Chapter ILHR 64

HEATING, VENTILATING AND AIR CONDITIONING

Note: Chapter Ind 59 as it existed on December 31, 1975 was repealed and a new chapter Ind 64 was created effective January 1, 1976. Chapter Ind 64 was renumbered to be chapter ILHR 64 effective January 1, 1984.

Part I—Scope

ILHR 64.01 Scope. All heating, ventilating and air conditioning systems shall be designed, installed, maintained and operated so as to provide the service and results required within the provisions of this chapter. The minimum requirements established in each part of this chapter shall be complied with as they apply to that specific public building or place of employment. The administrative rules pertaining to energy conservation may be applied retroactively to existing buildings.

Note: Compliance with this code shall not constitute assurance of proper installation or operation of the heating, ventilating and air conditioning system. This code is not to be used as a design manual, but it is established as a minimum standard for safety, health and general welfare of the public.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. Register, December, 1976, No. 252, eff. 1-1-77.

ILHR 64.02 Approval of drawings and specifications. All drawings and specifications shall be submitted to the department in accordance with the provisions of ss. ILHR 50.07 and 50.12.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. Register, December, 1976, No. 252, eff. 1-1-77.

Part II—Design Requirements

ILHR 64.03 Design. (1) BUILDING HEAT LOSS. The total building heat loss shall be equal to the sum of the building transmission losses and infiltration or ventilation losses, whichever are greater.

(2) HEATING SYSTEM DESIGN. The primary heating system intended to maintain the inside design temperature of s. ILHR 64.05 (1) shall be designed to equalize building transmission losses and infiltration or ventilation losses during occupied periods. Credit will be given for internal heat gains against the total design loss of the heating system, provided the heat gains are demonstrated by the designer.

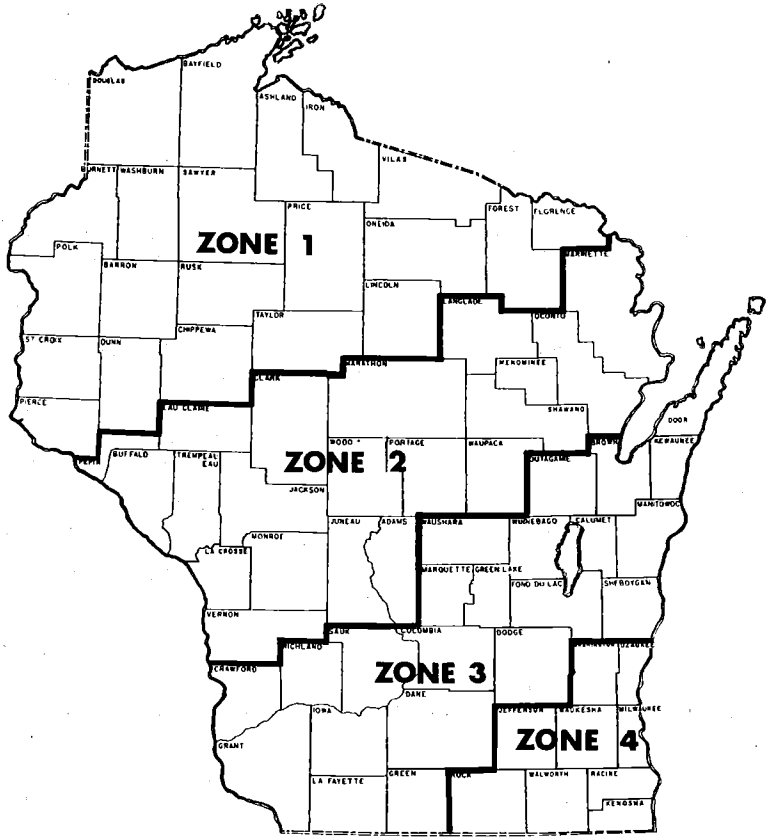
(3) CAPACITY AND ARRANGEMENT. The calculated capacity and the arrangement of all installations for required heating and ventilating shall be based upon simultaneous service to all parts of the building unless otherwise exempted by this code.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (1) and (2)(a), Register, January, 1980, No. 289, eff. 2-1-80; am. (2), Register, December, 1981, No. 312, eff. 1-1-82.

ILHR 64.04 Outside temperature design conditions. In the accompanying map, the state of Wisconsin has been divided into 4 zones. The maximum heat losses for a heating system shall be calculated on the basis of the outdoor temperatures indicated on the map with reference to location of the project.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

MAP OF WISCONSIN SHOWING DESIGN TEMPERATURE ZONES



Zone 1 . . . . . -25° below zero F
Zone 2 . . . . . -20° below zero F
Zone 3 . . . . . -15° below zero F
Zone 4 . . . . . -10° below zero F

ILHR 64.05 Inside design temperatures and ventilation requirements. (1) INSIDE DESIGN TEMPERATURES. The heating system shall be designed to maintain a temperature of not less than that shown in Table 1 and must be operated at not less than that temperature during occupied periods.

(a) *Spot heating.* Spot heating may be used to heat individual fixed work stations in large industrial buildings where it is impractical to provide heat to the entire space as described in (1) above, provided the inside design temperature at the fixed work station is at least 60° F.

(2) VENTILATION REQUIREMENTS. The ventilating system shall be designed, maintained and operated to accomplish the required ventilation indicated in Table 1.

(a) *Outdoor air requirement waived.* If a mechanical air supply system is provided and the requirement for outdoor air determined in accordance

with Table 1 is less than 5% of the code required air movement of 6 air changes per hour, the requirement for outdoor air may be eliminated.

(b) *Outdoor air requirement and percent of openings waived.* The requirement for outdoor air or percent of openings may be omitted in large volume spaces containing 5,000 cubic feet per occupant.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; cr. (1) (a), (2) (a) and (b), Register, December, 1976, No. 252, eff. 1-1-77; am. (2) (b), Register, December, 1978, No. 276, eff. 1-1-79; am. table, Register, August, 1985, No. 356, eff. 1-1-86.

ILHR 64.06 Mechanical ventilation systems. (1) DEFINITION. Mechanical ventilation is the process of supplying a mixture of tempered outside air or simultaneously removing contaminated air to the outside by power-driven fans or blowers or both.

(2) DESIGN. Mechanical ventilation systems shall be designed to supply a continuous source of outside air to all occupied areas during occupancy. Exhaust ventilation in equal volume shall be maintained simultaneously.

(3) AIR MOVEMENT. The air movement may be based on actual room height or up to 10 feet from the floor level of the room in question. The volume above 10 feet, in rooms which are more than 10 feet in height, need not be considered in the air change requirement if the required air change is designed to occur in the lower 10 feet of the occupied space.

(a) *Six air changes per hour.* The total air movement for all occupancies shall be at least 6 air changes per hour as specified in Table 1 of s. ILHR 64.05.

(b) *Less than 6 air changes per hour.* An air movement of less than 6 air changes per hour will be permitted where mechanical cooling (air conditioning) is provided and the heat gain requirement for the space has been satisfied.

(c) *Air movement requirement wavied.* The air movement requirement for 6 air changes per hour may be omitted in the following applications:

1. Spot heating.

2. Buildings where the requirement for outside air is waived in accordance with s. ILHR 64.05(2)(b).

3. Buildings utilizing percentage of openings as specified in s. ILHR 64.05, Table 1.

(4) AIR DISTRIBUTION. An adequate number of air supply, return and exhaust outlets or grilles shall be provided to insure a uniform distribution of air.

(5) RECIRCULATION AND TRANSFER OF AIR. (a) *Recirculation.* No air contaminated by any source other than human occupancy shall be recirculated, except within the same ventilation classification.

ILHR 64.05 TABLE 1

Use or Occupancy	Minimum Inside Temp. (Deg. F)	Ventilation Requirements[1]				Applicable Occupancy Code Section [ILHR No.]
		Ventilation Classification[2]	Basis of Capacity: Determination of No. of Persons[3] Net sq. ft. per person	Basis of Capacity: Percent of Openings[4]	Basis of Capacity: CFM/net sq. ft. Floor Area	
Factories, office and mercantile buildings						
Barber and beauty salons	67	(b)	20	3	—	64.54
(where hair spray is used)	67	(d)	20	—	—	64.18
Canning factories	60	(b)	75	3	—	64.54, 64.68
Conference rooms	67	(b)	7	3	—	64.54
Court rooms	67	(b)	6	3	—	64.54
Factories and machine shops	60	(b)	75	3	—	64.54
First aid rooms	67	(b)	6	3	—	64.54
Flammable liquids storage	NMR	(d)	—	—	—	64.18
Foundries and boiler shops	50	(b)	75	3	—	64.13, 64.54
Funeral homes:						
Chapel	67	(b)	6	3	—	64.54
Embalming room	67	(d)	—	—	2	64.54
Offices	67	(b)	75	3	—	64.54
Places of worship, entertainment and recreation which accommodate less than 100 persons	†	(b)	†	3	—	64.54
Printing establishments	60	(b)	—	3	—	64.18, 64.54
Retail establishments (basement)	65	(b)	40	3	—	64.54
(other floors)	65	(b)	60	3	—	64.54
Shopping malls corridor areas (except mercantile areas)	NMR	(g)	Aggregate capacity of stores served by mall	—	—	64.54
Security vaults (occupied)	65	(a)	300	—	—	64.54
Warehouses	NMR	—	—	—	—	64.18, 64.54
Theaters and places of assembly (which accommodate more than 100 persons)						
Arenas and field houses (use seated area)	60	(a)	6	—	—	64.55
Armory drill floors	55	(b)	30	3	—	64.55
Assembly halls (other than church)	67	(a)	6	—	—	64.55
Bowling alleys	67	(a)	15	—	—	Based on occupied areas
Cafeterias, dining areas, restaurants, billiard rooms	67	(a)	15	—	—	64.55
Churches and places of worship:						
Chapels	67	(b)	6	3	—	64.55 (3)
Dining and social rooms	67	(b)	15	3	—	64.55 (3)
Nave or auditorium	67	(b)	6	3	—	64.55 (3)
Sunday school rooms	67	(b)	20	3	—	64.55 (3)
Club rooms (seated)	67	(a)	6	—	—	64.55
(unseated)	67	(a)	15	—	—	64.55
Dance halls	67	(a)	15	—	—	64.55
Ice skating rinks (indoor)	NMR	(a)	15	—	—	64.55
Ice resurfacing (indoor)	NMR	(d)	—	—	—	64.18, 64.55
Lodge halls	65	(a)	15	—	—	64.55
Roller skating rinks (indoor)	50	(a)	15	—	—	64.55
Taverns	67	(a)	20	—	—	64.55
Tennis courts (indoor)	60	(a)	—	—	—	64.55
Theaters	67	(a)	6	—	—	64.55
Lobbies	65	(a)	15	—	—	64.55
Lounge rooms	67	(a)	15	—	—	64.55
Motion picture booths	60	(a) or (c)	—	—	2	64.55 (5)
Health Care Facilities				See ILHR 64.57		

CA = Cooking appliance.
LF = Lineal foot.
NMR = No minimum requirements.
TF = Toilet facilities (water closets and urinals).
†See Theaters and places of assembly for inside design temperature and net square feet per person.

[1]Ventilation requirements. See ss. ILHR 64.06, 64.07 and 64.08 for mechanical, natural and exhaust ventilation systems; and ss. ILHR 64.11 to 64.18 for ventilation and air standards.

[2]Ventilation classifications.

(a) Requires a supply of outside air and an equal amount of exhaust ventilation be provided at the rate of 5 CFM per person and a minimum air movement of 6 air changes per hour.

(b) Requires a supply of outside air and an equal amount of exhaust ventilation be provided at the rate of 5 CFM per person and a minimum air movement of 6 air changes per hour, or a percentage of openings.

(c) Requires a supply of outside air and exhaust ventilation determined on the basis of CFM per square foot of floor area.

(d) Requires exhaust ventilation determined on the basis of CFM per square foot of floor area. The area shall be provided with negative pressure relative to adjacent areas. A supply of outside air is required when the total building exhaust exceeds one air change per hour, unless otherwise exempted. In multiple-use occupancies, the area of each occupancy shall be considered separately.

(e) Requires a supply of outside air and exhaust ventilation determined on the basis of CFM per square foot of floor area. The area shall be provided with a negative pressure relationship with respect to the adjacent areas.

(f) Requires a percentage of openings.

(g) Does not require a separate supply of outside air provided the outside air introduced in the store areas adjacent to the mall is circulated through and exhausted from the shopping mall corridor area.

[3]Determination of number of persons. In determining the number of occupants in a given space, the department will accept the net square feet per person as listed in Table 1 or the actual number of persons, provided the expected occupancy is indicated on the plans and is reasonable. Where no value is indicated for net square feet per person, the actual number of occupants shall be used to determine the required amount of outside air.

[4]Percent of openings. See ss. ILHR 64.07 for special considerations on natural ventilation.

ILHR 64.05 TABLE 1 (CONTINUED)

Use or Occupancy	Minimum Inside Temp. (Deg. F)	Ventilation Requirements[1]					
		Ventilation Classification[2]	Basis of Capacity				Applicable Occupancy Code Section (ILHR No.)
			Determination of No. of Persons[3] Net sq. ft. per person	Percent of Openings[4]	CFM/net sq. ft. Floor Area		
Schools and other places of instruction							
Administrative office space	67	(b)	75	3	—		64.56
Arts, crafts, drafting rooms	67	(a)	30	—	—		64.56
Classrooms	67	(a)	20	—	—		64.56
Gymnasiums, field houses, auditoriums, theaters (fixed seats)	67	(a)	6	—	—		64.56
Bleachers	—	(a)	2.75 or 18"/LF	—	—		64.56
Locker and shower rooms	70	(c) or (d)	—	—	2		64.65
Gymnasiums, field houses, auditoriums theaters (nonseated areas)	55	(a)	75	—	—		64.56
Home economics	67	(a)	30	—	—		64.56
(cooking)	67	(d)	—	—	200/CA		64.67
Kitchens	60	(c) or (d)	—	—	2		64.67
Laboratories (science)	67	(a)	30	—	—		64.18
Lecture halls	67	(a)	6	—	—		64.56
Library and resource centers	67	(a)	20	—	—		64.56
Reading rooms	67	(a)	20	—	—		64.56
Stack areas	67	(a) or (d)	100	—	1/4		64.56
Lunchrooms	65	(a)	10	—	—		64.56
Museums and art galleries	67	(a)	40	—	—		64.56
Music rooms (instrumental)	67	(a)	20	—	—		64.56
(vocal)	67	(a)	10	—	—		64.56
Special education	67	(a)	35	—	—		64.56
Study halls, common areas with nonfixed seating	67	(a)	10	—	—		64.56
Toilet rooms	65	(d)	—	—	2 or 60/TF		64.65
Vocational shops:							
With vehicle service and repair	60	(c) or (d)	—	—	3/4		64.18
Without vehicle service and repair	60	(a)	50	—	—		64.18
Wardrobes	NMR	(d)	—	—	2		64.65
Detention and correctional facilities							
Sleeping rooms	67	(b)	—	4	—		64.58
Residential occupancies							
Living and sleeping areas	67	(f)	—	4	—		64.59
Day care facilities	67	(b)	35	4	—		64.60
Garages and service stations							
Automobile showrooms:							
Less than 6 vehicles	60	(b)	—	3	—		64.64
6 or more vehicles	60	(c) or (d)	—	—	1/2		64.64
Garages: less than 6 vehicles	NMR	(b)	—	3	—		64.62, 64.63
Garages: 6 or more vehicles	NMR	(c) or (d)	—	—	1/2		64.63
Repair areas	60	(c) or (d)	—	—	3/4		64.61
Vehicle service buildings	60	(c) or (d)	—	—	1/2		64.62
General sanitation and service areas							
Chlorine storage rooms	NMR	(d)	—	—	1		64.65
Janitor closets	NMR	(d)	—	—	2		64.65
Locker rooms and shower rooms	70	(c) or (d)	—	—	2		64.65
Toilet rooms	65	(d)	—	—	2 or 60/TF		64.65
Toilet rooms (w/outdoor stadium)	50	(d)	—	—	2 or 60/TF		64.65
Laundries	60	(c)	—	—	2		64.65
Natatoriums	76	(c)	—	—	1 or 2/ pool sf		64.66
Kitchens	60	(c) or (d)	—	—	2		64.67
Seasonal occupancies							
Camps and lodges:							
Dining and recreational areas	NMR	(b)	15	3	—		64.68
Living and sleeping areas	NMR	(f)	—	4	—		64.68
Club houses	NMR	(b)	15	3	—		64.68
Drive-ins	NMR	(b)	15	3	—		64.68
Kitchens	NMR	(c) or (d)	—	—	2		64.67
Outdoor toilets	NMR	(d)	—	—	2		64.65

CA = Cooking appliance.
LF = Lineal foot.
NMR = No minimum requirements.
TF = Toilet facilities (water closets and urinals).
†See Theaters and places of assembly for inside design temperature and net square feet per person.

[1]Ventilation requirements. See ss. ILHR 64.06, 64.07 and 64.08 for mechanical, natural and exhaust ventilation systems; and ss. ILHR 64.11 to 64.18 for ventilation and air standards.

[2]Ventilation classifications.

(a) Requires a supply of outside air and an equal amount of exhaust ventilation be provided at the rate of 5 CFM per person and a minimum air movement of 6 air changes per hour.

(b) Requires a supply of outside air and an equal amount of exhaust ventilation be provided at the rate of 5 CFM per person and a minimum air movement of 6 air changes per hour, or a percentage of openings.

(c) Requires a supply of outside air and exhaust ventilation determined on the basis of CFM per square foot of floor area.

(d) Requires exhaust ventilation determined on the basis of CFM per square foot of floor area. The area shall be provided with negative pressure relative to adjacent areas. A supply of outside air is required when the total building exhaust exceeds one air change per hour, unless otherwise exempted. In multiple-use occupancies, the area of each occupancy shall be considered separately.

(e) Requires a supply of outside air and exhaust ventilation determined on the basis of CFM per square foot of floor area. The area shall be provided with a negative pressure relationship with respect to the adjacent areas.

(f) Requires a percentage of openings.

(g) Does not require a separate supply of outside air provided the outside air introduced in the store areas adjacent to the mall is circulated through and exhausted from the shopping mall corridor area.

[3]Determination of number of persons. In determining the number of occupants in a given space, the department will accept the net square feet per person as listed in Table 1 or the actual number of persons, provided the expected occupancy is indicated on the plans and is reasonable. Where no value is indicated for net square feet per person, the actual number of occupants shall be used to determine the required amount of outside air.

[4]Percent of openings. See ss. ILHR 64.07 for special considerations on natural ventilation.

(b) *Transfer.* Air in a volume equal to the outside air required for a room may be transferred through a corridor and exhausted through a locker room, toilet room, kitchen, janitor closet or a similar area. Air shall not be transferred through elevator shafts and stairwells where doors are required at any floor level.

(6) DIVERSIFIED MECHANICAL SYSTEMS. If the mechanical ventilation system is able to deliver required quantities of outside air to each area when needed, the department will recognize diversity and the system may be designed on the actual occupancy.

Note #1: This rule permits the opening of outside air intakes in schools, offices and retail establishments to be delayed one hour after initial occupancy and permits the closing of outside air openings one hour prior to the termination of the occupancy.

Note #2: See ch. Ind 1000-2000, Safety & Health Code, for requirements for dust, fumes, vapors and gases.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; renum. (3) to be (6), renum. 64.15 (2) to be (3), 64.15 (3) to be (4), cr. (3) (c) and (5), Register, December, 1976, No. 252, eff. 1-1-77; am. (3)(c)2., Register, January, 1980, No. 289, eff. 2-1-80; am. (3) (c) 3., Register, December, 1981, No. 312, eff. 1-1-82.

ILHR 64.07 Natural ventilation system. (1) OUTDOOR OPENINGS. Outdoor openings used for natural ventilation shall be within 100 feet, or 5 times the least dimensional width of the occupied area, whichever is the least.

(a) *Outdoor openings located below grade.* Outdoor openings below grade will not be accepted unless there is a clear space outside of the opening having a width not less than 1½ times the distance below grade at the bottom of the opening.

Note: Width of clear space is the horizontal distance measured at right angles to the plane of the opening.

(b) *Outdoor openings located from a property line.* Outdoor openings shall be at least 5 feet from a property line or lot line or both or an adjacent building on the same property. This distance restriction does not apply to property lines along streets.

Note: For further restrictions, see Table 51.03-B and s. ILHR 64.19.

(2) VESTIBULE OPENINGS. Vestibule type openings may be used to satisfy the requirements specified in sub. (1) only for the areas of the building into which the vestibule opens.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; cr. (2), Register, December, 1981, No. 312, eff. 1-1-82.

ILHR 64.08 Exhaust ventilation system. (1) DEFINITIONS. (a) *Exhaust ventilating system.* Any combination of building construction, machinery, devices or equipment, designed and operated to remove harmful gases, dusts, fumes or vitiated air from the breathing zone of employes and frequenters. FP

(b) *Gravity exhaust ventilation.* A process of removing air by natural means, the effectiveness depending on atmospheric condition, such as difference in relative density, difference in temperature or wind motion.

(2) DESIGN. Exhaust ventilating systems shall be designed to reasonably prevent contaminated air from reentering the building.

(3) OPERATION. The required building exhaust ventilating systems shall operate continuously during periods of occupancy.

(4) EXHAUST VENTS. All exhaust vents shall be ducted to the exterior of the building.

(5) GRAVITY SIPHON-TYPE ROOF VENTILATORS. (a) Except as provided in par. (b), gravity siphon-type roof ventilators shall be sized to provide a free area so that the velocity of the air does not exceed 300 feet per minute.

(b) The allowable velocity specified in par. (a) may be increased to 600 feet per minute provided the outside air is supplied by mechanical means.

Note: Heat reclaim equipment for exhaust systems having more than 10,000 CFM capacity should be considered for energy savings.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; cr. (4), Register, December, 1976, No. 252, eff. 1-1-77; cr. (5), Register, December, 1983, No. 336, eff. 1-1-84.

FP **ILHR 64.09 Combustion air intakes.** Any room in which fuel-burning equipment, including fireplaces and process equipment, is located shall be supplied with combustion air for safe operation.

(1) COMBUSTION AIR. Combustion air shall be provided by one of the following methods:

(a) *Combustion air by gravitational means.* Where combustion air is introduced by gravitational means, the minimum free area for combustion air intakes shall be calculated in square inches as indicated in Table 64.09. The values for gas- and oil-fired equipment are based on the fuel input of the equipment. The value for solid-fuel equipment and fireplaces is based on the fuel input of the equipment, the area of the chimney connector or the listing for the specific piece of equipment. (See Table 64.09).

TABLE 64.09

Atmospheric Combustion	Combustion Air Intakes Ducted from the Outside to an Interior Room or Fireplace	Combustion Air Intakes Located at the Outside Wall of an Exterior Room
Gas-fired, all occupancies except industrial	1 sq.in./1000 Btu/hr.	1 sq.in./2000 Btu/hr.
Gas-fired, industrial occupancies	1 sq.in./1000 Btu/hr.	1 sq.in./5000 Btu/hr.
Oil-fired, all occupancies	1 sq.in./1000 Btu/hr.	1 sq.in./2000 Btu/hr.
Solid-fuel fired equipment and fireplaces, all occupancies	1 sq. in./1000 Btu/hr for furnace type units. ½ of the chimney connector area for free standing and fireplace type units. In accordance with equipment listing, if listing includes combustion air provisions.	

(b) *Combustion air for power burners.* The minimum free area for combustion air intakes for power burners shall be at least .5 square feet per 1,000,000 Btu per hour fuel input with a minimum free area of 10 square inches.

(c) *Combustion air by mechanical means.* Combustion air furnished by mechanical systems, such as makeup air units, may be used when complete design data is submitted and approved by the department.

(d) *Combustion air by infiltration.* If the heating equipment is not required to be located in a fire-resistive room, combustion air may be provided by means of infiltration where the total area of outdoor openings is greater than 3% of the floor area in which the equipment is located, or where 150% of the air required for theoretical complete combustion is no greater than ¼ air change govern the design.

Note: See s. ILHR 64.22 for special conditions.

(2) DAMPERS. (a) Manually operated dampers are prohibited in combustion air intakes, except for manually fired solid-fuel fired equipment, where the combustion air is connected directly to the equipment.

(b) Motorized dampers are acceptable when interlocked with the burner. Dampers shall be open when the burner is in operation. A safety interlock switch shall be installed to insure that the damper is in an open position before the burner is permitted to operate.

(3) DUCTWORK. Where ductwork is required to bring combustion air into the building, the duct shall have the same cross-sectional area as the free area of the combustion air openings.

(4) SEGREGATION OF COMBUSTION AIR. The combustion air path shall be completely segregated from the outside air ventilation ductwork.

(5) NEGATIVE PRESSURE LOCATIONS. Atmospheric combustion shall be prohibited in a space under negative pressure.

(6) MOUNTING HEIGHT. Mounting height of the combustion air intakes shall be as required in s. ILHR 64.19 (1) (c).

(7) AIR-HANDLING EQUIPMENT LOCATED IN A BOILER OR FURNANCE ROOM. If the fuel input rating of the fuel burning equipment exceeds 400,000 Btu per hour, the air-handling equipment and the fuel-burning equipment shall be interlocked to shut off the fuel-burning equipment and the air-handling equipment when any service door to the air-handling equipment is opened, unless an air barrier separation is provided between the fuel-burning equipment and the air handling equipment.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; r. and recr. Register, December, 1976, No. 252, eff. 1-1-77; renum. (1) (b) and (c) to be (c) and (d), cr. (1) (b), and am. (7), Register, December, 1977, No. 264, eff. 1-1-78; am. (5), Register, December, 1978, No. 276, eff. 1-1-79; am. (1)(d), Register, January, 1980, No. 289, eff. 2-1-80; am. (1)(a) and (d) (2)(a), (5) and (7), Register, December, 1981, No. 312, eff. 1-1-82; am. (1) (d), Register, December, 1983, No. 336, eff. 1-1-84.

ILHR 64.10 Refrigerants. The rules covering the use of refrigerants for air conditioning systems shall conform with ch. ILHR 45, Mechanical Refrigeration.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

Part III—Ventilation and Air Standards

ILHR 64.11 Ventilation and air standards. The quantity of air used to ventilate a given space during periods of occupancy shall always be suffi-

cient to maintain the standards of air distribution, air movement, recirculation, 64.12 to 64.19.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.12 Definitions. (1) "Air conditioning." The process of treating air to control temperature, humidity, cleanliness and distribution to meet the requirements of the conditioned space.

(2) "Outside air." Air that is taken from outside the building and is free from contamination of any kind in proportions detrimental to the health or comfort of the persons exposed to it.

(3) "Recirculated air." The transfer of air from a space through the air-handling equipment and back to the space.

(4) "Tempered air." Air transferred from a heated or cooled area of a building.

(5) "Tempered outside air." Outside air heated or cooled before distribution.

(6) "Ventilation." The process of supplying or removing air by natural or mechanical means, to or from any space.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; reprinted to correct error in (6), Register, December, 1985, No. 360.

ILHR 64.13 Tempered air requirements. (1) SUPPLY AIR. The design conditions of the supply air temperature to the occupied space shall be between 50° F. and 140° F.

(2) TEMPERED AIR SUPPLY DEPENDING ON NEGATIVE PRESSURE. A supply of tempered air, depending on a negative pressure within the space, will be permitted in foundries, steel fabricating shops and similar areas.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.14 Tempered outside air requirements. (1) MAKEUP AIR. A supply of tempered outside air shall be provided when the total volume of building exhaust from an area exceeds one air change per hour.

Note: See Ch. Ind 1000-2000, Safety & Health Code, for further requirements for makeup air for industrial exhaust systems.

(2) PROCESS HEAT. Process heat may be used to temper required outside air.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.15 Air movement and distribution. The air delivery capacity of all equipment supplying air for heating, ventilating and air conditioning purposes shall be based on standard air ratings.

Note: Standard air is substantially equivalent to dry air at 70° F. and 29.92 inches (Hg) barometric pressure.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; renum. (2) and (3) to be 64.06 (3) and (4), r. (4), Register, December, 1976, No. 252, eff. 1-1-77.

FP **ILHR 64.16 Air-cleansing devices.** (1) AIR-CLEANSING ACCESS. Air-cleansing devices shall be designed and installed to permit access to the equipment for maintenance and to insure proper operation of the heating and ventilating system.

(2) AIR-CLEANSING FILTERS. Approved air-cleansing filters shall be designed and installed in a manner to filter the outside air and recirculated air used with mechanical heating and ventilating systems except as follows:

(a) Filters are not required in garages, factories, foundries and similar occupancies;

(b) Filters are not required for use with unit heaters designed for heating and recirculation; or

(c) Where jet systems or blend-air systems are approved, air filters are not required in the ducts that are installed for the recirculation of air within the same occupied space.

Note: The department recognizes as approved, filters listed in the Building Materials List published by Underwriters' Laboratories, Inc., and test data of any other recognized testing agency for the purpose for which it is used.

(3) AIR-CLEANSING MATERIALS. Contaminated water shall not be used or recirculated through sprays affecting air used for ventilating purposes.

History: Cr. Register, December, 1975, No. 240, eff.1-1-76

ILHR 64.17 Controls. (1) GENERAL. Except as provided in sub. (2), automatic controls shall be provided to maintain design temperature, control ventilation to provide a continuous air movement of not less than the minimum required by this chapter, and to provide a continuous supply of outside air and exhaust determined by the provisions of s. ILHR 64.05, Table 1, during periods of occupancy.

(2) EXCEPTION. Manual control of solid-fuel fired equipment to maintain inside design temperature is permitted.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. Register, December, 1981, No. 312, eff. 1-1-82.

ILHR 64.18 Contamination of air. (1) CONTAMINATION. Air contaminated from odors, fumes, noxious gases, smoke, steam, dust, spray, or other contamination shall be diluted with uncontaminated air or exhausted to prevent the contaminated air from spreading to other parts of the building occupied by people.

Note: For requirements pertaining to all places of employment or occupancy where smoke, gas, dust, fumes, steam, vapor, industrial poisons, or other detrimental materials are used, stored, handled, or are present in the air in sufficient quantities to obstruct the vision, or to be injurious to the health, safety or welfare of the employes or frequenters, see Ch. Ind 1000-2000 Safety and Health Code.

(a) *Chlorinated hydrocarbons.* Areas where chlorinated hydrocarbons are introduced shall be arranged to satisfy the following conditions:

Note: Some of the chlorinated hydrocarbons commonly used are: trichloroethylene, perchloroethylene, carbon tetrochloride, methylene chloride, methyl chloroform, Freon F-11, Freon F-12, Freon F-21 and Freon F-114. For example, these materials are used in dry cleaning establishments, in degreasing operations, and where pressure can propellants are used. Pressure cans are used for such products as enamels, lacquers, paint removers, stencil inks, lubricants, pesticides, hair sprays, shaving lathers, shampoos and colognes.

1. The area shall have an exhaust system capable of maintaining a negative pressure within the enclosed area.

2. The volume and distribution of air movement within the area shall be such that the average threshold limit values of specific airborne contaminants are not exceeded.

Note: See chs. Ind 1000-2000, Wisconsin Safety and Health Code.

3. No fuel-fired heating unit, with or without a heat exchanger, shall be located within this area, nor shall it recirculate air from this area.

4. The surface temperatures of any type of heating equipment used in these areas shall be below the temperature at which toxic materials may be released.

Note: Toxic materials are those covered in Ch. Ind 1000-2000—Safety and Health Code.

(b) *Transfer of contaminated air.* Air shall not be transferred from an area of greater contamination.

Note: The department will accept air transferred from: corridor to toilet room; corridor to cloak room or janitor closet; dining room to kitchen; locker room to toilet room; gymnasium to locker room; showroom to garage; and corridor to school vocational shops.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (1)(a)3., Register, January, 1980, No. 289, eff. 2-1-80.

ILHR 64.19 Location of outside ventilating air intakes or exhausts for mechanical ventilation systems. (1) LOCATION AND DISTANCE. (a) *Location to prevent contamination.* Outside air intake openings shall be located so as to minimize contamination of outdoor air, but in no case shall the distance be less than 10 feet measured in any direction from outlets emitting products of combustion, exhaust vents and plumbing vents. Openable windows are exempt from the provisions of this paragraph, except that power vents from gas-fired equipment shall be located at least 12 inches measured in any direction from any openable windows.

Note: This requirement also applies to roof-top heating and ventilating equipment.

(b) *Distance to adjacent properties.* Air intakes and exhausts shall be at least 10 feet from a property line or lot line or both or an adjacent building on the same property. This distance restriction does not apply to property lines along streets or alleys.

(c) *Mounting height.* The lowest side of outside air intake openings shall be located at least 12 inches above outside grade, above adjoining roof surfaces, or above the bottom of an areaway.

Note: The department will accept outside air intakes in areaways provided the minimum horizontal cross section of the areaway is equal to the free area of the opening, a grating is provided over the areaway with a free area equal to the required air intake, and the grating is designed for a minimum of 100 PSF live load. A guardrail, as defined in s. ILHR 51.162, will be accepted in lieu of the grating.

(2) SCREENS. All outside air intake openings shall be provided with a device to prevent intake of foreign material of ½ inch size or larger.

(3) WEATHER PROTECTION. All outside air intake openings shall be protected against weather and water with a weatherproof hood or louvers.

(4) ACCESSIBILITY AND CLEANLINESS. All outside air intakes shall be easily accessible for cleaning and shall be kept clean and sanitary.

(5) DAMPERS. (a) *Intake.* All required outside air intakes shall be equipped with a damper with automatic controls which will close the

damper and prevent the intake of outside air into the building when the ventilating unit is not in operation.

(b) *Exhaust.* All exhaust openings shall be provided with automatic or self-activating back-draft dampers to prevent the intake of outside air into the building when the exhaust units are not in operation.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (5) (a), Register, December, 1976, No. 252, eff. 1-1-77; reprinted to correct error in (1) (c), Register, December, 1985, No. 360.

Part IV—Heating Equipment Requirements

ILHR 64.20 Equipment ratings and safety controls. (1) TEST AND INSTALLATION STANDARDS. All oil- and gas-fired heating equipment, electric heating equipment, solid-fuel heating equipment and accessory equipment or devices shall be tested and installed in accordance with standards recognized by the department. Department review and approval of input or output ratings or both are required when ratings are needed to satisfy s. ILHR 64.03 or 64.09.

Note: For a list of standards acceptable to the department, refer to Appendix A.

(2) SAFETY CONTROLS. (a) *General.* The complete safety control package for the heating and ventilating equipment shall comply with standards accepted by the department.

(b) *Limits and controls.* Oil and gas-fired heating equipment and electric heating equipment shall be equipped with primary (flame safeguard) safety controls, safety limit switches, and burners or electric elements that comply with standards accepted by the department.

Note: The department recognizes UL 296—Oil Burners, and UL 795—Commercial-Industrial Gas-Heating Equipment, as acceptable standards that satisfy the requirements of subs. (1) and (2).

(3) LISTED EQUIPMENT. Complete factory assembled heating units shall be labeled by listing agencies approved by the department.

Note: The department accepts heating equipment listed by American Gas Association (AGA), Underwriters' Laboratories (UL) and PFS corporation.

(4) UNLISTED EQUIPMENT. If the heating equipment is unlisted, the following provisions shall be taken:

(a) *Manufacturer's statement.* A statement from the equipment manufacturer shall be provided indicating the national standard with which the equipment complies.

(b) *Tests.* A test by a Wisconsin registered engineer shall be conducted on the output and safety controls, in accordance with the national standard used by the manufacturer. A statement regarding the test of the rating and safety controls shall be furnished for each installation unless an approval for the equipment is obtained from the department in accordance with sub. (5).

(5) EQUIPMENT APPROVAL. Equipment approval may be obtained from the department upon submission of a technical report, based on the test

required in sub. (4) (b), together with the fee as specified in ch. Ind 69 for equipment approval.

Note: The purpose of the technical report is to show that the equipment is in complete compliance with the national standard by which the equipment is designed, constructed and tested.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-75; r. and recr. Register, December, 1976, No. 252, eff. 1-1-77; am. (5), Register, December, 1977, No. 264, eff. 1-1-78; am. (1), Register, December, 1981, No. 312, eff. 1-1-82.

ILHR 64.21 Location of equipment. The various types of heating equipment for the corresponding types of occupancies in which the equipment may be located shall be installed as specified in Table 64.21.

Note #1: The footnotes below the table designate special requirements for the listed equipment.

Note #2: The department will accept net ratings as listed by Mechanical Contractors Association of America, Inc., Institute of Boiler and Radiator Manufacturers, and equipment tested according to commercial standard 140-47.

TABLE 64.21 - LOCATION OF EQUIPMENT

Location and Type of Occupancy	VENTED UNITS									UNVENTED UNITS		ELECTRIC	WATER OR STEAM
	Gas or Oil or Solid Fuel Boilers	Gas or Oil or Solid Fuel Furnaces		Gas or Oil Unit Heater	Gas or Oil Infrared		Gas or Oil Space Heater	Solid Fuel Space Heater[1,2]	Gas Direct Vent Sealed Combustion Appliance[18]	Gas Direct Fired Makeup Air[3,4]	Gas Infrared	Furnaces, Unit Heaters, Heat Pumps, Baseboard Heaters, etc.	Unit Ventilators, Heaters, Makeup Air Units, Baseboard Heaters, etc.
					Closed Combustion Infrared Equipment with Surface Temperatures not Exceeding 1500°F	Open Flame Infrared Equipment with Surface Temperatures Exceeding 1500°F							
	Rated Enclosure	Rated Enclosure	Suspended[5]	Suspended[5]	Suspended[5]				Rated Enclosure Not Required	Suspended[5]	Suspended[5]		
Type of Occupancy													
Factories	Yes[5]	Yes[5]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Mercantile Buildings	Yes[5]	Yes	Yes	Yes	Yes	Yes	N.P.[5,6]	N.P.[6]	Yes	N.P.	N.P.		
Office Buildings	Yes[5]	Yes	Yes	Yes	Yes	N.P.	N.P.[5,6]	N.P.[6]	Yes	N.P.	N.P.		
Places of assembly, entertainment, recreation, worship or dining (100 persons or less)	Yes[5]	Yes	Yes	Yes	Yes	Yes	N.P.[5,6]	N.P.[6]	Yes	N.P.[7]	N.P.		
Tennis Facilities (court areas only)	Yes[5]	Yes	Yes	Yes	Yes	Yes	N.P.[5,6]	N.P.[6]	Yes	N.P.	N.P.		
Tennis Facilities (all other areas)	Yes[5]	Yes	Yes	Yes	Yes	N.P.	N.P.[5,6]	N.P.[6]	Yes	N.P.	N.P.		
Theaters & places of assembly, entertainment, recreation, worship or dining (more than 100 persons)	Yes	Yes	Yes	Yes	Yes	N.P.	N.P.	N.P.	Yes	N.P.	N.P.	PERMITTED IN ALL OCCUPANCIES	PERMITTED IN ALL OCCUPANCIES
Restaurants	Yes	Yes	Yes	Yes	Yes	N.P.	N.P.	N.P.	Yes	N.P.[7]	N.P.		
Tennis Facilities (court areas only)	Yes	Yes	Yes	Yes	Yes	Yes	N.P.	N.P.	Yes	N.P.	N.P.		
Tennis Facilities (all other areas)	Yes	Yes	Yes	Yes	Yes	N.P.	N.P.	N.P.	Yes	N.P.	N.P.		
Schools & Other Places of Instruction	Yes	Yes	Yes	Yes	Yes	N.P.[10]	N.P.	N.P.	Yes	N.P.[9]	N.P.		
Hospitals, Nursing Homes & Penal Institutions	Yes	Yes	N.P.	N.P.	N.P.	N.P.	N.P.	N.P.	N.P.	N.P.	N.P.		
Residential Occupancies	Yes	Yes	N.P.	N.P.	N.P.	N.P.	N.P.[11]	N.P.[14]	Yes	N.P.	N.P.		
Hazardous Occupancies													
Garages	Yes	Yes	Yes[12]	Yes[12]	Yes	Yes	N.P.[15]	N.P.	Yes	Yes[12]	Yes[12]		
Aircraft Hangars	Yes	Yes	Yes[13]	Yes[13]	Yes[13]	N.P.	N.P.	N.P.	Yes	Yes[13]	Yes[13]		
Day Care Centers	Yes[16]	Yes	Yes	Yes	Yes	N.P.	N.P.[6]	N.P.[6]	Yes	N.P.	N.P.		
Community Based Residential Facilities[17]	Yes	Yes	N.P.	N.P.	N.P.	N.P.	N.P.[6]	N.P.[6]	Yes	N.P.	N.P.		

N.P. = Not Permitted

Unlisted Occupancies - Use the listed occupancy in the table that is most similar to the subject occupancy.

Clearances - Equipment shall be installed in accordance with the clearance from combustibles indicated in the name plate of the unit.

1 See s. ILHR 64.22 (7) (d) for fireplace requirements.

2 All solid-fuel fired space heaters shall be located in occupied space or in a space provided with approved smoke detectors and located or guarded to maintain clearances to combustibles and prevent accidental damage or contact with hot surfaces. Solid-fuel burning stoves are limited to 150,000 Btu/hr output.

3 Except as provided in Footnote 4, direct-fired makeup air units shall be mechanically exhausted in the range of 90% to 110% of the air supplied.

4 See s. ILHR 64.22 (4) for other permitted uses of direct fired unvented natural gas heaters.

5 Where permitted, such equipment other than infrared shall be located in an occupied space (see s. ILHR 64.22 (3)) and suspended at least 7 feet above the floor. Infrared equipment shall be located at least 8 feet above the floor. Suspension of solid-fuel fired equipment is not permitted. See s. ILHR 54.14 (3) for additional requirements.

6 Permitted with combustion air ducted to unit in occupancies less than 3,000 square feet gross area and with occupant load less than 100 persons.

7 Permitted in kitchens to provide makeup air for kitchen exhaust systems if located outside building or in a rated enclosure.

9 Permitted only in shops with a 3-hour separation from other areas of the school building.

10 Permitted only in shops with a 3-hour separation from other areas of the school building.

11 Gas-fired, direct-vent wall furnaces are permitted in apartments and motels.

12 Suspended heating units are allowed in garages if located at least 8 feet off the floor. Suspension of solid-fuel fired equipment is not permitted.

13 Suspended heating units are allowed if located at least 10 feet above the upper surface of the wings or engine enclosure of the aircraft. Suspension of solid-fuel fired equipment is not permitted.

14 Solid-fuel fired space heaters are permitted in rowhouse units only.

15 Waste oil burners are permitted provided they are installed on mezzanines or service platforms located at least 8'-0" above the main floor, are visible from the main floor and are guarded as specified in this section.

16 See s. ILHR 60.25 for smoke detector alternative.

17 See s. ILHR 61.24 for requirements.

18 See ss. ILHR 51.81(29a), 54.14(1)(b), 55.29(1)(b), 56.15(1)(c), 57.14(1)(c)5., 59.21, 60.25(1), 62.32(1)(b) and 62.78(1)(b) for additional requirements.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; r. and recr. Register, December, 1976, No. 252, eff. 1-1-77; r. and recr. table, Register, December, 1983, No. 336, eff. 1-1-84.; am. (intro.) and r. and recr. table, Register, August, 1985, No. 356, eff. 1-1-86.

ILHR 64.22 Special requirements. (1) BOILERS AND PRESSURE VESSELS. (a) *Construction standards.* Boilers and pressure vessels shall be constructed and installed in compliance with the standards of the American Society of Mechanical Engineers, as adopted under chs. ILHR 41-42.

(b) *Installation notification.* The installing contractor shall notify the department of boiler installation, in accordance with the requirements of s. ILHR 41.05, before the boiler or pressure vessel is put into operation.

(2) FURNACES. Forced-air heating systems shall be designed to prevent a negative pressure on the heat exchanger.

(3) SUSPENDED AND GUARDED EQUIPMENT. Equipment suspended or guarded as specified in s. ILHR 64.21 shall be installed in an occupied space. Suspended or guarded equipment may be used in multiple tenant buildings providing the equipment is located in tenant spaces of an occupancy use where suspended or guarded equipment is permitted. The equipment shall be visible to persons within the room.

(4) GAS OR OIL-FIRED RADIANT HEATERS AND DIRECT FIRED UNVENTED NATURAL GAS HEATERS. Gas- or oil-fired radiant heaters and direct fired unvented natural gas heaters are subject to the following provisions:

(a) The heaters shall be equipped with an automatic pilot of the complete shutoff type or with a 100% shutoff electric ignition;

(b) If unvented radiant heaters or direct fired unvented natural gas heaters are used, mechanical means shall be provided to supply at least 4 cfm of outside air per 1000 Btu per hour input of installed heaters;

(c) Gravity siphon-type roof ventilators or mechanical exhaust shall be provided to remove the amount of air supplied. Gravity siphon-type roof ventilators shall be sized to provide a free area so that the velocity of the air does not exceed 600 feet per minute;

(d) Oil-fired radiant heaters shall be equipped with mechanical pressure-atomizing burners; and

(e) Direct fired unvented natural gas heaters shall comply with the provisions of American National Standards Institute (ANSI) standard Z83.4-1980, Direct Gas-Fired Make-Up Air Heaters.

(5) SPACE HEATERS. Space heaters shall comply with the following provisions:

(a) The burner of the appliance shall be enclosed with a metal housing so constructed that there will be no open flame and the burner housing shall be effectively guarded against personal contact. The arrangement shall be such that the shield will prevent any combustible material in the vicinity of the appliance from coming in contact with the flame or with the housing that encloses the burner. Oil-fired space heaters shall be equipped with a mechanical pressure atomizing burner; and

(b) Space heaters shall not be equipped with duct extensions beyond the vertical and horizontal limits of the metal enclosure.

(c) The use of unvented space heaters fueled by natural gas, kerosene, alcohol or other fuel shall be prohibited based on the facts of oxygen depletion; contamination from carbon monoxide, carbon dioxide, nitrogen

dioxide, formaldehyde and other combustion-related contaminants; and water vapor development.

(6) EQUIPMENT IN HAZARDOUS LOCATIONS. The types of heating and ventilating equipment that may be installed in hazardous locations (as defined in Article 500 of the National Electrical Code as adopted by reference in ch. ILHR 16) are as follows:

(a) Listed low-pressure steam or hot water unit heaters and makeup air units; and

(b) Listed electric units.

(7) FIREPLACES AND FIREPLACE STOVES. Masonry fireplaces, factory-built fireplaces and factory-built fireplace stoves shall be constructed and installed in accordance with the NFPA standard No. 211—Standard for Chimneys, Fireplaces and Vents. FP

(a) *Masonry fireplaces.* 1. Masonry fireplaces shall be constructed of solid masonry units, stone or reinforced portland or refractory cement concrete.

a. Where a lining of low-duty firebrick complying with the provisions of ASTM C64, or the equivalent, at least 2 inches thick laid-in fire-clay mortar complying with the provisions of ASTM C105, or the equivalent, or other approved lining is provided, the total thickness of back and sides, including the lining, shall be not less than 8 inches.

b. Where the lining described in subpar. a. is not provided, the thickness of back and sides shall be not less than 12 inches.

2. Steel fireplace units incorporating a firebox liner of not less than ¼ inch thick steel and an air chamber shall be installed with masonry to provide a total thickness at the back and sides of not less than 8 inches, not less than 4 inches of which shall be solid masonry.

3. Warm air ducts employed with steel fireplace units of the circulating air type shall be constructed of metal or masonry.

4. Fireplace hearth extensions of approved noncombustible material for all fireplaces shall be provided.

a. Where the fireplace opening is less than 6 square feet, the hearth extension shall extend at least 16 inches in front of, and at least 8 inches beyond each side of the fireplace opening.

b. Where the fireplace opening is 6 square feet or larger, the hearth extension shall extend at least 20 inches in front of, and at least 12 inches beyond each side of the fireplace opening.

c. Where a fireplace is elevated above or overhangs a floor, the hearth extension shall also extend over the area under the fireplace.

d. Fireplaces constructed of masonry or reinforced portland or refractory cement concrete shall have hearth extensions of brick, concrete, stone, tile or other approved noncombustible material properly supported and with no combustible material against the underside thereof. Wooden forms or centers used during the construction of hearth and hearth extension shall be removed when the construction is completed.

5. All wood beams, joists and studs shall be trimmed away from fireplaces. Headers supporting trimmer arches at fireplaces shall be not less than 20 inches from the face of the chimney breast. Trimmers shall be not less than 6 inches from the inside face of the nearest flue lining.

6. Woodwork shall not be placed within 4 inches of the back face of a fireplace.

7. Woodwork shall not be placed within 6 inches of a fireplace opening. Woodwork above and projecting more than 1½ inches from a fireplace opening shall not be placed less than 12 inches from the top of a fireplace opening.

(b) *Factory-built fireplaces and fireplace stoves.* Factory-built fireplaces and fireplace stoves shall be installed according to the requirements of the approval as specified in s. ILHR 64.20.

(c) *Hearth opening protection.* Fireplaces and fireplace stoves shall be equipped with safety screens or glass doors to prevent the escape of sparks and embers.

(d) *Permitted installations.* Fireplaces are permitted in the following applications.

1. In all occupancies within the scope of chs. ILHR 54 and 55;

2. In health care facilities as specified in s. ILHR 58.24 (3);

3. In common use areas and individual living units in all residential occupancies except hotels and motels; and

4. In lobbies and other common use areas of motels and hotels but not in individual sleeping rooms.

(8) FLOOR-STANDING VENTED OR UNVENTED EQUIPMENT. Floor-standing, vented or unvented unit heaters, furnaces and boilers in metal fabricating plants, foundries and machine shops are exempt from the requirements of s. ILHR 54.14.

(9) HEAT EXCHANGER CORROSION PROTECTION. If the entering air to the heat exchanger of all gas-fired equipment is 30°F or lower, the heat exchanger and burners shall be constructed of corrosion-resistive materials.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; r. and recr. Register, December, 1976, No. 252, eff. 1-1-77; r. (4) (d) and renum. (4) (e) to be (d), Register, December, 1977, No. 264, eff. 1-1-78; am. (1) (b) and cr. (7), Register, December, 1978, No. 276, eff. 1-1-79; r. and recr. (2) and (7), Register, December, 1981, No. 312, eff. 1-1-82; r. and recr. (4), cr. (5) (c), (7) (d) and (8), Register, December, 1983, No. 336, eff. 1-1-84; am. (1), (3) (intro.), (4) (b) and (6) (intro.), r. (3) (a) and cr. (9), Register, August, 1985, No. 356, eff. 1-1-86.

ILHR 64.23 Piping. (1) PIPE SIZES AND ARRANGEMENT. All supply and return piping carrying steam, hot water or other fluids, air-line piping and auxiliary equipment shall be of appropriate sizes, elevations and arrangements to accomplish the calculated services in practical operation, without undue noise, stress or other detriment.

(2) EXPANSION AND CONTRACTION. The piping for the heating system shall be equipped with anchors, expansion swings or joints, supports and similar devices to relieve stress and strains caused by temperature change of the pipe material.

(3) PIPE INSULATION. All supply and return piping carrying steam, hot water or other fluids shall be covered with insulating material where the pipes pass through occupied areas and the surface temperature exceeds 180° F., unless guarded.

(4) PIPE PROTECTION. No pipe carrying hot water, steam, or other fluid at a surface temperature exceeding 250° F. shall be placed within one inch of any woodwork, pass through a combustible floor, ceiling or partition, unless the pipe is protected by a metal tube one inch larger in diameter than the pipe or with approved pipe covering.

(5) GAS OR OIL INSTALLATIONS. (a) *Piping installations.* All gas piping and all oil piping shall comply with the following standards: **FP**

1. National Fuel Gas Code, NFPA No. 54 [ILHR 51.27 (7a)]; or

2. Installation of Oil-Burning Equipment, NFPA No. 31 [ILHR 51.27 (7a)].

(b) *Oil tank installations.* All oil-burning equipment shall be supplied with oil from a supply tank having a capacity of not less than 250 gallons. The fuel oil tank shall be equipped with a fill pipe, vent pipe and oil gauge. The vent pipe and fill pipe shall terminate outside of the building.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; r. and recr. Register, December, 1976, No. 252, eff. 1-1-77; am. (1), (3) and (4), Register, December, 1978, No. 276, eff. 1-1-79; am. (5)(a), Register, January, 1980, No. 289, eff. 2-1-80.

Part V—Air Delivery Systems

ILHR 64.31 Duct design. All ducts shall be designed to promote the unrestricted flow of air.

Note: The department will accept air duct velocities designed in accordance with the standards of the ASHRAE Handbook of Fundamentals, published by the American Society of Heating, Refrigerating and Air Conditioning Engineers.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.32 Duct use. No duct designed for the transmission of air shall be used for any other purpose.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.33 Underground duct construction and installation. (1) MATERIALS. (a) *Tile ducts.* All underground duct systems using cement tile, glazed clay tile and other tile having a composition of cement and mineral shall be waterproof and shall have sufficient strength to prevent failure of duct at the time of installation and while in service. All fittings shall be designed with bell and spigot or slip-joint connections. All joints shall be waterproof.

(b) *Plastic and metal ducts.* Metal, plastic-coated metal ducts, and other approved materials may be used for underground systems if encased in not less than 2 inches of concrete. The ducts shall be waterproof, noncombustible, smooth and of sufficient strength to prevent collapse. The sealing material for fittings and joints shall be approved by the department.

1. Exception. Solid polyvinyl ducts and fittings and polyvinyl chloride (pvc)-clad metallic ducts and fittings need not be encased in concrete

provided the space around the ducts and fittings is backfilled with sand or similar fill material.

(2) DUCT INSULATION. All underground ducts shall be insulated as specified in s. ILHR 63.22 (1).

(3) DUCT DRAINAGE. Underground ducts shall be provided with drainage to a lower room of the building or to a sump. No duct shall be connected to a sewer.

(4) DUCT INLETS AND OUTLETS. A water-tight connection shall be provided where the inlet and outlet risers are connected to underground ducts.

(5) PIPING. Nonhazardous piping may be installed in underground ducts if it does not restrict the air flow.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (1)(b) and (2), Register, January, 1980, No. 289, eff. 2-1-80; am. (2), Register, December, 1983, No. 336, eff. 1-1-84.

ILHR 64.34 Duct construction. (1) METAL DUCTS. All sheet metal ducts, duct liners and fittings shall be constructed in compliance with standards approved by the department.

Note: The department will accept the standards for ducts in the ASHRAE Handbook of Equipment Volume, published by the American Society of Heating, Refrigerating and Air Conditioning Engineers, or as illustrated in the Low Pressure or High Pressure Duct Construction Standards published by the Sheet Metal and Air Conditioning Contractors National Association, Inc.

(2) COMBUSTIBLE DUCTS. All ducts or airways of wood or other combustible material shall be lined with sheet metal or other approved noncombustible material unless specifically exempted by this code.

(3) NONMETALLIC DUCTS. Coated metal ducts or ducts constructed of other than metal shall conform to the following:

(a) The method for fabricating, installing and supporting ducts shall be approved by the department;

Note: The department accepts Class 1 air ducts tested (Standards for Safety, UL 181) and listed by Underwriters' Laboratories, Inc., and constructed in accordance with fibrous glass duct construction standards published by the Sheet Metal and Air Conditioning Contractors National Association, Inc.

(b) The ducts shall resist puncture, deformation or collapse;

(c) The ducts shall not be used where the air temperature exceeds 250° F, for kitchen or fume exhaust ducts, or to convey solids or corrosive gases;

(d) The ducts shall not pass through required fire-resistive construction.

(4) SPIRALLY WOUND METAL DUCTS. Spirally wound metal ducts shall be constructed to provide structural strength equal to rectangular ducts. The metal may be one standard gauge lighter than required for round ducts.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (3) (intro.), Register, January, 1980, No. 289, eff. 2-1-80; reprinted to correct error in (3), Register, May, 1980, No. 293; am. (1) and r. (3) (e), Register, August, 1985, No. 356, eff. 1-1-86.

ILHR 64.35 Duct connectors. (1) FLEXIBLE DUCT CONNECTORS. Flexible duct connectors between duct systems and air outlets or air outlet units shall conform to the following:

(a) The duct material shall be approved for such use;

Note: Flame-retarded fabric or metal or mineral listed in the Building Materials List, published by Underwriters' Laboratories, Inc., are acceptable.

(b) The construction shall be approved by the department;

(c) The connector shall not be subject to deterioration from mildew or moisture; and

(d) The connector shall not pass through required fire-resistive construction.

(2) VIBRATION CONTROL. Vibration isolation connectors at the joint between the duct and fan or heat-producing equipment shall conform to the following:

(a) Connectors shall be a type approved for such use;

Note: Flame-retarded fabric or metal or mineral listed in the Building Materials List, published by Underwriters' Laboratories, Inc., are acceptable.

(b) Connectors shall be not more than 10 inches wide; and

(c) Connectors shall not be used where the air temperature is in excess of 250° F.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.36 Vertical shafts. Every vertical shaft shall be enclosed with noncombustible material which is fire-resistive rated in accordance with Table 51.03-A.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.37 Insulation. Heating supply ducts and pipes shall be covered with insulation unless an allowance is made for temperature drop in the system.

Note: Also see s. ILHR 63.22 for additional requirements.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. Register, December, 1983, No. 336, eff. 1-1-84.

ILHR 64.38 Gravity ventilation ducts. (1) DESIGN. Horizontal runs in gravity ventilation ducts connected to siphon-type roof ventilators shall be avoided wherever possible and the maximum practicable inclination shall be provided in all cases. In no case shall the horizontal run exceed 30% of the vertical run unless the room has a mechanical supply of air or the ventilation duct is connected to an exhaust fan.

(2) SEPARATE DUCTS. Separate gravity ventilation ducts, from each area of similar occupancy, shall extend to a plenum at the base of a siphon ventilator.

(3) PLENUMS. Gravity ventilation ducts, used with mechanical ventilation supply systems, shall not terminate in an attic plenum unless the plenum is airtight, of noncumbustible construction, and the attic floor is smooth. All collecting plenums shall be connected to an approved si-

phon-type roof ventilator or to an exhaust fan discharging outside the building.

(4) DAMPERS. Dampers are prohibited in gravity ventilation ducts, except atmospheric back-draft dampers are permitted.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.39 Ventilation discharge. All gravity and mechanical ventilation ducts shall be protected from the weather and shall be so located and constructed as to prevent contamination of an outside air supply. Gravity ventilation ducts shall extend not less than 2 feet above the highest portion of the roof and parapet wall and shall be provided with an approved type of siphon roof ventilator.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am., Register, December, 1981, No. 312, eff. 1-1-82.

ILHR 64.40 Relief vents. (1) BAROMETRIC RELIEF VENTS PERMITTED. The use of barometric relief vents is permitted for type (a) and (b) ventilation classifications designated in Table 1. Where barometric relief vents are installed on the roof, the discharge openings shall be not less than 2 feet above the roof.

(2) BAROMETRIC RELIEF VENTS PROHIBITED. The use of barometric relief vents is prohibited for type (c), (d) and (e) ventilation classifications designated in Table 1.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. Register, December, 1976, No. 252, eff. 1-1-77.

ILHR 64.41 Plenums. (1) GENERAL. Plenums used for the supply, return or transfer of air shall be of noncombustible construction.

(a) *Exception.* Combustible ceiling materials may be used provided they comply with the following:

1. The ceiling material is made from a base material of metal or mineral;

2. All surfaces of ceiling material possess a flame-spread rating of not over 25 without evidence of continued progressive combustion and with a smoke-developed rating of not higher than 50;

3. The ceiling material is supported by noncombustible material having a melting point above 1400° F. (760° C); and

4. The ceiling material is not subject to deterioration or deformation on long exposure to temperatures of 250° F. (121° C) or under conditions of high humidity, excessive moisture, or mildew.

Note #1: This section permits the use of steel, painted steel bar joists and metal decking, concrete, plaster, and other noncombustible materials and restricts the use of certain combustible materials within air-handling plenums.

Note #2: The requirements for ceiling materials are based upon the National Fire Protection Association (NFPA) standard 90A, section 2-2.1.3.

(2) DUCTWORK WITHIN THE PLENUM. Ducts within the plenum shall be constructed of metal in accordance with s. ILHR 64.34 (1) or approved nonmetallic materials in accordance with s. ILHR 64.34 (3).

(3) DUCT CONNECTORS. Duct connectors shall comply with the requirements of s. ILHR 64.35.

Note: Flame-retardant fabric or metal or mineral listed in the Building Materials List, published by Underwriters' Laboratories, Inc., are acceptable.

(4) INSULATING MATERIALS WITHIN THE PLENUM. (a) *Duct and pipe insulation.* Duct and pipe insulation, including coverings, linings, tapes and core materials, shall have a flame-spread rating of not over 25 without evidence of continued progressive combustion, and a smoke-developed rating no higher than 50 when tested according to ASTM E-84 standard tests. If coverings and linings are to be applied with adhesives, they shall be tested as applied with such adhesives, or the adhesives used shall have a flame-spread rating not over 25 and a smoke-developed rating no higher than 50 when in the final dry state.

(b) *Building envelope insulation.* Building envelope insulation within the plenum space shall have a flame-spread rating of 25 or less and a smoke-developed rating of 50 or less when tested according to ASTM E-84 test standards. The use of foam plastics, satisfying the requirements of s. ILHR 51.06, for envelope insulation is permitted provided the foam plastic is protected by a thermal barrier as specified in s. ILHR 51.06 (3).

(5) HAZARDOUS PIPING. The installation of hazardous piping as defined in s. ILHR 51.01 (102) is prohibited in the plenum space.

(6) OPENINGS. Openings into the plenum that would affect the fire-resistive rating of the structual component or system are prohibited.

(7) WIRING AND CABLES. Electric wiring, including low-voltage wiring, and telephone cables within the plenum space shall be installed according to the Wisconsin State Electrical Code, Vol. 2, ch. ILHR 16.

(8) PLUMBING. Plumbing within the plenum shall be of noncombustible material.

(a) *Exception.* Plastic plumbing pipe and fittings may be used provided the plastic material is of the self-extinguishing type with an average extent of burn not greater than 10 mm and an average time of burn not greater than 20 seconds when tested according to ASTM D-635. The plastic material shall be wrapped with at least one inch of inorganic insulation or enclosed with ½ inch type X gypsum wallboard.

(9) CONTROL TUBING. Plastic control tubing shall have an average extent of burn not greater than 10 mm and an average time of burn not greater than 20 seconds when tested according to ASTM D-635.

(10) SMOKE DETECTION. (a) *New construction.* Air-handling plenums which contain ductwork, duct connectors, insulation, plumbing or control tubing which do not meet the requirements of subs. (2) to (4), (8) and (9), respectively, shall be provided with an approved smoke detection system capable of stopping the air flow in and from the plenum and giving an audible alarm in the occupied area when activated.

(b) *Existing construction.* When existing plenum construction contains combustible insulation, wiring, plumbing or control tubing, and is altered or added to according to s. ILHR 50.03 (1) or (2), the entire plenum space, new and existing, shall be provided with a smoke detection system according to sub. (10) (a).

1. Exception. Building additions separated from existing construction by one-hour noncombustible construction need not be provided with a smoke detection system provided the plenum is constructed according to subs. (1) to (8).

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. Register, December, 1976, No. 252, eff. 1-1-77; r. and recr. Register, December, 1978, No. 276, eff. 1-1-79; r. and recr. Register, January, 1980, No. 289, eff. 2-1-80; am. (1) (intro,), (6) and (10), Register, December, 1981, No. 312, eff. 1-1-82; am. (4) (b), Register, August, 1985, No. 356, eff. 1-1-86.

FP ILHR 64.42 Fire dampers and fire curtain doors. (1) REQUIRED FIRE DAMPERS AND FIRE CURTAIN DOORS. All heating and ventilating ducts, except underground ducts used with counterflow or downflow heating equipment, which terminate at or pierce code-required, hourly rated wall, floor or floor-ceiling assemblies as specified in Table 51.03-A and rated enclosures shall be protected as follows:

(a) One-hour rated assemblies and enclosures shall be protected with 1½ hour rated fire dampers where continuous steel ductwork to the air handling device is not provided for at least 6 feet on either side of the assembly or enclosure;

(b) Two-hour rated assemblies and enclosures shall be protected with 1½ hour rated fire dampers; or

(c) Three-hour and 4-hour rated assemblies and enclosures shall be protected with 3-hour "A" label fire curtain doors.

(2) EXCEPTIONS. Exceptions to sub. (1) are:

(a) Any assembly, such as a floor-ceiling assembly, that has been certified for use without fire dampers and approved by a nationally recognized testing laboratory;

(b) Metal ducts which do not exceed a maximum area of 20 square inches; or

(c) Interior bearing walls and partitions if unrated openings are permitted by other sections of chs. ILHR 50-64.

(3) SERVICING FIRE DAMPERS. Access panels shall be provided next to fire dampers and fire curtain doors to permit viewing and servicing.

Note #1: The department will accept fire dampers and fire curtain doors listed by Underwriters' Laboratories, Inc. or an approved nationally recognized testing laboratory. The dampers must be installed in the vertical or horizontal position that the dampers were designed and tested for. The department will also accept fire damper and fire curtain door installations recommended in publications of the Sheet Metal, Air Conditioning Contractors National Association, Inc., and the National Fire Protection Association bulletins No. 80 and 90A.

Note #2: Fire dampers classified by Underwriters' Laboratories as 1-½ hour rated assemblies are of single blade, multi-blade and curtain types. Fire curtain doors classified by Underwriters' Laboratories as time rated (3 hour) and labeled (A) are of the curtain-blade type.

Note #3: See s. ILHR 64.67 for fire damper requirements in kitchen exhaust systems.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; r. (1) (a), renum. (1) (b) and (c) to be (1) (a) and (b), Register, December, 1976, No. 252, eff. 1-1-77; am. (2) (c), Register, December, 1977, No. 264, eff. 1-1-78; cr. (2) (d), Register, December, 1978, No. 276, eff. 1-1-79; am. (1) and (2), Register, December, 1981, No. 312, eff. 1-1-82; am. (1) (intro.) and (a), Register, December, 1983, No. 336, eff. 1-1-84.

ILHR 64.43 Dampers and damper controls. (1) VOLUME DAMPERS AND DEFLECTORS. Volume dampers, splitters and deflectors shall be provided

in all ducts to permit accurate balancing of the system. The dampers, splitters and deflectors shall be adjusted to satisfy the heating and ventilating requirements of the conditioned space and locked in place.

(2) AIR GRILLES. All air supply outlets and returns shall be equipped with grilles or devices which will provide a uniform distribution of air.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.44 Fans and blowers. (1) TYPE AND CAPACITY. Fans and blowers shall be of a type and size that will satisfy the design conditions of the heating and ventilating system. Fans and blowers shall be rated in accordance with an approved test procedure.

Note: The department accepts certified ratings listed by the Air Moving and Conditioning Association, Inc.

(2) QUIET OPERATION. The sound generated by various fans and blowers shall not be objectionable.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

Part VI—Chimneys, Gas Vents, Mechanical Draft and Venting Devices

ILHR 64.45 Chimneys, smoke stacks, gas vents, mechanical draft and venting devices. (1) GENERAL REQUIREMENTS. Heating equipment using solid, liquid or gas fuels shall be vented to the outside, except as permitted in s. ILHR 64.21. A natural draft chimney or other venting device shall have the height and area to remove the products of combustion. Chimneys, smoke stacks, gas vents, mechanical draft and venting devices shall comply with the requirements of NFPA No. 211 [s. ILHR 51.27 (7a)], Chimneys, Fireplaces and Vents. **FP**

(2) NONCOMBUSTIBLE SUPPORTS. All chimneys or gas vents shall be supported from noncombustible construction unless otherwise approved.

(3) TERMINATION. (a) *Gravity type.* 1. All chimneys or smokestacks depending on a gravity principle for the removal of the products of combustion shall extend at least 3 feet above the highest point where the chimneys or smokestacks pass through the roof of the building, and at least 2 feet higher than any ridge, peak or wall within 10 feet of the chimney or smokestack.

2. Type "B", "BW" and "L" vents and single wall vent pipes depending on a gravity principle for the removal of the products of combustion shall extend at least 2 feet above the highest point where the vents or pipes pass through the roof of the building, and at least 2 feet higher than any ridge, peak or wall within 10 feet of the vent or pipe.

(b) *Mechanical type.* The height and cross-sectional area may be reduced for chimneys employing a mechanical draft system of either forced or induced draft when approved by the department.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (1) and (3)(a), Register, January, 1980, No. 289, eff. 2-1-80.

ILHR 64.46 Masonry chimneys. The design and construction of the chimney shall conform to the provisions of this section. **FP**

(1) MATERIALS. The walls shall be built of brick or other approved fire-resistive material. No chimney shall rest upon a flooring of wood nor shall any wood be built into or in contact with any chimney. Combustible headers, beams, joists and studs shall be located at least 2 inches from the outside face of a chimney. The foundation shall be designed and built in conformity with the requirements for foundations for buildings. In no case shall a chimney be corbeled out more than 6 inches from the wall and in every case the corbeling shall consist of at least 5 courses of brick.

(2) FLUE SIZE. Every masonry chimney shall have walls at least 8 inches in solid thickness, except that in a chimney with a flue not larger than 260 square inches where a fire clay or other suitable refractory clay flue lining is used for the full height of the chimney the walls shall not be less than 4 inches in solid thickness. No smoke flue shall have a cross-sectional area less than 64 square inches. Flue linings 7 inches by 7 inches inside, or 8 inches in diameter inside, may be used.

(3) FLUE LININGS. All flue linings shall be capable of withstanding reasonably high temperatures and flue gases and shall have a softening point not lower than 1800° F. Flue linings shall be not less than ⅝ inch in thickness and shall be built in as outer walls of the chimney are constructed. Flue linings shall start from a point not less than 8 inches below the bottom of the smoke pipe intake and shall be continuous to a point not less than 4 inches above the enclosing walls.

(4) SMOKE PIPE CONNECTION. If there is more than one smoke pipe connected to a flue, the connections shall be at different levels. Two or more heating units, or appliances, may be connected to a common smoke pipe, or breeching, if joined by Y fittings as close as practicable to the flue. In all such cases, the size of the breeching and the flue shall be sufficient to accommodate the total volume of flue gases.

(5) CLEAN-OUT OPENING. Every chimney shall be provided with a clean-out opening at the base. Such openings shall be equipped with metal doors and frames arranged to remain closed when not in use.

(6) WIND PRESSURE. Every chimney shall be designed to withstand wind pressures in accordance with the requirements of s. ILHR 53.12.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (1), Register, January, 1980, No. 289, eff. 2-1-80.

FP ILHR 64.47 Metal smokestacks. (1) SMOKESTACKS IN EXCESS OF 30 FEET. The thickness of the metal walls shall be at least 3/16 inch for smokestack heights up to 40 feet and ¼ inch for greater heights. Stacks used for manufacturing, high-pressure boilers, furnaces or other similar heating or manufacturing appliances shall be lined with firebrick, or equivalent, for a distance of not less than 25 feet from the place where the smoke pipe enters and shall be protected on the outside up to and through the roof of the building with 8 inches of masonry, or a metal shield which provides an 8-inch ventilated air space between such shield and the stack. All stacks shall be properly guyed if the height of the stack exceeds 15 times its least diameter.

(a) *Exception.* Public utility or industrial power plants are exempted from the protection requirements of this paragraph if they are of type 1 or 2 construction.

(2) SMOKESTACKS LESS THAN 30 FEET. Smokestacks less than 30 feet high may be constructed of not less than No. 10 U.S. gauge steel, with either welded or riveted joints, and may be mounted directly upon masonry chimneys or foundations or upon industrial heating or power boilers provided all of which are designed to support the stack load. A clearance of not less than 6 inches shall be maintained at all times around such smokestack and any combustible material within 12 inches of such smokestack shall be protected by ¼ inch of asbestos covered by sheet metal.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (1) (intro.), Register, December, 1978, No. 276, eff. 1-1-79.

ILHR 64.48 Factory-built chimneys and gas vents. (1) GENERAL. Factory-built chimneys and gas vents shall be of an approved type. **FP**

(2) TYPES OF APPROVED CHIMNEYS AND GAS VENTS. (a) *Residential type and building heating appliance.* An approved "residential type and building heating appliance" chimney or "building heating appliance" chimney may be used with solid-, liquid- or gas-fired heating appliances where the flue gas temperature does not exceed 1000° F. continuously, and does not exceed 1400° F. for infrequent brief periods of forced firing.

(b) *Type "B".* An approved type "B" gas vent may be used with gas-fired appliances where the flue gas temperature does not exceed 550° F. at the outlet of the draft hood.

(c) *Type "BW".* An approved type "BW" gas vent may be used with a vented recessed wall heater.

(d) *Single wall vent pipe.* An approved single wall vent pipe may be used with gas-fired, low-heat appliances (low-pressure boilers, furnaces and space heaters). The vent shall be not less than No. 20 standard gauge galvanized iron, No. 24 Brown and Sharpe gauge sheet copper, or other approved corrosion-resistant material. The installation shall conform to the requirements of s. ILHR 64.50.

(e) *Type "L".* An approved type "L" vent may be used with oil-fired appliances listed as suitable by a recognized agency and with gas-fired appliances approved for type "B" vents.

(f) *Equipment listed with venting system.* Venting systems included with the listing of the heating appliance may be used subject to the requirements and limitations of the listing.

Note: The department recognizes, as approved, chimneys designated as "residential type", "building heating appliance", "B", "BW" and "L" types listed by Underwriters' Laboratories, Inc.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; r. and recr., Register, December, 1978, No. 276, eff. 1-1-79; am. (2)(a) and (d), Register, December, 1981, No. 312, eff. 1-1-82; cr. (2) (f), Register, December, 1983, No. 336, eff. 1-1-84.

ILHR 64.49 Gas vents. All gas ranges (except those designed as unvented), water heaters and other gas-fired equipment shall be provided with vent pipes conforming to the requirements for gas vents as specified in s. ILHR 64.48 and for connectors as specified in s. ILHR 64.50. Commercial kitchen appliances including but not limited to ranges, ovens, **FP**

booster heaters and similar equipment may be vented into the kitchen hood exhaust system.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. Register, December, 1978, No. 276, eff. 1-1-79; am. Register, January, 1980, No. 289, eff. 2-1-80; renum. from ILHR 64.50 and am., Register, December, 1981, No. 312, eff. 1-1-82.

FP ILHR 64.50 Chimney and vent connectors. (1) CONSTRUCTION AND INSTALLATION. The construction and installation of chimney connectors shall conform with the following requirements:

(a) *Concealed space.* No chimney connector shall pass through any outside window, door or combustible outside wall, nor be concealed in any closet, attic or similar space;

(b) *Combustible partitions and walls.* Connectors for appliances shall not pass through interior walls or partitions constructed of combustible material unless they are guarded at the point of passage by:

1. Metal ventilated thimbles not less than 12 inches larger in diameter than the connector, or

2. Metal or burned fireclay thimbles built in brickwork or other approved fireproofing materials extending not less than 8 inches beyond all sides of the thimble;

(c) *Distance from materials.* Connectors shall be installed with clearance to combustibles specified in par. (b) or NFPA Standard 211;

(d) *Multiple appliance venting.* Two or more appliances using the same type of fuel may be connected to a common gravity-type chimney or vent, provided the appliances are equipped with primary safety controls and listed shutoff devices and comply with the following requirements:

1. The appliances shall be located in the same story, except for engineered venting systems,

2. The appliances shall be joined at a manifold or Y-type fitting as close to the chimney or vent as possible, unless the connector from each appliance enters a separate chimney or vent inlet and the inlets are offset at least 12 inches vertically or are at right angles to each other,

3. The connector and chimney or vent shall be sized to accommodate the total volume of flue gases. For gas-burning appliances, the venting area shall be at least equal to the size of the largest vent connector plus at least 50% of the area of the other vent connectors, or

4. A chimney serving a fireplace or other piece of solid-fuel equipment shall not be used to vent any other appliance;

(e) *Pitch and length.* Chimney or vent connectors shall have no more than two 45° offsets with the vertical. The horizontal length shall not exceed 75% of the total vertical height of the total venting system measured from the appliance outlet. Chimney or vent connectors shall be pitched up at least ¼ inch per foot from the appliance outlet collar to the chimney or vent inlet;

(f) *Dampers.* A manual cast iron or equivalent damper to control the draft shall be provided in the chimney connector next to solid-fuel fired equipment. Manually operated dampers shall be prohibited in chimney or vent connectors of all other appliances. When used, listed automati-

cally operated dampers interlocked with the heating appliance shall be installed in accordance with the approved listing; and

(g) *Materials and thickness.* 1. Except as specified in subd. 2., chimney or vent connectors shall be listed or conform to the type of material and thickness indicated in Table 64.50 or equivalent.

2. 'Exception'. Connectors serving listed residential-type gas appliances shall be not less than .016 inch galvanized steel.

TABLE 64.50

MINIMUM CHIMNEY CONNECTOR METAL THICKNESS

Galvanized Steel		
Diameter of Connector	Min. thickness (inch)	Gauge
Less than 6 inches	.019	26
6 inches to less than 10 inches	.024	24
10 inches to 13 inches	.030	22
14 inches to 16 inches	.036	20
Greater than 16 inches	.058	16

History: Cr. Register, December, 1981, No. 312. eff. 1-1-82; am. (1) (c) and (g) 2., Register, August, 1985, No. 356, eff. 1-1-86.

Part VII—Equipment Location, Protection, Maintenance and Operation

ILHR 64.51 Guarding and fire protection. (1) GUARDING OF EQUIPMENT. Heating and ventilating equipment in gymnasiums, playrooms and similarly occupied areas shall be fully recessed and protected, or located not less than 7 feet above the floor. Heating and ventilating equipment shall not block any part of the required aisles, passageways and corridors.

(2) GUARDING OF SURFACES. Equipment located in occupied areas and installed less than 7 feet above the floor shall be guarded to prevent contact with surfaces that are likely to cause lacerations.

(3) GUARDING OF MECHANICAL APPARATUS. All mechanical apparatus shall be guarded to comply with the requirements of chs. Ind 1000-2000—Safety and Health Code.

(4) FIRE PROTECTION. (a) 1. Heat-producing appliances and their chimney or vent connectors shall be installed with clearances to combustible material as specified in NFPA Manual No. 211 unless listed for installation at other clearances. FP

2. Clearance to combustible materials shall be as specified in NFPA Standard No. 211 or as specified by a nationally recommended testing laboratory, whichever is greater.

(b) Clearances shall be measured from the outer surface of the appliance or connector to the combustible material, disregarding any intervening protection applied to the combustible material.

(c) Appliances shall not be installed in alcoves or closets unless approved for such installations.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (2), Register, December, 1976, No. 252, eff. 1-1-77; am. (2), Register, January, 1980, No. 289, eff. 2-1-80; am. (4), Register, December, 1981, No. 312, eff. 1-1-82; am. (4) and r. tables 64.51 A to D, Register, August, 1985, No. 356, eff. 1-1-86.

FP **ILHR 64.52 Maintenance and operation.** (1) MAINTENANCE. All heating, ventilating, exhaust and air conditioning systems shall be maintained in good working order and shall be kept clean and sanitary. Chimneys or vents and connectors serving solid-fuel burning appliances shall be cleaned and inspected for damage annually. Chimneys and vents, which have been subjected to a chimney fire, shall not be reused until inspected and approved by the department or authorized deputy.

(2) OPERATION. All heating, ventilating and exhaust systems shall be operated to satisfy the requirements of this chapter during periods the building is occupied.

(3) INSTRUCTIONS. The designer or installer shall provide the owner with written instructions for the operation and maintenance of the system and equipment.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (1), Register, December, 1981, No. 312, eff. 1-1-82.

ILHR 64.53 Final test required. The designer, installer or recognized balancing agency shall be responsible for the testing and balancing of every heating, ventilating and air conditioning system.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

Part VIII—Occupancy Requirements

ILHR 64.54 Factories, office and mercantile buildings. (1) SCOPE. This classification shall include all places of employment, mercantile buildings, retail establishments where goods and commodities are bought and sold, and places where not more than 100 persons assemble for worship, recreation, entertainment or dining purposes.

Note: For mall corridors of enclosed mall shopping centers, see s. ILHR 64.05, Table 1.

(2) VENTILATION. The air movement, supply and distribution for all occupancies in this class shall conform to the requirements of s. ILHR 64.05, Table 1, except that natural ventilation or mechanical ventilation need not be provided in warehouses and cold storage buildings.

(3) INDUSTRIAL EXHAUST SYSTEM. (a) *Contaminants.* Industrial exhaust systems shall be installed and operated to remove harmful contaminants in conformance with chs. Ind 1000-2000—Safety and Health Code.

(b) *Makeup air.* A volume of outside air shall be supplied to replace the air exhausted if the total volume of air exhausted exceeds one air change per hour. The quantity of makeup air shall equal at least 90% of the air exhausted.

(c) *Connections.* Connections between industrial exhaust systems that convey different materials, the combination of which may produce explosive, heat-generating, corrosive, toxic, or otherwise dangerous mixtures, shall be prohibited.

(4) LOCKER ROOMS. Locker rooms used in places of industrial employment shall be provided with outside air. See s. ILHR 64.05, Table 1.

Note: Exhaust air from locker rooms may be directed through the adjoining toilet room or shower room.

(5) FIRST AID REST ROOMS IN PLACES OF EMPLOYMENT. Ventilation shall be provided for all areas of this class to conform to the requirements of s. ILHR 64.05, Table 1.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.55 Theaters and places of assembly. (1) SCOPE. This classification shall include auditoriums, arenas, armories, assembly halls, banquet halls, billiard rooms, bowling alleys, cafeterias, club rooms, dance halls, dining rooms, gymnasiums, lecture halls, lodge halls, playrooms, restaurants, school auditoriums, Sunday schools and places of worship, funeral home chapels, parochial schools, convents, indoor skating rinks, and theaters which accommodate more than 100 persons for entertainment, recreation, worship, or dining purposes.

Note: For areas that will accommodate less than 100 persons, see s. ILHR 64.54.

(2) VENTILATION. The air movement, supply and distribution for all occupancies under this classification shall conform to the requirements of s. ILHR 64.05, Table 1.

(3) ALTERNATE SERVICE AND CAPACITY. Heating and ventilating systems installed in places of worship, Sunday schools, so-called community buildings and lodge halls may be arranged for selective delivery of the entire service to either the first floor area or to the basement floor area provided these areas are not used simultaneously.

(4) STAGES. The stage in any theater or assembly hall, for which a fire curtain is required, shall be supplied with sufficient air or other means to equalize the pressure to avoid deflecting the curtain.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.56 Schools and other places of instruction. (1) SCOPE. This classification shall apply to all public and private schools, colleges, universities, academies, seminaries, libraries, museums, art galleries, all places used for vocational instruction and research such as laboratories, shops, science rooms, and all parts of buildings used for instructional purposes.

(2) VENTILATION. The air movement, supply and distribution for all occupancies under this classification shall conform to the requirements of s. ILHR 64.05, Table 1. For corridors provided with lockers, the air movement shall be not less than 10 cubic feet per minute per lineal foot of corridor. This air supply shall be accomplished by means of air inlets admitting air from adjacent classrooms or by a direct tempered air supply.

Note: This rule does not apply to corridors furnished with coat hooks.

(3) EXHAUST SYSTEMS AND HEAT RECOVERY. (a) An exhaust system, as specified in s. ILHR 64.54 (3), shall be provided for all equipment and processes that create dust, fumes, vapors and gases injurious to health.

(b) Exhaust systems whose operation is more than 3600 hours per year shall be equipped with heat recovery devices to reduce the energy consumption in the building.

1. Exception. a. Systems exhausting explosive materials, such as perchloric acid need not be so equipped.

b. Fan systems exhausting 250 CFM or less need not be so equipped.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (3), Register, December, 1976, No. 252, eff. 1-1-77.; am. (3), Register, December, 1981, No. 312, eff. 1-1-82.

ILHR 64.57 Health care facilities. (1) SCOPE. The rules of this section apply to hospitals, nursing homes and outpatient surgical facilities where medical services are provided.

(2) GENERAL. (a) The heating, ventilating and air conditioning systems of all occupancies within the scope of this section shall be designed, operated and maintained as specified in sections 2, 7.29 A. to D., 8.12 A. to C., 9.2 L., 9.4 I., 9.5 M. and 9.6 J., depending upon the occupancy, of the Guidelines for Construction and Equipment for Hospitals and Medical Facilities, DHHS Publication No. (HRS-M-HF) 84-1.

(b) The heating, ventilating and air conditioning systems shall also be designed, operated and maintained as specified in the applicable sections of the following standards as referenced in DHHS Publication No. (HRS-M-HF) 84-1.:

1. Installation of Air Conditioning and Ventilating Systems, NFPA No. 90A;

2. ASHRAE Handbook of Fundamentals; and

3. Methods of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter, ASHRAE Standard No. 52.

(3) APPLICATION OF RULES. Where other sections of ch. ILHR 64 specify different requirements than those contained in this section, the requirements specified in this section shall govern.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; r. (2) (d), Register, January, 1980, No. 289, eff. 2-1-80; r. and recr., Register, February, 1982, No. 314, eff. 3-1-82; r. and recr. (2), r. (3), renum. (4) to be (3), Register, August, 1985, No. 356, eff. 1-1-86.

ILHR 64.58 Penal institutions and places of detention. (1) SCOPE. This classification shall include corridors and areas of compulsory occupancy in penal institutions, mental hospitals and other places of detention.

(2) VENTILATION. The air movement, supply and distribution for all areas of this class shall conform to the requirements of s. ILHR 64.05, Table 1.

(3) OVERNIGHT LOCK-UPS. Where cells are provided for not more than 6 occupants for the purpose of overnight detention only, exhaust ventilation shall be provided on the basis of 6 air changes per hour for the occupied area.

History: Cr. Register, December, 1975, No.240, eff. 1-1-76; am. (2), Register, December, 1981, No. 312, eff. 1-1-82.

ILHR 64.59 Residential occupancies. (1) SCOPE. This classification shall include all apartments, row houses, rooming houses, hotels, motels, dormitories, and all other places of abode.

Note: See s. ILHR 51.01 (102a) for definition of "place of abode."

(2) VENTILATION. The air movement, supply and distribution for all areas of this class shall conform to the requirements of s. ILHR 64.05, Table 1.

(a) *Exception.* For motel or hotel sleeping rooms without openable outside windows and facing naturally lighted pool or recreation areas, see ss. ILHR 52.02 (1) (b) and 57.13 (2).

(3) RETURN AIR DUCTS. Unlined wood joists and stud spaces will be permitted to be used as return air ducts in individual living units provided with individual heating and ventilating systems.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (3), Register, December, 1976, No. 252, eff. 1-1-77; cr. (2) (a), Register, May, 1980, No. 293, eff. 6-1-80.

ILHR 64.60 Day care facilities. (1) SCOPE. This classification shall include all public and private day care centers accommodating more than 4 children, including all buildings or parts of buildings used as child day care facilities.

(2) VENTILATION. The air movement, supply and distribution for all areas of this class shall conform to the requirements of s. ILHR 64.05, Table 1.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.61 Repair areas. (1) SCOPE. This classification includes all areas where motor-driven vehicles are repaired involving the fuel system components or requiring the operation of the internal combustion engine.

(2) VENTILATION. The air movement, supply and distribution shall be provided in accordance with the requirements of s. ILHR 64.05, Table 1. The exhaust air shall be drawn from not more than 18 inches above the floor. **FP**

(3) TAIL PIPE EXHAUST. (a) *Mechanical exhaust system.* A mechanical exhaust system shall be provided in the repair area to remove the exhaust fumes from internal combustion engines. The duct system shall be designed with sufficient outlets to accommodate the total number of vehicles in the repair area. A flexible hose, equipped with a device for connecting it to the exhaust pipe of the vehicle and to the exhaust system, shall be provided. Each outlet shall be provided with a shut-off valve that can be closed when not in use. The blower capacity shall be sufficient to exhaust a volume of air not less than 100 cubic feet per minute for each opening.

(b) *Nonmechanical exhaust.* A noncombustible flexible tube or hose not more than 10 feet long, connected to the engine exhaust (tail pipe) and terminating outside the building, may be used in lieu of the requirements stated in par. (a).

Note: The requirements stated in sub. (2) need not be increased when satisfying requirements of either sub. (3) (a) or (b). Also see chs. Ind 1000-2000—Safety and Health Code.

(4) MISCELLANEOUS REPAIR AREAS. Areas involved in the servicing of small internal combustion engines such as lawnmowers, snowmobiles, chainsaws, cycles, boat engines, and similiar types of engines, and battery charging areas, shall be provided with at least 3/4 cubic foot per minute of outside air per square foot of enclosed service floor area and an

equivalent exhaust. Exhaust from battery charging areas shall be from the top of the area.

(5) CONTAMINANTS. If the provisions of this section do not provide sufficient ventilation to meet the standards for threshold limit values covered in chs. Ind 1000-2000—Safety and Health Code, the additional exhaust requirements with an equivalent volume of outside air shall be provided to satisfy the requirements found in chs. Ind 1000-2000.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (4), Register, December, 1978, No. 276, eff. 1-1-79; am. (1), Register, December, 1983, No. 336, eff. 1-1-84.

ILHR 64.62 Vehicle service buildings. (1) APPLICATION. (a) This section applies to liquid fuel dispensing stations and facilities where vehicles can be driven into the building for washing, greasing, oil change, tire replacement, body repair, and similar operations.

(b) The exhaust air shall be drawn from not more than 18 inches above the floor.

FP (2) VENTILATION. (a) Air movement, supply, distribution and exhaust shall be provided as specified in s. ILHR 64.05, Table 1.

(b) Buildings or portions of buildings having a capacity of and used exclusively for washing 2 or more vehicles simultaneously shall be exhausted at not less than ½ cubic foot per minute per square foot of floor area based on that portion of the floor located between the termination of the conveyor system and the vehicle exit door. A supply of makeup air is not required for this exhaust.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (2)(b) (intro.), Register, January, 1980, No. 289, eff. 2-1-80; r. and recr. Register, August, 1985, No. 356, eff. 1-1-86.

ILHR 64.63 Garages. (1) SCOPE. This classification includes all buildings, or parts of buildings, where motor-driven vehicles are stored.

FP (2) VENTILATION. The air movement, supply and distribution shall be provided in accordance with the requirements of s. ILHR 64.05, Table 1. Live storage areas shall be provided with exhaust air drawn from a height not more than 18 inches above the floor unless the following requirements are satisfied:

(a) The floor is located at or above grade; and

(b) A permanent open-wall area of at least 30% of the total wall area is provided. The openings shall be distributed to permit circulation of air throughout the storage area.

Note: The department will permit the use of a mechanical exhaust system in conjunction with openings in the exterior walls to provide the ventilation required by Table 1.

(3) CONTAMINANTS. If the provisions of this section do not provide sufficient ventilation to meet the standards for threshold limit values covered in chs. Ind 1000-2000—Safety and Health Code, the additional exhaust requirements with an equivalent volume of outside air shall be provided to satisfy the requirements found in chs. Ind 1000-2000.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76.

ILHR 64.64 Vehicle showrooms. (1) SCOPE. This classification includes all vehicle showrooms with offices and occupancies unless designed as part of the vehicle garage adjacent to repair or vehicle storage areas

where all vehicles displayed in the showroom are without batteries and fuel tanks are empty and free of fumes.

Note: A live storage area is any area used for storage of fire trucks, tractors, automobiles, trucks, and similar self-propelled vehicles which are driven in and out of the storage area under their own power; it does not include areas where vehicles and equipment are stored for seasonal periods, or areas where vehicles are displayed without batteries and where the gasoline tanks of the vehicles are empty and free of fumes.

(2) VENTILATION. The air movement, supply and distribution shall be provided in accordance with the requirements of s. ILHR 64.05, Table 1.

(a) *Separate ventilating system.* A separate ventilating system shall be provided for showrooms or offices where such occupancies are adjacent to repair or live storage areas.

Note: Ventilation is not required if an openable area is provided to conform with the requirements of s. ILHR 64.07.

(b) *Recirculation.* Air shall not be recirculated from any repair, live storage or service area unless the total volume of air in circulation is in excess of the ventilation required. Excess air may be recirculated.

(c) *Contaminants.* If the provisions of this section do not provide sufficient ventilation to meet the standards for threshold limit values covered in chs. Ind 1000-2000—Safety and Health Code, the additional exhaust requirements with an equivalent volume of outside air shall be provided to satisfy the requirements found in chs. Ind 1000-2000.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (1), Register, December, 1983, No. 336, eff. 1-1-84.

ILHR 64.65 General sanitation and service areas. (1) SCOPE. This classification shall include toilet rooms, locker rooms, shower rooms and janitor closets.

Note #1: A janitor closet is a service closet with one or more plumbing fixtures.

Note #2: For exhaust ventilation requirements in hospital service areas, see s. ILHR 64.57.

Note #3: For exhaust ventilation requirements in places of employment, see s. ILHR 64.54.

Note #4: The use of wall registers within 4 inches of the floor, baseboard registers, and floor registers is prohibited in these areas. (See s. ILHR 52.57, Note.)

Note #5: The rules of this section are not intended to preclude the use of energy recovery wheels, plate type heat exchangers or similar energy recovery equipment.

(2) EXHAUST VENTILATING SYSTEMS. Exhaust ventilating systems serving this class of occupancy may be combined with other exhaust services provided the combined system:

(a) Does not allow recirculation; and

(b) Does not include grease hood exhaust, radioactive exhaust, fume hood exhaust, exhaust required by chs. Ind 1000-2000, exhaust that requires electical grounding, or exhaust that requires spark resistant fan construction.

(3) VENTILATION. The air movement, supply and distribution shall be provided in accordance with the requirements of s. ILHR 64.05, Table 1.

(a) *Exhaust ventilation.* Exhaust ventilation shall be provided for all areas of this class unless otherwise exempted. The volume of air exhausted shall be provided at a rate of not less than 2 cubic feet per minute

per square foot of floor area, or 60 cubic feet per minute per fixture (water closets and urinals). Mechanical exhaust ventilation shall be installed in toilet rooms having more than one fixture (water closets and urinals). The effectiveness of the exhaust shall be greater than the supply.

(b) *Natural ventilation.* Exhaust ventilation is not required from toilet rooms having one water closet or one urinal, or from janitor closets having one service sink or receptor, provided the room has an outside window of at least 4 square feet with at least 2 square feet that is openable.

1. Exception. Mechanical exhaust ventilation may be omitted from toilet rooms or bathrooms having one water closet or urinal except in taverns and restaurants, or from janitor closets having one service sink or receptor, where an approved ductless air circulating and treatment device is provided.

(c) *Locker, shower and toilet room ventilation.* Adjoining locker, shower and toilet rooms shall be exhausted at the rate of 2 cubic feet per minute per square foot of area, based on the floor area of the largest space. The rooms shall be provided with tempered makeup air supplied directly from the outside or transferred from other areas of the building in accordance with the requirements of s. ILHR 64.18. A negative pressure relationship shall be maintained in the shower and toilet rooms with respect to the locker room.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; am. (1), cr. (3) (c) and r. (4), Register, December, 1976, No. 252, eff. 1-1-77; cr. (3) (b) 1, Register, December, 1977, No. 264, eff. 1-1-78; am. (3) (b) 1., Register, December, 1981, No. 312, eff. 1-1-82; am. (3) (b) 1., Register, December, 1983, No. 336, eff. 1-1-84; r. and recr. (2), Register, August, 1985, No. 356, eff. 1-1-86; reprinted to correct an error in (2) (intro.), Register, December, 1985, No. 360.

ILHR 64.66 Natatoriums. (1) POOL VENTILATION. In natatoriums, a volume of tempered outside air supply and exhaust shall be provided at the rate of at least 2 cubic feet per minute per square foot of pool surface. The volume of tempered outside air and exhaust may be reduced to a minimum of one cubic foot per minute per square foot of pool surface provided humidity controls are used to limit the relative humidity to 60%.

(2) AIR MOVEMENT. The air movement in a natatorium shall be not less than 6 air changes per hour unless mechanical cooling is provided to satisfy the heat gain requirement for the space.

History: Cr. Register, December, 1976, No. 252, eff. 1-1-77.

ILHR 64.67 Kitchens (1) SCOPE. This classification includes all areas where food is prepared (except in domestic science educational facilities from grades kindergarten through 12, and single unit apartments in hotels, motels and apartment buildings).

(2) EXHAUST VENTILATION SYSTEMS. Exhaust ventilation systems serving this occupancy shall not be used for any other service.

(a) *Required exhaust ventilation.* When cooking equipment is being operated, mechanical exhaust ventilation shall be provided at a rate not less than 2 cubic feet per minute per square foot of floor area for every occupied area within the scope of this section. When cooking equipment is not being operated, a minimum supply of outside air and exhaust at the rate of 5 CFM per person or natural ventilation as specified in s. ILHR 64.07 shall be provided during periods of occupancy.

(b) *Required exhaust hood.* Exhaust hoods shall be required where frying, including deep-fat frying and surface frying, or broiling or both is conducted as part of a regular commercial operation involving ranges, griddles, fryers, broilers and similar grease-producing equipment.

(3) REPLACEMENT AIR. Adequate replacement air shall be provided to equal the air being exhausted by all exhaust systems.

(4) EXHAUST HOOD REQUIREMENTS. (a) *Size of hood.* The horizontal inside dimensions for canopy hoods shall be sized to effectively capture grease vapors, but in no case shall these dimensions be less than the overall horizontal dimensions of the grease-producing equipment. The horizontal inside dimensions for noncanopy, prefabricated backshelf hoods may be less than the overall horizontal dimensions of the grease-producing equipment.

(b) *Exhaust rates.* The kitchen exhaust hood shall be provided with a capture velocity to effectively capture the grease vapors and may be designed through engineering analysis or the empirical design formulas stated below:

1. *Canopy hood.* Hood open on all 4 sides: $Q = 150$ A (area).

2. *Wall hood.* Hood open on 3 sides or less: $Q = 100$ A (area).

3. *Slotted-type hood.* $V = 350$ feet per minute through the slot opening. The slot shall be at least 3 inches in width and shall extend around the open sides of the hood.

4. *Noncanopy hood.* The minimum volume of exhaust air for noncanopy type hoods (prefabricated backshelf) shall be not less than $Q = 300$ L (length).

Note: Q equals the exhaust air in cubic feet per minute; A equals the area of the hood over the grease-producing equipment in square feet; V equals the velocity in feet per minute; and L equals the total length in feet of the cooking appliance being ventilated, and measured parallel to the front edge of the appliance.

(c) *Materials.* Hoods shall be constructed and supported by steel not less than .0478 inch U.S. standard gage (No. 18 manufacturers standard gage) or stainless steel not less than .0359 inch U.S. standard gage (No. 20 manufacturers standard gage) or other materials of equivalent strength, fire and corrosion resistance.

(d) *Seams.* All seams and joints shall be liquid-tight.

(e) *Grease-removal devices.* Approved grease extractors, grease filters or other grease-removal devices shall be provided.

(f) *Exposed hood surfaces.* Hood surfaces and exposed exhaust ducts within 18 inches of combustible material shall be protected as specified in sub. (5) (f).

(g) *Concealed hood surfaces.* Hood surfaces that are concealed by or recessed into adjoining construction shall be protected as specified in sub. (5) (f).

(h) *Double-wall hoods utilizing outdoor air.* When hoods are connected to ducts supplying outside air, performance data shall be submitted.

Note: Double-wall hoods provided with a supply of outdoor air conserve energy.

(5) EXHAUST DUCTS FROM HOODS. (a) *Design.* All ducts shall lead, as directly as possible, to the exterior of the building without forming dips or traps which collect residues. Ducts exposed to the exterior shall be protected with a suitable weatherproof coating.

Note: Temperatures in excess of 2000° F. may be experienced within ducts in the event of fire. A means of expansion of long ducts should be considered.

(b) *Materials.* Ducts shall be constructed of and supported by steel not lighter than .0598 inch U.S. standard gage (No. 16 manufacturers standard gage) or stainless steel not lighter than .0478 inch U.S. standard gage (No. 18 manufacturers standard gage) or other materials of equivalent strength, fire and corrosion resistance.

(c) *Seams and joints.* All seams and joints shall be liquid-tight.

(d) *Clean-out openings.* Accessible clean-out openings at the sides of ducts shall be provided at each change of direction of the duct for inspection and servicing.

FP (e) *Interior ducts.* Ducts shall not pass through required fire walls or partitions.

FP (f) *Concealed exhaust ducts.* 1. Horizontal ducts. Horizontal concealed ducts connected to hoods that pass through any other area of the building, including suspended ceilings, shall be protected with insulating material to withstand a flue temperature of not less than 1000° F. The temperature of the exposed surface of the insulating material shall not exceed 250° F. above the normal ambient temperature of 68° F.

Note: The department will accept the use of masonry chimneys or manufactured chimneys which are tested and approved for use at a flue gas temperature of not less than 1000° F., or insulating materials for fire endurance systems listed in the Fire Resistance Index published by Underwriters' Laboratories, Inc.

2. Vertical ducts. Vertical concealed ducts that pass through any other area of the building, including suspended ceilings, in one- and 2-story buildings, shall be protected with insulating material as specified in subd. 1., or shall be located in 2-hour noncombustible fire-resistive enclosures. In buildings of 3 or more stories, vertical ducts shall be located in 2-hour noncombustible fire-resistive enclosures.

FP (g) *Exposed exhaust ducts.* Exposed exhaust ducts connected to hoods or canopies shall be located not less than 18 inches from combustible material unless the duct is protected in accordance with the requirements of par. (f).

(h) *Air discharge.* The air discharge shall be directed away from the roof or combustible materials.

(i) *Dampers.* Fire dampers shall not be installed in kitchen exhaust duct systems unless the assembly includes an approved extinguishing system designed to operate with a fire damper in the closed position.

FP (6) AUTOMATIC SUPPRESSION SYSTEMS. Exhaust hoods and ducts in kitchens used for commercial purposes shall be protected by an approved automatic fire suppression system. The suppression system shall comply with the following:

(a) When the fire suppression system is activated, all gas and electrical sources serving cooking appliances, grease consuming appliances or fume

incinerators and equipment associated with the hoods shall be automatically deactivated. Such gas and electrical sources shall not be capable of reactivation except by manual means after the fire suppression system has been serviced and is again ready for action;

(b) 1. Except as provided in subd. 2., hood and duct suppression systems shall provide for both automatic and manual actuation of the system;

2. Automatic fire sprinkler systems using water need not be provided with means for manual actuation.

(c) A manual station for actuation of the suppression system shall be located at or near one of the means of egress from the area but not nearer than 10 feet to the range hood unless otherwise specifically approved, and shall be securely mounted not less than 4½ feet nor more than 5 feet above the floor;

(d) The system shall be maintained at full operating capacity by the owner and shall be serviced every 6 months; and

(e) All nozzles shall be accessible for cleaning and replacement.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; renum. from 64.66, r. and recr. (5) (a) to (d), renum. (5) (e) to (i) to be (5) (d) to (h), am. (6) (b), Register, December, 1976, No. 252, eff. 1-1-77; am. (5) (f) and (g), Register, December, 1977, No. 264, eff. 1-1-78; am. (4) and (6) (f) 1., Register, December, 1978, No. 276, eff. 1-1-79; am. (2)(a), r. (4), renum. (5) and (6) to be (4) and (5), Register, January, 1980, No. 289, eff. 2-1-80; am. (2) (a), (4) (f) and (g), Register, December, 1981, No. 312, eff. 1-1-82; cr. (6), Register, June, 1983, No. 330, eff. 7-1-83; r. and recr. (2) (b), am. (4) (b) 3., Register, December, 1983, No. 336, eff. 1-1-84.

ILHR 64.68 Seasonal occupancies. When approved in writing by the department, heating requirements may be waived but not ventilation required by s. ILHR 64.05, Table 1 during the period of May 15 through September 15 for the following or similar occupancies: drive-in eating places, club houses, outdoor toilets, camp lodge buildings, canning factories and migrant labor camps.

Note: Rules on migrant labor can be found in ch. Ind 201.

History: Cr. Register, December, 1975, No. 240, eff. 1-1-76; renum. from 64.67, Register, December, 1976, No. 252, eff. 1-1-77; am., Register, December, 1981, No. 312, eff. 1-1-82.