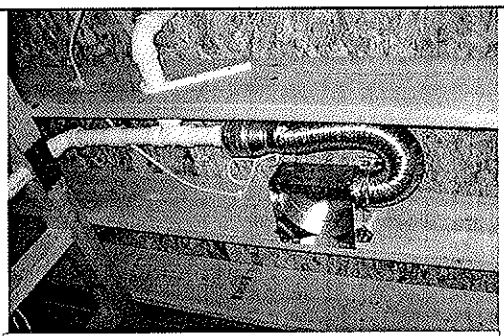


Space can be can an issue, but good judgment must prevail

ICC Codes w/WI Amendments 68

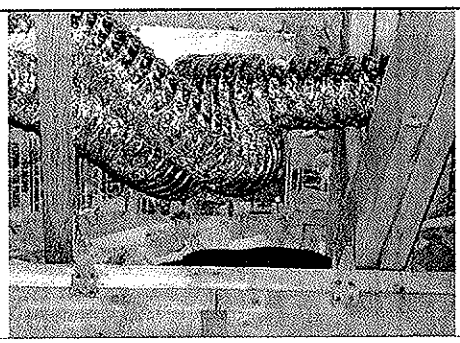


But then again maybe not....



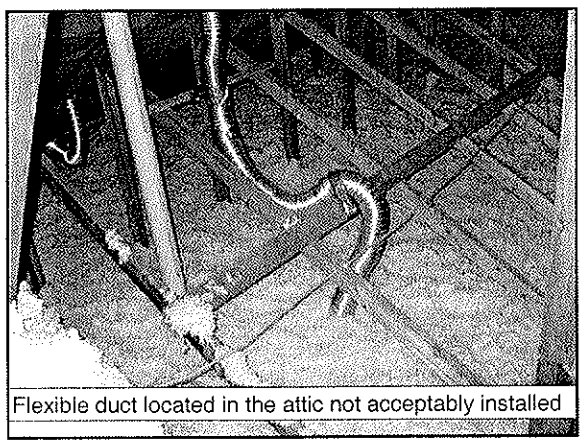
This was a plumbing vent that was "integrated" with a bathroom exhaust fan duct

ICC Codes w/WI Amendments 70

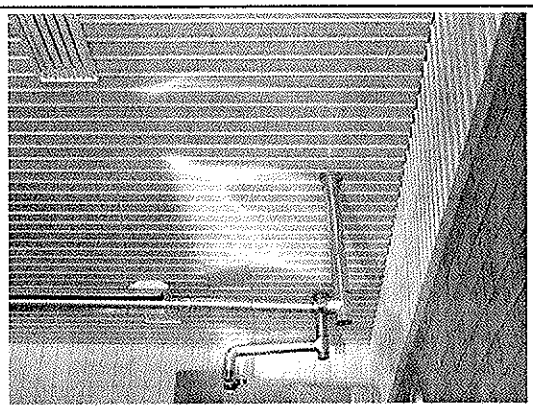


There are times that you simply do not have enough space....

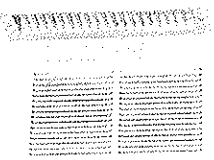
ICC Codes w/WI Amendments 71



Flexible duct located in the attic not acceptably installed



Here's a brilliant idea: Keep the supply & return registers close together so the hot air can flow freely back to the furnace.



Questions?