

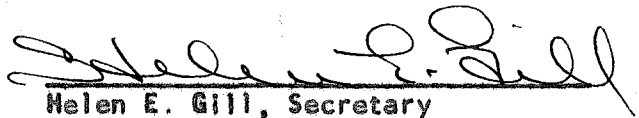
Ind 58

Filed March 5, 1962  
1:45 P.M.

Pursuant to authority vested in the Industrial Commission of Wisconsin by Section 101.01-101.29 Wisconsin Statutes, and pursuant to Chapter 227, the Industrial Commission on March 2, 1962 voted to repeal safety orders Ind 58.001, Ind 58.10, Ind 58.20-Ind 58.25 inclusive, Ind 58.40-Ind 58.55 inclusive, Ind 58.60 and Ind 58.75 inclusive known collectively as the Heating, Ventilation and Air Conditioning Code and adopt new orders Ind 58.01, Ind 58.10, Ind 58.20-Ind 58.22 inclusive, Ind 58.24, Ind 58.25, Ind 58.40-Ind 58.53 inclusive, Ind 58.55, Ind 58.56, Ind 58.60, Ind 58.61, Ind 58.63, Ind 58.65-Ind 58.72 inclusive, Ind 58.74 and Ind 58.75 to be known collectively as the Heating, Ventilating and Air Conditioning Code.

The repeal of the old orders and the adoption of the new orders shall become effective on the first day of the month following their publication in the administrative code as provided in Section 227.

INDUSTRIAL COMMISSION OF WISCONSIN

  
Helen E. Gill, Secretary

March 5, 1962

STATE OF WISCONSIN )  
DEPT. OF INDUSTRIAL COMMISSION ) ss.

TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETINGS:

I, Helen E. Gill, Secretary of the Industrial Commission of Wisconsin and custodian of the official records of said commission, do hereby certify that the attached copy of orders Ind 58.01, Ind 58.10, Ind 58.20-Ind 58.22 inclusive, Ind 58.24, Ind 58.25, Ind 58.40-Ind 58.53 inclusive, Ind 58.55, Ind 58.56, Ind 58.60, Ind 58.61, Ind 58.63, Ind 58.65-Ind 58.72 inclusive, Ind 58.74 and Ind 58.75 to be known collectively as the Heating, Ventilating and Air Conditioning Code, were adopted by the Industrial Commission on March 2, 1962.

I further certify that said copy has been compared by me with the original on file in this commission and that the same is a true copy thereof, and of the whole of such original.

IN TESTIMONY WHEREOF, I have here  
unto set my hand and affixed  
the official seal of the  
department at the Capitol, in  
the City of Madison, this

5th day of March,

A.D., 1962.

  
Secretary

## CHAPTER IND 58

### HEATING, VENTILATING AND AIR CONDITIONING

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CHAPTER IND 58

HEATING, VENTILATION AND AIR CONDITIONING

Ind 58.01 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.

Cross Reference: The phrase "place of employment" shall mean and include every place, whether indoors or out or underground and the premises appurtenant thereto where either temporarily or permanently any industry, trade or business is carried on, or where any process or operation, directly or indirectly related to any industry, trade or business, is carried on, and where any person is directly or indirectly, employed by another for direct or indirect gain or profit, but shall not include any place where persons are employed in (a) private domestic service which does not involve the use of mechanical power, or (b) farm labor when the employer is the farmer operating the farm and the labor is such as is customarily performed as a part of farming, and including the transportation of farm products immediately and directly from the farm, and of materials, supplied or equipment directly to the farm for use thereon.

The term "public building" as used in sections 101.01 to 101.29, Wis. Stats., shall mean and include any structure used in whole or in part as a place of resort, assemblage, lodging, trade, traffic, occupancy, or use by the public or by three or more tenants.

(2) New buildings. The provisions of this code shall apply to the heating, ventilation 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.

Ind 58.10 Definitions.

(1) The term "air conditioning", for the purpose of this code, shall mean the simultaneous control of temperature, humidity, movement and purity of air.

(2) "Air supply" is the supply and distribution of the air required for heating, ventilating and air conditioning.

(3) A "duct" is any pipe, flue or channel used, or intended to be used, for the conveyance of air, gases or entrained materials pertaining to a heating, ventilation or air conditioning system. An underground duct is any duct wholly,

or in part, below the surface of the ground adjacent to the duct.

(4) A 'duct furnace' is a direct-fired suspended type heating appliance normally installed in air distribution ducts. This definition shall apply only to an appliance which depends for air circulation on a blower not furnished as part of the appliance.

(5) An 'exhaust system of ventilation' is any combination of building construction, machinery, devices or equipment, so proportioned, arranged, maintained and operated, that gases, dusts, fumes, vitiated air, or other materials injurious to health, are effectively withdrawn from the breathing zone of employes and frequenters and disposed of in a proper manner.

(6) The term 'existing building' used in this code shall be understood to mean and include buildings, additions thereto, and alterations thereof, structurally completed, or for which complete drawings have been approved by the Industrial Commission, and construction was in progress prior to April 11, 1936. Buildings constructed after April 11, 1936, shall conform with the requirements of the code in effect at the time the drawings were approved, or construction was completed.

(7) A 'furnace' is a completely self-contained direct-fired, automatically controlled, vented appliance for heating air by transfer of heat of combustion through metal to the air and designed to supply heated air through ducts to spaces remote from the appliance location.

(8) A 'gravity system of ventilation', is any ventilation, the practical effectiveness of which depends wholly upon atmospheric conditions, such as relative density, temperature or wind motion. Where outside air is supplied directly to an area by mechanical means, the vent, if surmounted by an approved siphon type roof ventilator, shall be classed as a mechanical exhaust.

(9) 'Hazardous piping' may be defined as any service piping conveying oxygen, inflammable liquids, inflammable gases and toxic gases.

(10) A "heating system" is any combination of building construction, machinery, devices or equipment, so proportioned, arranged, installed, operated, and maintained as to produce and deliver in place the required amount and character of heating service.

(11) A "jacketed stove" is a vented, self-contained free standing, non-recessed heating appliance, using solid, liquid or gas fuels. The effective heating is dependent on a gravity flow of air circulation over the heat exchanger.

(12) "Major apparatus" shall be defined as central air-handling equipment supplying more than one occupancy or rooms and heat-producing equipment generating heat for the heating and ventilating system.

(13) A "mechanical system of ventilation" is any ventilation, exhaust or heating system, the effectiveness of which depends upon the operation of power-driven fan equipment.

(14) The term "new building" includes buildings, additions thereto, and alterations thereof, for which complete drawings have not been approved by the Industrial Commission, or construction is not in progress, prior to the effective date of this code.

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

(16) The "outside air intake" includes the ducts and outdoor openings through which outside air is admitted to a ventilating, air conditioning or heating system.

(17) An "occupied area" is any room, area or enclosure, the normal use of which involves actual or intended occupancy by one or more persons.

(18) "Outdoor openings" are those actual openings in outside walls of the area or room in question which are arranged and equipped in such manner as to be easily operated and accessible for manipulation.

(19) An "outlet" or supply opening is an opening, the sole purpose of which is to deliver air into any space to provide heating, ventilation or air conditioning.

(20) A "return" or exhaust opening is any opening the sole purpose of which is to remove air from any space being heated, ventilated or air conditioned.

(21) A "space heater" is a vented, self-contained, free standing or wall recessed appliance using liquid or gas fuels, the heater may be of a gravity or mechanical air circulating type and the input capacity shall not exceed 70,000 B.t.u.'s per hour.

(22) A "unit heater". (Direct-fired low and high static type).

(a) Low Static Type is a direct-fired suspended, self-contained, automatically controlled, vented, heating appliance, having integral means for circulation of air, normally by means of a propellor fan or fans. Such appliance shall not be provided with duct extensions and shall be installed in the space to be heated.

(b) High Static Pressure Type is a direct-fired suspended or floor standing, self-contained, automatically controlled and vented, heating appliance having an integral means for circulation of air against 0.2 inch or greater static pressure.

(23) "Ventilation" is the process of supplying or removing air by natural or mechanical means, to or from any space. For the purpose of this code, the minimum quantity and quality of outside and recirculated air introduced into the space shall be in compliance with the requirements stipulated herein.

(24) A "ventilation" system is any combination of building construction, machinery, devices or equipment, so proportioned, arranged, installed, operated and maintained as to secure with normal operation the standard of ventilation required by this code.

Ind 58.20 Drawings, Specifications and Data.

(1) Design and Preparation of Drawings. All drawings and data for the installation of heating, ventilating and air conditioning equipment shall be designed and prepared to satisfy the requirements of this code.

Note. See the Wisconsin Statutes 101.31 regulating the practice of architecture and professional engineering in Wisconsin.

The approval of drawings, specifications and data under this code does not imply compliance with other applicable codes and ordinances.



(2) Approval of drawings and specifications. Complete drawings, specifications and data sheets for heating, ventilating and air conditioning of all buildings and occupancies within the scope of this code shall be submitted to the Industrial Commission for approval. Approval shall be obtained before affected work is commenced and all work shall be executed according to the approved drawings and specifications.

(a) In Milwaukee, where such drawings are examined and building permits are issued by the city building official in a manner approved by the Industrial Commission, additional approval by the Industrial Commission is not required.

(b) Where an occupied area does not require ventilation under this code and supplementary air cooling is desired by the building occupant as an added comfort, drawings and specifications need not be submitted to the Industrial Commission. All such installations shall comply with the requirements of this code.

(c) Where major apparatus is to be replaced in an existing building<sup>and</sup> where drawings and data have been previously approved, a statement may be submitted in triplicate indicating that requirements of this code are met in lieu of data required in Ind 58.20(7).

(3) Number of drawings and specifications. One copy of specification and three complete sets of drawings shall be submitted for approval.

Note. Extra copies of drawings may be filed for an approval and shall be submitted with the original submittal.

(4) Approval of changes on drawings. Where it is necessary to change the approved drawings or specifications covered by this or any other code, revised drawings shall be submitted to the Industrial Commission for approval before the equipment is installed.

(5) Approved drawings kept at building. A complete set of drawings approved by the Industrial Commission shall be kept at the building at all times.

(6) Information required on ~~plans~~<sup>drawings</sup> and in specifications. The lines, data and information shown on ~~plans~~<sup>in drawings</sup> for heating, ventilating and air conditioning systems submitted for approval shall be permanent, clear, legible and complete, and shall include all details and data necessary for review of the proposed installation, such as:

- (a) Name of the owner of the building.
- (b) Complete address of the building.
- (c) Architect, engineer or designer's name shall appear on the title sheet.
- (d) A floor plan for each floor where equipment is installed shall be furnished as part of the set of ~~plans~~ drawings.
- (e) A room schedule, indicating the intended use of all rooms.
- (f) Description of the construction for walls, floor, ceiling, and roof.
- (g) Elevation and sectional plans to illustrate and clarify equipment arrangements.
- (h) Location, size and type of all principal units of equipment.
- (i) Size and continuity of all ducts and vents.
- (j) Description and location of chimney.
- (k) Specifications shall be properly identified with and completely supplement the ~~plans~~ drawings.

(7) Data required. All ~~plans~~<sup>drawings</sup> submitted for approval shall be accompanied by data indicating sufficient information for the Industrial Commission to judge if the capacity of the equipment and the performance of the system would meet the minimum requirements of this code. The following data shall be submitted:

- (a) Heat loss calculated in B.t.u. per hour.
- (b) Calculated amount of air at design temperature for each occupied area.
- (c) Calculated direct and indirect radiation required for each occupied area.
- (d) Calculations to determine ventilation requirements.
- (e) Summation of total heating and ventilation requirements.

Cross reference: The Industrial Commission will accept the method and standards recommended by the Mechanical Contractors' Association of America, American Society of Heating, Refrigeration and Air Conditioning Engineers, National Warm Air Heating and Air Conditioning Association and Institute of Boiler and Radiator Manufacturers as the basis for calculations and design data.

(8) Fundamental data required. When requested, additional data pertaining to design and operation of a heating and ventilating system shall be filed for approval with the Industrial Commission by the architect, engineer, designer or manufacturer before such equipment is installed or used.

(9) Approval of materials and equipment. When requested by the Industrial Commission, materials, equipment, devices and methods of installation used in connection with this code and not specifically mentioned herein shall not be so used until approved in writing by the Industrial Commission. The data, tests and other evidence necessary to prove the merits of such material, equipment, devices and methods of installation shall be determined by the Industrial Commission.

Ind 58.21 Accident Prevention and Fire Protection. (1) Guards. All mechanical apparatus shall be guarded to comply with the Wisconsin Administrative Code Chapter I.

(2) Fire protection. All installations under this code shall comply with the precautionary requirements of the Industrial Commission to reduce fire hazards.

Cross reference: The following are references to the Building Code and Electrical Code which contain general safety and fire protection requirements:

- Masonry chimneys, construction.....section Ind 52.10
- Metal smoke stacks, construction.....section Ind 52.11
- Smoke pipes.....section Ind 52.12
- Steam and hot water pipes, protection.....section Ind 52.13
- Ducts, general construction.....sections Ind 52.14, Ind 52.15
- Heaters, fire protection.....sections Ind 52.16, Ind 52.17
- Boiler and furnace rooms.....sections Ind 54.13, Ind 55.29,  
Ind 56.15, Ind 57.20,  
Ind 57.50
- Heating and ventilation equipment and wiring.....Wisconsin Administrative  
Code Chapter E 1 - E 900

Ind 58.22 Design. (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, ventilation and air conditioning 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 three 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.

Map of Wisconsin Showing Design Temperature Zones



Table 1

Zone 1  
Zone 2  
Zone 3

30° Below Zero F  
25° Below Zero F  
15° Below Zero F

(4) Inside Temperature Design Conditions. The 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.....	68	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.....	75	Factories and Machine Shops.....	60
Hospitals:		Foundries and Boiler Shops.....	50
Private Rooms.....	70	Toilet and Locker Rooms -	
Operating Rooms.....	75	General.....	68 70
Wards.....	68		
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) Maximum Inlet Temperature. The room inlet temperature of air used for heating and ventilating purposes shall be designed on the basis not to exceed 140° Fahrenheit.

(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 Ind 58.24).

Ind 58.24 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) 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.

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 the Wisconsin Administrative Code/Chapter 20 on Dusts, Fumes, Vapors and Gases issued by the Industrial Commission.

(3) Gravity direct-indirect systems. The installation of gravity direct-indirect systems are prohibited by this code.

Note. This rule is intended to prohibit the use of so-called direct-indirect radiators whereby the room air supply is presumably admitted directly from the outside to the base, and delivered at the top without mechanical assistance.

(4) 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 hot water shall be circulated continuously by mechanical means.

(5) Exhaust systems required. Exhaust systems shall be provided, maintained and operated for all occupied areas where machines, vats, tanks, furnaces, forges, salamanders, and any other equipment and processes in such areas produce or throw off dust or particles sufficiently light to float in the air, or which emit heat, odors, fumes, spray, gas or smoke, in such quantities as to be irritating or injurious to the health. See the Wisconsin Administrative Code Chapter 20.

(6) Exhaust systems, clean discharge. Exhaust systems required under the Wisconsin Administrative Code on Dusts, Fumes, Vapors and Gases shall include dust collectors, air washers, or other approved machines, devices or methods whereby the discharge from the system will be prevented from contaminating the breathing zone inside the building or re-entering any occupied area. See the Wisconsin Administrative Code Chapter 20.

(7) Tempered air supply. (a) Where ventilation is secured 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 kitchen equipment and the process of manufacture is adequate to equal all or part of the ventilation 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, providing that dampers and temperature controls are designed into the system to provide for a minimum discharge temperature of not less than 55 degrees Fahrenheit.

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

(8) Contamination of adjacent area. 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 any other occupied parts of the building.

(9) Final test required. The performance of every heating, ventilating and air conditioning system shall be tested and balanced in place by the designer or installer.

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

Ind 58.25 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.

Ind 58.40 Occupancy Classification. 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.

Note. The following table indicates the individual classifications of occupancies within the scope of this code, together with the method to be used in establishing the number of persons for which ventilation is to be provided.

~~Table 3~~



Table 3

Use or Occupancy	Classification	Basis of Capacity
Apartment houses <del>XXXXXX</del> Kitchens <del>XXXXXX</del>	(c)	<del>200 sq. ft. per person of floor area</del>
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 Ind 58.51
Banquet halls	(a) or (b)	15 sq. ft. per person - see Ind 58.51
Bath and shower rooms	(c)	See Ind 58.48
Barber shops	(b)	20 sq. ft. per person - see Ind 58.51
Beauty parlors	(b)	20 sq. ft. per person - see Ind 58.51
Billiard rooms	(a) or (b)	15 sq. ft. per person - see Ind 58.51
Bowling alleys	(a) or (b)	Seating capacity, plus 6 persons : per alley : Terminate occupied area at foul line - : see Ind 58.51
Brokerage board rooms	(a) or (b)	7 sq. ft. per person - see Ind 58.51
Cafeterias	(a) or (b)	15 sq. ft. per person - see Ind 58.51
Churches and other places of worship	(b)	Dining room: 15 sq. ft. per person - : see Ind 58.44
Sunday school rooms	(b)	15 sq. ft. per person - see Ind 58.44
Club rooms	(a) or (b)	Depends on usage
Dance halls	(a) or (b)	15 sq. ft. per person - see Ind 58.51
Dining rooms	(a) or (b)	15 sq. ft. per person - see Ind 58.51
<del>XXXXXX</del> Dormitories <del>XXXXXX</del>	(b)	<del>40 sq. ft. per person - see Ind 58.54</del>
Factories and machine shops	(b)	See Ind 58.53. Also see rules of : Wisconsin Administrative Code on Dusts, : Fumes, Vapors and Gases
First aid rest rooms	(a) or (b)	15 sq. ft. per person - see Ind 58.47
Foundries and boiler shops	(b)	See Ind 58.53. Also see rules of : Wisconsin Administrative Code on Dusts, : Fumes, Vapors and Gases
Funeral homes	(b)	See Ind 58.44
Garages and service stations	(d)	See Ind 58.52
General offices	(a) or (b)	See Ind 58.50
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 Ind 58.56
Janitor closets	(c)	See Ind 58.48 and 58.56
Kitchens	(c)	See Ind 58.49
Laboratories	(a) or (c)	25 sq. ft. per person. See rules of : Wisconsin Administrative Code on Dusts, : Fumes, Vapors and Gases
Laundries	(c)	See rules of Wisconsin Administrative : Code on Dusts, Fumes, Vapors and Gases
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 Ind 58.47
Lodge halls	(a) or (b)	6 sq. ft. per person for seated space : 15 sq. ft. per person for space not : seated - see Ind 58.51

(Continued)

Mental hospitals	:	(a) or (b)	:See Ind 58.55
Motion picture booth	:	(a) or (c)	:See Ind 58.43
Penal institutions	:	(a) or (b)	:See Ind 58.55
Places of employment	:	(b)	:75 sq. ft. per person - see Ind 58.53
Play room (unfinished areas)	:	(c)	:23 sq. ft. per person
Printing establishments	:	(b)	:See Ind 58.53. Also rules of Wisconsin
	:		:Administrative Code on Dusts, Fumes,
	:		:Vapors and Gases
Restaurants	:	(a) or (b)	:15 sq. ft. per person - see Ind 58.51
Retail establishments	:	(a) or (b)	:Basement: 40 sq. ft. per person
	:		:Other floors: 60 sq. ft. per person -
	:		:see Ind 58.51
School all-purpose, dining, and:	:		:
recreation rooms	:	(a)	:15 sq. ft. per person
School auditoriums	:	(a)	: 7 sq. ft. per person
School classrooms	:	(a)	:23 sq. ft. per person
School kindergarten rooms	:	(a)	:23 sq. ft. per person
School lecture rooms	:	(a)	: 7 sq. ft. per person. Use seated area
	:		: only
School project rooms	:	(a)	:23 sq. ft. per person
School study rooms	:	(a)	:16 sq. ft. per person
Security vaults (occupied)	:	(d)	: 2 C.F.M. per sq. ft.
Skating rinks	:	(a) or (b)	:15 sq. ft. per person - see Ind 58.51
Swimming pools	:	(c)	:See Ind 58.48
Taverns	:	(a) or (b)	:20 sq. ft. per person - see Ind 58.51
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 Ind 58.48
Vocational instruction and	:		:40 sq. ft. per person. See rules of
research	:	(a) or (c)	:Wisconsin Administrative Code on Dusts,
	:		:Fumes, Vapors and Gases
Wardrobes, lockers and cloak	:		:
rooms	:	(c)	:See Ind 58.47

Ind 58.41 General Requirements for Occupancies under (a) and (b) Classifica-

tions. (1) Scope. The requirements of this rule shall apply to all occupancies listed under (a) and (b) in section Ind 58.40 unless otherwise exempted <sup>by</sup> ~~in~~ 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 <sup>by</sup> ~~in~~ this code.

(a) The air delivery capacity of all equipment supplying air for heating, ventilation and air conditioning purposes shall be based on standard air ratings.

(b) For the purpose of this code, standard air is air that is equivalent to dry air at 70 degrees Fahrenheit and 29.92 inches barometer.

(c) In installations, where cooling is provided and the heat gain requirements for the space have been satisfied, an air movement of less than 6 air changes per hour may be permitted.

(3) Outside air supply. The outside air supply during occupancy shall not be less than  $7\frac{1}{2}$  <sup>cubic</sup> feet per minute per occupant and an equal amount shall be exhausted unless otherwise exempted <sup>by</sup> this code. See section Ind 58.40 for method used in determination of capacity.

(4) Air distribution. All air outlets and returned 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  $7\frac{1}{2}$  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 Industrial Commission will recognize as approved, filters listed in Building Materials List published by the Underwriters' Laboratories, Inc. and test data of any other recognized testing agency.

Ind 58.42 Places of Assembly. (1) Scope. This classification shall include all occupancies such as 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.

(a) The above occupancies which accommodate less than 100 persons shall conform to the requirements of section Ind 58.51.

(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 58.41.

(a) For theaters, assembly halls, gymnasiums and similar occupancies having a ceiling height of 15 feet or more, the total air supply shall be based on 6 air changes per hour.

(b) For theaters, assembly halls, gymnasiums, and similar occupancies having a ceiling height of less than 15 feet, the total air supply shall be based on  $7\frac{1}{2}$  air changes per hour.

(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.

Ind 58.43 Motion Picture Booth. (1) Scope. This classification shall include all motion picture booths housing projection equipment using carbon arc lamps.

(2) Exhaust ventilation. Fumes, gases and other harmful contamination shall be effectively removed by mechanical exhaust ventilation directly from their source, including projectors, spot lights, stereopticons, and similar equipment and discharged to the outside air. A single exhaust system, including the exhaust unit and connecting ducts, shall be arranged to serve all the sources of harmful contamination in such booth area. The capacity of the exhaust system shall not be less than 15 cubic feet per minute for each arc lamp or other source of contamination. Dampers shall not be installed in such a system and it shall be entirely independent of any other system serving the building.

(3) Air supply. In every booth or room which is required to have a mechanical exhaust system, provisions shall be made for a supply of fresh tempered air to replace the air exhausted. The supply of air to a booth or room shall be accomplished in one of, or by a combination of, the following methods:

(a) The ventilation system for the building may be arranged to supply air for the booth or room if the inlet opening is protected with an approved shutter having quick acting fusible links, or other approved heat release devices, which 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 the front of the booth.

(c) Where approved in writing by the Industrial Commission, the air may be taken through openings in the booth walls, from the auditorium or other space adjoining the booth.

Cross reference: For relief outlets in addition to exhaust ventilation, see section Ind 55.45 of the Building Code issued by the Industrial Commission.

Ind 58.44 Places of Assembly for Worship. (1) Scope. This classification shall include auditoriums, social assembly rooms, Sunday school rooms, and similar areas which are contained in churches or houses of worship. It shall also include chapels used in connection with funeral homes, as well as those in parochial schools, convents and similar occupancies.

(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 58.41, except that no ventilation will be required where the total openable area of the outside windows is greater than 3% of the floor area served, except that in funeral homes the openable area of the outside windows shall be greater than 5% of the floor area served. Such window openings shall preferably be all above grade. No window openings below grade will be considered unless there is a clear space outside of the windows having a width of at least  $1\frac{1}{2}$  times the distance below grade at the bottom of the window.

(a) By width is meant 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.

Ind 58.45 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 section Ind 58.42 for assembly rooms).

(2) Air movement and supply. The air movement and supply for all occupancies under this classification shall conform to the requirements of section Ind 58.41. 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.

Ind 58.46 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) Air movement and supply. The air movement and supply for all occupancies under this classification shall conform to the requirements of section Ind 58.41.

(3) Equipment and Process Exhaust. An exhaust ventilating system shall be provided in connection with all equipment and processes which create any dusts, fumes, vapors or gases which may be injurious to the health of any frequenter exposed thereto.

Note. See Wisconsin Administrative Code Chapter 20.

(4) Separate exhaust systems. Exhaust systems serving this ~~classification~~ <sup>classification</sup> shall be separate from, and independent of, all other services and systems in the building.

Ind 58.47 Wardrobes and Locker Rooms. (1) Scope. This classification shall include all wardrobes, cloak rooms, lockers, locker rooms and similar areas in all buildings within the scope of this code, except as noted herein.

(2) Ventilation required. Ventilation shall be provided and maintained for all areas of this class. Wherever practicable, such ventilation shall be accomplished by exhaust methods and in any case the effectiveness of the exhaust shall be greater than that of the supply.

(3) Minimum air movement. The air movement provided and maintained for areas of this class shall be not less than 2 cubic feet per minute per square foot of floor area.

(4) Wardrobes and cloak rooms in school buildings. Where necessary in order to insure practical results in wardrobes or cloak rooms adjacent to or connected with occupied areas covered by section Ind 58.45, the required ventilation shall be accomplished by use of inlets admitting air from adjacent classrooms, or corridors, or similar areas, in conjunction with outlets and ducts discharging direct to outside atmosphere. The movement of air in such areas shall be such as to promote thorough aeration of clothing therein.

(5) Locker rooms in conjunction with toilet, bath and swimming rooms. Occupancies in this classification are required to have a tempered air supply which may be exhausted through the adjoining toilet, shower or swimming room.

(6) Locker rooms in places of employment. In places of industrial employment where locker rooms are required, a tempered air supply shall be provided for the locker rooms and may be exhausted through the adjoining toilet or shower room.

(7) First aid rest rooms in places of employment. Ventilation shall be provided and maintained for all areas of this class to conform with the requirements of section Ind 58.41, unless the outside window sash area is greater than 10% of the floor area of the room. The openable area of such windows shall equal at least 5% of the floor area of the room.



Ind 58.48 Toilets, Janitor Closets, Sterilizing and Swimming Rooms. (1) Scope. This classification shall include all toilet, bath and swimming pool rooms, hospital janitor closets and sterilizing rooms.

(2) Ventilation required. (a) Ventilation shall be provided and maintained for all areas of this class. Such ventilation shall be accomplished by exhaust methods with the effectiveness of the exhaust greater than that of the supply. For multiple shower installations, a mechanical exhaust shall be provided unless the room has a direct positive air supply in which case the exhaust may be by gravity.

(b) Every toilet room having more than one fixture (water closets or urinals) and all toilet rooms which do not have an outside window, shall be provided with gravity or mechanical exhaust ventilation. Exhaust ventilation shall not be required for toilet rooms containing one water closet or one urinal provided such toilet room has a window or skylight having a glass area of not less than 4 square feet opening directly upon a street, alley or court. The openable area of such window shall not be less than 2 square feet.

(3) Air movement and supply. (a) The air movement provided and maintained in toilet rooms, hospital janitor closets and sterilizing rooms shall not be less than 2 cubic feet per minute per square foot of floor area.

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

(4) Separate exhaust systems. Exhaust systems serving this class of occupancy shall be separate from, and independent of, all other services and systems in the building.

Ind 58.49 Kitchens. (1) Scope. This classification shall include all occupied areas housing the cooking of food in all buildings within the scope of this code, except those classified under vocational instruction.

(2) Exhaust ventilation. The exhaust ventilation required and maintained for every occupied area of this class shall not be less than 4 cubic feet per minute per square foot of floor area except for kitchens used occasionally in connection with church auditoriums, lodge halls, and schools, the exhaust ventilation may be reduced to a minimum of 2 cubic feet per minute per square foot of floor area.

(3) Range hoods. (a) The velocity of air motion over the face area of a single wall hood shall not be less than 100 feet per minute and 350 feet per minute through the openings of a perimeter slot type hood.

(b) Exhaust systems provided for exhausting greasy fumes, shall be separate from and independent of all other services and systems in the building.

(c) The electrical wiring and fixtures shall be of a type approved for use in damp locations.

(4) Ducts. (a) Ducts/<sup>or vents</sup>connected to range hoods, passing through concealed combustible construction, shall be protected with a 2-hour fire-resistive construction. Manufactured chimneys may be used without the 2-hour fire-resistive protection providing that such chimneys have been approved for use with low heat appliances and tested for a continuous temperature of/<sup>not less than</sup>1000 degrees Fahrenheit and 1400 degrees Fahrenheit for infrequent periods.

(b) Accessible clean-out openings shall be installed to permit cleaning the interior of exposed ducts.

(c) The discharge shall be directed away from combustible materials and shall pass through a side wall or terminate not less than 3 feet above roof.

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

Ind 58.50 Offices. (1) Scope. This classification shall include all offices and similar occupied areas, wherein the air conditions and nature of occupancy do not involve reasonable inclusion in any other classification in this code.

(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 58.41 unless the following requirements have been satisfied.

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

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

(c) Heat or odors shall not be present in sufficient quantities to be injurious to the health, safety or welfare of the employees and frequenters.

Ind 58.51 Retail Establishments. (1) Scope. This classification shall include barber shops, beauty parlors, brokerage board rooms, taverns, bowling alleys and all 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) 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 58.41 unless the total area of outdoor openings is more than 3% of the floor area served, provided such outdoor openings are arranged so as to cause air circulation throughout the respective rooms.

(a) No window or outdoor opening which is below grade will be considered unless there is a clear space outside the window having a width of not less than  $1\frac{1}{2}$  times the distance below grade at the bottom of the window.

Ind 58.52 Garages. (1) Scope. Ventilation shall be provided for this classification which shall include all repair garages, service stations, body shops and all live storage garages housing 6 or more vehicles driven by internal combustion engines. A live storage area is defined as 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.

(2) Ventilation required. The supply and exhaust ventilation shall be provided and maintained for all occupied areas in this classification during periods of occupancy.

(3) Storage areas. (a) Heated live storage area. Areas used for the storage of 6 or more motor-driven vehicles and where heat is provided or required by this code, shall be provided with a tempered supply of outside air of not less than  $3/4$  cubic foot per minute per square foot of floor area. Necessary vents shall be provided to exhaust the outside air supplied.

(b) Unheated live storage area. Areas used for the storage of 6 or more motor-driven vehicles and where heat is not required by this code, shall be provided with exhaust ventilation based on  $3/4$  cubic foot of air per minute per square foot of floor area unless the following requirements have been satisfied:

1. The floor shall be at or above grade level.

2. Permanent open wall of the included area shall not be less than 30% of the total wall area and shall be arranged to cause air circulation throughout the respective area.

(4) Repair areas. (a) All areas in which the repairing of motor-driven vehicles is done shall be provided with a tempered supply of outside air of not less than  $3/4$  cubic foot per minute per square foot of floor area and with the necessary vents for exhausting the same volume of air.

(b) An exhaust system shall be provided in the repair area to remove the exhaust fumes from the internal combustion engines. The duct system shall be designed with sufficient outlets to provide for the total number of vehicles in the repair area. Flexible hose shall be provided which shall be equipped with a device for connecting it to the exhaust pipe of the vehicle and the exhaust system. Each outlet shall be provided with a shut-off valve which may be closed when not in use. The blower shall have sufficient capacity to exhaust a volume of air not less than 100 cubic feet per minute for each opening.

(c) No basement or sub-basement garage shall be used for the repair of motor-driven vehicles.

(5) Service stations. Buildings of this classification shall include liquid fuel dispensing stations where vehicles can be driven into the building for washing, greasing, oil change, tire or battery replacement and similar operations.

(a) All service room or work room areas shall be provided with a tempered supply of outside air of not less than 1/2 cubic foot per minute per square foot of floor area and with the necessary gravity vent or vents exhausting the same volume of air from a point not more than 18 inches above the floor.

(6) General requirements. (a) A separate ventilating system shall be provided for show rooms or offices, where such occupancies are located adjacent to repair or live storage areas and would require ventilation in accordance with section Ind 58.41. This requirement does not apply to service stations.

(b) There shall be no recirculation of air from any repair, live storage, or service area during periods of occupancy, except where the total amount of air in circulation is in excess of the quantity required by this rule, the excess air may be recirculated.

(c) The air that is exhausted from the repair, live storage, and service areas in a building shall be removed at a point not more than 18 inches above the floor through properly distributed vent ducts located in areas of greatest contamination. Where the exhaust is by gravity, the vent duct or ducts shall extend from a point not more than 18 inches above the floorline up through the roof of the building and shall be capped with an approved siphon type roof ventilator extending at least 2 feet above the high point of the roof or above the top of the parapet whichever is the higher.

(d) The products of combustion from vapors or gases and fumes from fuel or batteries, shall be removed promptly and effectively from the breathing zone of employes and frequenters.

Note. For ventilation requirements where spray coating is done, see Wisconsin Administrative Code Chapter 21.

Ind 58.53 Places of Employment. (1) Scope. This classification shall include all places of employment not classified elsewhere in this code.

(2) Air movement, supply and distribution. The air movement supply and distribution for all occupied areas under this classification shall conform to the requirements of section Ind 58.41 unless all of the following requirements have been satisfied.

(a) The available floor space for each occupant shall not be less than 75 square feet per person.

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

(c) The total area of outdoor openings shall be not less than 3% of the floor area served. This requirement does not apply to refrigeration plants, warehouses, cold storage buildings and processing areas where the nature of the occupancy would not permit outdoor openings.

(3) Special exhaust systems required. (a) Special exhaust systems shall be provided and operated at all sources of harmful contamination in occupied areas of this classification in accordance with the Wisconsin Administrative Code Chapter 20.

(b) Tempered outside air shall be supplied to replace the air exhausted, if the volume of air exhausted exceeds an infiltration rate of 3 air changes per hour.

Ind 58.55 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) Air movement, supply and distribution. The air movement supply and distribution for all occupancies under this classification shall be accomplished by mechanical means and shall conform to the requirements of section Ind 58.40 and Ind 58.41. The air movement through the corridors shall be a minimum of 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.

Ind 58.56 Hospitals. (1) Scope. This classification shall include hospitals, nursing homes, public health centers, treatment centers and similar occupancies where professional medical services are provided for treatment and care of patients.

(2) Air movement. (a) Exhaust ventilation shall be provided from bedpan rooms, baths, janitor closets, sterilizing rooms and laboratories on the basis of 2 cubic feet per minute for each square foot of floor area.

(b) Enclosed nursing stations, drug storage rooms, utility rooms, treatment rooms, dark rooms and X-ray rooms shall have a minimum air movement of 6 air changes per hour unless the total openable window area is 3% of the floor area served. Such ventilation shall be accomplished by exhaust methods with the effectiveness of the exhaust being greater than the supply.

(c) The operating rooms, anesthesia rooms, recovery rooms, labor rooms, delivery rooms and nursery shall have a minimum air movement of not less than 6 air changes per hour. Tempered outside air shall be provided and the system shall be designed to maintain a room temperature of 75 degrees Fahrenheit. The recirculation of air is not permitted except in a nursery where a part of the air may be recirculated from the area supplied. Provide mechanical exhaust ventilation equal to the volume of air supplied. Relative humidity in the anesthetizing locations shall be maintained at not less than 50%.

(d) Private, semi-private wards and day rooms shall be ventilated in accordance with the requirements of section Ind 58.41 unless sufficient openable sash area has been provided and the content of the room is in excess of 400 cubic feet per occupant.

Ind 58.60 Outside Ventilating Air Intakes. (1) Location. (a) Outside air intake openings shall be located a distance of at least 20 feet horizontally or 10 feet vertically from vents and chimney outlets.

(b) Where vents and intakes are located on adjacent walls of outside corners, the horizontal distance may be reduced to 10 feet.

(c) Outside air intake openings located in exterior walls shall be located at least 10 feet (measured in any direction) from any exhaust vent or chimney outlet.



(2) Mounting height. (a) Outside air intake openings shall be located at least 12 inches above the outside grade or above roof.

(b) Where outside air intake openings are located in any areaway below grade, the top of the areaway shall be not less than 12 inches above the grade level.

Screens.

(3) All outside air intakes shall be protected against the admission of foreign material.

(4) Weather protection. All outside air intakes 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 admission of unheated air to the building when the heating unit is not in operation.

(5) Accessibility and cleanliness. All outside air intakes shall be made and maintained easily accessible for cleaning, and shall be kept clean and sanitary in use throughout the circuit to the heater.

(6) Size and openings for intakes. Consult section Ind 58.69 for allowable velocities to be used in the design of outside air intakes.

(7) Combustion air intakes. (a) All boiler rooms and furnace rooms shall be provided with an opening to the outside air. The free area of such opening shall be not less than 1 square inch for each 5,000 B.t.u. per hour of fuel consumed, except the minimum free area of such opening shall be not less than 100 square inches.

(b) The use of manual operated dampers is not approved.

(c) The use of motorized dampers is approved where the motor is interconnected with the burner(s) of direct-fired equipment which will open the damper when burner(s) is operating.

Ind 58.61 Air Cleansing Apparatus. (1) Air washers and filters. Dirty water shall not be recirculated through sprays affecting air used for ventilation purposes, and not less than 10% of air washer water used shall be renewed during each day of operation exclusive of make-up water; and the reservoir

shall be emptied and thoroughly cleaned and refilled with fresh water after each month of operation.

Cross reference: See note following Ind 58.41(7) for approved materials used in cleansing devices.

Ind 58.63 Boilers. (1) General. The boiler, safety devices and other auxiliary equipment shall be of a type approved by the Industrial Commission.

Note. See Wisconsin Administrative Code Chapter 41.

(2) Rating. The capacity of all low pressure heating boilers shall be determined on the basis of a net rating equal to 75% of the gross output rating, or net ratings listed by a recognized testing laboratory and approved by the Industrial Commission.

Note. The Industrial Commission will recognize as approved, net ratings as listed by Mechanical Contractors' Association of America, Inc., Steel Boiler Institute, Inc. and Institute of Boiler and Radiator Manufacturers.

Ind 58.65 Jacketed Stoves. (1) Use. The installation of jacketed stoves is approved for use in the following occupancies:

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

(b) One-story buildings for occupancies indicated in rule Ind 58.50 ~~xxxxxxx~~ ~~xxxxx~~, where the floor area is less than 1500 square feet.

(c) One-story motels and apartment buildings.

(2) Location. All jacketed stoves and heaters shall be located in that portion of a schoolroom most exposed to cold weather, usually the northwest portion. They shall be set well clear of any obstruction which may prevent the free and rapid distribution and circulation of heat and air.

(3) Shields. The casings or shields of jacketed stoves or heaters used in schools shall be so constructed as to shield adjacent occupants from undue radiant

heat. The clear air space between shield and stove shall average 6 inches and the shields themselves are to extend well above and below all heat radiation surfaces of stoves, but in no case more than 12 inches clear of the floor.

(4) Outside air intake. Every jacketed stove or heater installed in a school building shall have an outside air intake terminating outside the building at a point not less than <sup>12 inches</sup>~~2 feet~~ above grade. The outside air intake shall be protected against weather and water with a weather-proof hood or louvers and shall be protected against the admission of foreign material with a 1/2 inch wire mesh screen or equal. The intake duct shall be joined to the heater casing and airway to prevent cold air from spreading over the floor and to insure contact with the heater surface. Underfloor ducts are not permitted.

(a) The area of the outside air duct shall not be less than 0.25 square inches per square foot of floor area. A damper shall be provided in the outside air supply duct to prevent the admission 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 shall not be 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 Wisconsin Administrative Code Chapter 8.

Ind 58.66 Furnaces, Direct-Fired Unit Heaters, Suspended Furnaces, Duct Heaters and Space Heaters. (1) Furnaces. (a) Fan-furnace installations. Draw-through fans are not permitted in connection with any fan-furnace installation, except where equipment is specifically designed for 100% tempered make-up air to replace an equal volume of air exhausted.

(b) Gravity systems. All 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 inlets to 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 inlets shall not be higher than 2 inches below the top of the grates.

(c) Rating. All furnaces shall have a net rating equal to 60% of fuel input rating.

(d) The furnace shall be enclosed with a fire-resistive enclosure constructed in accordance with the requirements of the Wisconsin Administrative Building Code.

Note. See cross reference Ind 58.21(2).

(e) Furnaces shall be of a type approved by the Wisconsin Industrial Commission.

(f) Furnaces shall be connected to an approved stack, vent or chimney. (See Ind 58.67).

Note. The Industrial Commission will recognize as approved, equipment listed by Underwriters' Laboratories, American Gas Association or other recognized testing laboratories.

(2) Unit heaters, suspended furnaces and duct heaters. (a) The installation of direct-fired appliances of this class shall not be approved for 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 such equipment is enclosed in a fire-resistive enclosure constructed in accordance with the requirements of the Wisconsin Administrative Building Code.

(b) Direct-fired unit heaters, horizontal furnaces and duct furnaces may be installed within the occupied space without a fire-resistive enclosure in retail establishments, manufacturing plants, garages, service stations, machine shops, wood-working plants, foundries, offices and similar areas provided such installations comply with the following requirements.

1. The heating appliance shall be of a type approved by the Wisconsin Industrial Commission.

2. The heating appliance shall be vented to the outside atmosphere by connecting it to a masonry chimney, an approved vent pipe, or metal smoke stack. (See Ind 58.67 - approved chimneys).

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

4. The heating appliance shall not be installed in any normally closed room having a volume of less than 1000 cubic feet, unless the enclosure is provided with an outside air intake to conform with the requirements of Ind 58.60(7).

5. The oil-fired unit shall be suspended over incombustible materials.

(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) The installation of floor-standing direct-fired unit heaters, furnaces and boilers may be approved for use without a fire-resistive enclosure for metal fabricating plants, foundries, and machine shops, where the materials used in the construction of the building are classified as incombustible and the materials manufactured, processed and stored therein are classified as primarily 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, factories and similar buildings.

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

2. The unit shall be equipped with automatic controls which will shut off fuel supply to the gas burner in case of non-ignition.

Note. The Industrial Commission will recognize as approved, equipment listed by the American Gas Association, Underwriters' Laboratories, Inc. and test data of any other recognized testing laboratories.

(3) Space heaters. (a) The heating appliance may be installed in individual apartments, guest rooms in motels, and tourist courts. This equipment may also be installed in occupancies listed in section Ind 58.51, where the floor area is less than 1500 square feet on any floor level and where the combustion air supply is taken from outside of the building directly to the appliance.

(b) Space heaters may be used in individual offices, except in service stations, garages and other hazardous occupancies where direct-fired equipment is not permitted without a fire-resistive enclosure.

(c) Space heaters shall be of a type that has been approved by the Industrial Commission.

(d) Space heaters shall not be installed in any normally closed room having a volume of less than 1000 cubic feet unless the heater is equipped with an air intake to supply the outside air for combustion.

(e) The space heater shall be vented to the outside atmosphere by connecting it to a masonry chimney, an approved vent, vent pipe or metal smoke stack. (See Ind 58.67 approved chimneys).

(f) Space heaters shall be equipped with an automatic temperature limit control and controls which will shut off fuel supply to the gas burner in case pilot light is not in operation and which will shut off fuel supply to the oil burner in case of non-ignition.

(g) All oil-fired space heaters shall be equipped with mechanical pressure atomizing burners.

(h) 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.

(i) The appliance shall be located at least 6 inches from any unprotected combustible wall or partition, except that the clearance may be reduced where approved by a recognized testing agency. Space heaters installed on combustible floors shall be mounted on legs securely fastened in place. The space under the unit shall not be enclosed.

(j) 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.

(k) Appliances of this class shall not be provided with duct extensions beyond the vertical and horizontal limits of the casing proper.

Note. The Industrial Commission will recognize as approved, equipment listed by American Gas Association, Underwriters' Laboratories, Inc. and test data of any other recognized testing laboratory.

(4) Infra-red gas-fired radiant heaters. (a) The heating appliances of this class may be installed in machine shops, foundries, manufacturing plants, warehouses and similar areas provided that such installations comply with the following requirements.

1. All gas-fired infra-red radiant heaters shall be of a type that have been approved by the Industrial Commission.
2. All gas-fired infra-red heaters shall be equipped with 100% automatic control which will automatically shut off the gas supply to the unit in case the pilot is not in operation.
3. The building shall be provided with sufficient vents and combustion air to remove the products of combustion.

4. All gas-fired infra-red radiant heaters shall be supported by incombustible brackets or hangers.

5. Not less than the minimum clearances shall be maintained between the heating appliance and combustible materials determined in accordance with test procedure and standards approved by the Industrial Commission. Heating appliances of this class may be suspended above the floor not less than a height equal to 7 feet plus the approved minimum clearance required from face of heater to combustible materials.

Note. The Industrial Commission will recognize as approved, equipment listed by the American Gas Association, Underwriters' Laboratories, Inc. and test data of any other recognized testing laboratories.

(5) Electric space heating equipment. (Electric furnaces, space heaters, unit heaters, cable heating devices, infra-red radiant heaters and heat pump systems). Electric heating equipment is approved for use as a source of heat for occupancies indicated within the scope of this code provided that such installations comply with the following requirements.

(a) All electric space heating equipment shall be of a type approved by the Industrial Commission.

(b) All electric space heating equipment shall be provided with adequate safety and temperature controls.

(c) Not less than minimum clearances shall be maintained between the electric space heating equipment and combustible material based on test conditions.

(d) Electric space heating may be installed in hazardous occupancies provided that the unit is approved for use in each respective class and location as specified in Chapters E-500-517 of the Wisconsin State Electrical Code. The use of the open type resistance heating elements is prohibited when installed in hazardous occupancies.

Note: The Industrial Commission will recognize as approved equipment listed by the Underwriters' Laboratories.



Ind 58.67 Chimneys, Gas Vents, Mechanical Draft and Venting Devices. (1) General

requirements. All heating appliances using solid, liquid or gas fuels shall be vented to the outside unless otherwise approved by the Industrial Commission. Any natural draft chimney, smoke stack, vent or other venting device shall have a minimum height and area as specified by the boiler, furnace and equipment manufacturers in regular published literature or by letter.

(2) Types. (a) Masonry chimney. The design and construction of a chimney shall conform with the requirements of the Wisconsin Building Code, section Ind 52.10.

(b) Metal smoke stacks. The design and construction of a metal smoke stack shall conform with the requirements of the Wisconsin Building Code, section Ind 52.11.

(c) A prefabricated chimney or a gas vent may be used in lieu of a masonry chimney or smoke stack for venting low heat appliances provided that the unit has been approved by the Wisconsin Industrial Commission.

1. An approved type "A" chimney may be used with solid liquid or gas-fired low heat 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. 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. An approved type "BW" gas vent may be used with a vented recessed heater.

4. A type "C" gas vent may be used with gas-fired low heat appliances. The vent shall be constructed of ~~sheet copper of not less than No. 24 U.S. Standard gauge~~ of galvanized iron of not less than No. 20 U.S. Standard gauge or of other approved corrosion-resistant material. The installation shall conform with the requirements of the Wisconsin Building Code, section Ind 52.12.

Note: The Industrial Commission will recognize, as approved, chimneys designated as types "A", "B", "BW" and "C" and listed by American Gas Association and Underwriters' Laboratories.

(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, where approved by the Industrial Commission.

(4) Smoke pipes. The construction and installation of smoke pipes shall conform with the requirements of the Wisconsin Building Code, section Ind 52.12.

Ind 58.68 Fans and Blowers. (1) Type and capacity. All fans and blowers shall be of appropriate type and size and shall be selected on a basis of performance against the resistance of the system as installed. The capacity of all fans and blowers shall be determined in accordance with an approved standard test procedure.

(2) Quiet operation. Fans and blowers installed in buildings where noisy operation would be objectionable, shall be located and set, and shall be of such type and outlet velocity in practical use, that reasonably quiet operation is assured.

(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.

Ind 58.69 Ducts. (1) Design. All ducts shall be designed to promote the unrestricted flow of air, with long sweep elbows or turning vanes. In gravity systems all ducts shall be as direct as possible and heat ducts shall have a rise of not less than one inch per foot in the direction of flow.

(2) Air velocities. For the purpose of calculation and design, the velocities in any airways shall not in general exceed the limits indicated in Table 4, except that for mechanical systems these velocities may be exceeded where properly designed in accordance with the best accepted engineering practice.

Table 4

Part of System	Maximum Allowable Velocities	
	Mechanical System	Gravity System
1. Intake Opening (net free area).....	1,000 F.P.M.	300 F.P.M.
2. Blast Coils (total face area).....	600 F.P.M.	-
3. Trunk Ducts.....	1,400 F.P.M.	300 F.P.M.
4. Branch Ducts.....	1,000 F.P.M.	300 F.P.M.
5. Branch Risers.....	800 F.P.M.	300 F.P.M.
6. Vertical Vent Ducts.....	600 F.P.M.	300 F.P.M.
7. Return Air Ducts.....	1,000 F.P.M.	250 F.P.M.
8. Roof Ventilators.....	600 F.P.M.	300 F.P.M.
9. Inlets and Outlets (net free area)....	-	300 F.P.M.

(a) Where vent ducts are connected to exhaust fan(s), the velocities for branch risers, branch ducts and trunk ducts may be used.

(3) Use. All ducts shall be used for the transmission of air, and shall not be designed or used for any other purpose unless otherwise exempted.

(4) Underground duct construction and installation. (a) All underground ducts constructed of cement tile, glazed clay tile and other cement and minerals shall be waterproof and shall have sufficient strength to prevent failure of the duct at time of installation and while in service. All duct couplings, reducers, and fittings shall be of a design to provide a rigid waterproof connection with the use of bell and spigot or slip joint connections.

(b) Round underground ducts may be constructed of approved sheet materials and shall be encased in not less than 2 inches of concrete. The duct shall be waterproof, incombustible, smooth and so installed to provide sufficient strength to prevent failure of the duct at time of installation and while in service.

(c) Underground ducts shall be provided with free drainage to a lower room of the building or to a sump so water will not stand anywhere in the duct. All such ducts shall be constructed without a direct sewer connection.

(d) All room inlets and outlets for underground ducts shall comply with section Ind 58.71(4) and a water-tight connection shall be provided where the inlet and outlet risers are connected to underground ducts.

(e) In addition to the requirements indicated in Ind 58.69(4)(a), (b), (c) and (d), return air or outside air ducts shall be designed on the basis of allowable air velocities indicated in Table 4 and such duct shall not be less than 12 inches in diameter or 12 inches in the clear vertically and horizontally, except that branch underground ducts not more than 16 feet in length may be reduced to not less than 8 inches in diameter. All such ducts shall be provided with access openings having tight fitting incombustible covers located at intervals to provide for inspection and cleaning service.

(f) In addition to the requirements indicated in Ind 58.69(4)(a), (b), (c) and (d), underground ducts used for conveying warm air supply shall be designed on the basis of allowable velocities indicated in Table 4. Where supply air ducts are installed parallel and adjacent to an outside wall, a moisture-proof insulating material shall be provided having a thermal conductance factor of .19 B.t.u. per hour per square foot per degree Fahrenheit and extending from bottom of floor to 2 feet below finished grade.

(g) Non-hazardous piping may be installed in underground ducts, providing that the net/<sup>free</sup>area is sufficient for the flow of air and the inside dimensions of the duct are greater than 4 feet wide and 4 feet high.

(5) Construction. All sheet metal ducts and fittings shall be constructed in accordance with a method approved by the Industrial Commission. All ducts or airways of wood or other combustible materials shall be completely lined on the inside with sheet metal or other approved incombustible material.

Note. The Industrial Commission will recognize as approved sheet metal gauges and construction of duct connections as illustrated in the ASHRAE Guide and Data Book, published by the American Society of Heating, Refrigerating and Air-Conditioning Engineers or as illustrated in the Duct Manual published by the Sheet Metal and Air-Conditioning Contractors National Association, Inc.

(6) Suspended ceiling plenum. The void above suspended ceilings may be used for the transmission of air and shall not be used for the installation of hazardous piping. The plenum shall be of incombustible construction. Any openings to this space, not connected to the duct system that would affect the fire-resistive rating of the roof and ceiling construction are prohibited.

(7) Insulation of ducts. Where heat supply ducts are so located or exposed so as to create an excessive temperature drop in the air stream, they shall be covered with not less than 1/2 inch of insulating material unless otherwise exempted by this code.

(8) Separate vent ducts. (a) Gravity vent ducts, serving similar occupancies, shall be continuous to a gathering chamber immediately below the point of final delivery to the outside atmosphere, such as the base of a roof ventilator.

(b) This rule prohibits the use of open pipe spaces as a substitute for a continuous duct.

(9) Termination of vent ducts. Vent ducts used in connection with mechanical ventilation supply systems may terminate in air-tight incombustible gathering chambers in the attic if the floor is of smoothly finished fire-resistive construction. 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) Where dampers are installed in gravity vent ducts, automatic back draft dampers shall be used. Hand-operated dampers shall not be installed in vent ducts that are connected to a siphon type roof ventilator.

(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) Barometric relief vents may not be used in lieu of siphon ventilators where ventilation is required by the exhaust method 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 from the roof.

Ind 58.70 Volume Dampers and Deflectors. Necessary volume dampers, splitters and deflectors, shall be provided for all ducts to permit accurate balancing of the system, and such dampers, splitters and deflectors shall be set according to air measurements of the system and shall then be locked in place.

Ind 58.71 Outlets and Returns. (1) Number and arrangements. The capacity, number and arrangement of outlets, returns and exhausts shall be such as to insure a uniform distribution of air throughout the areas served during all periods of occupancy.

(2) Elevator shafts and stairwells. Elevator shafts and stairwells shall not be used for ventilation purposes nor shall they be permitted to interfere with the effectiveness of the installation, except where there is a change in elevation and doors are not provided or are not required to separate the stairwell or elevator shaft from other areas.

(3) Outlets and returns for gravity systems. Gravity outlets and returns shall be arranged in room walls in such a manner as to use every possible natural advantage to provide proper and effective air movement and distribution.

(4) 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. Floor registers are not permitted.

(5) Corridor ventilation. Air from occupied areas uncontaminated by other than human occupancy may be discharged into corridors and recirculated or vented through auxiliary spaces, such as built-in lockers, toilet rooms, kitchens, or similar areas. Where the vent capacity of such auxiliary spaces is insufficient, additional direct vent flues shall be provided.

(a) Where lockers are installed in recessed walls and used for venting purposes, they shall have a net free inlet and outlet area each, of not less than 15 square inches per lineal foot of locker width.

Ind 58.72 Radiation. (1) Radiation, recessed or elevated. Heating and ventilation units or radiation installed in gymnasiums, play rooms and similar occupied areas shall be fully recessed and protected or elevated not less than 7 feet above the floor. Radiators in aisles, passageways and corridors shall not project into minimum width required by the Wisconsin Building Code.

(2) Shields required. Direct radiators installed within 2½ feet of fixed seats shall be provided with insulated shields constructed and arranged to affect convective air currents and to protect the adjacent occupants from direct radiant heat.

Ind 58.74 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. Appropriate anchors, expansion swings or joints, supports and similar trade essentials shall be provided in every piping system.

(3) Pipe insulation. Where steam and hot water supply, and return piping pass through occupied areas where the heat emission might be objectionable or where such piping is subjected to the danger of freezing, it shall be properly covered with not less than 1/2 inch of insulating material.

Cross reference: For additional requirements see Wisconsin Administrative Code section Ind 52.13, Ind 52.14 and Ind 52.15.

Ind 58.75 Refrigerants. (1) Scope. This rule covers the use of refrigerants in heat transfer apparatus for temperature reduction or dehumidification as a function of air conditioning of occupied areas.

Cross reference: For regulations, permits, and information covering plant and air conditioning refrigeration equipment, see Refrigerating Plant Code ~~XXXXXX~~ ~~XXXXXX~~ Chapter 45.

(2) Classification of refrigerants. Refrigerants used in connection with this code shall be classified as follows:

(a) Class 1. Non-toxic and non-flammable refrigerants. Included in this list are:



	Chemical Formula
Water or water vapor.....	H <sub>2</sub> O
Carbon Dioxide.....	C O <sub>2</sub>
Dichlorodifluoromethane (R-12).....	C Cl <sub>2</sub> F <sub>2</sub>
Dichlorotetrafluoroethane (R-114).....	C <sub>2</sub> Cl <sub>2</sub> F <sub>2</sub>
Monochlorodifluoromethane (R-22).....	CHClF <sub>2</sub>
Dichlorodifluoromethane, 73.8%.....	C Cl <sub>2</sub> F <sub>2</sub>
and Ethylidene Fluoride, 26.2% (Carrene #7).....	CH <sub>3</sub> CHF <sub>2</sub>
Dichloromonofluoromethane (R-21).....	CH Cl <sub>2</sub> F

(b) Class II. Relatively non-toxic and non-flammable refrigerants, having a sufficiently high boiling point to prevent rapid evaporation in event of release.

Included in this list are:

	Chemical Formula
Dichloroethylene.....	C <sub>2</sub> H <sub>2</sub> Cl <sub>2</sub>
Dichloromethane-Methylene chloride (Carrene #1).....	CH <sub>2</sub> Cl <sub>2</sub>
Trichloromonofluoromethane (R-11).....	C Cl <sub>3</sub> F
Trichlorotrifluoroethane (R-113).....	C <sub>2</sub> Cl <sub>3</sub> F <sub>3</sub>

(c) Class III. Irritant and inflammable refrigerants. Included in this list are:

Ammonia.....	N H <sub>3</sub>
Methyl chloride.....	C H <sub>3</sub> Cl
Ethyl bromide.....	C <sub>2</sub> H <sub>5</sub> Br

(3) Uses, where permitted. Only the refrigerants included in class I may be used for cooling air by direct expansion or circulation in coils or extended surface cooling apparatus.

(a) Refrigerants included in classes I and II may be used for the purpose of cooling water to be circulated through air washers.

(b) Refrigerants included in classes I, II and III may be used for the purpose of cooling brine or water in a closed system where such brine or water is not circulated directly through the air to be conditioned.

Cross reference: Refrigerants not included in class I shall be classified and may be used in accordance with the requirements of the American Standard Association Safety Code for Mechanical Refrigeration B9.1-1953.

(4) Refrigerants prohibited. The following toxic and inflammable refrigerants shall not be used for air conditioning purposes:

Butane.....	$C_4H_{10}$
Isobutane.....	$(C_3H_7)_3C H$
Propane.....	$C_3H_8$
Ethane.....	$C_2H_6$
Ethyl Chloride.....	$C_2H_5Cl$
Methyl Bromide.....	$C_2H_5Br$
Methyl Formate.....	$HCOOCH_3$
Sulphur Dioxide.....	$SO_2$