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Note: Chapter Ind 59 as it existed on December 31, 1975 was repealed and a new chapter Ind 64 was created effective January 1, 1976.

PART I—SCOPE

Ind 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.

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.

Ind 64.02 Approval of drawings and specifications. All drawings and specifications shall be submitted to the department in accordance with the provisions of sections Ind 50.10 and Ind 50.13.

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

PART II—DESIGN REQUIREMENTS

Ind 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 and/or ventilation losses, whichever are greater.

(2) HEATING SYSTEM DESIGN. The heating system shall be designed on the basis of the losses determined by (a) or (b) below, whichever is greater. 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.

(a) *Occupied periods.* The heating system shall be designed to equal building transmission losses and infiltration and/or ventilation losses during occupied periods; or

(b) *Unoccupied periods.* The heating system shall be designed to equal building transmission losses and infiltration losses during unoccupied periods.

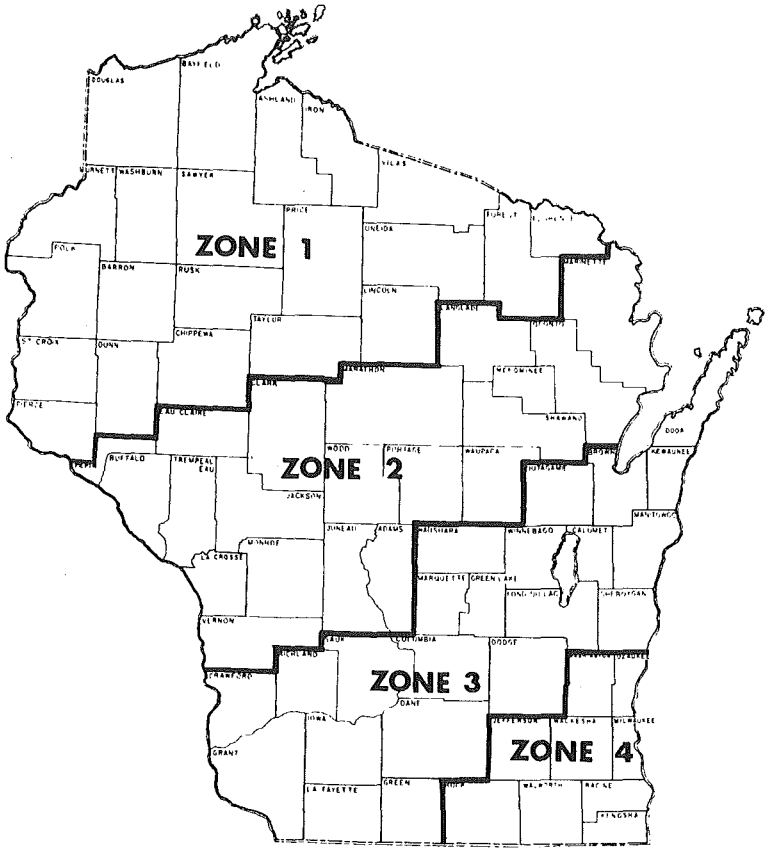
(3) CAPACITY AND ARRANGEMENT. The calculated capacity and the arrangement of all installations for required heating and ventilating shall be based upon simultaneous service to all parts of the building unless otherwise exempted by this code.

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

Ind 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

Ind 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.

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

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

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

(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) 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: The intent of this statement is not to require full outside air when there is not full occupancy of the building. The opening of outside air intakes may be delayed one hour after initial occupancy of the building.

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

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

Ind 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 and/or lot line 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 section Ind 64.19.

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

TABLE 1

Use or Occupancy	Minimum Inside Temp. (Deg. F)	Ventilation Requirements[1]				Applicable Occupancy Code Section (Ind No.)
		Ventilation Classification[2]	Basis of Capacity: Determination of No. of Persons[3] Net sq. ft. per Person	Basis of Capacity: % 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	3	--	64.54
Canning factories (June 1-Sep 15)	NMR	(b)	75	3	--	64.54, 64.67
(other months)	60	(a)	--	3	--	64.54
Computer rooms	67	(a)	75	--	--	64.54
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)	15	5	--	64.54 (5)
Flammable liquids storage	NMR	(d)	--	--	--	S&H Code
Foundries and boiler shops	50	(b)	75	3	--	64.54
Funeral homes:						
Chapel	67	(b)	6	5	--	64.54
Embalming room	67	(d)	--	--	2	64.54
Offices	67	(b)	75	3	--	64.54
Printing establishments	60	(b) and (d)	--	3	--	64.54 and S&H Code
Retail establishments (basement)	65	(b)	40	3	--	64.54
(other)	65	(b)	60	3	--	64.54
Security vaults (occupied)	65	(a)	300	--	--	64.54
Warehouses	NMR	--	--	--	--	64.18, 64.54
(See Theaters and places of assembly for places of worship, entertainment and recreation which accommodate less than 100 persons.)						
Theaters and places of assembly						
Arenas and field houses (use seated area)	60	(a)	6	--	--	64.55
Armories (drill halls)	55	(a)	30	--	--	64.55
Assembly halls (other than church)	67	(a)	6	--	--	64.55
Bowling alleys	67	(b)	15	--	--	Based on occupied areas
Cafeterias, dining areas, restaurants, billiard rooms	67	(b)	15	3	--	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	(b)	6	3	--	64.55
(unseated)	67	(b)	15	3	--	64.55
Dance halls	67	(a)	15	3	--	64.55
Lodge halls	65	(b)	--	3	--	64.55
Places for entertainment and dining	60	(a) or (c)	15	--	--	64.55
Roller and ice skating rinks (indoor)	50	(a)	15	--	--	64.55
Ice resurfacing machine area	NMR	(c)	--	--	1/2	64.55
Taverns (50 or less persons)	67	(b)	20	3	--	64.55
(over 50 persons)	67	(a)	20	--	--	64.55
Tennis courts (indoor)	55	(b)	--	--	--	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)
Hospitals and nursing homes						
Corridors	75	(a) and (d)	--	--	--	64.57
Day rooms	75	(b)	15	5	--	64.57
Laboratories	67	(a) and/or (d)	25	--	--	64.18 and S&H Code
Laundries	60	(d)	--	--	2	64.65
Nurses stations	75	(b)	15	5	--	64.57
Operating rooms	70	(a) and (d)	--	--	--	64.57
Private rooms, wards, dormitories	75	(b)	--	5	--	64.57
Recovery, labor, delivery, anesthesia, nurseries, isolation, therapy, autopsy rooms and bathrooms	75	(a) and (d)	--	--	--	64.57
Storage rooms for anesthetics, bed pans, soiled linen, and sterilizing rooms	60	(d)	--	--	2	64.65

CA = Cooking appliance.
LF = Lineal foot.
NMR = No minimum requirements.
S&H Code = Chapters Ind 1000-2000, Wis. Safety and Health Code.
TF = Toilet facilities (water closets and urinals).

[1]Ventilation requirements. See sections Ind 64.06, 64.07 and 64.09 for mechanical, natural and exhaust ventilation systems; and sections Ind 64.11 through 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.

(b) Requires a supply of outside air and an equal amount of exhaust ventilation at the rate of 5 CFM per person, or a percentage of openings.

(c) Requires a supply of outside air and exhaust 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.

[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.

[4]Percent of openings. See section Ind 64.07 for special considerations on natural ventilation.

TABLE 1 (CONTINUED)

Use or Occupancy	Minimum Inside Temp. (Deg. F)	Ventilation Requirements[1] Basis of Capacity: Ventilation Classification[2]	Determination of No. of Persons[3] Net sq. ft. per Person	% of Openings[4]	CFM/net sq. ft. Floor Area	Applicable Occupancy Code Section (Ind No.)
Schools and other places of instruction						
Administrative office space	67	(b)	75	3	--	64.56
Arts, crafts, drafting	67	(a) or (d)	30	--	--	64.56 (3) and S&H Code
Classrooms	67	(a)	20	--	--	64.56
Corridors	NMR	(a)	--	--	--	64.56 (2)
Gymnasiums, field houses, auditoriums, theaters (fixed seats)	55-67	(a)	6	--	--	64.56
Bleachers	--	(a)	2.75 or 18"/LF	--	--	64.56
Locker and shower rooms	70	(d)	--	--	2	64.65
Natatoriums	70	(d)	--	--	2 pool sf	64.65
Chlorine storage rooms	NMR	(d)	--	--	--	64.65
Home economics (non-cooking)	67	(a)	30	--	--	64.56
(cooking)	67	(a) and (d)	30	--	200/CA	64.66
Kitchens	60	(d)	--	--	2	64.66
Laboratories (science)	67	(a) and/or (d)	30	--	--	64.18 and S&H Code
Lecture halls	67	(a)	6	--	--	64.56
Libraries 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	64.56
Vocational shops:						
With vehicle service and repair	60	(d)	--	--	3/4	64.18 and S&H Code
Without vehicle service and repair	60	(a)	50	--	--	64.18 and S&H Code
Wardrobes	NMR	(d)	--	--	2	64.65
Penal institutions and places of detention						
Cells	67	(a)	--	--	--	64.58
Corridors	67	(a) and (d)	--	--	--	64.58
Residential occupancies						
Living and sleeping areas	67	--	--	5	--	64.59
Day care facilities	67	(b)	35	5	--	64.60
Garages and service stations						
Automobile showrooms	60	(a) or (b)	--	--	--	64.55, 64.64
Garages (live storage):						
Less than 6 vehicles	NMR	NMR	--	--	NMR	
6 or more vehicles	NMR	(c)	--	--	1/2	64.63
Repair areas	60	(c)	--	--	3/4	64.61
Vehicle service buildings	60	(c)	--	--	1/2	64.62
General sanitation and service areas						
Chlorine storage rooms	NMR	(d)	--	--	1	64.65
Cloak rooms	NMR	(d)	--	--	2	64.65
Janitor closets	NMR	(c)	--	--	2	64.65
Locker rooms and shower rooms	70	(c)	--	--	2	64.65
Natatoriums	70	(c)	--	--	2 pool sf	64.65
Toilet rooms	65	(c)	--	--	2 or 60/TF	64.65
Kitchens	60	(d)	--	--	2	64.66
Seasonal occupancies						
Camps and lodges:						
Dining and recreational areas	NMR	(b)	15	3	--	64.67
Living and sleeping areas	NMR	--	--	5	--	64.67
Club houses	NMR	(b)	15	3	--	64.67
Drive-ins	NMR	(b)	15	3	--	64.67
Kitchens	NMR	(d)	--	--	2	64.66
Outdoor toilets	NMR	(d)	--	--	2	64.65

CA = Cooking appliance.
LF = Lineal foot.
NMR = No minimum requirements.
S&H Code = Chapters Ind 1000-2000, Wis. Safety and Health Code.
TF = Toilet facilities (water closets and urinals).

[1]Ventilation requirements. See sections Ind 64.06, 64.07 and 64.09 for mechanical, natural and exhaust ventilation systems; and sections Ind 64.11 through 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.

(b) Requires a supply of outside air and an equal amount of exhaust ventilation at the rate of 5 CFM per person, or a percentage of openings.

(c) Requires a supply of outside air and exhaust 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.

[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.

[4]Percent of openings. See section Ind 64.07 for special considerations on natural ventilation.

Ind 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.

(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.

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.

Ind 64.09 Combustion air intakes. (1) COMBUSTION AIR FOR BURNERS. All burners shall be provided with combustion air by one of the following methods:

(a) *Infiltration combustion air.* Infiltration where total area of outdoor openings (doors and windows) is greater than 3% of the floor area in which the burner is located.

Note: See section Ind 64.25 for special conditions.

(b) *Gravitational combustion air.* Gravity intakes shall have a free area of at least one square inch for each 5,000 BTU per hour of fuel consumed to supply combustion air for atmospheric burners. The minimum free area of the intake shall be at least 100 square inches. For other equipment, a minimum free area of 0.5 square foot per 1,000,000 BTU per hour shall be provided.

1. Manually operated dampers are prohibited.

2. Motorized dampers are acceptable when interconnected with the burner of direct-fired equipment. 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.

(c) *Mechanical combustion air.* Mechanical combustion air systems, such as makeup air units, are acceptable when complete design data, including the size of the combustion air intake, has been approved by the department.

Note: The department will accept 150% or more of theoretical combustion air requirements or burner manufacturer's recommendations.

(2) COMBUSTION AIR FOR FURNACE ROOMS. All boiler and furnace rooms, and rooms containing flame-fired equipment, shall be provided with combustion air from the outside of the building as required by subsection (1) (b) or (c) above.

(3) BURNERS IN NEGATIVE PRESSURE LOCATIONS. A natural-draft burner shall not be installed where the space in which the burner is located is under negative pressure due to an exhaust system.

(4) MOUNTING HEIGHT. Mounting height of the combustion air intakes shall be as required in section Ind 64.19 (c).

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

Ind 64.10 Refrigerants. The rules covering the use of refrigerants for air conditioning systems shall conform with Wis. Adm. Code chapter Ind 45, Mechanical Refrigeration.

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

PART III-VENTILATION AND AIR STANDARDS

Ind 64.11 Ventilation and air standards. The quantity of air used to ventilate a given space during periods of occupancy shall always be sufficient to maintain the standards of air distribution, air movement, recirculation, air quality and air temperature as required by the following sections: Ind 64.12 through Ind 64.19.

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

Ind 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.

Ind 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.

Ind 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, Wis. 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.

Ind 64.15 Air movement and distribution. (1) AIR DELIVERY CAPACITY. 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.

(2) 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 unless otherwise specified in this code.

(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.

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

(4) RECIRCULATION AND TRANSFER AIR. (a) *Recirculation.* No air contaminated by other than human occupancy shall be used for recirculation, except within the same occupancy classification. Air in a volume equal to the outside air required from a room may be discharged and recirculated through a corridor and exhausted through lockers, toilet rooms, kitchens, janitor closets and similar areas. Additional exhaust ventilation shall be provided where the volume of air exhausted from the corridor is less than the volume of air supplied.

(b) *Transfer.* Air shall not be transferred through elevator shafts and stairwells where doors are required at any floor level.

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

Ind 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.

(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

Ind 64.17 Automatic controls. 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 code, and to provide a continuous supply of outside air and exhaust as determined by the provisions of section Ind 64.05, Table 1, during periods of occupancy.

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

Ind 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: Cross reference: 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 Wis. Adm. Code Ch. Ind 1000-2000—Wis. 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. See Wis. Adm. Code Ch. Ind 1000-2000—Wisconsin Safety and Health Code.

3. No direct-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 Wis. Adm. Code Ch. Ind 1000-2000—Wisconsin 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.

Ind 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.

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 and/or lot line 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.

(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 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.

PART IV-HEATING EQUIPMENT REQUIREMENTS

Ind 64.20 Boilers. (1) GENERAL. The boiler, ratings, safety devices and other auxiliary equipment shall be of a type approved by the department.

Note #1: See Wis. Adm. Code Ch. Ind 41-Boiler and Pressure Vessel Code.

Note #2: The department will accept manufacturers net ratings, but reserves the right to have the ratings verified by an independent testing agency.

(2) CONTROLS. The boiler shall be equipped with automatic controls that will shut off the fuel supply to the burner and pilot in case of ignition failure.

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

Ind 64.21 Radiation and convection equipment. The rating of steam or hot water radiation and convection equipment shall be based on approved standards.

Note: 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.

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

Ind 64.22 Gravity direct-indirect system. The installation of gravity direct-indirect systems is prohibited.

Note: This rule is intended to prohibit the use of direct-indirect radiation whereby the outside air supply is admitted to the base and delivered at the top without mechanical assistance.

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

Ind 64.23 Hot water heating and ventilating systems. In hot-water systems installed in areas where ventilation is required under this code, the system hot water shall be circulated by mechanical means.

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

Ind 64.24 Piping. (1) PIPE SIZES AND ARRANGEMENT. All steam and hot water supply and return piping, 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. Steam, hot water supply and return piping shall be covered with not less than 1/2-inch insulating material where

the heat emission is objectionable, where piping is subject to freezing, or where the pipes pass through occupied areas.

(4) STEAM AND HOT WATER PIPES. No pipe carrying hot water or steam 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.

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

Ind 64.25 Space heaters. (1) LOCATION. Space heaters are prohibited in hazardous occupancies. Space heaters may be used in motel guest rooms, individual apartments, individual offices and retail establishments, subject to the following provisions:

(a) Space heaters may be used in retail establishments provided the floor area of any story does not exceed 1500 square feet. Space heaters used in a retail establishment shall be provided with outside combustion air supplied directly to the burner.

(b) Space heaters may be used in offices located within a factory or warehouse building providing the total floor area of the office space or spaces does not exceed 500 square feet.

(c) Space heaters shall not be installed in any enclosed space having a volume less than 1000 cubic feet unless a combustion air supply is provided from the outside directly to the appliance.

(2) APPROVED EQUIPMENT. Space heaters shall be a type approved by the department. Space heaters not rated by a recognized testing laboratory shall have a net rating equal to 60% of fuel input. The rated input capacity shall not exceed 70,000 BTU per hour for each appliance.

(3) CONTROLS. Space heaters shall be equipped with an automatic pilot of the complete shut-off type for gas burners and an automatic valve in the oil supply line for oil burners that will close in case of ignition failure.

(4) MINIMUM CLEARANCES. Space heaters shall be located at least 6 inches from any unprotected combustible wall or partition, unless approved by the department. Space heaters standing on a combustible floor shall be supported on legs securely fastened to the floor. The space under the unit shall not be enclosed.

(5) BURNERS. 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.

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

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

Ind 64.26 Furnaces. (1) FAN FURNACE INSTALLATIONS. Forced-air heating systems shall be designed to prevent a negative pressure on the heat exchanger, except where systems are designed to supply 100% tempered outside air to replace a volume equal to that exhausted.

(2) GRAVITY FURNACES. Gravity furnaces shall be located so that the air supply circuits leading to and from them will be as short and direct as practicable. The outside air inlet to gravity furnace airways shall be such as to insure distribution of air to relatively unheated portions of the furnace proper and throughout the furnace airways. The top of such inlet shall not be higher than 2 inches below the top of the grates.

(3) RATING. All furnaces not rated by a recognized testing laboratory shall have a net rating equal to 60% of fuel input.

(4) FIRE-RESISTIVE ENCLOSURE. The furnace shall be isolated in a fire-resistive enclosure constructed in conformity with the applicable provisions of the occupancy chapters of this code.

(5) APPROVED TYPE. Furnaces shall be a type approved by the department.

(6) CONTROLS. Furnaces shall be equipped with automatic controls that will shut off fuel supply to the burner and pilot in case of ignition failure.

(7) CONTROLS FOR FAN FURNACE INSTALLATIONS. All fan furnace installations shall be equipped with controls to shut off the heat-generating equipment whenever the bonnet air temperature exceeds a safe limit and to maintain air circulation through furnace airways whenever required to distribute the heat generated. The fan shall be of a capacity adequate to provide the required ventilation.

Note: The department recognizes equipment listed by Underwriters' Laboratories, American Gas Association, or other nationally recognized testing laboratories.

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

Ind 64.27 Unit heaters, suspended furnaces and duct furnaces. Appliances of this type are prohibited in theaters, assembly halls, places of worship, schools, hospitals, hotels, apartment houses, day care facilities, nursing homes, and places where more than 100 persons assemble for recreation, entertainment or dining purposes unless the equipment is located in a fire-resistive enclosure or located outside of the building.

(1) VENTED APPLIANCES. Vented appliances (where products of combustion are vented directly to the outside) are permitted in retail establishments, manufacturing plants, garages, service stations, machine shops, woodworking plants, foundries, offices, and similar areas, and shall comply with the following requirements:

(a) The appliance shall be suspended in an occupied space and be visible.

(b) The heating appliance shall be of an approved type.

(c) The heating appliance shall be supported by noncombustible brackets or hangers. All units shall be located at least 7 feet above any occupied floor, at least 6 inches away from any combustible wall, and at least 12 inches from any ceiling.

Note: The department will accept reduced clearances provided the equipment and clearances have been approved by a testing laboratory.

(d) The oil-fired unit shall not be suspended over combustible material.

(e) The appliance shall be equipped with automatic controls that will shut off fuel supply to the burner and pilot in case of ignition failure.

(f) 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.

(g) Floor-standing, direct-fired unit heaters, furnaces and boilers in metal fabricating plants, foundries and machine shops shall be isolated in a fire-resistive enclosure unless the building and contents are noncombustible.

(2) UNVENTED APPLIANCES. Unvented direct-fired gas appliances designed to supply 100% outside air (where the products of combustion are mixed with the comfort air stream) are permitted in metal fabricating plants, foundries, machine shops, factories, and kitchens provided:

(a) The volume of air supplied to the occupied space is exhausted mechanically.

(b) The heater is equipped with automatic controls that will shut off fuel supply to the burner in case of ignition failure.

(3) DUCT CONNECTIONS. Supply duct connections are prohibited on "low static" direct-fired unit heaters.

(4) RATING. Unit heaters, suspended furnaces and duct furnaces not rated by a recognized testing laboratory shall have a net rating equal to 60% of fuel input.

Note: The department recognizes equipment listed by the American Gas Association, Underwriters' Laboratories, Inc., and test data of any other nationally recognized testing laboratory.

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

Ind 64.28 Gas or oil-fired radiant heaters. (1) UNVENTED RADIANT HEATERS. Unvented, gas-fired, open-flame radiant heaters are permitted in machine shops, foundries, manufacturing plants, warehouses, garages and aircraft hangars.

(2) VENTED RADIANT HEATERS. Vented, gas- or oil-fired radiant heaters may be installed in the occupancies listed in (1) above.

Vented radiant heaters may also be installed in the following types of buildings having a total capacity of less than 100 persons:

(a) Mercantile buildings (excluding theaters and exhibition halls);

(b) Woodworking plants, service stations; and

(c) Swimming pools, tennis courts, ice rinks, horse arenas and similar recreational facilities.

(3) EQUIPMENT STANDARDS. The following requirements are applicable to vented and unvented radiant-fired heaters:

(a) The heaters shall be a type approved by the department.

(b) The heaters shall be equipped with an automatic pilot of the complete shut-off type or with a 100% shut-off electric ignition.

(c) If unvented radiant heaters are used, gravity or mechanical means shall be provided to exhaust at least 4 CFM per 1000 BTU per hour input of installed heaters. Provisions shall be made for an equal supply of outside air.

(d) Exhaust openings for removing products of combustion shall be provided above the level of the radiant heaters.

(e) The heaters shall be supported by noncombustible brackets or hangers.

(f) The minimum clearances shall be maintained between the heater and combustible material, as determined in accordance with the test procedures and the standards approved by the department.

(g) Oil-fired radiant heaters shall not be suspended over combustible materials.

(h) Oil-fired radiant heaters shall be equipped with mechanical pressure-atomizing burners.

(i) Oil-fired radiant heaters shall be vented.

(j) Gas- or oil-fired radiant heaters, vented or unvented, not rated by a recognized testing laboratory, shall have a net rating equal to 60% of the fuel input.

Note: The department will accept equipment listed by the American Gas Association, Underwriters' Laboratories, Inc., and any other nationally recognized testing laboratory.

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

Ind 64.29 Electric space-heating equipment. (1) SCOPE. This section includes electric furnaces, space heaters, unit heaters, cable heating devices, infrared radiant heaters, baseboard heaters, and heat pump systems.

(2) APPROVED EQUIPMENT. The equipment shall be a type approved by the department.

(3) CONTROLS. The equipment shall be provided with safety and temperature controls.

(4) MINIMUM CLEARANCES. Not less than the minimum clearances shall be maintained between the electric space-heating equipment and combustible material, determined in accordance with test procedures and standards approved by the department.

(5) HAZARDOUS LOCATIONS. Electric space-heating equipment shall not be installed in hazardous occupancies unless it is approved for such use. (See Wis. Adm. Code Electrical, Vol. 2.) An open-type resistance heating element is prohibited in hazardous occupancies.

(6) RATING. Electric space-heating equipment shall be rated on the energy input to the heating element, expressed in BTU per hour.

Note: The department recognizes equipment listed by Underwriters' Laboratories, Inc.

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

Ind 64.30 Oil-burning equipment. 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 an oil gauge. The vent pipe and fill pipe shall terminate outside of the building.

Note: For fuel oil storage location and piping requirements, see Wis. Adm. Code Ch. Ind 1000-2000—Wis. Safety and Health Code.

(1) APPROVED EQUIPMENT. The equipment shall be of a type approved by the department.

(2) CONTROLS. The equipment shall be provided with safety and temperature controls.

(3) RATING. Oil-burning equipment not rated by a recognized testing laboratory shall have a net rating equal to 60% of fuel input.

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

PART V—AIR DELIVERY SYSTEMS

Ind 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 American Society of Heating, Refrigerating and Air Conditioning Engineers, Guide and Data Book.

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

Ind 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.

Ind 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.

Note: The department will accept polyvinyl ducts installed underground without concrete.

(2) DUCT INSULATION. Supply air ducts installed parallel and adjacent to an outside wall shall be insulated with a moistureproof material (thermal conductance factor of .19 BTU per hour per square foot per degree Fahrenheit) placed between the duct and outside wall. The insulation shall extend from the underside of the floor to 2 feet below the finished grade.

(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.

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

(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.

Note: For acceptable standards see ASHRAE Guide and Data Book, published by the American Society of Heating, Refrigerating and Air Conditioning Engineers, or as illustrated in the Duct Manual, published by the Sheet Metal and Air Conditioning Contractors National Association, Inc.

(3) NONMETALLIC DUCTS. 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.

(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.

(e) The ducts shall not be connected to a furnace, duct heater or similar heat-producing appliance unless a connecting duct of steel, having a length of not less than 6 feet, is used to separate them from the appliance.

(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.

Ind 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.

(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.

(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.

Ind 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.

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

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

Ind 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 siphon-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.

Ind 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 or parapet wall and shall be surmounted with an approved type of siphon roof ventilator.

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

Ind 64.40 Relief vents. The use of barometric relief vents is prohibited where exhaust ventilation is required for occupancies classified as (a) and (b) 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.

History: Cr. Register, December, 1975, No. 140, eff. 1-1-76.

Ind 64.41 Suspended ceiling plenum. Plenums above ceilings shall be of noncombustible construction, as defined in subsection Ind 51.01 (86) (a). The installation of hazardous piping and cables is prohibited. Openings into the plenum that would affect the fire-resistive rating of the roof and ceiling are prohibited.

Note: This section permits the use of steel, painted steel bar joists and metal decking, concrete, plaster and other inorganic materials and prohibits the use of plastic wire sheathing, plastic thermal insultation, plastic pipe, intumescent paint and organic materials which will not pass ASTM test procedure E-136 [Ind 51.25 (50)].

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

Ind 64.42 Fire dampers and fire curtain doors. (1) REQUIRED FIRE DAMPERS AND FIRE CURTAIN DOORS. All heating and ventilating ducts which terminate at or pierce code-required, hourly rated wall, floor or floor-ceiling assemblies (Table 51.03-A) and rated enclosures shall be protected as follows:

(a) 3/4-hour and one-hour rated floor assemblies and vertical shafts shall be protected with one-hour rated fire dampers.

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

(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 Ind 64.42 (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.

(c) Combustion air ducts which extend from the exterior of the building and terminate at one-hour rated enclosures and which do not pierce any other fire-rated assembly in other areas of the building.

(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 section Ind 64.66 for fire damper requirements in kitchen exhaust systems.

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

Ind 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.

Ind 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

Ind 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. A natural draft chimney or other venting device shall have the height and area to remove the products of combustion.

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

(3) TERMINATION. (a) *Gravity type.* All chimneys or vents 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 and vents 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.

(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.

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

(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 8 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 section Ind 53.12.

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

Ind 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 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 No. 1 or No. 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.

Ind 64.48 Factory-built chimneys. (1) GENERAL. Factory-built chimneys or gas vents shall be of an approved type.

(2) TYPE "A". An approved type "A" 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.

(3) 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.

(4) TYPE "BW". An approved type "BW" gas vent may be used with a vented recessed heater.

(5) TYPE "C". A type "C" gas vent 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 or other approved corrosion-resistant material. The installation shall conform to the requirements of section Ind 64.49.

Note: The department recognizes as approved, chimneys designed as types "A", "B", "BW" and "C" and listed by American Gas Association and Underwriters' Laboratories, Inc.

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

Ind 64.49 Smoke pipes. (1) CONSTRUCTION AND INSTALLATION. The construction and installation of smoke pipes shall conform with the following requirements:

(a) *Concealed spaces.* No smoke pipe or breeching serving heating appliances shall pass through any outside window, door, or combustible outside wall, nor be concealed in any closet, attic or similar space.

(b) *Smoke pipes which pass through combustible partitions.* Every smoke pipe which passes through combustible partitions shall be encased with noncombustible material at least 4 inches thick, or with a double safety thimble made of 2 concentric rings of sheet metal with at least one inch open air space between and with the outer ring covered with at least ¼-inch asbestos.

(c) *Distance from materials.* No part of any smoke pipe shall be placed nearer to any non-fire-resistive partition or wall than the diameter of the pipe, nor nearer to any non-fire-resistive ceiling than 1-½ times the diameter. The above distances may be reduced by one-half if the wall or ceiling is covered with not less than ¼-inch asbestos board covered with sheet metal or with equivalent protection.

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

Ind 64.50 Gas vents. All gas ranges (except those for domestic use), water heaters and other gas-fired equipment shall be provided with vent pipes conforming to the requirements for smoke pipes as specified in section Ind 64.49.

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

PART VII—EQUIPMENT LOCATION, PROTECTION, MAINTENANCE AND OPERATION

Ind 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 bodily contact with:

(a) Any surface temperatures that exceed 180° F;

(b) Surfaces that are likely to cause lacerations.

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

(4) FIRE PROTECTION. All installations under this chapter shall comply with the precautionary requirements of the department to reduce fire hazards.

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

Ind 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.

(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.

Ind 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

Ind 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.

(2) VENTILATION. The air movement, supply and distribution for all occupancies in this class shall conform to the requirements of section Ind 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 Wis. Adm. Code Ch. Ind 1000-2000—Wisconsin 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 section Ind 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 section Ind 64.05, Table 1.

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

Ind 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 Ind 64.54.

(2) VENTILATION. The air movement, supply and distribution for all occupancies under this classification shall conform to the requirements of section Ind 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.

Ind 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 section Ind 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.

(3) SCHOOL SHOP EQUIPMENT AND LABORATORY EXHAUST. An exhaust system, in accordance with the requirements of section Ind 64.54 (3), shall be provided for all equipment and processes that create dust, fumes, vapors or gases injurious to health.

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

Ind 64.57 Hospitals and nursing homes. (1) SCOPE. This classification shall include hospitals, nursing homes, public health centers and treatment centers where medical services are provided for treatment and care of "bedfast patients."

Note #1: A "bedfast patient" is a person who is normally confined to a bed or chair.

Note #2: For additional requirements, refer to Wis. administrative codes of the state department of health and social services.

(2) VENTILATION. The air movement, supply and distribution shall conform to the requirements of section Ind 64.05, Table 1, and the following:

(a) Exhaust ventilation shall be provided on the basis of 2 cubic feet per minute for each square foot of floor area from such rooms as baths, laboratories, laundries, anesthetic storage, bedpan, sterilizing, soiled utility, soiled linen, and janitor closets.

(b) The heating and ventilating system serving such rooms as operating, anesthesia, recovery, labor, delivery, nursery, isolation, therapy, and autopsy shall satisfy the following conditions:

1. A minimum air movement of not less than 6 air changes per hour.

2. Outside air of not less than 6 air changes per hour shall be provided.

3. The recirculation of air is not permitted in autopsy rooms.

4. Recirculation of air shall only be permitted within the system serving an individual room.

5. Mechanical exhaust shall be provided.

6. The relative humidity in rooms where anesthetic gases are used shall be maintained at not less than 50%.

(c) Private rooms, semi-private wards, day rooms, and nurses stations shall be ventilated in accordance with the requirements of section Ind 64.05, Table 1, unless an openable sash area has been provided and the content of the space is in excess of 400 cubic feet per occupant.

Note: See sections Ind 57.17 and 57.19.

(d) The air movement in corridors and halls shall be not less than 10 cubic feet per minute per lineal foot of corridor or hall.

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

Ind 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 be accomplished by mechanical means and shall conform to the requirements of section Ind 64.05, Table 1. The air movement through the corridors shall be not less than 10 cubic feet per minute per lineal foot of corridor.

(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.

Ind 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 section Ind 57.001 (2) 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 section Ind 64.05, Table 1.

(3) DUCTS. 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.

Ind 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 section Ind 64.05, Table 1.

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

Ind 64.61 Repair areas. (1) SCOPE. This classification includes all areas where motor-driven vehicles are repaired.

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

(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 (a) above.

Note: The requirements stated in (2) need not be increased when satisfying requirements of either (3) (a) or (b). Also see Wis. Adm. Code Ch. Ind 1000-2000—Wis. 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, battery charging areas, etc. shall be provided with at least 3/4 cubic foot of outside air per square foot of enclosed service floor area and an equivalent exhaust. Exhaust from battery charging or battery storage 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 Wis. Adm. Code Ch. Ind 1000-2000—Wis. Safety and Health Code, the additional exhaust requirements with an equivalent volume of outside air shall be provided to satisfy the requirements found in Ch. Ind 1000-2000.

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

Ind 64.62 Vehicle service buildings. (1) SCOPE. Buildings of this classification shall include liquid fuel dispensing stations and/or where vehicles can be driven into the building for washing, greasing, oil change, motor tune-up or repair, tire replacement, body repair, and similar operations.

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

(a) *Repair area ventilation.* All service and/or workroom areas involving engine tune-up or repair requiring the operation of internal combustion engines shall be provided with ventilation to satisfy the requirements of section Ind 64.61 above.

(b) *Vehicle washing facilities.* Buildings or portions of buildings having a capacity of and used exclusively for washing 2 or more vehicles simultaneously shall be supplied and exhausted with a volume of outside air equal to 1/2 cubic foot per minute per square foot of floor area.

1. The minimum floor area calculated for wash areas provided with vehicle conveyor systems shall be based on that portion of the floor located between the termination of the conveyor system and the vehicle exit door.

(3) CONTAMINANTS. If the provisions of this section do not provide sufficient ventilation to meet the standards for threshold limit values

covered in Wis. Adm. Code Ch. Ind 1000-2000—Wis. Safety and Health Code, the additional exhaust requirements with an equivalent volume of outside air shall be provided to satisfy the requirements found in Ch. Ind 1000-2000.

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

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

(2) VENTILATION. The air movement, supply and distribution shall be provided in accordance with the requirements of section Ind 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.

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

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

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

Ind 64.64 Automobile showrooms. (1) SCOPE. This classification includes all showrooms with offices and occupancies adjacent to repair or live storage areas.

(2) VENTILATION. The air movement, supply and distribution shall be provided in accordance with the requirements of section Ind 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 section Ind 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 Wis. Adm. Code Ch. Ind 1000-2000—Wis. Safety and Health Code, the additional exhaust requirements with an equivalent

volume of outside air shall be provided to satisfy the requirements found in Ch. Ind 1000-2000.

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

Ind 64.65 General sanitation and service areas. (1) SCOPE. This classification shall include toilet rooms, locker rooms, natatoriums, 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 section Ind 64.57.

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

(2) EXHAUST VENTILATING SYSTEMS. Exhaust ventilating systems serving this class of occupancy shall not be used for any other service.

(3) VENTILATION. The air movement, supply and distribution shall be provided in accordance with the requirements of section Ind 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.* Mechanical 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.

(4) AIR MOVEMENT. (a) The air movement in a natatorium shall be not less than 6 air changes per hour and the volume of outside air supplied and exhausted shall be not less than 2 cubic feet per minute per square foot of pool surface.

(b) Locker rooms used with natatoriums, shower rooms and toilet rooms shall be supplied with outside air.

Note: The air supplied may be exhausted through shower rooms or toilet rooms.

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

Ind 64.66 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.* 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.

(b) *Required exhaust hood.* Exhaust hoods shall be required where frying and/or broiling is done (includes deep-fat frying and surface frying), and where cooking is a regular commercial operation (includes 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) RECIRCULATION OF AIR. Recirculation of air as described under subsection Ind 64.15 (4) is prohibited during occupied periods.

(5) EXHAUST HOOD REQUIREMENTS. (a) *Size of hood.* The horizontal inside dimensions of the hood 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.

(b) *Canopy hood exhaust rates.* The minimum volume of exhaust air for canopy-type hoods shall be not less than the following:

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

2. 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.

Note: Q equals the exhaust air in cubic feet per minute; A equals the area of the hood in square feet; V equals the velocity in feet per minute.

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

Note: Q equals the exhaust air in cubic feet per minute and L equals the total length in feet of the cooking appliance(s) being ventilated, and measured parallel to the front edge of the appliance(s).

(d) *Materials.* Hoods shall be constructed and supported by steel not less than No. 18 manufacturers standard gauge, or stainless steel not less than No. 20 manufacturers standard gauge.

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

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

(g) *Exposed hood surfaces.* Hood surfaces and exposed exhaust ducts within 18 inches of combustible material shall be protected in accordance with the requirements of subsection Ind 64.66 (6) (f).

(h) *Concealed hood surfaces.* Hood surfaces that are concealed by or recessed into adjoining construction shall be protected in accordance with the requirements of subsection Ind 64.66 (6) (f).

(i) *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.

(6) 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 No. 16 manufacturers standard gauge, or stainless steel not lighter than No. 18 manufacturers standard gauge.

(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.

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

(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.

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 1. above, 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.

(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 (f) above.

(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.

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

Ind 64.67 Seasonal occupancies. When approved in writing by the department, heating requirements may be waived (but not ventilation required by section Ind 64.05, Table 1) during the period of June 1 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 (also see chapter Ind 49—Migrant Labor Camps).

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

APPENDIX A

The following notes, bearing the same number as the text of the building and heating, ventilating and air conditioning code to which they apply, contain useful explanatory material to calify the referenced definitions and rules.

A-51.01 (12) BUILDING. The intent was to consider permanent awnings as part of a building.

A-51.01 (42) FAMILY. The intent of this definition is to clarify the use of the word "family" in reference to subsection Ind 57.001 (2) (a); it is not intended as a variance to requirements stated under Ind 57.001 (2) (b).

A-51.01 (67a) HABITABLE ROOM. It is the intent that rooms designated as recreation, study, den, family room, office, etc. and providing the only space for living and/or sleeping are considered habitable rooms.

A-51.01 (115) SETBACK. The intent was to not include gutters, downspouts, outdoor lighting fixtures, signs and similar attachments as parts of a building.

A-51.01 (121) STORIES, NUMBER OF. For further clarification, refer to A-51.02 (14).

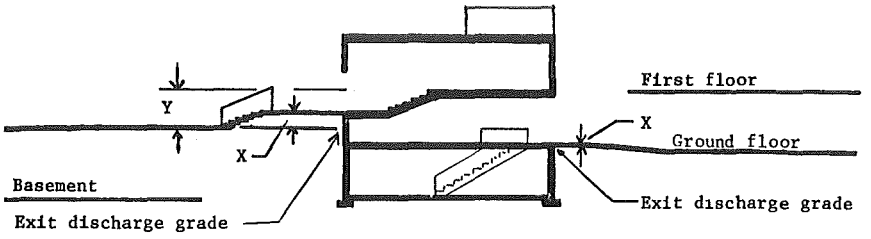
A-51.01 (144) WALL (DIVISION).

(a) *Building division wall* is intended to denote a wall constructed in a manner sufficient to meet requirements for a party wall [see "Wall (Party)"] and is acceptable as a dividing wall or enclosing wall when determining the volume of a building as referred to in sections Ind 50.10, 52.001 and 59.20. Also see Chapter A-E 2 of Wis. Adm. Code—Examining Board of Architects, Professional Engineers, Designers and Land Surveyors.

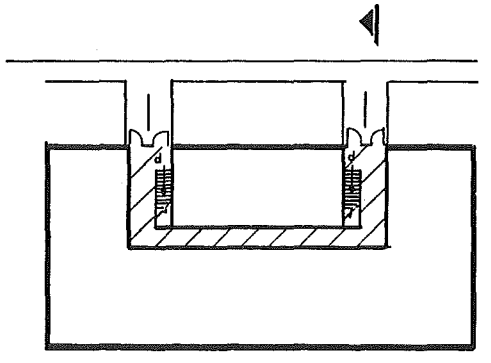
(b) *Fire division wall* is intended to relate to construction that provides separation between portions of a building to satisfy allowable floor area limitations, separation between 2 classes of construction, or separation of hazardous occupancies. For other separations, see "occupancy separations" and isolation of hazards sections of this code.

A-51.01 (151) WALL (PARTY). It is intended that a property consisting of joining plotted subdivisions owned by one individual, that can be owned by separate individuals, is included in the definition of party wall.

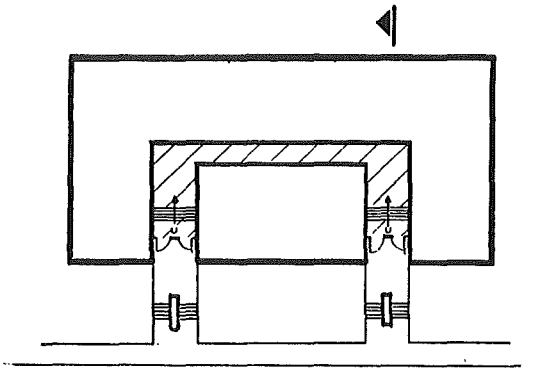
A-51.02 (14) DETERMINATION OF NUMBER OF STORIES. The following illustrations are provided to give visual aid to this rule and the definition of Ind 51.01 (121) Stories, Number of.



Note: X = 3'-0" (maximum)
Y = 6'-0" (maximum)



Ground floor



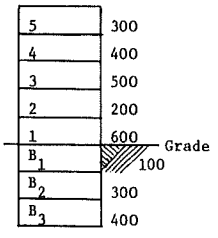
First floor

Appendix

A-51.042 (5) The use of the term "high hazard" as referred to in this section is intended to apply to the following list of operations and occupancies:

1. **Aircraft hangars.**
2. **Dry cleaning establishments: using or storing gasoline or other volatile flammable liquids.**
3. **Enameling or japanning operations.**
4. **Mills: sugar, starch, cereal, feed, flour and grist mills.**
5. **Paint and varnish: manufacturing, storing, handling, spraying, and other related operations.**
6. **Pyroxylin products: manufacture and storage.**
7. **Repair garages.**
8. **Smoke houses.**
9. **Storage of: explosive gases under pressure (15 psi and over 2,500 cubic feet) such as acetylene, hydrogen, natural gas, etc.**
10. **Storage of: materials with a flash point under 200° F. such as celluloid products, kerosene, oils, etc.**
11. **Woodworking establishments.**

A-51.15 (6) EXAMPLE TO DETERMINE TOTAL AGGREGATE EXIT WIDTH.



Type No. 1 sprinklered construction.

Aggregate exit width required from a floor into the stairwell is 30 inches per 100 people on that floor; i.e.,

5th floor to stairwell = 3 x 30 = 90"

4th floor to stairwell = 4 x 30 = 120"

3rd floor to stairwell = 5 x 30 = 150"

Stair width required:

5th to 4th - 300 persons (100%) x 30"/100 persons = 90"

4th to 3rd - [400 persons (100%) + 300 persons (50%)] 30"/100 persons = 165"

3rd to 2nd - [500 persons (100%) + 400 persons (50%) + 300 persons (25%)] 30"/100 persons = 232.5"

2nd to 1st - [200 persons (100%) + 500 persons (50%) + 400 persons (25%)] 30"/100 persons = 165" (Use 232.5")

1st to exterior - [600 persons (100%) + (200 persons + 100 persons) (50%) + (500 persons + 300 persons) (25%)] 30"/100 persons = 285"

B_1 to 1st - [100 persons (100%) + 300 persons (50%) + 400 persons (25%)] 30"/100 persons = 105" (Use 150")

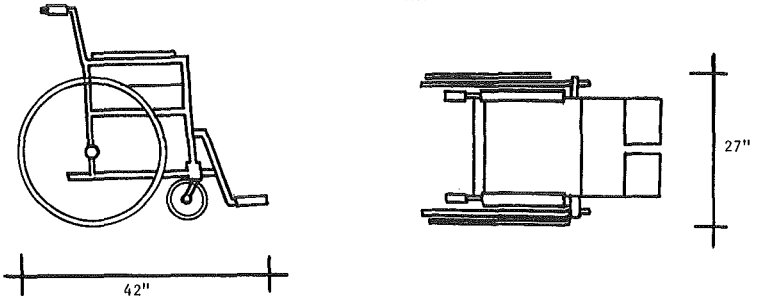
B_2 to B_1 - [300 persons (100%) + 400 persons (50%)] 30"/100 persons = 150"

B_3 to B_2 - 400 persons (100%) x 30"/100 persons = 120"

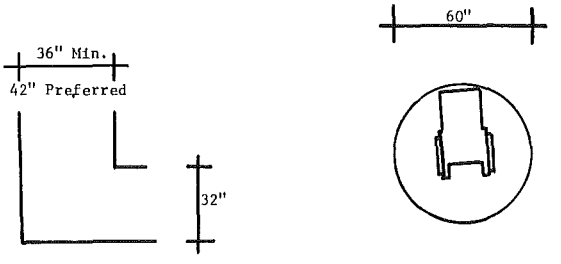
Stair width required from B_1 to 1 is 150" as stair cannot decrease in width along path to exit [Ind 51.16 (2) (c)].

A-52.04 REQUIREMENTS FOR BARRIER-FREE ENVIRONMENTS. The following illustrations are provided to give the designer visual aids for making facilities accessible.

WHEELCHAIR DIMENSIONS



TURNING SPACE

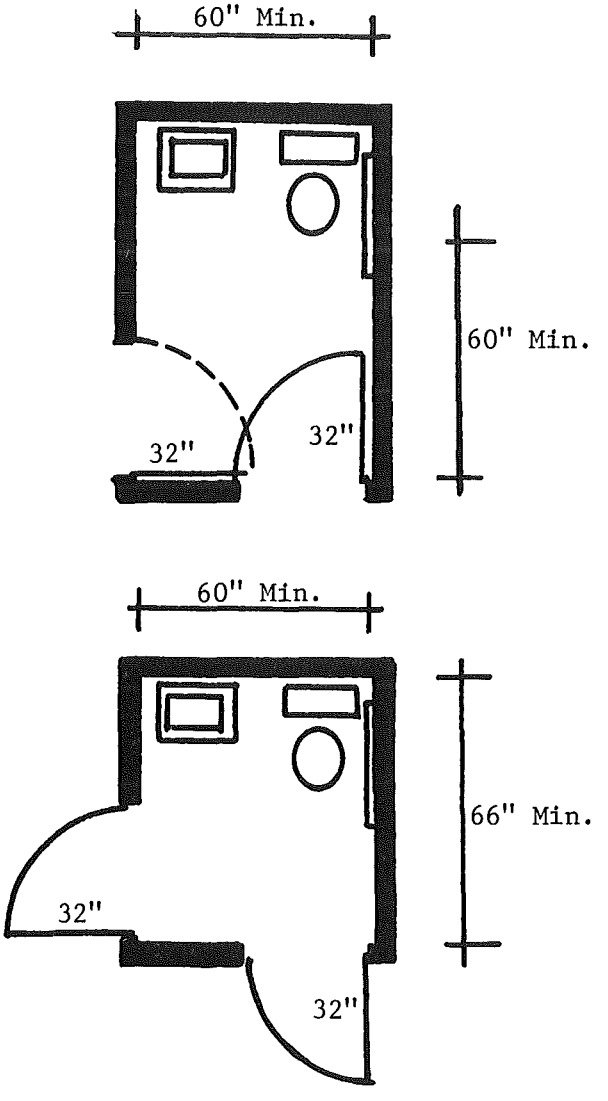


90° Turn

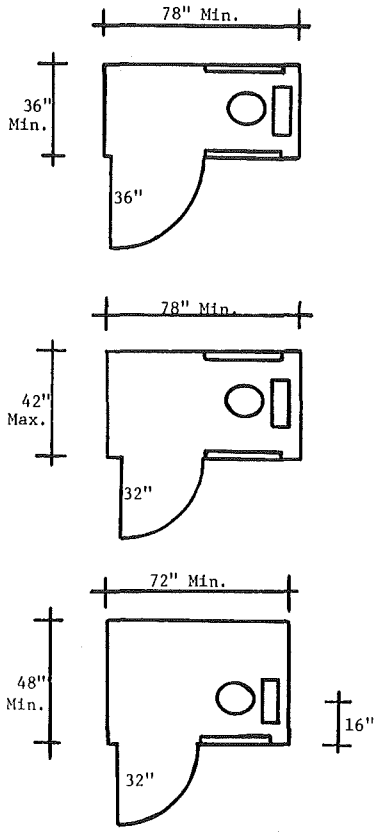
180-360° Turn

Appendix

EXAMPLES OF ACCESSIBLE TOILET ROOMS
CONTAINING ONE LAVATORY AND ONE WATER CLOSET



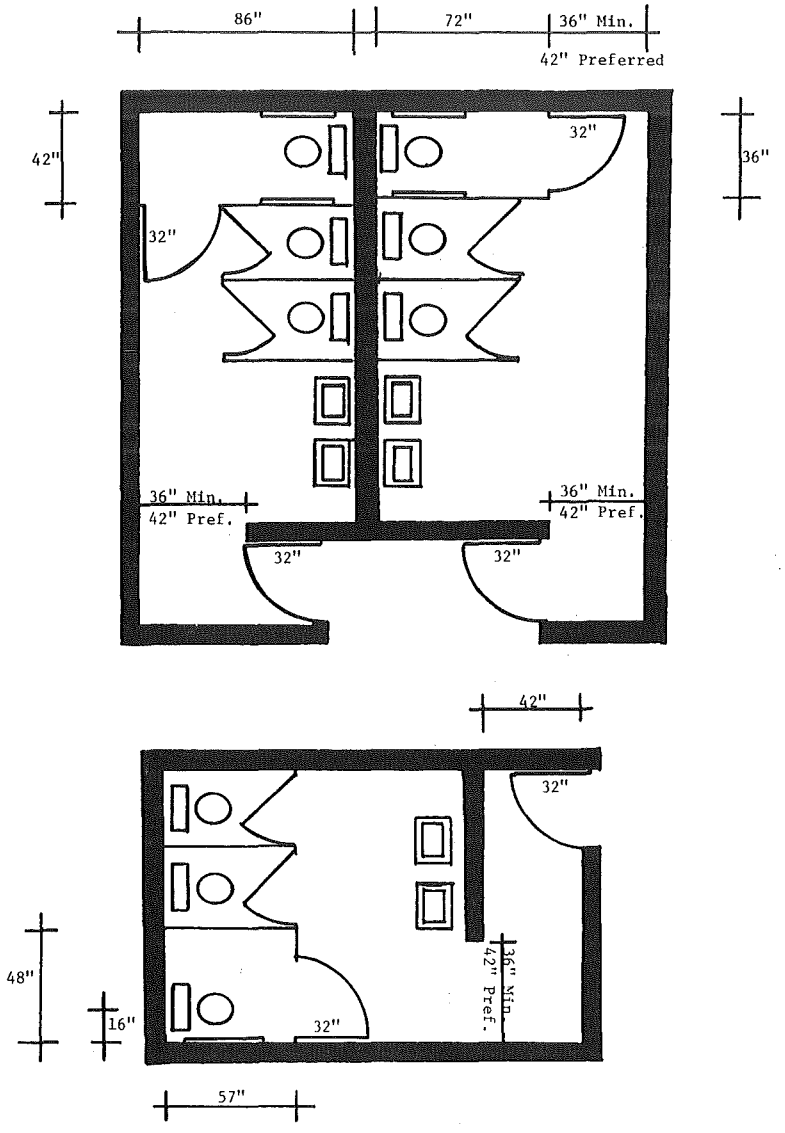
EXAMPLES OF WATER CLOSET COMPARTMENTS
WITH A SIDE ENTRANCE APPROACH



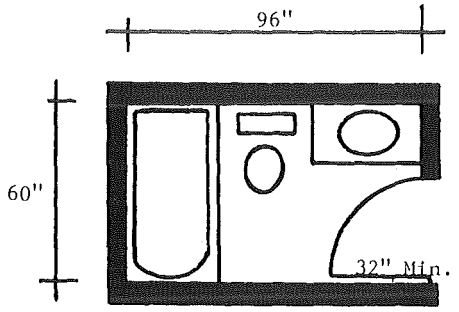
(The water closet compartments are located within a toilet room.)

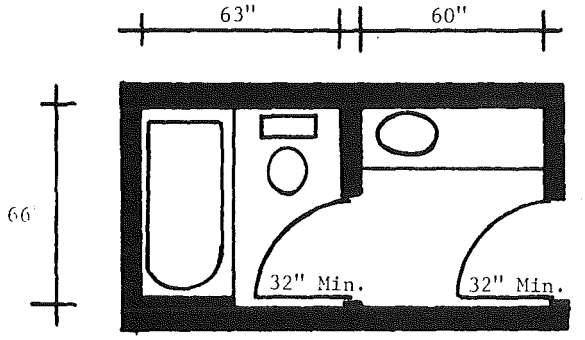
Appendix

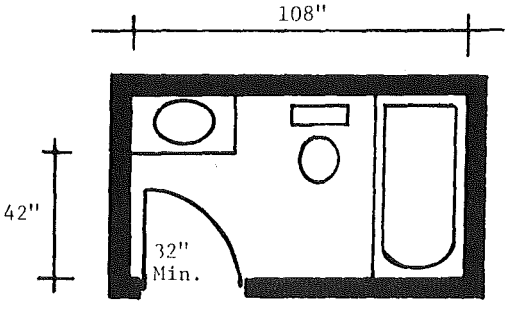
EXAMPLES OF ACCESSIBLE TOILET ROOMS



EXAMPLES OF ACCESSIBLE BATHROOM LAYOUTS
FOR MOTELS AND RESIDENTIAL LIVING UNITS







INTERNATIONAL SYMBOL FOR BARRIER-FREE ENVIRONMENTS

A-57.18 The intent of this section is to apply to floor levels not more than one story below grade (at building)

A-57.18 (6) It is the intent of this subsection that each living unit needs only one means of exit from within the unit and that the entire building be provided with no less than 2 exits.

A-60.19 (4). The standard is available from the National Fire Protection Association, 470 Atlantic Ave. Boston, Massachusetts 02210.

A-60.24 Class A fires are fires in ordinary combustible materials such as wood, cloth, paper, rubber, and many plastics. Class B fires are fires in flammable liquids, gases and greases.

A-60.35 See A-60.24.

A-60.36 (1) (a). See A-60.19 (4).