Chapter Ind 59

HEATING, VENTILATING AND AIR CONDITIONING

History: Chapter Ind 58 as it existed on January 31, 1965 was repealed and a new chapter Ind 59 was created effective February 1, 1965.

Ind 59.01 Scope of code. (1) PUBLIC BUILDINGS AND PLACES OF EMPLOYMENT. The provisions of this code shall apply to all buildings used, or to be used, as places of employment or as public buildings, as defined by statutes.

Note: For a definition of "public buildings" and "places of employment" see section 101.01 (1), Wis. Stats. For a definition of "farming" see section 102.04 (3), Wis. Stats.

(2) NEW BUILDINGS. The provisions of this code shall apply to the heating, ventilating and air conditioning of all new buildings.

(3) EXISTING INSTALLATIONS. The provisions of this code shall apply to the addition of or replacement of any major apparatus in existing buildings.

(4) CHANGE IN USE. The provisions of this code shall apply to every building, or portion of a building, devoted to new use for which the requirements under this code are in any way more stringent than the requirements covering the previous use.

(5) DEFINITIONS. See section Ind 51.01.

History: Cr. Register, January, 1965, No. 109, eff. 2-1-65; cr. (5), Register, September, 1973, No. 213, eff. 10-1-73.

59.10 History: Cr. Register, January, 1965, No. 109, eff. 2-1-65; r. Register, June, 1972, No. 198, eff. 1-1-73.

Ind 59.20 Design, inspection, approval of drawings and specifications. (1) The design and preparation of drawings and data for the installation of heating, ventilating and air conditioning equipment shall satisfy the requirements of this code.

(2) All drawings and specifications shall be sealed or stamped by an engineer, architect or designer registered in accordance with the

laws of Wisconsin when they involve one or more of the following conditions:

(a) Buildings whose total volume is greater than 50,000 cubic feet.

(b) An addition to a building in which the addition results in the entire building having a volume greater than 50,000 cubic feet.

Note: Laws regulating the practice of engineering and architecture are found in Chapter 443, Wis. Stats.

(3) The installation of the heating, ventilating and air conditioning equipment that must satify requirements of Ind 59.20 (2) shall be inspected by a registered professional engineer, architect or designer.

(a) On completion of the installation, the inspecting engineer, architect or designer shall file a written statement with the department certifying that, to the best of his knowledge and belief, the installation has been performed in compliance with approved drawings and specifications.

(b) No building owner shall alter the installation or portions thereof except in compliance with the provisions of this code.

(4) APPROVAL OF DRAWINGS AND SPECIFICATIONS. (a) At least 3 complete sets of all drawings and one copy of specifications and data for the design and installation of heating, ventilating and air conditioning equipment shall be submitted to the department for approval before affected work is commenced. The requirement shall apply to the following:

1. Where such equipment is installed in buildings or structures that are included in the scope of the building code.

a. Exception: Refer to Ind 50.03 and Ind 50.10 (2).

2. Where the installation of this equipment is in connection with meeting requirements of the following codes and, as a result, the installation has a direct bearing on the acceptance of the entire heating, ventilating and air conditioning system:

a. Chapter Ind 4, Elevator.
b. Chapter Ind 7, Cleaning and Dyeing.
c. Chapter Ind 8, Flammable and Combustible Liquids.
d. Chapter Ind 20, Dusts, Fumes, Vapors and Gases.
e. Chapter Ind 21, Spray Coating.
f. Chapters Ind 41–42, Boilers and Unfired Pressure Vessels.
g. Chapter Ind 45, Mechanical Refrigeration.
h. Chapter Ind 49, Migrant Labor Camps.
i. Chapters Ind 50–59, Building and Heating, Ventilating and Air Conditioning.
j. Volume 2, Electrical.

Note #1: To expedite approval, the required material should be submitted with the drawings submitted for approval of building designs.

Note #2: Approval is not required for the installation of air cooling equipment when added to an approved heating and ventilating system.

(b) Drawings for installations within the city limits of Milwaukee shall be submitted to the Inspector of Buildings, Milwaukee, for examination and approval. For list of additional cities to which drawings may be submitted, see subsection Ind 50.10 (7) of the building code.

(c) The replacement of major apparatus is subject to approval by the department.

1. A statement, in triplicate, showing capacities of old and new equipment may be submitted instead of data required in subsection Ind 59.20 (4) (g).

(d) *Approval of major changes.* Revisions to approved heating and ventilating drawings or specifications shall be approved by the department before work is commenced when such revisions involve code regulations.

(e) *Evidence of approval.* A complete set of approved drawings and specifications shall be made available at the job site.

(f) *Information required on drawings and in specifications.* The drawings, data and information for heating, ventilating and air conditioning systems submitted for approval shall be prints that are permanent, clear, legible and complete and shall include all details and data necessary for review of the proposed installation, such as:

Note #1: Original drawings are not considered as a substitute for permanent prints.

Note #2: Duplicate information need not be submitted when heating, ventilating, air conditioning and building drawings are submitted simultaneously.

1. Name of the owner of the building and complete address of the building.

2. The location of building with respect to property lines and/or lot lines and/or adjoining streets, alleys and any other buildings on the same lot or property when wall openings are used for natural ventilation as per Ind 59.24 or are used for outside ventilating intakes or exhausts per Ind 59.60.

3. Architect, engineer or designer's name shall appear on the title sheet.

4. A floor plan for each floor where equipment is installed.

5. A room schedule, indicating the intended use of all rooms.

6. A description of the construction for walls, floors, ceilings and roof.

a. Location of required fire or smoke dampers. [See Ind 59.69 (13).]

7. Elevation and sectional plans to illustrate and clarify equipment arrangements where required.

8. Location, size and type of all equipment.

9. Size and continuity of all pipe and duct work.

10. Description of construction and location of chimney.

11. Specifications shall be properly identified with the drawings.

(g) *Data required.* All drawings submitted for approval shall be accompanied by sufficient data and information for the department to judge if the capacity of the equipment and the performance of the system will meet the requirements of the code. The following data shall be submitted:

1. Construction losses for each typical room.

a. Heat loss calculated in Btu per hour.

2. List CFM circulated, outside air and exhaust required for each typical room.

Note: Refer to Ind 59.64 concerning ratings of radiators and convectors.

3. Summation(s) of total heating and ventilating requirements shall include:

a. A listing of specific heating and/or ventilating unit(s) with their input and net rating in Btu/hour to satisfy the summation(s). For direct fired equipment give input rating.

b. Where more than one heating and/or ventilating unit is to be installed, provide a separate summation for each unit.

Note: Cross reference: The department will accept as the basis for calculations and design data the methods and standards recommended by the Mechanical Contractors' Association of America; the American Society of Heating, Refrigerating and Air Conditioning Engineers; and the Institute of Boiler and Radiator Manufacturers.

4. When requested, additional data pertaining to design and operation of a heating and ventilating system shall be submitted to the department for approval by the engineer, architect, designer or manufacturer before such equipment is installed or used.

(5) SEASONAL OCCUPANCIES. When approved in writing by the department, heating requirements may be waived (but not ventilation required by sections Ind 59.40 and 59.41) during the period of June 1 through September 15 for the following or similar occupancies:

(a) Drive-in eating places.

(b) Club houses.

(c) Outdoor toilets.

(d) Camp lodge buildings.

(e) Canning factories.

(f) Migrant labor camps. (Also see Ind Chapter 49, Migrant Labor Camps.)

(6) APPROVAL OF MATERIAL AND EQUIPMENT. The use of materials, equipment, devices and methods of installation not mentioned in this code is subject to written approval by the department. Sufficient test data and descriptive information shall be submitted to prove its use.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65; am. (1), Register, May, 1966, No. 125, eff. 6–1–66; am. (1), Register, October, 1967, No. 142, eff. 11–1–67; r. and recr. (1), Register, June, 1968, No. 150, eff. 7–1–68; am. (1) and (2) intro. par., Register, December, 1970, No. 180, eff. 1–1–71; r. and recr. Register, March, 1971, No. 183, eff. 4–1–71; r. and recr. Register, September, 1973, No. 213, eff. 10–1–73.

Ind 59.21 Accident prevention and fire protection. (1) GUARDS. All mechanical apparatus shall be guarded to comply with Wis. Adm. Code, chapter Ind 1.

(2) FIRE PROTECTION. All installations under this code shall comply with the precautionary requirements of the department of industry, labor and human relations to reduce fire hazards.

Note: Refer to the building code and electrical code for additional safety and fire protection requirements:

Masonry chimneys, construction---Wis. Adm. Code section Ind 52.10
Metal smoke stacks, construction--Wis. Adm. Code section Ind 52.11
Smoke pipes----------Wis. Adm. Code section Ind 52.12
Steam and hot water pipes, protection----------Wis. Adm. Code section Ind 52.13
Vertical duct shaft, construction--Wis. Adm. Code section Ind 52.14

Boiler and furnace rooms_____Wis. Adm. Code sections Ind 54.13, Ind 55.29, 56.15, 57.20, 57.50

Heating and ventilating equipment and wiring_____Wis. Adm. Code section E 1–E 900

Ind 59.22 Design conditions. (1) INSTALLATION OF EQUIPMENT. All heating, ventilating and air conditioning installations shall be designed and installed to provide the service and results required by this code.

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.

(2) 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 provided in this code.

(3) OUTSIDE TEMPERATURE DESIGN CONDITIONS. In the accompanying map, the state of Wisconsin has been divided into 3 zones. The maximum heat losses for a heating system shall be calculated on the basis of the temperatures indicated in Table 1 with reference to location of the project in each respective zone.

(4) INSIDE TEMPERATURE DESIGN CONDITIONS. The heating system shall be designed to maintain a temperature of not less than that shown in Table 2.

TABLE 2

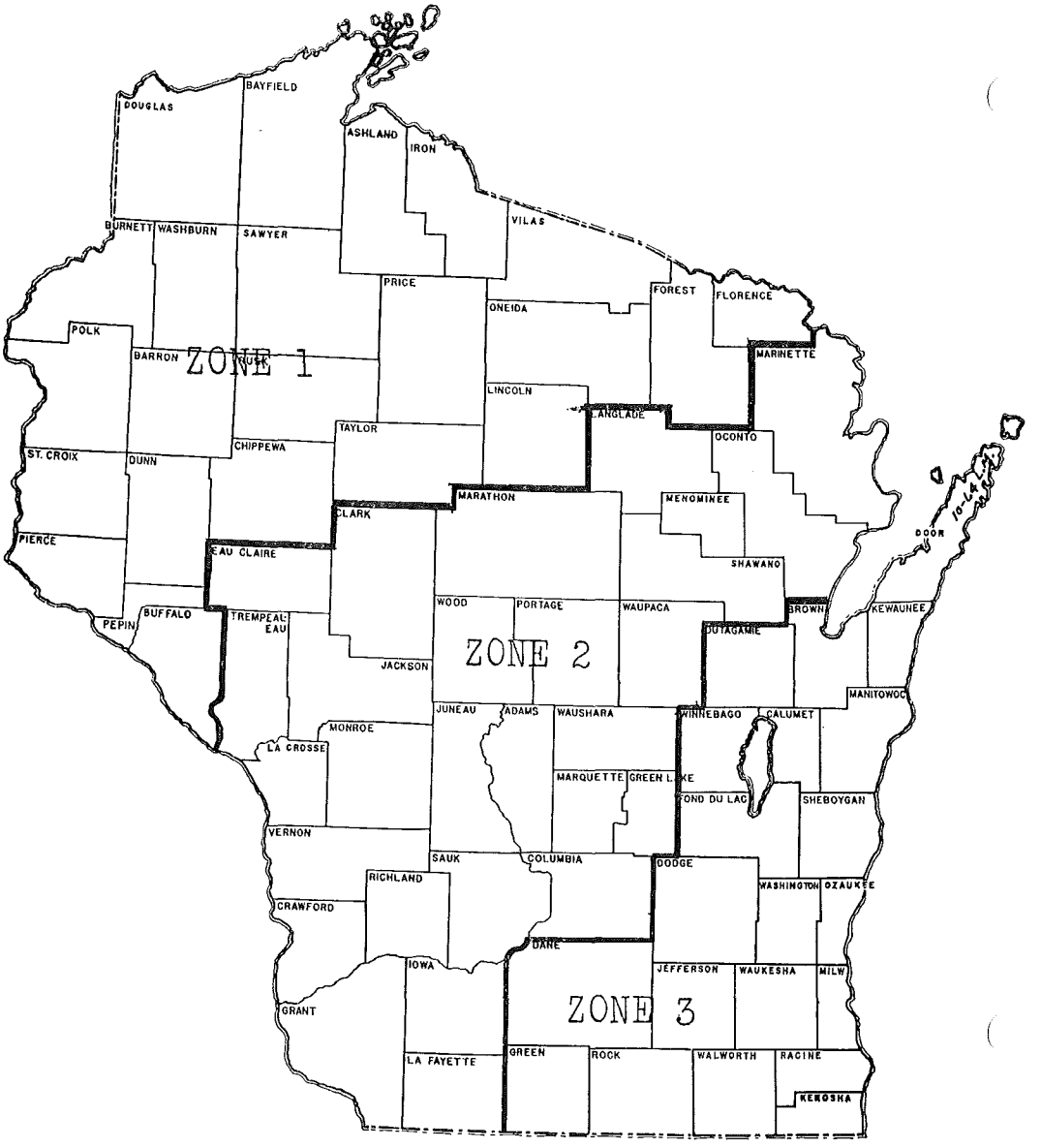
Type of Buildings	Deg. Fahr.	Type of Buildings	Deg. Fahr.
Barber Shops and Beauty Parlors	75	Hotels:	
Schools:		Bedrooms and Baths	70
Classrooms	70	Dining Rooms	70
Assembly Rooms	68	Kitchens and Laundries	66
Gymnasiums	55	Ballrooms	65
Wardrobe and Locker Rooms	70	Service Rooms	68
Kitchens	66		
Dining and Lunch Rooms	65	Apartments	70
Play Rooms	60	Offices	68
Natatoriums and Bathrooms	75	Stores	65
Toilet Rooms	70	Factories and Machine Shops	60
Hospitals:		Foundries and Boiler Shops	50
Private Rooms	75	Toilet and Locker Rooms—	
Operating Rooms	75	General	70
Wards	75		
Kitchens and Laundries	66	Garages:	
Bathrooms	75	Repair and Service Areas	60
Toilet Rooms	75		
Theaters:			
Seating Space	68		
Lounge Rooms	68		

(5) AIR-CLEANSING APPARATUS. (a) Air-cleansing apparatus shall be designed and installed to permit access to the equipment for maintenance and to insure proper operation of the heating and ventilating system.

(6) SUPPLY AIR TEMPERATURE. The design condition of the supply air temperature shall not exceed 140° Fahrenheit.

TABLE 1

MAP OF WISCONSIN SHOWING DESIGN TEMPERATURE ZONES



Zone 1 - - - - - - - - - - - - - - - - 30° Below Zero F.
Zone 2 - - - - - - - - - - - - - - - - 25° Below Zero F.
Zone 3 - - - - - - - - - - - - - - - - 15° Below Zero F.

Register, September, 1973, No. 213
Building and heating, ventilating
and air conditioning code

(7) CONTROLS. Where ventilation is required by this code, controls shall be provided so that minimum air circulation, supply and exhaust shall be maintained continuously during periods of occupancy.

(8) AIR QUANTITY. The quantity of air used to ventilate a given space during period of occupancy shall always be sufficient to maintain the standards of air temperature, air quality, air motion and air distribution as required by this code. (See Wis. Adm. Code section Ind 59.24).

(9) NUMBER AND ARRANGEMENTS. The capacity, number and arrangement of outlets, returns and exhausts shall insure a uniform distribution of air.

(10) ELEVATOR SHAFTS AND STAIRWELLS. Air shall not be transferred through elevator shafts and stairwells where doors are required at any floor level.

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

(12) CORRIDOR VENTILATION. 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.

History: Cr. Register, January, 1965, No. 109, eff. 2-1-65; am. table 2, cr. (9), (10), (11) and (12), Register, September, 1973, No. 213, eff. 10-1-73.

Ind 59.24 General requirements for heating, ventilating and exhaust systems. (1) HEATING SYSTEMS REQUIRED. Heating systems complying with the requirements of this code shall be provided, maintained and operated for all occupied areas within the scope of this code.

(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.

Note: For more restrictive conditions, see Ind 59.66 (2).

(3) VENTILATING SYSTEMS REQUIRED. Ventilating systems shall be provided, maintained and operated to accomplish required ventilation service for all occupied areas within the scope of this code.

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 irritating, or to be injurious to the health, safety or welfare of the employes or frequenters, see Wis. Adm. Code Chapter Ind 20—Dusts, Fumes, Vapors and Gases.

(4) NATURAL VENTILATION. Where outdoor openings are used for natural ventilation the openings shall be within 100 feet, or 5 times the least dimensional width of the occupied area, whichever is the least.

(a) 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 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 59.60.

(5) GRAVITY DIRECT-INDIRECT SYSTEMS. 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.

(6) HOT WATER HEATING AND VENTILATING SYSTEMS. Hot water systems installed in areas where ventilation is required under this code shall comply with the following requirement:

(a) The system hot water shall be circulated continuously by mechanical means.

(7) EXHAUST VENTILATING SYSTEM. (a) Exhaust ventilating systems shall be designed to reasonably prevent contaminated air reentering the building.

(b) The required exhaust ventilating systems shall operate continuously whenever the space exhausted is occupied.

Note: See Wis. Adm. Code Chapter Ind 20.

(8) TEMPERED AIR SUPPLY. (a) Where ventilation is affected by exhaust methods, an outside tempered air supply shall be provided to replace the air exhausted from the area if the volume of air exhausted exceeds one air change per hour.

(b) Where heat gain from a process is equal to all or part of the ventilation heat load, the air may be recirculated and supplied mechanically within the immediate area and mixed with a quantity of outside air to temper the air supply, provided that dampers and temperature controls are installed in the system to maintain a discharge temperature of not less than 50° F.

Note: See other applicable sections of Chapter Ind 59 for further restrictions.

(c) A tempered air supply depending on a negative pressure within the space is prohibited except in foundries, steel fabricating shops and similar areas.

(9) CONTAMINATION OF ADJACENT AREA. The ventilation of all equipment and system service rooms which house sources of odors, fumes, noxious gases, smoke, steam, dust, spray, or other contamination, shall be such as to prevent spreading of any such contamination to other parts of the building occupied by people.

(a) 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 Chapter Ind 20—Dusts, Fumes, Vapors and Gases.

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. Surface temperatures of any kind 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 Chapter Ind 20—Dusts, Fumes, Vapors and Gases.

(b) Ventilation air shall not be drawn from an area of greater contamination to satisfy code requirements.

Note: The following examples are typical of acceptable systems: corridor to toilet; corridor to cloak rooms or janitor closets; dining room to kitchen; locker room to toilet room; gymnasium to locker room; and showroom to garage.

(10) FINAL TEST REQUIRED. The designer or installer shall be responsible for the testing and balancing of every heating, ventilating and air conditioning system.

(11) 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, January, 1965, No. 109, eff. 2–1–65; r. and recr., Register, September, 1973, No. 213, eff. 10–1–73.

Ind 59.25 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 code during periods the building is occupied unless otherwise exempted by this code.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65.

Ind 59.40 Occupancy classification. (1) The various occupancies to which the provisions of this code apply shall be classified as follows:

(a) Require ventilation on an occupancy basis.

(b) Require ventilation on an occupancy basis unless otherwise exempted.

(c) Require exhaust.

(d) Require ventilation on the basis of floor area.

(2) Table 3 is a list of occupancies to determine ventilation requirements and number of persons.

TABLE 3

Use or Occupancy	Classification	Basis of Capacity
Arenas and field houses*	(a)	4 sq. ft. per person. Use seated area only.
Armories (drill halls)	(a)	30 sq. ft. per person.
Assembly halls*	(a) or (b)	7 sq. ft. per person. See Wis. Adm. Code section Ind 59.42.
Banquet halls*	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.42.
Barber shops	(b)	20 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Bath and shower rooms	(c)	See Wis. Adm. Code section Ind 59.48.
Beauty parlors	(b)	20 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Billiard rooms	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Bowling alleys	(a) or (b)	Seating capacity, plus 6 persons per alley. Terminate occupied area at foul line. See Wis. Adm. Code section Ind 59.51.
Brokerage board rooms	(a) or (b)	7 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Cafeterias*	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.42.
Churches and places of worship	(a) or (b)	See Wis. Adm. Code section Ind 59.44.
Chapel	(a) or (b)	7 sq. ft. per person.
Dining and social rooms	(a) or (b)	15 sq. ft. per person.
Nave or auditorium	(a) or (b)	7 sq. ft. per person.
Club rooms	(a) or (b)	Depends on usage.
Dance halls	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Dining rooms*	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.42.
Educational facilities†		
Academic classrooms-regular	(a)	20 sq. ft. per person.
Administrative and office space	(a) or (b)	75 sq. ft. per person.
Arts, crafts, drafting	(a) or (c)	30 sq. ft. per person. Also see Wis. Adm. Code chapter Ind 20—Dusts, Fumes, Vapors and Gases.
Bleachers	(a)	One seat per 18 inches of bench length.
Gymnasiums, field houses, auditoriums, theaters, lecture rooms (fixed seating)	(a)	6 sq. ft. per person.
Gymnasiums, field houses, multipurpose rooms, cafeterias, study halls, commons and other level floor areas with nonfixed individual seating	(a)	10 sq. ft. per person.
Home economics, business education	(a)	30 sq. ft. per person.
Industrial arts-vocational shop	(a) or (c)	50 sq. ft. per person. See Ind 59.52 and Wis. Adm. Code chapter Ind 20—Dusts, Fumes, Vapors and Gases.
Laboratories-science (fixed lab. tables)	(a) or (c)	30 sq. ft. per person. Also see Wis. Adm. Code chapter Ind 20—Dusts, Fumes, Vapors and Gases.
Libraries and resource centers	(a)	20 sq. ft. per person.
Museums and art galleries	(a)	40 sq. ft. per person.
Music		
Vocal	(a)	10 sq. ft. per person.
Instrumental	(a)	20 sq. ft. per person.
Special education (mentally retarded, physically handicapped, etc.)	(a)	35 sq. ft. per person.
Factories and machine shops	(b)	See Wis. Adm. Code section Ind 59.53. Also see rules of Wis. Adm. Code chapter Ind 20—Dusts, Fumes, Vapors and Gases.
First-aid rest rooms	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.53.
Foundries and boiler shops	(b)	See Wis. Adm. Code section Ind 59.53. Also see rules of Wis. Adm. Code chapter Ind 20—Dusts, Fumes, Vapors and Gases.

TABLE 3—Continued

Use or Occupancy	Classification	Basis of Capacity
Funeral homes		See Wis. Adm. Code section Ind 59.44.
Chapel	(a) or (b)	7 sq. ft. per person.
Garages and service stations	(d)	See Wis. Adm. Code section Ind 59.52.
General offices*	(a) or (b)	See Wis. Adm. Code section Ind 59.50.
Gymnasiums and combined gymnasiums and assembly halls*	(a)	6 sq. ft. per person for seated space. 15 sq. ft. per person for space not seated.
Hospitals	(a) or (b)	See Wis. Adm. Code section Ind 59.56. See Wis. Adm. Code section Ind 57.17 and Ind 57.19.
Hospitals (Mental)		See Wis. Adm. Code section Ind 59.55.
Day rooms	(b)	See Wis. Adm. Code section Ind 57.19.
Dormitories	(b)	See Wis. Adm. Code section Ind 57.17 and Ind 57.19.
Janitor closets	(c)	See Wis. Adm. Code section Ind 59.48 and Ind 59.56.
Kitchens	(c)	See Wis. Adm. Code section Ind 59.49.
Laboratories*	(a) or (c)	25 sq. ft. per person. See rules of Wis. Adm. Code chapter Ind 20—Dusts, Fumes, Vapors and Gases.
Laundries*	(c)	See Wis. Adm. Code section Ind 59.56 (a).
Lecture halls*	(a)	7 sq. ft. per person. Use seated area only.
Library reading rooms*	(a)	20 sq. ft. per person.
Locker rooms	(c) or (d)	See Wis. Adm. Code section Ind 59.48 and Ind 59.53.
Lodge halls	(a) or (b)	6 sq. ft. per person for seated space. 15 sq. ft. per person for space not seated. See Wis. Adm. Code section Ind 59.51.
Mental hospitals		See Wis. Adm. Code section Ind 59.55.
Day rooms	(b)	See Wis. Adm. Code section Ind 57.19.
Dormitories	(b)	See Wis. Adm. Code section Ind 57.17 and Ind 57.19.
Motion picture booths	(a) or (c)	See Wis. Adm. Code section Ind 59.43.
Penal institutions		See Wis. Adm. Code section Ind 57.17 and Ind 57.19.
Jail cell (overnight lockup)	(b) & (c)	6 air changes per hour.
Places of employment*	(b)	75 sq. ft. per person. See Wis. Adm. Code section Ind 59.53.
Playrooms (unfinished areas)*	(c)	23 sq. ft. per person.
Printing establishments	(b)	See Wis. Adm. Code section Ind 59.53. Also see rules of Wis. Adm. Code chapter Ind 20—Dusts, Fumes, Vapors and Gases.
Restaurants	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Retail establishments	(a) or (b)	Basement: 40 sq. ft. per person. Other floors: 60 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Security vaults (occupied)	(d)	2 CFM per sq. ft.
Skating rinks	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Sunday School	(b)	15 sq. ft. per person.
Swimming pools	(c)	See Wis. Adm. Code section Ind 59.48.
Taverns	(a) or (b)	20 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Theaters*	(a)	7 sq. ft. per person.
Theater lobbies*	(a)	15 sq. ft. per person.
Theater lounge rooms*	(a)	15 sq. ft. per person.
Toilet rooms	(c)	See Wis. Adm. Code section Ind 59.48.
Wardrobes, lockers and cloak rooms		2 CFM per sq. ft. floor area. See Wis. Adm. Code section Ind 59.48 and Ind 59.53.

*These occupancies are other than those related to educational facilities under Chapter Ind 56.

†For areas listed under "educational facilities," the department will accept maximum capacities stated on building plans according to section Ind 56.07.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65; am. (2) table 3, Register, September, 1973, No. 213, eff. 10–1–73.

Ind 59.41 General requirements for occupancies under (a) and (b) classifications. (1) SCOPE. The requirements of this rule shall apply to all occupancies listed in Wis. Adm. Code section Ind 59.40 (1) (a) and (b) unless otherwise exempted by this code.

(2) AIR MOVEMENT. The total air circulated for all occupancies in this classification shall not be less than 6 air changes per hour unless otherwise provided by this code.

(a) 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° Fahrenheit and 29.92 inches (H^g) barometric pressure.

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

(3) OUTSIDE SUPPLY. The outside air supply maintained during occupancy of a given space shall not be less than 7½ cubic feet per minute per occupant. Exhaust ventilation in equal volume shall be maintained simultaneously.

Note: See Wis. Adm. Code section Ind 59.40 (Table 3) for method of determining number of occupants.

(4) AIR DISTRIBUTION. All air outlets and returns shall be so located, arranged or equipped as to provide a uniform distribution of air.

(5) RECIRCULATION. No air contaminated by other than human occupancy shall be used for recirculation, except within the same occupancy classification.

(6) AUTOMATIC CONTROLS. Automatic controls shall be provided to maintain temperature and controlled ventilation to satisfy the following conditions during periods the area is occupied.

(a) Provide a continuous air movement of not less than the minimum required by this code.

(b) Provide a continuous supply of tempered outside air as determined by the number of occupants of not less than 7½ cubic feet of air per minute per person.

(c) Maintain design temperature.

(7) AIR CLEANSING DEVICES. Approved air cleansing devices shall be 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 of industry, labor and human relations recognizes as approved, filters listed in Building Materials List published by the Underwriters' Laboratories, Inc. and test data of any other recognized testing agency for the purpose for which it is used.

History: Cr. Register, January, 1965, No. 109, eff. 2-1-65.

Ind 59.42 Places of assembly. (1) SCOPE. This classification shall include 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, skating rinks and theaters, that will accommodate more than 100 persons.

Note: For areas that will accommodate less than 100 persons, see Wis. Adm. Code section Ind 59.51.

(2) AIR MOVEMENT, SUPPLY AND DISTRIBUTION. The air movement, supply and distribution for all occupancies under this classification shall conform to the requirements of section Ind 59.41.

(3) 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.

(4) ALTERNATE SERVICE AND CAPACITY. Heating and ventilating systems installed in 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.

History: Cr. Register, January, 1965, No. 109, eff. 2-1-65.

Ind 59.43 Motion picture booth. (1) SCOPE. This classification shall include all motion picture booths housing projection equipment using carbon arc lamps.

(2) EXHAUST VENTILATION. Hazardous fumes and gases shall be mechanically exhausted to the outside atmosphere from projectors, spotlights, stereopticons, and similar equipment. One exhaust system shall be used to remove all contaminated air. The volume of air exhausted shall be not less than 15 cubic feet per minute for each arc lamp or other source of contamination. Dampers are prohibited in the system. The system shall not be used for any other service.

(3) AIR SUPPLY. Where a mechanical exhaust system is required, a volume of tempered air shall be supplied to equal the volume of air exhausted. Air shall be supplied by one or a combination of the following methods:

(a) Tempered air may be supplied to the booth from other ventilating systems in the building if the inlet opening is protected wih an approved shutter having quick acting fusible links, or other approved heat release devices that will automatically and quickly close the inlet opening simultaneously with the openings in the front of the booth.

(b) A separate supply system, such as a unit ventilator, if the equipment is arranged so that the air supply will be stopped automatically and simultaneously with the closing of the openings in front of the booth.

Note: When approved in writing by the department of industry, labor and human relations, the air may be taken through openings in the booth walls from the auditorium or other space adjoining the booth. For relief outlets in addition to exhaust ventilation, see Wis. Adm. Code section Ind 55.45.

History: Cr. Register, January, 1965, No. 109, eff. 2-1-65.

Ind 59.44 Places of assembly for worship. (1) SCOPE. This classification shall include auditoriums, social assembly rooms, and Sunday

School rooms, in churches or houses of worship. It shall also include chapels in funeral homes, parochial schools and convents.

(2) VENTILATION REQUIRED. The air movement supply and distribution for occupancies in this class shall conform to the requirements of Wis. Adm. Code section Ind 59.40 and Ind 59.41. Mechanical ventilation will not be required where the total openable area of outside doors and windows is greater than 3% of the floor area served, except in funeral homes the openable area shall be greater than 5%. Window openings below grade will not be accepted unless there is a "clear space" outside of the window having a width not less than 1½ times the distance below grade at the bottom of the window.

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

(3) ALTERNATE SERVICE AND CAPACITY. Heating and ventilating systems installed in occupied areas of this class may be arranged for selective delivery of the entire service to either the auditorium floor area or to the basement floor area provided these areas are not used simultaneously.

History: Cr. Register, January, 1965, No. 109, **eff.** 2–1–65.

Ind 59.45 Schools. (1) SCOPE. This classification shall include all class, study, recitation, lecture, project rooms, kindergartens, library reading rooms and similar areas in all school, college and library buildings used for educational purposes. (See Wis. Adm. Code section Ind 59.42 for assembly rooms).

(2) VENTILATION REQUIRED. (a) *General.* The air movement and supply for all occupancies in this class shall conform to the requirements of sections Ind 59.40, 59.41 and 59.42.

(b) *Air movement and supply.* The air movement and supply for all occupancies under this classification shall conform to the requirements of section Ind 59.41. For corridors and halls used in conjunction with occupied areas of this class, the air movement shall not be less than 10 cubic feet per minute per lineal foot of corridor or hall. This air supply shall be accomplished by means of air inlets admitting air from adjacent classrooms or by a direct tempered air supply.

History: Cr. Register, January, 1965, No. 109, **eff.** 2–1–65.

Ind 59.46 Places for vocational instruction and research. (1) SCOPE. This classification shall include all places for vocational instruction and research, such as laboratories, school shops, domestic science rooms and similar occupied areas.

(2) VENTILATION REQUIRED. The air movement and supply for areas in this class shall conform to the requirements of sections Ind 59.41 and 59.52.

(3) EQUIPMENT AND PROCESS EXHAUST. (a) An exhaust system shall be provided for all equipment and processes that create dusts, fumes, vapors or gases injurious to health.

Note: See Wis. Adm. Code, Ch. Ind 20.

(b) Exhaust systems shall be separate from and independent of all other services and systems in a building.

History: Cr. Register, January, 1965, No. 109, **eff.** 2–1–65.

Ind 59.48 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 Wis. Adm. Code section Ind 59.56 (2).

Note #3: For exhaust ventilation requirements in places of employment, see Wis. Adm. Code section Ind 59.53.

(2) VENTILATION REQUIRED. (a) Exhaust ventilation shall be provided for all areas of this class unless otherwise exempted. The volume of air exhausted shall not be less than 2 cubic feet per minute per square foot of floor area.

(b) The effectiveness of the exhaust shall be greater than the supply.

(c) Exhaust ventilation shall be installed in toilet rooms having more than one fixture (water-closets and urinals).

Note: Exhaust ventilation is not required from toilet rooms having one water-closet or one urinal when the window area is greater than 4 square feet and more than 2 square feet is openable.

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

(e) Locker rooms used with natatoriums, baths and toilet rooms, shall be supplied with tempered air.

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

(f) *Exemptions.* 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, providing the room has an outside window of at least 4 square feet with at least 2 square feet that is openable.

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

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65; am. (1), cr. (2) (f), Register, September, 1973, No. 213, eff. 10–1–73.

Ind 59.49 Kitchens. (1) SCOPE. This classification includes all areas where food is prepared, except in domestic science educational facilities from grades kindergarten thru 12, and single unit apartments in hotels, motels and apartment buildings.

(2) VENTILATION REQUIRED. (a) *Exhaust.* The exhaust ventilation shall be not less than 4 cubic feet per minute per square foot of floor area for every occupied area within the scope of this section.

1. Exception: The exhaust ventilation shall be not less than 2 cubic feet per minute per square foot of floor area for kitchens used in the preparation of only one meal a day. The exception may apply to churches, auditoriums and lodge halls.

(b) *Exhaust ventilating system.* Exhaust ventilating systems serving this class of occupancy shall not be used for any other services.

(3) EXHAUST HOODS. (a) *Where required.* Exhaust hoods are required under the following conditions:

1. Where frying and/or broiling is done.

Note: The above includes deep-fat frying and surface frying.

2. Where cooking is a regular commercial operation.

Note: The above includes ranges, griddles, fryers, broilers and similar grease-producing equipment.

(b) *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.

(c) The volume of exhaust air from the hood shall be not less than 100 cubic feet per minute per square foot of the overall horizontal dimensions of the grease-producing equipment.

(d) When hoods are connected to ducts supplying outside air, performance data shall be submitted as required by subsection Ind 59.20 (4) (g).

(e) Hood surfaces and exposed exhaust ducts within 18 inches of combustible material shall be protected by 2-hour fire-resistive construction.

(f) Hood surfaces that are concealed by or recessed into adjoining construction shall be protected by 2-hour fire-resistive construction.

(g) Recirculation of air as described under subsection Ind 59.24 (8) (b) is prohibited.

(4) DUCTS. (a) Exhaust ducts or vents connected to required hoods that pass through any other area of the building, including suspended ceilings, shall be protected with not less than 2-hour fire-resistive construction. Where 2-hour fire-resistive construction cannot be provided, a manufactured or masonry chimney shall be used. The manufactured chimney shall be tested and approved for use at a flue gas temperature of not less than 1000° F.

Note #1: See Wis. Adm. Code section Ind 51.04 for various building materials having a 2-hour rating.

Note #2: See Ind 59.69 (13) (a) 5. for fire dampers.

(b) Accessible clean-out openings shall be installed in the area of the duct not requiring a 2-hour fire-resistive construction.

(c) The air discharge shall be directed away from combustible materials.

(d) Sheet metal ducts shall be constructed of not less than 20 U.S. gauge sheet steel.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65; am. (1) and (4) (a), r. and recr. (2) (a) and (3), Register, September, 1973, No. 213, eff. 10–1–73.

Ind 59.50 Offices. (1) SCOPE. This classification shall include areas where clerical and administrative work is the chief usage.

(2) VENTILATION REQUIRED. The air movement supply and distribution for this classification shall conform to the requirements of Wis. Adm. Code section Ind 59.41 unless each of the following requirements has been satisfied:

(a) The total area of outdoor openings is not less than 3% of the floor area served.

(b) The available floor space for each occupant is not less than 75 square feet per person.

(c) Heat or odors are not present in sufficient quantities to be injurious to the health, safety or welfare of the occupants.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65.

Ind 59.51 Retail establishment. (1) SCOPE. This classification shall include barber shops, beauty parlors, brokerage board rooms, taverns, bowling alleys, retail establishments where goods and commodities are bought and sold and places where not more than 100 persons assemble for recreation, entertainment or dining purposes.

(2) VENTILATION REQUIRED. The air movement, supply and distribution for all occupancies of this class shall conform to the requirement of section Ind 59.41 unless the total area of "outdoor openings" is more than 3% of the floor area served. Window openings below grade will not be accepted unless there is a "clear space" outside of the window having a width of not less than 1½ times the distance below grade at the bottom of the window.

Note: Width of "clear space" means the horizontal distance measured at right angles to the plane of the window.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65.

Ind 59.52 Garages and service stations. (1) SCOPE. Ventilation shall be provided for all repair garages, service stations, body shops, repair service shops and live storage garages where vehicles or equipment having internal combustion engines are operated for repair or other purposes.

Note: A live storage area does not include vehicles or equipment stored for a seasonal period or where such vehicles or equipment, when new, are displayed in a showroom area.

(2) VENTILATION REQUIRED. The supply and exhaust ventilation shall be provided for areas of this class, whenever open to the public or to employes.

(3) STORAGE AREAS. (a) *Heated live storage area.* Areas used for the storage of 6 or more motor-driven vehicles shall be provided with a tempered outside air supply of not less than ½ cubic foot per minute per square foot of floor area. Exhaust ventilation shall equal the volume of air supplied.

Note: A live storage area is any area within a building used for the storage of fire trucks, tractors, automobiles, trucks and other self-propelled vehicles driven in and out under their own power. For exception, see note under (1).

(b) *Unheated live storage area.* Areas used for the storage of 6 or more motor-driven vehicles and where heat is not required, shall be provided with exhaust ventilation equal to ½ cubic foot of air per minute per square foot of floor area unless the following requirements have been satisfied:

1. The floor is at or above grade level.

2. A permanent open wall of the included area is not less than 30% of the total wall area and arranged to cause air circulation throughout the respective area.

(4) REPAIR AREAS. (a) All areas in which motor-driven vehicles are repaired shall be supplied with a volume of tempered outside air not

less than ¾ cubic foot per minute per square foot of floor area. An equal volume of exhaust ventilation shall be provided and maintained. Exhaust air shall be drawn from a line not more than 18 inches above the floor.

(b) Provide a mechanical exhaust system 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. Provide flexible hose equipped with a device for connecting it to the exhaust pipe of the vehicle and to the exhaust system. 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.

Note: In a repair area of a garage where the repair area can accommodate not more than 2 vehicles, an incombustible flexible tube or hose not more than 10 feet long connected to the engine exhaust (tail pipe) and terminating outside of the building may be used in lieu of a mechanical exhaust system.

(c) 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 requirements stated in (b) above.

Note: The requirements stated in (4) (a) need not be increased when satisfying requirements of either (b) or (c). Also see Wis. Adm. Code Chapter Ind 20—Dusts, Fumes, Vapors and Gases, for additional requirements.

(d) Areas involved in the servicing of small internal combustion engines such as lawnmowers, snowmobiles, chainsaws, cycles, boat engines, etc. shall be provided with at least ¾ cubic foot of tempered outside air per square foot of enclosed service floor area and an equivalent exhaust.

(5) SERVICE STATIONS. 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, battery charging or replacement, and similar operations.

(a) All service and/or workroom areas, other than where engine tune-up or repair is made, shall be supplied with a volume of tempered outside air not less than ½ cubic foot per minute per square foot of floor area.

1. An exhaust ventilation system shall be provided to satisfy the minimum required air movement.

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

(b) 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 requirements of (4) above.

(c) 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 air equal to ½ 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 floor

located between the termination of the conveyor system and the vehicle exit door.

(6) GENERAL REQUIREMENTS. (a) A separate ventilating system shall be provided for show rooms or offices, except in service stations, where such occupancies are adjacent to repair or live storage areas.

Note: Ventilation is not required if openable area is provided to conform with Wis. Adm. Code sections Ind 59.50 (2) (a) and 59.51 (2).

(b) 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) The air exhausted from the repair, live storage and service areas shall be removed from a line not more than 18 inches above the floor through vent ducts located in areas of greatest contamination. Where gravity exhaust ventilation is provided, the vent ducts shall extend not less than 2 feet above the high point of the roof or parapet and shall be capped with an approved siphon type roof ventilator.

Note: For ventilation requirements where spray coating is done, see Wis. Adm. Code Ch. Ind 21.

(d) If the provisions of this section do not provide sufficient ventilation to meet the standards for threshold limit values covered in Wis. Adm. Code Chapter Ind 20—Dusts, Fumes, Vapors and Gases, the additional exhaust requirements with an equivalent volume of tempered outside air shall be provided to satisfy the requirements of Chapter Ind 20.

(e) The ventilation for battery-charging rooms shall satisfy the requirements of (4) (d).

History: Cr. Register, January, 1965, No. 109, eff. 2-1-65; r. and recr. (1) and (5), cr. (4) (c) and (d), (6) (d) and (e), Register, September, 1973, No. 213, eff. 10-1-73.

Ind 59.53 Places of employment. (1) SCOPE. This classification shall include all places of employment not classified elsewhere in this code.

(2) VENTILATION REQUIRED. (a) The air movement supply and distribution for all areas in this class shall conform to the requirements of Wis. Adm. Code section Ind 59.41 unless all of the following requirements have been satisfied:

1. The available floor space for each occupancy shall be at least 75 square feet per person.

2. Heat, smoke, gas, dust, spray, hazardous fumes, vapors, steam or other contamination shall not be present in sufficient quantities to obstruct the vision, or be irritating, or injurious to the health or safety of employes and frequenters.

3. The total area of outdoor openings shall be not less than 3% of floor area served, except in refrigeration plants, warehouses, cold storage buildings and processing areas where the nature of the occupancy does not permit outdoor openings.

(3) INDUSTRIAL EXHAUST SYSTEMS REQUIRED. (a) Industrial exhaust systems shall be installed and operated to remove harmful contaminants in conformance with Wis. Adm. Code, Ch. Ind 20.

(b) Supply a volume of tempered outside air to replace the air exhausted if the volume of air exhausted exceeds an infiltration rate of 3 air changes per hour.

(4) LOCKER ROOMS. Locker rooms used in places of industrial employment shall be provided with a tempered air supply.

Note 1: See Wis. Adm. Code section Ind 59.48.

Note 2: Exhaust air from locker rooms may be directed through the adjoining toilet 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 Wis. Adm. Code section Ind 59.41. Ventilation is not required where the total sash area is greater than 10% of the floor area and the openable area is greater than 5%.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65.

Ind 59.55 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 REQUIRED. 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 sections Ind 59.40 and 59.41. 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, January, 1965, No. 109, eff. 2–1–65.

Ind 59.56 Hospitals. (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: Refer to the State Board of Health, Hospital and Related Services, for additional requirements.

(2) VENTILATION REQUIRED. (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) Drug storage rooms, clean utility rooms, treatment rooms, dark rooms, and X-ray rooms shall have a minimum air movement of 6 air changes per hour. Such ventilation shall be accomplished by exhaust methods.

(c) 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. Tempered 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 system shall be designed to maintain room temperature at 75° F.

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

(d) Private rooms, semi-private wards, day rooms, and nursing stations shall be ventilated in accordance with the requirements of Wis. Adm. Code section Ind 59.41 unless openable sash area has been provided and the content of the space is in excess of 400 cubic feet per occupant.

Note: See Wis. Adm. Code sections Ind 57.17 and 57.19.

History: Cr. Register, January, 1965, No. 109, eff. 2-1-65; am. (2) (d), Register, December, 1967, No. 144, eff. 1-1-68; r. and recr. (2), Register, September, 1973, No. 213, eff. 10-1-73.

Ind 59.59 Combustion air intakes. (1) All burners shall be provided with combustion air by one of the following methods:

(a) Infiltration where total area of outdoor openings is greater than 3% of the floor area in which the burner is located.

Note: See Ind 59.66 (3) for special conditions.

(b) Gravity intakes where the free area of such opening is at least one square inch for each 5,000 Btu per hour of fuel consumed. The minimum free area of such opening shall be not less than 100 square inches.

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.

(c) Mechanical combustion air systems such as induced draft, forced draft or makeup air units when complete design data, including size of combustion air intake, has been approved by the department.

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

(2) All boiler and furnace rooms shall be provided with combustion air from outside the building as required by subsection (1) (b) or (c) above.

(3) A natural-draft burner shall not be installed where the space in which the burner is located is under negative pressure due to another exhaust system.

(4) Mounting height shall be as required in subsection Ind 59.60 (1) (c).

History: Cr. Register, September, 1973, No. 213, eff. 10-1-73.

Ind 59.60 Outside ventilating air intakes or exhausts. (1) LOCATION. (a) Outside air intake openings shall be located so as to minimize contamination of intake air, but in no case shall the distance be less than:

1. Twenty feet horizontally or 10 feet vertically from chimney outlets.

2. Ten feet (measured in any direction) from all other exhaust and plumbing vents.

(b) 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.* 1. The lowest side of outside air intake openings shall be located at least 12 inches above the outside grade or above the adjoining roof surface.

2. Where outside air intake openings are located in any areaway below grade, the lowest side of opening shall be at least 12 inches above the bottom of areaway.

a. The minimum horizontal cross-sectional area of areaway shall be at least equal to the free area of the opening.

3. A grating shall be provided over the top of the areaway required in 2. above.

a. The grating shall have a free area at least equal to the required area of combustion air intake.

b. The openings in grating shall be ½ inch to one inch in the clear.

c. The grating shall be capable of supporting the design loads for intended location, but in no case shall it be designed for less than 100 pounds per square foot.

(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.

Note: See Wis. Adm. Code section Ind 59.69 (Table 4) for allowable velocities in the design of outside air intake openings.

(3) WEATHER PROTECTION. All outside air intake openings shall be protected against weather and water with a weatherproof hood or louvers. All outside air intakes except intakes for combustion air shall be equipped with a damper to prevent the intake of unheated air to the building when the heating unit is not in operation.

(4) ACCESSIBILITY AND CLEANLINESS. All outside air intakes shall be easily accessible for cleaning, and shall be kept clean and sanitary in use throughout the circuit to the heater.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65; r. and recr. (1); r. (2) and (6); renum. (3), (4) and (5) to be (2), (3) and (4), Register, September, 1973, No. 213, eff. 10–1–73.

Ind 59.61 Air cleansing apparatus. (1) Contaminated water shall not be recirculated through sprays affecting air used for ventilating purposes.

Note: See note following Wis. Adm. Code, section Ind 59.41 (7) for approved materials used in cleansing devices.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65.

Ind 59.63 Boilers. (1) GENERAL. The boiler, safety devices and other auxiliary equipment shall be of a type approved by the department of industry, labor and human relations.

Note: See Wis. Adm. Code, Ch. Ind 41.

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

Note: The department of industry, labor and human relations accepts net ratings as listed by Mechanical Contractors Association of America, Inc., Steel Boiler Institute, Inc. and Institute of Boiler and Radiator Manufacturers.

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

History: Cr. Register, January, 1965, No. 109, **eff.** 2-1-65.

Ind 59.64 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, September, 1973, No. 213, eff. 10-1-73.

Ind 59.65 Jacketed stoves. (1) SCOPE. Jacketed stoves are acceptable in the following occupancies:

(a) One-room schools and portable schools having no basement or other subfloor heater space.

(b) One-story office buildings, where total floor area is less than 1500 square feet.

(c) One-story motels and apartment buildings.

(2) LOCATION. Jacketed stoves in a schoolroom shall be located in the coldest area.

(3) SHIELDS. The casings or shields of jacketed stoves in schools shall be so constructed as to shield adjacent occupants from radiant heat. The clear air space between shield and stove shall average 6 inches and the shields themselves shall extend above and below all heat radiating surfaces, but not more than 12 inches clear of the floor.

(4) OUTSIDE AIR INTAKE. Jacketed stoves installed in school buildings shall have an outside air intake terminating outside the building at a line not less than 12 inches above grade. The outside air intake shall be protected with a weatherproof hood or louvers and a ½ inch wire mesh screen. The intake duct shall be joined to the heater casing and airway in a manner that will prevent cold air from spreading over the floor and insure contact with the heater surface. Underfloor ducts are prohibited.

(a) The area of the outside air duct shall not be less than 0.25 square inch per square foot of floor area. A damper shall be provided in the outside air supply duct to prevent the intake of unheated outside air to the building during periods when the heater is not in operation.

(5) VENTS. Vent outlets in rooms served by jacketed stoves and heaters shall be located at the floor line and not less than 6 feet from the heater casing.

(a) The area of auxiliary metal vent flues used in connection with smoke pipes shall not be less than 150 square inches.

(b) Where effective devices for mixing smoke and vented air are used, the smoke flue and outlet duct may be combined, provided that the free area of the vent duct is not less than 144 square inches.

(6) OIL BURNING HEATERS. Every oil burning jacketed stove or

room heater shall be supplied directly from an oil supply tank having a capacity of not less than 250 gallons.

(a) The fuel oil tank shall be equipped with a fill pipe, vent pipe and an oil gauge.

Note: See Wis. Adm. Code, chapter Ind 8.

History: Cr. Register, January, 1965, No. 109, **eff.** 2–1–65.

Ind 59.66 Space heating equipment. (1) FURNACES. (a) *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 make-up air to replace a volume equal to that exhausted.

(b) *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 will 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.

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

(d) *Fire-resistive enclosure.* The furnace shall be isolated in a fire-resistive enclosure constructed in conformity to the applicable provisions of the Wis. Adm. Code, chapters Ind 50–59, building and heating, ventilating and air conditioning code.

Note: See Wis. Adm. Code, section Ind 59.21 (2)

(e) *Approved type.* A furnace shall be a type approved by the department of industry, labor and human relations.

(f) *Venting.* Furnaces shall be connected to an approved stack, vent or chimney. (See Wis. Adm. Code section Ind 59.67.)

Note: The department of industry, labor and human relations recognizes equipment listed by Underwriters' Laboratories, American Gas Association or other nationally recognized testing laboratories.

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

(2) UNIT HEATERS, SUSPENDED FURNACES AND DUCT FURNACES. (a) Direct-fired appliances of this class are prohibited in theaters, assembly halls, places of worship, schools, hospitals, hotels, apartment houses, and similar places where more than 100 persons assemble for recreation, entertainment or dining purposes, except where the appliance is enclosed in a fire-resistive enclosure constructed in conformity to applicable provisions of the Wis. Adm. Code, chapters Ind 50–59, building, heating, ventilating and air conditioning code.

(b) Direct-fired appliances of this class in retail establishments, manufacturing plants, garages, service stations, machine shops, woodworking plants, foundries, offices, and similar areas shall comply with the following requirements:

1. The appliance shall be suspended in an occupied space.
2. The heating appliance shall be of an approved type.
3. The heating appliance shall be vented to the outside atmosphere by connection to a masonry chimney, an approved vent pipe, or to a

metal smoke stack. (See Wis. Adm. Code section Ind 59.67—approved chimneys.)

4. The heating appliance shall be supported by incombustible brackets or hangers. All units shall be located at least 7 feet above the floor and at least 6 inches away from any combustible wall or ceiling.

5. The oil-fired unit shall not be suspended over combustible material.

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

(c) Where the entering air to the heat exchanger of all gas-fired equipment is 30 degrees Fahrenheit or lower, the heat exchanger and burners shall be constructed of corrosion-resistive materials.

(d) 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 incombustible.

(e) Direct-fired gas appliances designed to supply 100% outside air (where the products of combustion are mixed with the comfort air stream), may be installed in metal fabricating plants, foundries, machine shops and factories provided:

1. The volume of air supplied to the occupied space is exhausted mechanically.

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

Note: The department of industry, labor and human relations recognizes as approved, equipment listed by the American Gas Association, Underwriters' Laboratories, Inc. and test data of any other recognized testing laboratories.

(f) Supply duct connections are prohibited with "low static" direct-fired unit heaters.

(g) 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.

(3) SPACE HEATERS. (a) 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:

1. A space heater may be used in retail establishments provided the floor area of any story does not exceed 1500 square feet.

2. Space heaters used in a retail establishment shall be provided with outside combustion air supplied directly to the burner.

3. 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.

4. The rated input capacity shall not exceed 70,000 BTU per hour for each appliance.

5. Space heaters shall be a type approved by the department of industry, labor and human relations.

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

7. Space heaters shall be vented to the outside atmosphere by connection to a masonry chimney, an approved vent, vent pipe or metal smoke stack. (See Wis. Adm. Code section Ind 59.67—approved chimneys.)

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

9. Oil-fired space heaters shall be equipped with mechanical pressure atomizing burner.

10. 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.

11. Space heaters shall be located at least 6 inches from any unprotected combustible wall or partition, unless approved by the department of industry, labor and human relations. 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.

12. Every oil-burning space heater shall be supplied directly from an oil supply tank having a capacity of not less than 250 gallons. The fuel oil tank shall be equipped with an oil gauge, vent and fill pipe. The vent and fill pipe openings shall terminate outside of the building.

Note: For fuel oil storage location and piping requirements, see Wis. Adm. Code, Ch. 8.

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

14. Space heaters not rated by a recognized testing laboratory shall have a net rating equal to 80% of fuel input.

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

(4) INFRA-RED GAS-FIRED RADIANT HEATERS. (a) Heating appliances of this class installed in machine shops, foundries, manufacturing plants, warehouses, garages and aircraft hangars shall conform to the following:

1. The heaters shall be a type approved by the department of industry, labor and human relations.

2. The heater shall be equipped with automatic pilot of the complete shut-off type.

3. Ventilation shall be provided to supply combustion air and dilute the products of combustion.

4. The heaters shall be supported by incombustible brackets or hangers.

5. Not less than the minimum clearances shall be maintained between the heater and combustible materials determined in accordance with test procedures and standards approved by the department of industry, labor and human relations. The heater shall be suspended above the floor not less than a height equal to 7 feet plus the approved minimum clearance from face of heater to combustible materials.

6. Infra-red gas-fired radiant heaters, vented or unvented, not rated by a recognized testing laboratory shall have a net rating equal to 80% of fuel input.

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

(5) ELECTRIC SPACE HEATING EQUIPMENT. (Electric furnaces, space heaters, unit heaters, cable heating devices, infra-red radiant heaters, and heat pump systems.) Where electric space heating equipment is used, it shall conform to the following requirements:

(a) It shall be a type approved by the department of industry, labor and human relations.

(b) It shall be equipped with safety and temperature controls.

(c) 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 of industry, labor and human relations.

(d) Electric space heating equipment shall not be installed in hazardous occupancies unless it is approved for such use. (See Wis. Adm. Code, Electrical code, volume 2.) The open type resistance heating element is prohibited in hazardous occupancies.

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

Note: The department of industry, labor and human relations recognizes as approved equipment listed by Underwriters' Laboratories, Inc.

History: Cr. Register, January, 1965, No. 109, **eff.** 2–1–65.

Ind 59.67 Chimneys, gas vents, mechanical draft and venting devices. (1) GENERAL REQUIREMENTS. Heating appliances 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) TYPES. (a) *Masonry chimney.* The design and construction of the chimney shall conform to the provisions of Wis. Adm. Code, section Ind 52.10, (Building and heating, ventilating and air conditioning code).

(b) *Metal smoke stacks.* The design and construction of a metal smoke stack shall conform to the provisions of Wis. Adm. Code, section Ind 52.11.

(c) *Factory-built chimneys.* Where a factory-built chimney or a gas vent is used instead of a masonry chimney or a metal smoke stack, it shall be an approved type.

1. 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 degrees Fahrenheit continuously and does not exceed 1400 degrees Fahrenheit for infrequent brief periods of forced firing.

2. Type "B". An approved type "B" gas vent may be used with

gas-fired appliances where the flue gas temperature does not exceed 550 degrees Fahrenheit at the outlet of the draft hood.

3. Type "BW". An approved type "BW" gas vent may be used with a vented recessed heater.

4. Type "C". A type "C" gas vent may be used with gas-fired low heat appliances (low pressure boiler, 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 Wis. Adm. Code, section Ind 52.12.

Note: The department of industry, labor and human relations recognizes as approved chimneys designated as types "A", "B", "BW", and "C" and listed by American Gas Association and Underwriters' Laboratories, Inc.

(3) SPECIAL REQUIREMENTS. (a) All chimneys or gas vents shall be supported from incombustible construction unless otherwise approved.

(b) All chimneys or gas vents depending on a gravity principle for the removal of the products of combustion shall terminate not less than 3 feet above the highest point where they 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.

(c) The height and cross-sectional area may be reduced for chimneys employing mechanical draft equipment when approved by the department of industry, labor and human relations.

(4) SMOKE PIPES. The construction and installation of smoke pipes shall conform with the requirements of the Wis. Adm. Code, section Ind 52.12.

History: Cr. Register, January, 1965, No. 109, **eff.** 2–1–65.

Ind 59.68 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 of industry, labor and human relations accepts certified ratings listed by Air Moving and Conditioning Association, Inc.

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

(3) 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.

History: Cr. Register, January, 1965, No. 109, **eff.** 2–1–65.

Ind 59.69 Ducts. (1) DESIGN. All ducts shall be designed to promote the unrestricted flow of air with long sweep elbows or turning vanes. All ducts of a gravity system shall be as direct as possible and shall have a rise of not less than one inch per foot in the direction of flow.

(2) AIR VELOCITIES. The air velocity in vent ducts shall not exceed the limits established in Table 4.

TABLE 4

	Maximum Allowable Velocities	
	Mechanical System	Gravity System
Intake openings using propellor fans	600 F.P.M.	
Vertical vent ducts		300 F.P.M.
Roof siphon ventilators	600 F.P.M.	300 F.P.M.

Note: The allowable velocity may be increased to 600 feet per minute for gravity vent ducts equipped with siphon ventilators and the tempered outside air is supplied by mechanical means.

Note: For supply and return air duct velocities, reference may be made to the standards of the American Society of Heating, Refrigerating and Air Conditioning Engineers Guide and Data Book, which are acceptable.

(3) USE. No duct designed for the transmission of air shall be used for any other purpose.

Note: See Wis. Adm. Code section Ind 59.69 (4) (g) for exception.

(4) UNDERGROUND DUCT CONSTRUCTION AND INSTALLATION. (a) All underground duct systems using cement tile, glazed clay tile and other tile having a composition of cement and minerals shall be waterproof and shall have sufficient strength to prevent failure of duct at 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) Metal and other approved materials not specified in (a) may be used for underground systems if encased in not less than 2 inches of concrete. The ducts shall be round, water-proof, incombustible, smooth, and of sufficient strength to prevent collapse.

(c) Supply air ducts installed parallel and adjacent to an outside wall shall be insulated with a moisture proof 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 bottom of floor to 2 feet below finished grade.

(d) 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.

(e) All room inlets and outlets for underground ducts shall comply with Wis. Adm. Code, subsection Ind 59.71 (4). A water-tight connection shall be provided where the inlet and outlet risers are connected to underground ducts.

(f) In addition to the requirements of subsections (4) (a), (b), (c), (d), and (e), the trunk duct shall not be less than 12 inches high and 12 inches wide and branch ducts not more than 16 feet long may be 8 inches high and 8 inches wide. All ducts shall be provided with inspection and clean-out openings equipped with tight fitting incombustible covers.

(g) In addition to the requirements in subsections (4) (a), (b), (c), (d) and (e) warm air supply ducts shall be designed in compliance with allowable air velocities in Table 4. Where supply air ducts are installed parallel and adjacent to an outside wall, a moisture-proof insulating material (thermal conductance factor of .19 BTU per hour per square foot per degree Fahrenheit) shall be placed

between the duct and outside wall. The insulation shall extend from bottom of floor to 2 feet below finished grade.

(h) Non-hazardous piping may be installed in underground ducts if it does not restrict the air flow and the inside dimensions of the duct are greater than 4 feet wide and 4 feet high.

(5) CONSTRUCTION. (a) All sheet metal ducts and fittings shall be constructed in compliance with standards approved by the department of industry, labor and human relations. All ducts or airways of wood or other combustible material shall be lined on the inside with sheet metal or other approved incombustible material.

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

(b) Ducts constructed of other than metal need not conform to subsection (5) (a), provided:

1. They are approved for such use and the method for fabricating, installing and supporting is approved by the department of industry, labor and human relations.

Note: The department of industry, labor and human relations accepts Class 1 air ducts tested (Standards for Safety U.L. 181) and listed by Underwriters' Laboratories, Inc.

2. They resist puncture, deformation or collapse.

3. They are not used where the air temperature exceeds 250 degrees Fahrenheit.

4. They do not pass through required fire-resistive construction.

5. They are not 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.

(c) Flexible duct connectors between duct systems and air outlets or air outlet units need not conform to subsections (5) (a) and (b), provided:

1. The duct material is approved for such use.

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

2. The construction is approved by the department of industry, labor and human relations.

3. The connector is not subject to deterioration from mildew or moisture.

4. The connector does not pass through required fire-resistive construction.

(d) The vibration isolation connectors at the joint between the duct and fan or heat-producing equipment shall conform to the following:

1. The connector shall be a type approved for such use.

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

2. The connector shall be not more than 10 inches wide.

3. The connector shall not be used where the air temperature is in excess of 250 degrees Fahrenheit.

(e) 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.

(6) SUSPENDED CEILING PLENUM. The plenum above suspended ceilings shall be of incombustible construction. The installation of hazardous piping is prohibited. Openings into the plenum that would affect the fire-resistive rating of the roof and ceiling are prohibited.

(7) INSULATION. Heating supply ducts shall be covered with not less than ½ inch of insulation unless an allowance is made for temperature drop in the system.

(8) GRAVITY VENT DUCTS. (a) Separate vent ducts from each area of similar occupancy shall extend to a plenum at the base of a siphon ventilator.

(b) The use of open pipe space for a gravity vent duct is prohibited.

(9) TERMINATION OF VENT DUCTS. Vent ducts used with mechanical ventilation supply systems shall not terminate in attic space, unless the space is air tight, of incombustible construction and the attic floor is smooth. All such gathering chambers shall be connected to an approved siphon type roof ventilator or to an exhaust fan discharging outside the building.

(10) VENT DUCTS, HORIZONTAL RUN. (a) Horizontal runs in vent 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 direct mechanical supply or the vent duct is connected to an exhaust fan.

(b) Dampers are prohibited in gravity vent ducts, unless automatic back draft dampers are installed.

(11) VENT DUCTS ABOVE ROOF. Final delivery of all vent circuits shall be protected from weather, and shall be so located and constructed as to prevent contamination of air supply for or in any occupied area. Gravity vent ducts shall extend not less than 2 feet above the high portion of the roof or parapet wall, and shall be surmounted with an approved type of siphon roof ventilator.

(12) RELIEF VENTS. (a) The use of barometric relief vents is prohibited where exhaust ventilation is required for occupancies classified as (c) and (d) in Table 3.

(b) Barometric relief vents may be used to exhaust an air volume equal to the mechanical ventilation supplied for occupancies classified as (a) and (b) in Table 3.

(c) Where barometric relief vents are installed on the roof, the discharge opening shall not be less than 2 feet above the roof.

(13) FIRE DAMPERS AND FIRE DOOR ASSEMBLIES. (a) Where heating and ventilating ducts pass through required fire-resistive walls or floor systems, such ducts shall have approved fire dampers or fire door assemblies installed in the approved tested position and located at the point where the ducts pierce the walls or floor systems. Ducts shall be protected according to the following conditions:

1. For construction requiring a fire-resistive rating of one hour or less, the damper or fire door assembly shall be rated not less than the rating of construction. See the following exception.

a. If the above referenced duct is constructed entirely of 20 U.S. gauge sheet metal, no damper will be required. Ducts installed in combustible fire-resistive construction shall satisfy the installation requirements for smoke pipes as stated in section Ind 52.12.

2. For construction requiring a fire-resistive rating of not less than 1½ hours up to ratings not more than 2 hours, the damper or door shall be rated not less than 1½ hours.

3. For construction requiring a fire-resistive rating of 3 or 4 hours, the door assembly shall be rated not less than 3 hours.

4. Access panels shall be provided next to damper or door assembly to permit viewing and servicing.

Note #1: Special attention should be given to design and installation of equipment where highly corrosive conditions exist.

Note #2: See Wis. Adm. Code Chapters 50 through 57 for fire-resistive rated construction.

5. No openings will be permitted in fire-resistive rated doors unless such door assemblies satisfy the requirements of Ind 51.047.

6. Fire dampers are prohibited in kitchen exhaust ducts where combustion-supporting grease deposits can accumulate unless approved kitchen hood assemblies including fire dampers and extinguishing systems are used.

Note #1: The department will accept those hoods and systems approved by Underwriters' Laboratories.

Note #2: The above includes those exhaust ducts serving ranges, broilers, fryers and griddles, for example, but does not include such equipment as dishwashers and steam kettles.

(b) Where heating and ventilating ducts terminate after penetration of required fire-resistive walls or floor systems, such duct openings shall be protected by approved fire dampers or fire door assemblies installed in the approved tested position and rated to satisfy one of the following conditions:

Note: The above includes transfer grilles, combustion air intakes, and supply and return air ducts.

1. Where construction of enclosure must satisfy a fire-resistive rating of one hour or less, the damper or fire door assembly shall be rated not less than the rating of construction. See the following exception.

a. Exception: If the above referenced duct is constructed entirely of 20 U.S. gauge sheet metal, no damper will be required. Ducts installed in combustible fire-resistive construction shall satisfy the installation requirements for smoke pipes as stated in section Ind 52.12.

2. Where construction of enclosure must satisfy a fire-resistive rating of one and one-half (1½) hours or two (2) hours, the damper or fire door assembly shall be rated not less than one and one-half (1½) hours.

3. Where construction of enclosure must satisfy a fire-resistive rating of three (3) or four (4) hours, the fire door assembly shall be rated not less than three (3) hours.

Note: The department will accept listed fire damper and fire door assemblies tested by a nationally recognized testing laboratory and the systems recommended in publications of Sheet Metal, Air Conditioning Contractors National Association, Inc. and National Fire Protection Association Bulletin No. 90A.

(c) Exceptions: Fire damper or fire door assemblies are not required in (a) where

1. Maximum duct area does not exceed 20 square inches.
2. Duct serves as an exhaust for kitchen range hood.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65; r. and recr. Register, September, 1973, No. 213, eff. 10–1–73.

Ind 59.70 Volume dampers and deflectors. Necessary 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.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65.

Ind 59.71 History: Cr. Register, January, 1965, No. 109, eff. 2–1–65; r. Register, September, 1973, No. 213, eff. 10–1–73.

Ind 59.72 Equipment location and protection required. Heating and ventilating equipment in gymnasiums, play rooms and similar 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.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65.

Ind 59.74 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 in accordance with standard engineering practice to accomplish the calculated services in practical operation, without undue noise, stress or other detriment.

(2) EXPANSION AND CONTRACTION. The piping for 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 in occupied areas shall be covered with not less than ½ inch insulating material, where the heat emission is objectionable or where piping is subject to freezing.

Note: For additional requirements see Wis. Adm. Code section Ind 52.13.

History: Cr. Register, January, 1965, No. 109, eff. 2–1–65.

Ind 59.75 Refrigerants. The rules covering the use of refrigerants as a function of air conditioning systems shall conform with Wis. Adm. Code chapter Ind 45 (Mechanical Refrigeration).

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 clarify 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-51.02 (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.

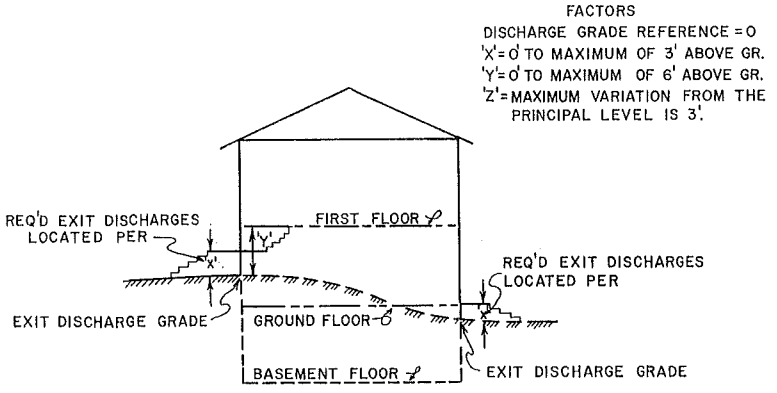


ILLUSTRATION SHOWING EXTREME ALLOWABLE CONDITION FOR FIRST FLOOR AND GROUND FLOOR
ILLUSTRATION A-1

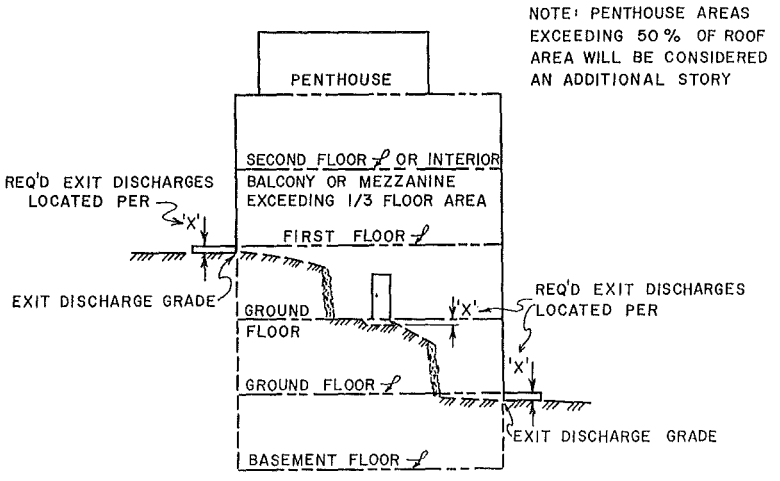
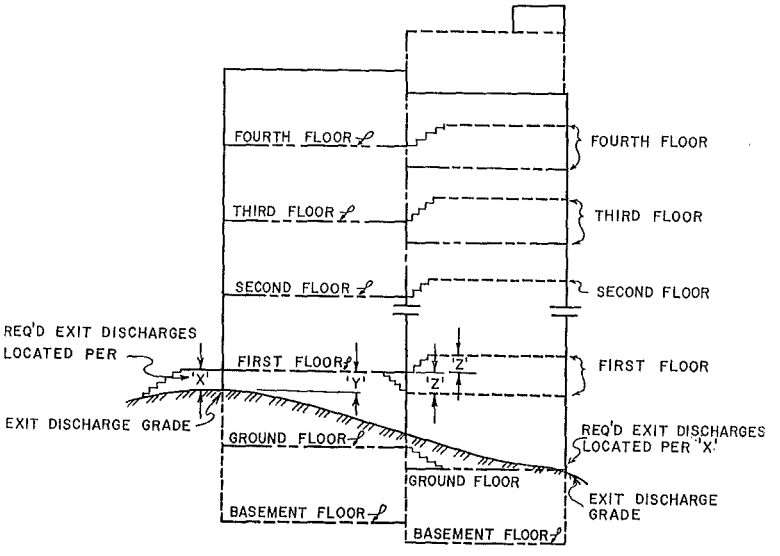


ILLUSTRATION SHOWING POSSIBLE
2 STORY CONDITION OR 3
STORY WITH PENTHOUSE

NOTE: FOR ADDITIONAL VARIATIONS TO NO. OF STORIES SEE IND. 51.02 (3)(b).
ILLUSTRATION A-2



FOUR STORY BUILDING
ILLUSTRATION A-3

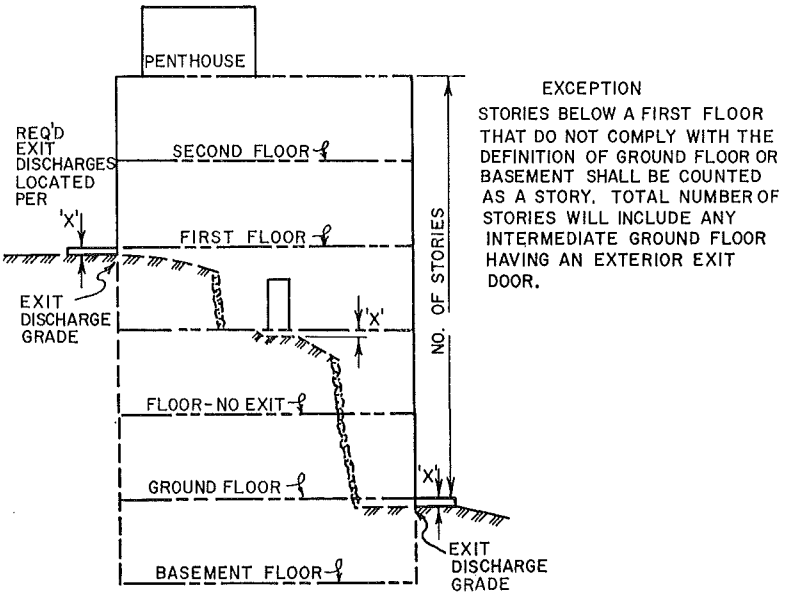


ILLUSTRATION A-4

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-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.