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THE VENTILATION DIRECTORY

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A Directory on Building Regulatory Criteria Affecting Ventilation and Indoor Air Quality

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ABOUT NCSBCS

NCSBCS, on behalf of the nation's governors, promotes the development of an efficient, cooperative system of building regulation to ensure the public's safety in all buildings-residential and commercial occupancies. Since 1967, NCSBCS has provided a national forum for discussing issues and concerns on building construction codes and regulations.

NCSBCS also works for the acceptance of new technologies in building construction, a uniform national education and certification system for building regulatory personnel; accountability in the design, construction, and inspection of buildings; public awareness of building regulatory personnel; and interstate acceptance of modular and industrialized buildings.

NCSBCS' members include governor-appointed delegates of each state and territory, state and local building officials, architects and engineers, building contractors, manufacturers of equipment and building materials, national corporations, federal government officials, and consumers. Through NCSBCS, members have an active voice in the codes and standards-writing organizations and the federal government.

ACKNOWLEDGEMENT

NCSBCS thanks the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) for its cooperation in compiling this Directory. ASHRAE is an international non-profit technical society. Through research, standards writing, and continuing education, ASHRAE's sole objective is to advance the arts and sciences of heating, ventilation, air conditioning, and refrigeration for the public's benefit.

INTRODUCTION

Ventilation of habitable spaces has long been a consideration in the design, construction, and operation of buildings. Before the availability of mechanical systems, openings within the interior and exterior of buildings were the sole mechanism by which fresh air was introduced into habitable spaces. While such natural ventilation still provides a source of ventilation today, many buildings also rely on some form of mechanical ventilation for temperature, humidity, and velocity control as well as positive control of the quality of the indoor air. This shift from all natural to predominately mechanical ventilation would not appear to be cause for great concern. Due, however, to changes in building design and construction, new materials applications, and the forces for more efficient energy use, the quality of indoor air has commanded much attention recently. In part air quality is addressed by building construction regulations (building, mechanical, plumbing codes, etc.) as well as voluntary consensus standards such as ASHRAE (American Society of Heating, Refrigerating and Air-Conditioning Engineers) Standard 62 *Ventilation for Acceptable Indoor Air Quality*. These documents form the basis for much of what designers may use voluntarily. In addition, compliance with these documents may also be a criterion for building design approval by state and local government agencies which regulate building construction.

One familiar with the building regulatory situation within the United States recognizes there are numerous federal, state, and local agencies with responsibility for development, administration, and enforcement of building construction regulations. Within those regulations are criteria which address ventilation but may vary from state to state and within states. The National Conference of States on Building Codes and Standards (NCSBCS) *Directory of Building Codes and Regulations* (1989 edition) outlines which codes are used throughout the United States and who is responsible for their administration and enforcement. As such it provides a snapshot of the country without focusing on technical detail or any specific technical issue. The NCSBCS *Energy Directory* 1989 edition provides the technical details of each state energy code in a way that allows state-by-state and issue-by-issue comparisons. It "boils down" thousands of pages of text into 150 pages, thereby allowing the user to grasp the full national picture.

This *Ventilation Directory* is intended to accomplish the same objective. It identifies the major US codes and standards on ventilation and presents their criteria in an easily manageable and comparable format. This *Directory* is not intended to replace the documents covered nor is it intended to cover each and every innuendo, possible interpretation, or unique situation. It is intended to give the user a reasonable understanding of the issue from a building regulatory standpoint, and facilitate a review and comparison of the numerous codes and standards which address ventilation at the national level.

OVERVIEW

The *Ventilation Directory* is broken into four sections. Section 1 is a brief overview of each of the covered documents' format and function. The other three contain a more intensive comparison of the actual ventilation criteria in each of the covered documents. Each type of building is addressed where necessary to allow a review by building type. Section 2 contains matrices for natural ventilation. Section 3 contains matrices for mechanical ventilation but addresses the issues by different building type (i.e., multi-family, office, mercantile). Section 4 addresses exhaust and supply air provisions which are applicable regardless of building type. Appendices include unique state code provisions.

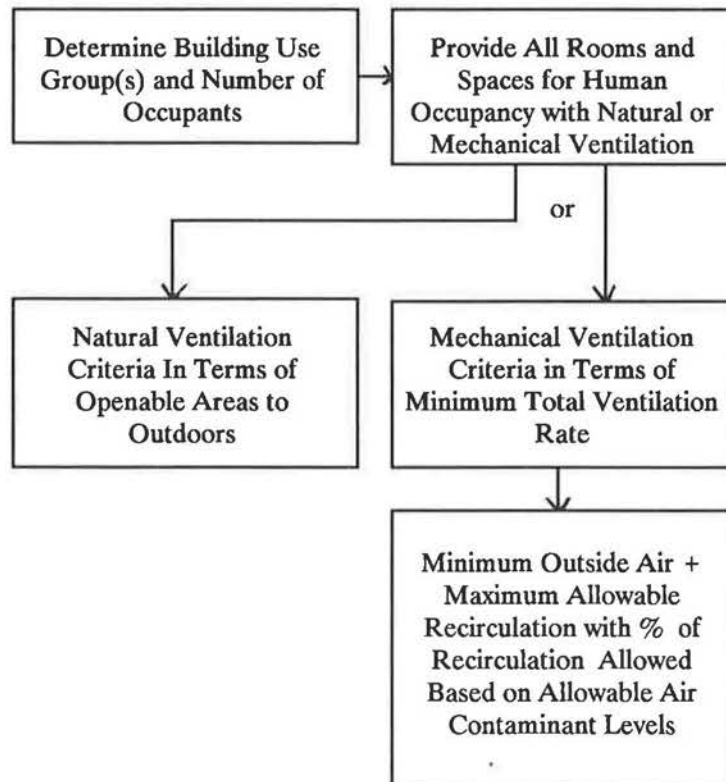
Note that many state and local governments use their own unique criteria to address ventilation or adopt a model code or ASHRAE standard. The *Ventilation Directory* covers all those documents which NCSBCS has identified as unique throughout the United States. Where a specific state or locality is not listed it is likely it uses a model code or ASHRAE Standard addressed in the *Ventilation Directory*. Information on which states or major cities use a particular model code can be found in the *NCSBCS Directory of Building Codes and Regulations*.

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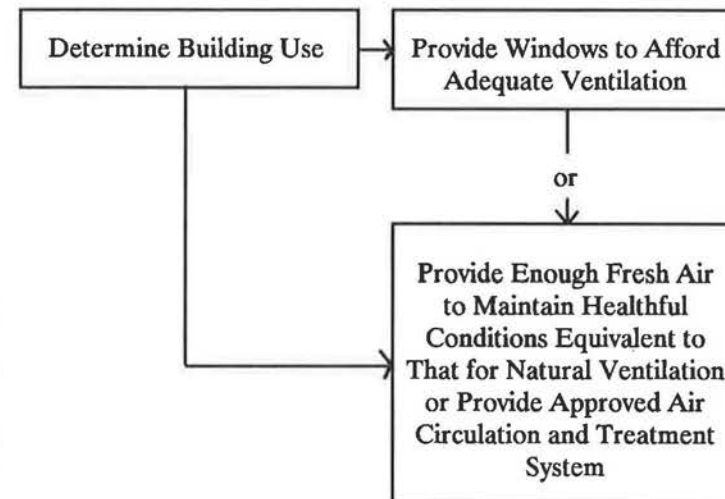
SECTION 1

General Overview and Flow of Model Codes and ASHRAE Standards

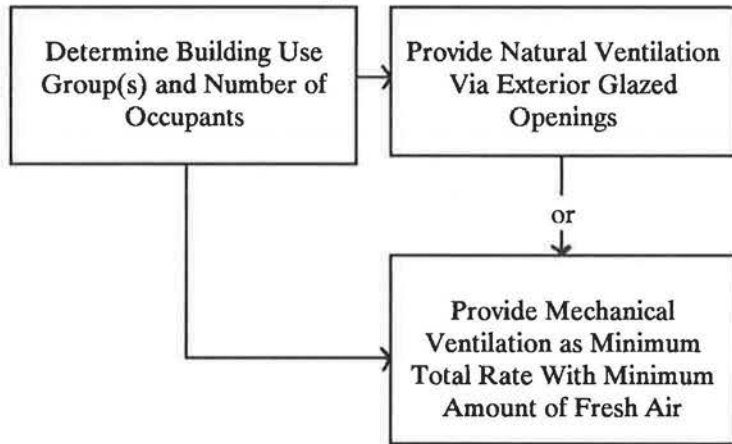
1990 National Building and Mechanical Codes



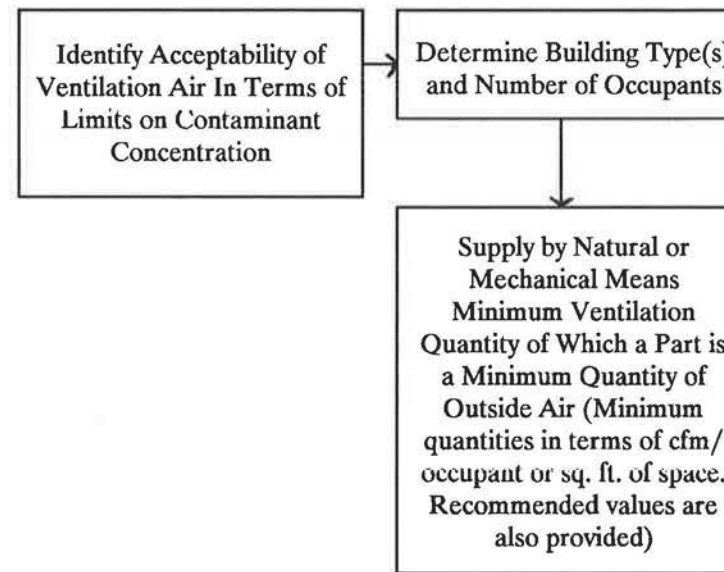
1988 Standard Building Code with 1989 Supplement



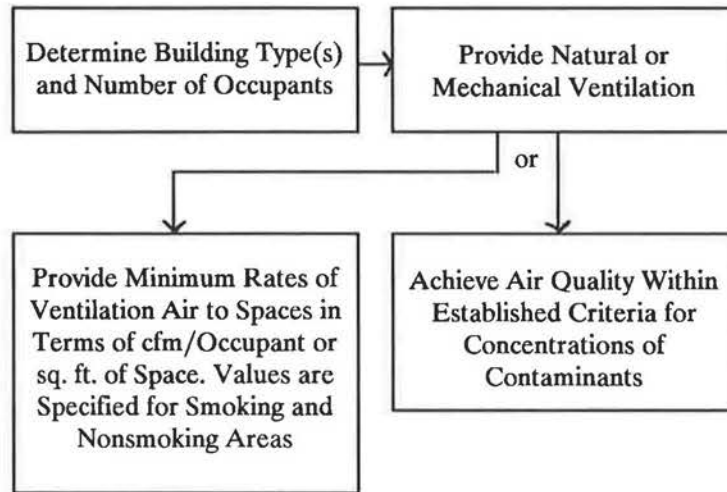
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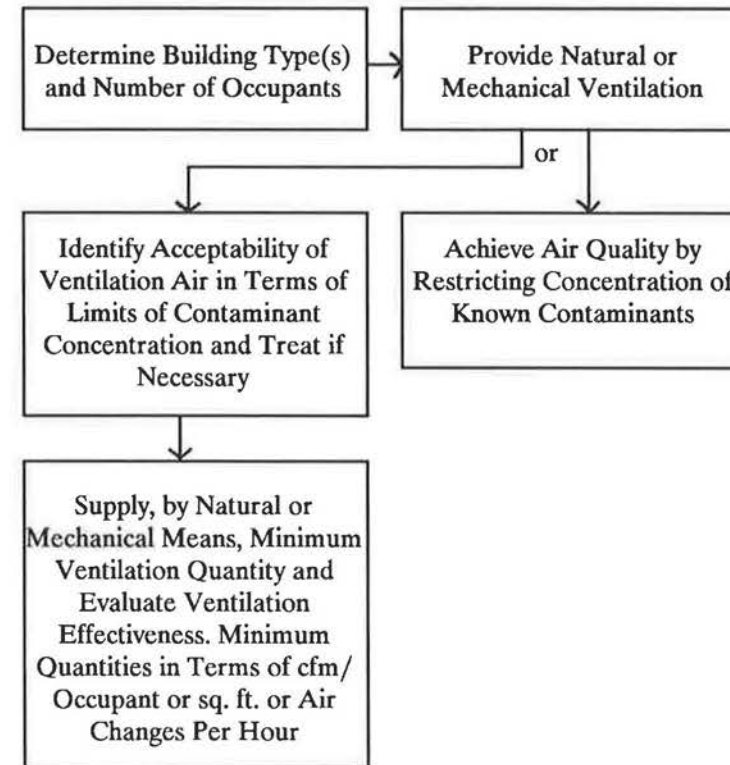
ASHRAE Standard 62-1973



ASHRAE Standard 62-1981



ASHRAE Standard 62-1989



Statewide Ventilation Codes (For Other Than One-and Two-Family Dwellings)

For more detailed information see the *1989 Directory of Building Codes & Regulations*. This Directory lists the code and edition used, whether it is amended, preemptive application, and contacts in each state for promulgation and enforcement. Use the order form at the end of this publication or contact the Communications Division at (703) 437-0100.

NBC - National Building Code (BOCA) SBC - Standard Building Code (SBCCI) UBC - Uniform Building Code (ICBO)
NMC - National Mechanical Code (BOCA)

Alabama	1988 SBC	Montana	1988 UBC
Alaska	1985 UBC	Nebraska	None (UBC most prevalent ¹)
Arizona	None (UBC most prevalent ¹)	Nevada	None (1988 UBC for state buildings)
Arkansas	1985 SBC	New Hampshire	None (NBC/NMC most prevalent ¹)
California	1988 UBC	New Jersey	1989 NBC/NMC ⁴
Colorado	None (1988 UBC for hotel/motel)	New Mexico	1988 UBC
Connecticut	1988 NBC/NMC ⁴	New York	State-written
Delaware	None (NBC/NMC & SBC prevalent ¹)	North Carolina	State-written
Florida	1988 SBC, 1988 S. Florida ² , Epcot ³	North Dakota	1985 UBC
Georgia	1988 SBC	Ohio	1987 NBC ⁴
Hawaii	State-written	Oklahoma	None (1987 NMC required for license)
Idaho	None (1988 UBC for state buildings)	Oregon	1988 UBC
Illinois	None (NBC/NMC most prevalent ¹)	Pennsylvania	None (NBC/NMC most prevalent ¹)
Indiana	1988 UBC	Rhode Island	1987 NBC/NMC ⁴
Iowa	1988 UBC	South Carolina	None (1988 SBC for state buildings)
Kansas	None (1988 UBC for state buildings)	South Dakota	None (UBC most prevalent ¹)
Kentucky	1987 NBC/NMC ⁴	Tennessee	1988 SBC
Louisiana	None (SBC most prevalent ¹)	Texas	None (All 3 model codes used ¹)
Maine	None (NBC/NMC most prevalent ¹)	Utah	1988 UBC
Maryland	None (NBC/NMC most prevalent ¹)	Vermont	1987 NBC/NMC
Massachusetts	1987 NMC + State Building Code	Virginia	1987 NBC/NMC ⁴
Michigan	1987 NBC/NMC ⁴	Washington	1988 UBC
Minnesota	1988 UBC ⁴	West Virginia	1987 NBC/NMC
Mississippi	None (SBC most prevalent ¹)	Wisconsin	State-written
Missouri	None (NBC/NMC & UBC prevalent ¹)	Wyoming	1988 UBC
		District of Columbia	1986 NBC/NMC ⁴

1 Where there is no statewide code most prevalent model code(s) adopted by local government shown

2 Dade and Broward Counties

3 Reedy Creek Improvement District (Disney World, Epcot Center, MGM Theme Park)

4 In process of adopting 1990 edition

SECTION 2

Natural Ventilation

Required Openings for Private Dwelling Units	NBC/NMC	SBC	UBC	ASHRAE 62-1973	ASHRAE 62-1981
Method of Providing Natural Ventilation	Windows, doors, louvers, or other natural openings to outdoor air	Windows. Skylights, vents, louvers, or mechanical ventilation may be substituted with building official approval	Openable exterior openings	Windows and doors (intentionally provided openings) or non-powered ventilators	Windows and doors (intentionally provided openings) or non-powered ventilators or infiltration
Minimum Openable Area to Outdoors	4% of floor areas ventilated	4% of floor area of room served except 2-1/2% in storage rooms and 3 sq. ft. open in toilet room	5% of floor area of room served but \geq 5 sq. ft. except \geq 1-1/2 sq. ft. in bathroom, laundry rooms, etc.	See provisions Section 3 Mechanical Ventilation which apply since ventilation air can be from natural or mechanical means	See provisions Section 3 Mechanical Ventilation which apply since ventilation air can be from natural or mechanical means. Natural ventilation rate must be demonstrable
Ventilation of Adjoining Rooms or Spaces (i.e. rooms without openings to exterior but communicating with rooms which are)	Provide \geq 8% of floor area of adjoining room as unobstructed opening to room with openings but \geq 25 sq. ft.	Half of common wall must be open and have opening \geq 10% of interior room floor area but \geq 25 sq. ft.	Half of common wall must be open and have opening \geq 10% of interior room floor areas but \geq 25 sq. ft.	Not addressed	Not addressed
Use of Openings Below Grade as Ventilation Source	Provide distance of at least 1-1/2 distance below grade as horizontal clearance from opening to grade in front ¹	Not addressed	Not addressed	Not addressed	Not addressed

ASHRAE 62-1989	Massachusetts 2	New York 2	South Florida	Wisconsin 2	CABO 1&2 Family	Comments
Windows and doors (intentionally provided openings) or non-powered ventilation or infiltration	Ventilating skylights, monitors, louvers, windows, transoms, doors, or other alternate ventilating devices in exterior walls or roof ³	Openable parts of windows or other above grade openings in exterior walls which face legal open space \geq 5 ft. wide or through openable skylights ³	Windows in exterior walls	Openable exterior doors or windows ³	Glazing area (not defined) ³	1 i.e., If bottom of window is 2 ft. below grade, provide 3 ft. horizontal clearance in front of window 2 See Appendix 2A for a copy of applicable code criteria.
See provisions Section 3 Mechanical Ventilation which apply since ventilation air can be from natural or mechanical means. Ventilation must be demonstrable	4% of floor area served except 2% of basement and cellar floor area and \geq 1-1/2 sq. ft. open in bath and toilet room	4% of total floor area of each space except 1-1/2% for bathrooms or toilet rooms and 3% for kitchenettes	5% of floor area of room for sleeping or those for living purposes. Provide mechanical in kitchens and toilet rooms	3-1/2% of net floor area	4% of floor area served except 1-1/2 sq. ft. for bathrooms, water closet compartments, and similar rooms	3 Mechanical ventilation is an alternative in some instances. See Section 3 Mechanical Ventilation
Not addressed	May include alcove room \leq 60 sq. ft. open at least 50% to adjoining room in floor area on which window area based	Not addressed	Not addressed	Not addressed	May include alcove room when \geq 50% of common wall open and unobstructed and \geq 10% of interior room floor area but \geq 25 sq. ft.	
Not addressed	Not addressed	Not addressed	Not addressed	Not addressed		

Required Openings for Public Buildings¹

	NBC/NMC	SBC	UBC	ASHRAE 62-1973	ASHRAE 62-1981
Method of Providing Natural Ventilation	Windows, doors, louvers, or other natural openings to outdoor air	Windows. Skylights, vents, louvers, or mechanical ventilation may be substituted with building official approval and ≥ 3 sq. ft. open in toilet room	Openable exterior openings	Windows and doors (intentionally provided openings) or non-powered ventilators	Windows and doors (intentionally provided openings) or non-powered ventilators or infiltration
Minimum Openable Area to Outdoors	4% of floor areas ventilated	4% of floor area of room served except 2-1/2% in storage rooms and 3 sq. ft. open in toilet room	5% of total floor area except ≥ 3 sq. for toilet room or vertical duct ≥ 100 sq. in. for 1st toilet facility and ≥ 50 for all others	See provisions Section 3 Mechanical Ventilation which apply since ventilation air can be from natural or mechanical means	See provisions Section 3 Mechanical Ventilation which apply since ventilation air can be from natural or mechanical means. Natural ventilation rate must be demonstrable
Ventilation of Adjoining Rooms or Spaces (i.e., rooms not on building exterior but communicating with rooms which are)	Provide $\geq 8\%$ of floor area of adjoining room as unobstructed opening to room with openings but ≥ 25 sq. ft.	Half of common wall must be open and have opening $\geq 10\%$ of interior room floor area but ≥ 25 sq. ft.	Half of common wall must be open and have opening $\geq 10\%$ of interior room floor areas but ≥ 25 sq. ft.	Not addressed	Not addressed
Use of Openings Below Grade as Ventilation Source	Provide distance of at least 1-1/2 distance below grade as horizontal clearance from opening to grade in front ²	Not addressed	Not addressed	Not addressed	Not addressed

ASHRAE 62-1989	Massachusetts 3	New York 3	South Florida	Wisconsin	Comments
Windows and doors (intentionally provided openings) or non-powered ventilation or infiltration	Ventilating skylights, monitors, louvers, windows, transoms, doors, or other alternate ventilating devices in exterior walls or roof	Openable parts of windows or other openings in exterior walls which face legal open space or through openable skylights	Windows or skylights	Outside windows	1 Consider Public Buildings to Include: Food Service Public Facilities Sports and Amusement Facilities Theaters Offices Schools Institutional* Hospitals, Nursing & Convalescent Homes Merchantile Hotels, Motels, Resorts, and Dormitories Multiple Dwellings
See provisions Section 3 Mechanical Ventilation which apply since ventilation air can be from natural or mechanical means. Ventilation must be demonstrable Not addressed	4% of floor area served except 2% of basement and cellar floor area and $\geq 1\text{-}1/2$ sq. ft. open in bath and toilet room May include alcove room ≤ 60 sq. ft. open at least 80% to adjoining room in floor area upon which window area is based	4% of floor area or 3 sq. ft. for kitchenettes, bathrooms, & toilet rooms. Public or employee-1 sq. ft./water closet but ≥ 3 sq. ft. Provide basements with sufficient area Alcoves ≤ 60 sq. ft. ⁴ except cooking space or foyer, are part of room when at least 80% of separation partition is open but ≥ 40 sq. ft.	1/16 total floor area except 1/20 in hotels, motels, apartments, rooming houses, dormitories, monasteries, and similar uses with ≥ 3 living units Not addressed	4% of floor area except ≥ 2 sq. ft. for toilet rooms. Openings must be within 100 ft. or 5 times least dimensional width of occupied area Not addressed	2 i.e., If bottom of window is 2 ft. below grade provide 3 ft. horizontal clearance in front of window 3 See Appendix 2B for a copy of applicable code criteria. Note that in some instances mechanical ventilation is required or may be an option 4 For multiple dwellings which include apartments, lodging houses, dormitories, motels, senior citizen residences, and adult residential care facilities
Not addressed	Not addressed	Not addressed	Not addressed	Provide distance of at least 1-1/2 distance below grade as horizontal distance from opening to grade in front ²	* For SBC, for buildings without openable windows, windows not readily breakable, or with no windows, provide vent openings, smoke shafts, or engineered smoke control system to provide ventilation

Appendix 2A

Massachusetts

2101.5 Light and ventilation: All habitable rooms shall be provided with aggregate glazing area of not less than eight (8) per cent of the floor area of such rooms. One-half (1/2) of the required area of glazing shall be openable.

Exception: A combination of natural and mechanical ventilation shall be allowed when evidence is submitted that the combination meets the minimum requirements established in this article.

2101.5.1 Alcove rooms: When alcove rooms open without obstruction into adjoining rooms, the required window openings to the outer air shall be based on the combined floor area of room and alcove. An alcove space shall be not more than sixty (60) square feet in area and the opening to the adjoining room shall not be less than fifty (50) per cent of the superficial area of the dividing wall, unless provided with separate means of light and ventilation.

2101.5.2 Mechanical ventilation: Ventilation air shall conform to Std. RS-21- 12. The minimum value for each type of room use is given in Table 2101-2. The ventilation quantities specified are for one hundred (100) per cent outdoor air ventilating systems. A reduction to thirty-three (33) per cent of the specified outdoor values for recirculating HVAC systems is permitted. In no case shall the outdoor air quantity be less than five (5) cfm per person.

Exception: If outdoor air quantities other than those specified are used or required because of special occupancy requirements or other standards, the required outdoor air quantities shall be used as the basis for calculating the heating and cooling design loads.

**Table 2101-2
Ventilation Requirements for One- and Two-Family Dwellings**

Type of Room	Required Ventilation Air in Cubic Feet/Minute/Human Occupant
General living areas, bedrooms	5
Kitchens	20
Baths, toilet rooms	20
Basements, utility rooms	5

Note: If design occupancy is not known, ventilation is to be based upon an estimate of five (5) persons per one thousand (1,000) square feet of floor area.

2101.5.2.1 Natural ventilation: In a bathroom, if a window is available which is unrestricted and opens directly to the outer air, no mechanical ventilation shall be necessary.

New York

Part 712 LIGHT AND VENTILATION

(Statutory authority: Executive Law, § 375, 377)

§ 712.1 Habitable space

§ 712.2 Nonhabitable space

Section 712.1 Habitable space. (a) Light. (1) Habitable space, except kitchens, shall be provided with natural light through one or more windows, skylights, transparent or translucent panels, or any combination thereof, that face directly on legal open spaces at least five feet wide above the adjoining finished grade, or above a roof. The amount of light shall be equivalent to that transmitted through clear glass equal in area to not less than eight percent of the floor area of the habitable space.

(2) Kitchens shall be provided with artificial lighting equipment and may also be provided with natural light.

(b) Ventilation. Habitable space shall be provided with ventilation in accordance with either of the following:

(1) natural ventilation through openable parts of windows or other openings in exterior walls that face legal open spaces at least five feet wide above the adjoining finished grade or above a roof, or through openable parts of skylights, providing total clear ventilation area equal to not less than four percent of the total floor area of each habitable space;

(2) mechanical ventilation providing outdoor air, or a mixture of outdoor and recirculated air, in accordance with the quantities set forth in the applicable requirements of the State Energy Conservation Construction Code.

712.2 Nonhabitable space. (a) Light. Kitchenettes, bathrooms and toilet rooms shall be provided with light of sufficient intensity and so distributed as to permit the maintenance of sanitary conditions and the safe use of the space and the appliances, equipment and fixtures.

(b) Ventilation. Kitchenettes, bathrooms and toilet rooms shall be provided with ventilation in accordance with either of the following:

(1) natural ventilation as set forth in section 712.1(b) of this Part, except that such openable areas shall be not less than 1-1/2 square feet for bathrooms or toilet rooms and not less than three square feet for kitchenettes; or

(2) mechanical exhaust ventilation in accordance with the quantities set forth in the applicable requirements of the State Energy Conservation Code.

Wisconsin

ILHR 21.05 Light and ventilation. (1) Natural Light. All habitable rooms shall be provided with natural light by means of glazed openings. The area of the glazed openings shall be at least 8% of the net floor area, except under the following circumstances:

(a) Exception. Habitable rooms, other than bedrooms, located in basements need not be provided with natural light.

(b) Exception. Natural light may be obtained from adjoining areas through glazed openings, louvers or other approved methods. Door openings into adjoining areas may not be used to satisfy this requirement.

(2) Ventilation. (a) Natural ventilation. Natural ventilation shall be provided to all habitable rooms, kitchens and bathrooms by means of openable exterior doors or windows. The net area of the openable exterior doors or windows shall be at least 3% of the net floor area of the room. Mechanical ventilation may be provided in lieu of openable exterior doors or windows provided the system is capable of providing at least one air change per hour.

(b) Exhaust ventilation. All exhaust ventilation shall terminate outside the building.

(3) Attic Ventilation. Ventilation above the ceiling/attic insulation shall be provided as specified in either § ILHR 22.05(3)(1) or § ILHR 22.11(3)(a).

(4) Crawl Space Venting. Crawl spaces shall be vented in accordance with either § ILHR 22.05(3)(b) or § ILHR 22.11(3)(b). Unheated crawl spaces shall be provided with a concrete slab, roll roofing or plastic film vapor barrier.

(5) Safety Glass. Glass in entrance and exit doors, sliding glass doors, storm doors, bathtub enclosures, shower doors, and fixed glass panels immediately adjacent to doors shall be safety glass.

Appendix 2B

Massachusetts

SECTION 504.0 ARTIFICIAL LIGHT AND VENTILATION

504.1 When required: When natural light and ventilation do not meet the minimum requirements of this code, or when rooms, which by use or occupancy, involve the presence of dust, fumes, gases, vapors or other noxious or deleterious impurities that create a fire or health hazard, or when required by the provisions of Article 4 for special uses, the building shall be equipped with artificial light and mechanical means of ventilation under the conditions and of the minimum capacity prescribed herein and in the mechanical code listed in Appendix B.

504.2 Operation of ventilating systems: Where mechanical ventilation is accepted as an alternate for natural means of ventilation, or is required under the conditions herein prescribed, the system, equipment and distributing ducts shall be installed in accordance with the provisions of Article 10 and the mechanical code listed in Appendix B. Ventilating systems shall be kept in operation at all times during normal occupancy of the building or space so used.

504.3 Habitable rooms: The glazed areas of windows and exterior doors in habitable rooms and spaces need not be operable where an approved mechanical ventilation system is provided capable of producing two (2) changes of air per hour. Recirculation of not more than seventy-five (75) per cent of the air supplied may be permitted in habitable rooms except kitchens, provided with air recirculated does not come from a plenum or system fed with air returned from habitable rooms occupied by other families, or from the stairways or common hallways; except that recirculation of one hundred (100) per cent of the air supplied may be permitted if the system supplies only a single dwelling unit.

SECTION 506.0 NATURAL LIGHTING AND VENTILATION OF ROOMS

506.1 Window and skylights: All habitable and occupiable rooms or spaces shall contain windows, skylights, monitors, glazed doors, transoms, glass block panels or other light transmitting media opening to the sky or on a public street, yard or court complying with the provisions of this article. The light transmitting properties and the area of the devices used shall be adequate to meet the minimum daylighting and ventilating requirements specified herein and in the approved rules.

506.2 Window size: Windows and exterior doors may be used as a natural means of light and ventilation, and when so used their aggregate glass area shall amount to not less than eight (8) per cent of the floor area served, and with not less than one-half (1/2) of this required area available for unobstructed ventilation.

space, or on a yard or court located on the same lot or plot complying with the requirements of Sections 516.0, 517.0 and 518.0.

506.4 Alternate devices: In place of the means for natural light and ventilation herein prescribed, alternate arrangement of windows, louvres, or other methods and devices that will provide the equivalent minimum performance requirements shall be permitted when complying with the code.

SECTION 507.0 LIGHTING AND VENTING OF SPECIAL PLACES

507.1 Alcove rooms: When alcove rooms open without obstruction into adjoining rooms, the required window openings to the outer air shall be based on the combined floor area of room and alcove. An alcove space shall not be more than sixty (60) square feet in area and the opening to the adjoining room shall be not less than eighty (80) per cent of the superficial area of the dividing wall, unless provided with separate means of light and ventilation.

SECTION 508.0 BASEMENTS AND CELLARS

508.1 General: Except as may be otherwise specified for habitable or occupiable rooms or specifically provided in Article 4 for special uses, the glass window area in basements and cellars, except crawl spaces as provided in Section 507.3, shall be not less than one fiftieth (1/50) of the floor area served, and the provisions shall be made for fresh air supply prescribed for specific uses in Section 514.0 and the mechanical code listed in Appendix B.

SECTION 509.0 BUSINESS AND WORK ROOMS

509.1 General: Offices, stores, mercantile and salesrooms, restaurants, markets, bakeries, hotel and restaurant kitchens, factories, workshops, machinery and boiler rooms shall be provided with the required windows specified in Section 506.0 for habitable and occupiable rooms, opening directly on a street or required yard or court; or such rooms shall be equipped with an approved system of mechanical ventilation complying with Section 504.0 and the mechanical code listed in Appendix B.

SECTION 510.0 ASSEMBLY ROOMS

510.1 General: In addition to the requirements of Article 4 for special uses, the required windows or other approved devices for natural ventilation shall be distributed as equally as practicable on at least two (2) sides of this room; and artificial lighting shall comply with the requirements of this article and Article 15.

SECTION 511.0 ROOMS OF INSTITUTIONAL BUILDINGS

511.1 General: In buildings of the institutional use group, every habitable and occupiable room shall be provided with light and ventilation as herein provided, except that in buildings used for enforced detention of people (use group I-1) indirect openings to the street or court may be permitted through intermediate corridors or by other approved means of light and ventilation.

SECTION 512.0 BATH AND TOILET ROOMS

512.1 General: Every bath and toilet room shall be lighted and ventilated by one (1) of the methods prescribed in Sections 512.2 through 512.7.

512.2 Exterior windows: Windows opening to the outer air as provided in Section 506.0 but not less than three (3) square feet in area.

512.3 Vent shaft windows: Windows as provided in Section 506.0 but not less than three (3) square feet in area, opening on vent shaft with a cross-sectional area of one (1) square foot for every foot in height, but not less than nine (9) square feet in area, open to the outer air at top or constructed with equivalent side louvre openings.

512.4 Vents and ducts: Individual vents or ducts constructed with approved noncombustible materials complying with Section 1009.0 with a minimum cross-sectional area of one-half (1/2) square foot and one-third (1/3) additional square foot for each additional water closet or urinal alcove two (2) in number. Such ducts shall be of adequate height and so located as to insure a minimum supply of two (2) cubic feet of fresh air per square foot of room area.

512.5 Skylights: A skylight of approved non combustible construction complying with Section 925.3, and not less than three (3) square feet in area with ventilating opening.

512.6 Mechanical ventilating systems: Any system of mechanical or gravity ventilation capable of producing a change of air every 12 minutes in private bathrooms. Public bathroom mechanical ventilation systems shall comply with the mechanical code listed in Appendix B.

512.6.1 Recirculation: Recirculation of air supplied to toilet rooms, bathrooms and rest rooms shall not be permitted.

512.7 Artificial lighting: Illumination shall be provided in all toilet rooms to afford an average intensity of three (3) foot candles measured at a level thirty (30) inches above the floor.

New York

732.2 Habitable space.

(a) Size. (1) Habitable space shall have a minimum height of seven feet six inches measured from finished floor to finished ceiling.

(2) Every dwelling unit shall contain at least one habitable room which shall contain a minimum of 150 square feet of floor area and shall have a minimum horizontal dimension of 10 feet.

(3) Kitchens shall have a minimum of 60 square feet of floor area, and other habitable spaces shall contain not less than 80 square feet of floor area and shall have a minimum horizontal dimension of seven feet.

(4) Every alcove less than 60 square feet in area, except a cooking space or foyer, shall be deemed to be party of a habitable room. The area of the opening in the dividing partition between the alcove and the room shall be at least 80 percent of the wall area of such partition, measured on the alcove side, but not less than 40 square feet. The depth of such alcove shall not exceed half of its width. The floor area of the alcove shall be added to the floor area of the room for the purpose of complying with the requirements of Part 733 of this code. An alcove with an area of 60 square feet or more, but less than the required area of a habitable room, shall be separately lighted and ventilated as required for habitable space.

(b) Location in respect to grade level. (1) Floor level of habitable space shall not be more than four feet below the average adjoining finished grade, except that below-grade space is permitted as a habitable space provided the grade adjoining one exterior wall, for the width of the habitable space, is at or lower than the floor level of the habitable space, the depth is not more than four times the height, and such space conforms to all other requirements for habitable space. Public space, occupied space and play or recreation rooms may be located below grade.

(2) Windows for light and ventilation shall open upon a required yard, court or legal open space having access to a public thoroughfare. The elevation of the finished grade shall be at least six inches below sills of such windows.

(c) Miscellaneous requirements. (1) Dwelling units shall be separated from each other and from other spaces outside the dwelling unit.

(2) Separation between dwelling units shall have a sound transmission class (stc) of at least 45, and between dwelling units and corridors or public spaces of at least 45 stc.

(3) Sleeping rooms within dwelling units shall be separated from each other and from other spaces outside the sleeping rooms to provide privacy.

PART 733 LIGHT AND VENTILATION

(Statutory authority: Executive Law, § 375, 377)

- § 733.1 General requirements
- § 733.2 Natural light for habitable space
- § 733.3 Natural ventilation for habitable space
- § 733.4 Ventilation for occupied space and public space
- § 733.5 Ventilation for nonhabitable space

Section 733.1 General requirements. (a) Habitable spaces shall be provided with both natural light and artificial light, except that kitchens less than 80 square feet in area shall be permitted with artificial light only where another dining area is provided.

(b) All spaces, except closets or similar spaces, shall be provided with artificial light.

(c) Habitable spaces shall be provided with natural ventilation, and may also be provided with mechanical ventilation, except that kitchens less than 80 square feet in area shall be permitted with ventilation conforming to the requirements for kitchenettes where another dining area is provided.

(d) Kitchens and kitchenettes having domestic ranges more than 15 feet from an opening for natural ventilation shall be provided with mechanical ventilation as set forth in section 1004.2(c) of this code.

(e) The tops of windows or equivalent sources of natural light and ventilation in habitable space shall not be more than 18 inches below finished ceilings, unless the top of at least one such source in each room is at least seven feet above the finished floor.

(f) Assembly spaces shall be provided with either natural ventilation or mechanical ventilation, or both.

(g) Artificial light and mechanical ventilation shall comply with Part 1031 and section 1004.2 of this code.

(h) Required lighting or ventilating openings shall not face on a street, or other space permanently dedicated to public use, of lesser width than required for side yards or courts, except that the width of such street, alley or space may be credited in the computation to establish the width or depth of side yards or courts.

733.2 Natural light for habitable space. (a) Natural light shall be provided through one or more windows, skylights, transparent or translucent panels, or any combination thereof, that face directly on legal open spaces above the adjoining finished grade, or above a roof.

(b) Each habitable space shall be provided with natural ventilation through openable parts of the opening described in this section which are equal in area to not less than four percent of the total floor area of each habitable space.

733.4 Ventilation for occupied space and public space. Occupied space and public space, if provided only with natural ventilation, shall comply with the requirements of section 733.3 of this Part.

733.5 Ventilation for nonhabitable space. (a) The following spaces shall be provided with natural ventilation by openings which comply with the requirements of section 733.3 of this Part, or with mechanical ventilation as set forth in section 1004.2 of this code. The minimum openable area of the opening for natural ventilation shall be:

**Table I-733
Minimum Openable Areas for Natural Ventilation**

Space	Minimum openable area
Kitchenettes ¹	3 sq. ft.
Bathrooms	3 sq. ft.
Toilet rooms:	
connected to bedrooms	3 sq. ft.
or in dwelling units	1 sq. ft. per water closet
used by public or employees	minimum 3 square feet
Cellars, basements	Openings of sufficient area to provide adequate ventilation

¹ Kitchenettes adjacent to a habitable space, and having no means of separation, shall be deemed to be part of such space.

(b) Spaces which contain central heat-producing, air-conditioning and other equipment shall be ventilated as set forth in Article 10 of this Subchapter, and air from these spaces shall not be recirculated to other parts of the building.

PART 763 LIGHT AND VENTILATION

(Statutory authority: Executive Law, § 375, 377)

- § 763.1 General requirements
- § 763.2 Natural light for habitable space
- § 763.3 Natural ventilation for habitable space
- § 763.4 Ventilation for occupied space and assembly space
- § 763.5 Ventilation for nonhabitable space

Section 763.1 General requirements. (a) All spaces, except closets or similar spaces, shall be provided with artificial light.

(b) Habitable spaces shall be provided with both natural light and artificial light.

(c) Habitable spaces shall be provided with natural ventilation, and may also be provided with mechanical ventilation.

(d) The tops of windows or equivalent sources of natural light and ventilation in habitable space shall not be more than 18 inches below the finished ceilings, unless the top of at least one such source in each room is at least seven feet above the finished floor.

(e) Occupied spaces shall be provided with either natural ventilation or mechanical ventilation.

(f) Assembly spaces shall be provided with either natural ventilation or mechanical ventilation.

(g) Artificial light and mechanical ventilation shall comply with section 1004.3 and Part 1031 of this code.

(h) Required lighting or ventilating openings shall not face on a street, alley, or other space permanently dedicated to public use, of lesser width than required for yards or courts, except that the width of such street, alley, or space may be credited in the computation to establish the width or depth of yards or courts.

763.2 Natural light for habitable space. (a) Natural light shall be provided through one or more windows, skylights, transparent or translucent panels, or any combination thereof, that face directly on legal open spaces above the adjoining finished grade, or above a roof on the same premises.

(b) Each habitable space shall be provided with natural light by means of openings described in this section, in an amount equivalent to that transmitted through clear glass equal in area to not less than eight percent of the floor area of the habitable space, except as provided in subdivision (c) of this section.

(c) In group C6.3 Penal Institutions, each habitable space shall be provided with natural light by means of openings described in this section in an amount equivalent to that transmitted through clear glass equal in area to not less than four percent of the floor area of the habitable space or not less than eight percent of the floor area of the habitable space from a remote source located not more than 20 feet from open-front cells.

763.3 Natural ventilation for habitable space. (a) Natural ventilation shall be provided through openable parts of windows or other openings in exterior walls that face legal open spaces above the adjoining finished grade, or above a roof on the same premises, or through openable parts of skylights.

(b) Each habitable space shall be provided with natural ventilation through openable parts of the openings described in this section which are equal in area to not less than four percent of the total floor area of each habitable space, except as provided in subdivision (c) of this section.

(c) In group C6.3 Penal Institutions, each habitable space shall be provided with natural ventilation as described in subdivision (b) of this section or mechanical ventilation providing not less than 10 cubic feet per minute per occupant.

763.4 Ventilation for occupied space and assembly space. Occupied space and assembly space, if provided only with natural ventilation, shall comply with the requirements for natural ventilation of habitable space set forth in section 763.3 of this Part.

763.5 Ventilation for nonhabitable space. (a) The following spaces shall be provided with natural ventilation by openings which comply with the requirements of section 763.3 if this Part, or with mechanical ventilation as set forth in section 1004.2 of this code. The minimum openable area of the opening for natural ventilation shall be as set forth in Table I-763.

Table I-763
Minimum Openable Areas for Natural Ventilation

Space	Minimum openable area
Kitchenettes, bathrooms, toilet or shower rooms connecteed to, or in, habitable space	3 sq. ft.
Bathrooms, toilet or shower rooms used by public or employees	1 sq. ft. per water closet; minimum 3 sq. ft.
Cellars, basements	Openings of sufficient area to provide adequate ventilation

(b) Spaces which contain central heat-producing, air-conditioning, and other equipment shall be ventilated to the outer air, and air from these spaces shall not be recirculated to other parts of the building.

SECTION 3

Mechanical Ventilation

Required Minimum Ventilation Air Quantities for Private Dwelling Units	NBC/NMC	SBC	UBC	ASHRAE 62-1973	ASHRAE 62-1981
General Living Areas	10 cfm/room	Provide mechanical ventilation (cannot substitute mechanical for natural in sleeping rooms) at least equal to requirements for natural ventilation or an approved air circulation and treatment system. For lavatories, toilets, bathrooms, and restrooms, exhaust 1.0 cfm/sq. ft. floor area or meet natural air treatment provisions	2 ach with 1/5 from outside	5 cfm/occupant	10 cfm/room
Bedrooms	10 cfm/room		2 ach with 1/5 from outside	5 cfm/occupant	10 cfm/room
Kitchens	100 cfm/room		5 ach	20 cfm/occupant (installed capacity for intermittent use)	100 cfm/room
Bath/Toilet Rooms	100 cfm/room (Exhaust. Do not recirculate)		5 ach and may vent with approved recirculating fan if only 1 water closet	20 cfm/occupant (installed capacity for intermittent use)	50 cfm/room
Basements	10 cfm/room		2 ach with 1/5 from outside	5 cfm/occupant	10 cfm/room
Utility Rooms	10 cfm/room		5 ach	5 cfm/occupant	10 cfm/room
Single Garages for 1 Dwelling Unit					1.5 cfm/sq. ft. floor area
Common Garages for Multiple Units				1.5 cfm/sq. ft. floor area	1.5 cfm/sq. ft. floor area

ASHRAE 62-1989	Massachusetts 3	New York 3	South Florida 3	Wisconsin 3	CABO 1&2 Family	Comments
0.35 ach ¹ but 15 cfm/person	Adopts 1987 NMC which has not been changed for these buildings in the 1990 edition	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accor- dance with the state energy code. The state energy code refers to generally accepted standards which are consid- ered as ASHRAE 62-1989 by the New York State Energy Office. Note kitch- ens need not have windows and may therefore be re- quired to have mechanical exhaust ventilation	For spaces other than sleeping or living purposes, mechanical ventila- tion ³ can be provided in lieu of natural ventilation. Such mechanical ventilation must provide 2 ach, except 6 ach in auto storage areas and in toilet rooms, 20 ach when not air conditioned and 8 ach when air conditioned. Do not count recircu- lated air in toilet rooms	May provide 1 ach as alternate to natural ventilation	For other than required exits and emergency egress openings mechani- cal ventilation can be provided in lieu of openable glazed areas. Such me- chanical ventilation must be capable of producing 2 ach except 5 ach in bathrooms, water closet compart- ments, and similar rooms	1 In determining ach include all areas within condi- tioned space. Such ventilation normally met through infil- tration and natural ventilation but sup- plemental ventila- tion may be re- quired in tight struc- tures. Base occu- pant load on 2 peo- ple in first bedroom and 1 for each additional bedroom 2 Installed mechan- ical exhaust. Make- up air may come from adjacent spaces 3 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which refer- ences ASHRAE Standard 62 revised
0.35 ach ¹ but 15 cfm/person						
100 cfm intermit- tent ² , 25 cfm continuous ² or openable windows	Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventila- tion at 2 ach provided. For bath and toilet rooms provide 12 ach without recirculation					
50 cfm intermittent ² , 20 cfm continuous ² or openable win- dows						
0.35 ach ¹ but 15 cfm/person						
0.35 ach but 15 cfm/person						
100 cfm/car						
1.5 cfm/sq. ft. floor area						

Required Minimum Ventilation Air Quantities For Multiple Dwelling Units	NBC/NMC	SBC	UBC	ASHRAE 62-1973	ASHRAE 62-1981
General Living Areas	10 cfm/room	Provide mechanical ventilation (cannot substitute mechanical for natural in sleeping rooms) at least equal to requirements for natural ventilation or an approved air circulation and treatment system. For lavatories, toilets, bathrooms, and restrooms, exhaust 1.0 cfm/sq. ft. floor area or meet natural air treatment provisions	2 ach with 1/5 from outside	5 cfm/occupant	10 cfm/room
Bedrooms	10 cfm/room		2 ach with 1/5 from outside	5 cfm/occupant	10 cfm/room
Kitchens	100 cfm/room		5 ach	20 cfm/occupant (installed capacity for intermittent use)	100 cfm/room
Bath/Toilet Rooms	100 cfm/room (Exhaust. Do not recirculate)		5 ach and may vent with approved recirculating fan if only 1 water closet	20 cfm/occupant (installed capacity for intermittent use)	50 cfm/room
Basements	10 cfm/room		2 ach with 1/5 from outside	5 cfm/occupant	10 cfm/room
Utility Rooms	10 cfm/room		5 ach	5 cfm/occupant	10 cfm/room
Single Garages for 1 Dwelling Unit					1.5 cfm/sq. ft. floor area
Common Garages for Multiple Units				1.5 cfm/sq. ft. floor area	1.5 cfm/sq. ft. floor area

ASHRAE 62-1989	Massachusetts	New York	South Florida	Wisconsin	Comments
0.35 ach ¹ but 15 cfm/person	Adopts 1987 NMC which has not been changed for these buildings in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided. For bath and toilet rooms provide 12 ach without recirculation	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	For spaces other than sleeping or living purposes, mechanical ventilation ³ can be provided in lieu of natural ventilation. Such mechanical ventilation must provide 2 ach, except 6 ach in auto storage areas and in toilet rooms, 20 ach when not air conditioned and 8 ach when air conditioned. Do not count recirculated air in toilet rooms	See Appendix 3A for applicable code provisions	1 In determining ach include all areas within conditioned space. Such ventilation normally met through infiltration and natural ventilation but supplemental ventilation may be required in tight structures. Base occupant load on 2 people in first bedroom and 1 for each additional bedroom
0.35 ach ¹ but 15 cfm/person					2 Installed mechanical exhaust. Make-up air may come from adjacent spaces
100 cfm intermittent ² , 25 cfm continuous ² or openable windows					3 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised
50 cfm intermittent ² , 20 cfm continuous ² or openable windows					
0.35 ach ¹ but 15 cfm/person					
0.35 ach but 15 cfm/person					
100 cfm/car					
1.5 cfm/sq. ft. floor area					

Required Minimum Ventilation Air Quantities For Food Service Uses	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 3
Bars and Cocktail Lounges	50 cfm/person @ 66 /1000 sq. ft.	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system for all uses unless noted	5 cfm/occupant outside air with total 15 cfm/occupant @ 66/1000 sq. ft.	30 cfm/person @ 100 /1000 sq. ft. (150/1000 sq. ft. for standup bars)	50 cfm/person smoking and 10 cfm non-smoking @ 100 /1000 sq. ft.
Cafeterias	35 cfm/person @ 66 /1000 sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 66/1000 sq. ft.	30 cfm/person @ 100 /1000 sq. ft.	35 cfm/person smoking and 7 cfm non-smoking @ 100 /1000 sq. ft.
Fast Food	35 cfm/person @66 /1000 sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 66/1000 sq. ft.	30 cfm/person @ 100 /1000 sq. ft.	35 cfm/person smoking and 7 cfm non-smoking @ 100 /1000 sq. ft.
Dining Rooms	35 cfm/person @ 66 /1000 sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 66/1000 sq. ft.	10 cfm/person @ 70 /1000 sq. ft.	35 cfm/person smoking and 7 cfm non-smoking @ 70 /1000 sq. ft.
Kitchens	30 cfm/person ²		5 cfm/occupant outside air with total 15 cfm/occupant @ 5/1000 sq. ft.	30 cfm/person @ 20 /1000 sq. ft. Exhaust to outside and control source as required	10 cfm/person @ 20 /1000 sq. ft.
Baths/Toilet Rooms	75 cfm/water closet or urinal for public and 50 for non-public	2 cfm/sq. ft. floor area or provide natural ventilation or approved air treatment	4 ach exhaust system	15 cfm/person @ 100 /1000 sq. ft.	75 cfm/stall or urinal

ASHRAE 62-1989 4	Massachusetts	New York	South Florida	Wisconsin	Comments
30 cfm/person @ 100/1000 sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁵ of at least 2 ach with at least 10 cfm/occupant of outside air. Occupant load varies from 7 sq. ft./person for concentrated use without fixed seats to 15 sq. ft./person for less concentrated use. For those with fixed seats use number of installed seats	See Appendix 3A for applicable code provisions	1 Recirculate \leq 67% except \leq 85% with effective absorption/filtration but \geq 5 cfm/person outside air.
20 cfm/person @ 100/1000 sq. ft.					2 Recirculate up to 85% of required ventilation air
20 cfm/person @ 100/1000 sq. ft.					3 Recirculate \leq 67% except more allowed based on absorption/filtration efficiency but \geq 5 cfm/person outside air
20 cfm/person @ 70/1000 sq. ft.					4 Outside air recirculation shown based on air quantity procedure
15 cfm/person @ 20/1000 sq. ft.					5 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised
50 cfm/water closet or urinal			20 ach when not air conditioned and 8 ach when air conditioned		

Required Minimum Ventilation Air Quantities for Public Facilities	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 4
Assembly Rooms	35 cfm/person ²	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system	5 cfm/occupant outside air with total 15 cfm/occupant ³	15 cfm/person @140/1000 sq. ft.	35 cfm/person-smoking and 7 nonsmoking @ 120/1000 sq. ft.
Ballrooms	35 cfm/person ²		5 cfm/occupant outside air with total 15 cfm/occupant ³	15 cfm/person @ 100/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 100/1000 sq. ft.
Casinos	35 cfm/person ²		5 cfm/occupant outside air with total 15 cfm/occupant ³	Not specifically addressed	35 cfm/person smoking and 7 nonsmoking @ 120/1000 sq. ft.
Conference Rooms	35 cfm/person ²		5 cfm/occupant outside air with total 15 cfm/occupant ³	20 cfm/person @ 70/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 50/1000 sq. ft.
Lobbies	15 cfm/person ²		5 cfm/occupant outside air with total 15 cfm/occupant ³	20 cfm/person @ 150/1000 sq. ft. for theaters. 7 cfm/person @ 30/1000 sq. ft. in hotels, motels & resorts	15 cfm/person smoking and 5 nonsmoking @ 30/1000 sq. ft.
Baths/Toilet Rooms	75 cfm/water closet or urinal for public and 50 cfm for non-public. Recirculate up to 85% of required ventilation air	2 cfm/sq. ft. floor area or provide-natural ventilation or approved air treatment	4 ach exhaust system	15 cfm/person @ 100/1000 sq. ft.	75 cfm/stall or urinal

ASHRAE 62-1989 5	Massachusetts	New York	South Florida	Wisconsin	Comments
15 cfm/person @ 120/1000 sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁶ of at least 2 ach with at least 10 cfm/occupant of outside air. Occupant load varies from 7 sq. ft./person for concentrated use without fixed seats to 15 sq. ft./person for less concentrated use. For those with fixed seats use number of installed seats. 20 ach when not air conditioned and 8 ach when air conditioned	See Appendix 3A for applicable code provisions	1 Recirculate \leq 67% except \leq 85% with effective absorption/filtration but \geq 5 cfm/person outside air
25 cfm/person @ 100/1000 sq. ft.					2 @ 143/1000 sq. ft. for concentrated with only nonfixed chairs, 333/1000 sq. ft. for standing space, and 66/1000 sq. ft. for un-concentrated (tables and chairs). For fixed seats base on seating capacity
30 cfm/person @ 120/1000 sq. ft.					3 @ 143/1000 sq. ft. for concentrated use without fixed seats, 333/1000 sq. ft. for waiting areas, and 66/1000 sq. ft. for less concentrated use
20 cfm/person @ 50/1000 sq. ft.					4 Recirculate \leq 67% except more allowed based on absorption/filtration efficiency but \geq 5 cfm/person outside air
15 cfm/person @ 30/1000 sq. ft.					5 Outside air. Recirculation allowed based on air quality procedure
50 cfm/water closet or urinal					6 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised

**Required Minimum Ventilation
Air Quantities for Sports and
Amusement Facilities**

	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 3
Billiard and Game Rooms	35 cfm/person	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system	5 cfm/occupant outside air with total 15 cfm/occupant @ 66/1000 sq. ft.	20 cfm/person @ 25/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 70/1000 sq. ft.
Bowling Alleys (Seating Area)	35 cfm/person @ 5 people/alley and 15 ft. runway and 143/1000 sq. ft. for other areas		5 cfm/occupant outside air with total 15 cfm/occupant @ 5 people/alley and 15 ft. runway	15 cfm/person (seating area @ 70/1000 sq. ft.)	35 cfm/person smoking and 7 nonsmoking @ 70/1000 sq. ft.
Playing Floors, Gyms, and Ice Arenas	20 cfm/person		5 cfm/occupant outside air with total 15 cfm/occupant @ 66/1000 sq. ft. assume 50 on skating area	10 cfm/person @ 70/1000 sq. ft. except 20 cfm/person for playing floors	20 cfm/person @ 30/1000 sq. ft.
Ramps, Foyers, and Lobbies	10 cfm/person		5 cfm/occupant outside air with total 15 cfm/occupant @ 143/1000 sq. ft.	10 cfm/person @ 150/1000 sq. ft.	Not specifically addressed
Spectator Area	35 cfm/person ²		5 cfm/occupant outside air with total 15 cfm/occupant total @ 143/1000 sq. ft.	20 cfm/person @ 150/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 150/1000 sq. ft.

(continued)

ASHRAE 62-1989 4	Massachusetts	New York	South Florida	Wisconsin	Comments
25 cfm/person @ 70/1000 sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with < 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁵ of at least 2 ach with at least 10 cfm/occupant of outside air. Occupant load varies from 7 sq. ft./person for concentrated use without fixed seats to 15 sq. ft./person for less concentrated use. For those with fixed seats use number of installed seats	See Appendix 3A for applicable code provisions	1 Recirculate \leq 67% except \leq 85% with effective absorption/filtration but \geq 5 cfm/person outside air.
25 cfm/person @ 70/1000 sq. ft.					2 @ 143/1000 sq. ft. for concentrated with only nonfixed chairs, 33/1000 sq. ft. for standing space, and 66/1000 sq. ft. for unconcentrated (tables and chairs). For fixed seats base on seating capacity
0.5 cfm/sq. ft. For ice arenas 20 cfm/person @ 30/ 1000 sq. ft. for others					3 Recirculate \leq 67% except more allowed based on absorption/filtration efficiency but \geq 5 cfm/person outside air
Not specifically addressed					4 Outside air. Recirculation allowed based on air quality procedures
15 cfm/person @ 150/1000 sq. ft.					5 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised

**Required Minimum Ventilation Air
Quantities for Sports and Amuse-
ment Facilities (Continued)**

	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 2
Swimming Pools and Deck Areas	0.5 cfm/sq. ft. with all return air exhausted to outside	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system.	5 cfm/occupant outside air with total 15 cfm/occupant @ 50 in pool and 15 on deck	15 cfm/person @ 25/1000 sq. ft.	0.5 cfm/sq. ft.
Indoor Courts	20 cfm/person		5 cfm/occupant outside air with total 15 cfm/occupant @ 100/1000 sq. ft.	20 cfm/person	20 cfm/person @ 30/1000 sq. ft.

ASHRAE 62-1989 3	Massachusetts	New York	South Florida	Wisconsin	Comments
0.5 cfm/ sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with < 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁴ of at least 2 ach with at least 10 cfm/occupant of outside air. Occupant load varies from 7 sq. ft./ person for concentrated use without fixed seats to 15 sq. ft./person for less concentrated use. For those with fixed seats use number of installed seats	See Appendix 3A for applicable code provisions	1 Recirculate \leq 67% except \leq 85% with effective absorption/filtration but \geq 5 cfm/person outside air
20 cfm/person @ 30/1000 sq. ft.					2 Recirculate \leq 67% except more allowed based on absorption/filtration efficiency but \geq 5 cfm/person outside air
					3 Outside air. Recirculation allowed based on air quality procedure
					4 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised

Required Minimum Ventilation Air Quantities for Theaters	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 2
Auditoriums	35 cfm/person based on number of fixed seats	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system	5 cfm/occupant outside air with total 15 cfm/occupant based on number of fixed seats	5 cfm/person @ 150/1000 sq. ft. except 10 cfm where smoking allowed	35 cfm/person smoking and 7 nonsmoking @ 150/1000 sq. ft.
Lobbies, Foyers, and Lounges	35 cfm/person @ 333/1000 sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 333/1000 sq. ft.	20 cfm/person @ 150/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 150/1000 sq. ft.
Projection Booths	20 cfm/person with return air exhausted		5 cfm/occupant outside air with total 15 cfm/occupant total	Not addressed	Not addressed
Stages	10 cfm/person		5 cfm/occupant outside air with total 15 cfm/occupant	10 cfm/person @ 70/1000 sq. ft.	10 cfm/person @ 70/1000 sq. ft.
TV and Movie Studios	10 cfm/person		5 cfm/occupant outside air with total 15 cfm/occupant	30 cfm/person @ 20/1000 sq. ft.	10 cfm/person @ 70/1000 sq. ft.
Ticket Booths	20 cfm/person		5 cfm/occupant outside air with total 15 cfm/occupant	5 cfm/person	20 cfm/person smoking and 5 nonsmoking

ASHRAE 62-1989 3	Massachusetts	New York	South Florida	Wisconsin	Comments
15 cfm/person @ 150/1000 sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁴ of at least 2 ach with at least 10 cfm/occupant of outside air. Occupant load varies from 7 sq. ft./person for concentrated use without fixed seats to 15 sq. ft./person for less concentrated use. For those with fixed seats use number of installed seats	See Appendix 3A for applicable code provisions	1 Recirculate \leq 67% except \leq 85% with effective absorption/filtering but \geq 5 cfm/person outside air
20 cfm/person @ 150/1000 sq. ft.					2 Recirculate \leq 67% except more allowed based on absorption/filtration efficiency but \geq 5 cfm/person outside air
Not addressed					3 Outside air. Recirculation allowed based on air quality procedures
15 cfm/person @ 70/1000 sq. ft.					4 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised
20 cfm/person @ 60/1000 sq. ft.					

**Required Minimum Ventilation
Air Quantities For Offices**

	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 2
Conference Rooms	35 cfm/person @ 10/1000 gross sq. ft.	Provide mechanical ventilation at least equal to require- ments for natural ventilation or an approved air circulation and treatment system	5 cfm/occupant outside air with total 15 cfm/occupant @ 10/1000 sq. ft.	25 cfm/person @ 60/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 60/1000 sq. ft.
Duplicating and Printing Rooms	0.5 cfm/sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 10/1000 sq. ft.	7 cfm/person @ 20/1000 sq. ft.	0.5 cfm/sq. ft.
Office Space	20 cfm/person @ 10/1000 gross sq.ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 10/1000 sq. ft.	15 cfm/person @ 10/1000 sq. ft.	20 cfm/person smoking and 5 nonsmoking @ 7/1000 sq. ft.
Waiting Rooms	35 cfm/person @ 10/1000 gross sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 10/1000 sq. ft.	10 cfm/person @ 30/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 60/1000 sq. ft.
Banks	20 cfm/person @ 10/1000 gross sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 10/1000 sq. ft.	15 cfm/person @ 10/1000 sq. ft.	Not specifically addressed
Bank Vaults	5 cfm/person @ 10/1000 gross sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 10/1000 sq. ft.	5 cfm/person	5 cfm/person @ 10/1000 sq. ft.
Computer Rooms	Not specifically addressed		5 cfm/occupant outside air with total 15 cfm/occupant @ 10/1000 sq. ft.	5 cfm/person @ 20/1000 sq. ft.	Not specifically addressed

ASHRAE 62-1989 3	Massachusetts	New York	South Florida 3	Wisconsin	Comments
20 cfm/person @ 50/1000 sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with < 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages. Also requires > 10 cfm/person outdoor air in office buildings	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁴ of at least 2 ach with at least 10 cfm/occupant of outside air. Occupant load for office space is 100 sq. ft./person. For other areas of assembly see public facilities	See Appendix 3A for applicable code provisions	1 Recirculate $\leq 67\%$ except $\leq 85\%$ with effective absorption/filtration but ≥ 5 cfm/person outside air
0.5 cfm/sq. ft.					2 Recirculate $\leq 67\%$ except more allowed based on absorption/filtration efficiency but ≥ 5 cfm/person outside air
20 cfm/person @ 7/1000 sq. ft.					3 Outside air. Recirculation allowed based on air quality procedure
15 cfm/person @ 60/1000 sq. ft.					4 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised
Not specifically addressed					
15 cfm/person @ 5/1000 sq. ft.					
20 cfm/person @ 60/1000 sq. ft.					

Required Minimum Ventilation Air Quantities for Schools	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 4
Auditorium	35 cfm/person ²	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system.	5 cfm/occupant outside air with total ³ 15 cfm/occupant	5 cfm/person @ 150/1000 sq. ft.	Not specifically addressed
Classroom	25 cfm/person @ 50/1000 sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 50/1000 sq. ft.	10 cfm/person @ 50/1000 sq. ft.	25 cfm/person smoking and 5 nonsmoking @ 50/1000 sq. ft.
Gymnasium	20 cfm/person ²		5 cfm/occupant outside air with total 15 cfm/occupant @ 66/1000 sq. ft.	20 cfm/person @ 70/1000 sq. ft.	20 cfm/person @ 30/1000 sq. ft.
Laboratories	10 cfm/person @ 20/1000 sq. ft. net		5 cfm/occupant outside air with total 15 cfm/occupant @ 10/1000 sq. ft. net	10 cfm/person @ 30/1000 sq. ft.	10 cfm/person @ 30/1000 sq. ft.
Libraries	7 cfm/person @ 20/1000 sq. ft. net reading and 10/1000 sq. ft. gross stacks		5 cfm/occupant outside air with total 15 cfm/occupant @ 20/1000 sq. ft. reading and 10/1000 sq. ft. stacks	7 cfm/person @ 20/1000 sq. ft.	5 cfm/person @ 20/1000 sq. ft.
(continued)					

ASHRAE 62-1989 5	Massachusetts	New York	South Florida	Wisconsin	Comments
15 cfm/person @ 150/1000 sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with < 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages. Also requires > 10 cfm/person outside air in schools	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁶ of at least 2 ach with at least 10 cfm/occupant of outside air. For classrooms, lecture rooms, gymnasias, or cafeterias > 50 people occupant load varies from 7 sq. ft./person for concentrated use without fixed seats to 15 sq. ft./person for less concentrated use. For those with fixed seats use number of installed seats. For others use 20 sq. ft. net/person classroom and 50 sq. ft. net/person shops, labs, and similar vocational rooms.	See Appendix 3A for applicable code provisions	1 Recirculate \leq 67% except \leq 85% with effective absorption or filtering but \geq 5 cfm/person outside air
15 cfm/person @ 50/1000 sq. ft.					2 @ 143/1000 sq. ft. for concentrated use with only nonfixed chairs, 333/1000 sq. ft. for standing space, and 66/1000 sq. ft. for unconcentrated use (tables and chairs). For fixed seats base on seating capacity
20 cfm/person @ 30/1000 sq. ft.					3 @ 143/1000 sq. ft. for concentrated use without fixed seats, 333/1000 sq. ft. for waiting areas, and 66/1000 sq. ft. for less concentrated use
20 cfm/person @ 30/1000 sq. ft.					4 Recirculate \leq 67% except more allowed based on absorption/filtration efficiency but \geq 5 cfm/person outside air
15 cfm/person @ 20/1000 sq. ft.					5 Outside air. Recirculation allowed based on air quality procedure
					6 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised

Required Minimum Ventilation Air Quantities for Schools (Continued)	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 3
Lunchroom/Dining	35 cfm/person ²	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system.	5 cfm/occupant outside air with total 15 cfm/occupant @ 66/1000 sq. ft.	10 cfm/person @ 100/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 100/1000 sq. ft.
Music Room	35 cfm/person @ 20/1000 sq. ft. net		5 cfm/occupant outside air with total 15 cfm/occupant @ 20/1000 sq. ft.	10 cfm/person @ 70/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 50/1000 sq. ft.
Training Shop	35 cfm/person @ 20/1000 sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 20/1000 sq. ft.	10 cfm/person @ 30/1000 sq. ft.	35 cfm/person smoking and 7 nonsmoking @ 30/1000 sq. ft.
Multiple Use Room	Not specifically addressed		5 cfm/sq. ft. outside air with total 15 cfm/sq. ft. @ 10/1000 sq. ft.	10 cfm/person @ 70/1000 sq. ft.	Not specifically addressed
Baths and Toilet Rooms	75 cfm/water closet or urinal	2 cfm/sq. ft. floor area or provide natural ventilation or approved air treatment	4 ach exhaust system	15 cfm/person @ 100/1000 sq. ft.	75 cfm/stall or urinal

ASHRAE 62-1989 4	Massachusetts	New York	South Florida	Wisconsin	Comments
20 cfm/person @ 100/1000 sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with < 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages. Also required > 10 cfm/person outdoor air in schools	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁵ of at least 2 ach with at least 10 cfm/occupant outside air. For classrooms, gymnasias, or cafeterias > 50 people, occupant load varies from 7 sq. ft./person for concentrated use without fixed seats to 15 sq. ft./person for less concentrated use. For fixed seats use number of installed seats. For others use 20 sq. ft. net/person classroom and 50 sq. ft. net/person shops, labs, and similar vocational rooms	See Appendix 3A for applicable code provisions	1 Recirculate ≤ 67% except ≤ 85% with effective absorption/filtration but ≥ 5 cfm/person outside air
15 cfm/persons @ 50/1000 sq. ft.					2 @ 143/1000 sq. ft. for concentrated use with only nonfixed chairs, 333/1000 sq. ft. for standing space, and 66/1000 sq. ft. for unconcentrated use (tables and chairs). For fixed seats base on seating capacity
20 cfm/person @ 30/1000 sq. ft.					3 Recirculate ≤ 67% except more allowed based on absorption/filtration efficiency but ≥ 5 cfm/person outside air
Not specifically addressed					4 Outside air. Recirculation allowed based on air quality procedure
50 cfm/water closet or urinal					5 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised

Required Minimum Ventilation Air Quantities for Institutional	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 2
Correctional Facility Bedrooms	30 cfm/room	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system	5 cfm/occupant outside air with total 15 cfm/1000 @ 10/1000 sq. ft.	7 cfm/person @ 20/1000 sq. ft.	30 cfm/person smoking and 15 nonsmoking @ 5/1000 sq. ft.
Correctional Facility Day Rooms, Activity Spaces	1 ach		5 cfm/occupant outside air with total 15 cfm/1000 @ 66/1000 sq. ft.	15 cfm/person @ 70/1000 sq. ft. (eating halls)	50 cfm/person smoking and 25 nonsmoking @ 20/1000 sq. ft.
Group Home Bedrooms	30 cfm/room		5 cfm/occupant outside air with total 15 cfm/1000 @ 12/1000 sq. ft.	10 cfm/person @ 15/1000 sq. ft.	35 cfm/bed smoking and 7 non-smoking @ 10/1000 sq. ft.
Group Home Living Areas	50 cfm/room		5 cfm/occupant outside air with total 15 cfm/1000 @ 12/1000 sq. ft.	5 cfm/person @ 7/1000 sq. ft.	10 cfm/room
Group Home Kitchens	30 cfm/person		5 cfm/occupant outside air with total 15 cfm/1000 @ 5/1000 sq. ft.	30 cfm/person @ 20/1000 sq. ft.	10 cfm/person @ 20/1000 sq. ft.

ASHRAE 62-1989 3	Massachusetts	New York	South Florida	Wisconsin	Comments
20 cfm/person @ 20/1000 sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with < 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages. When for enforced detention indirect ventilation openings to street or court may be through intermediate corridors or other approved means	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁴ of at least 2 ach with at least 10 cfm/occupant of outside air. Base on occupant load of 120 sq. ft./person in sleeping areas	See Appendix 3A for applicable code provisions	1 Recirculate \leq 67% except \leq 85% with effective absorption/filtration but \geq 5 cfm/person outside air
15 cfm/person @ 100/1000 sq. ft. (dining halls)					2 Recirculate \leq 67% except more allowed based on absorption/filtration efficiency but \geq 5 cfm/person outside air
25 cfm/person @ 10/1000 sq. ft.					3 Outside air. Recirculation allowed based on air quality procedure.
30 cfm/room					4 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised
15 cfm/person @ 20/1000 sq. ft.					

Required Minimum Ventilation Air Quantities for Hospitals, Nursing and Convalescent Homes

	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 2
Autopsy Rooms	12 ach exhaust return air outside	Provide mechanical ventilation at least equal to require- ments for natural ventilation or an approved air circulation and treatment system	5 cfm/occupant outside air with total 15 cfm/occupant @ 12/1000 sq. ft.	30 cfm/person @ 10/1000 sq. ft.	100 cfm/person @ 20/1000 sq. ft.
Delivery Rooms and Trauma Rooms	15 ach		20 cfm/person	40 cfm/person @ 20/1000 sq. ft.	
Laboratories	6 ach		15 cfm/person @ 50/1000 sq. ft.	10 cfm/person @ 30/1000 sq. ft.	
Operating Rooms	20 ach		20 cfm/person	40 cfm/person @ 20/1000 sq. ft.	
Patient Rooms	2 ach		10 cfm/person @ 15/1000 sq. ft.	35 cfm/bed smok- ing and 7 nonsmok- ing @ 10/1000 sq. ft.	
Pharmacy, Medication Rooms	4 ach		Not addressed	Not addressed	
Physical Therapy Areas and Treatment Rooms	6 ach		15 cfm/person @ 20/1000 sq. ft.	15 cfm/person @ 20/1000 sq. ft.	
Recovery and Intensive Care Rooms	6 ach		15 cfm/person	15 cfm/person @ 20/1000 sq. ft.	
Soiled Utility Rooms and Janitor Closets	10 ach		Not addressed	Not addressed	

ASHRAE 62-1989 3	Massachusetts	New York	South Florida	Wisconsin	Comments
0.5 cfm/sq. ft. without circulation	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with < 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-19 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁴ of at least 2 ach with at least 10 cfm/occupant of outside air. Base on occupant load of 120 sq. ft./person in sleeping rooms	See Appendix 3A for applicable code provisions	1 Recirculate $\leq 67\%$ except $\leq 85\%$ with effective absorption or filtering but ≥ 5 cfm/person outside air.
Not addressed					2 Recirculate $\leq 67\%$ except more allowed based on absorption or filtration efficiency but ≥ 5 cfm/person outside air
20 cfm/person @ 30/1000 sq. ft.					3 Outside air. Recirculation allowed based on air quality procedure
30 cfm/person @ 20/1000 sq. ft.					4 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised
25 cfm/person @ 10/1000 sq. ft.					
Not addressed					
15 cfm/person @ 20/1000 sq. ft.					
> 15 cfm/person @ 20/1000 sq. ft.					
Not addressed					

**Required Minimum Ventilation
Air Quantities for Mercantile
Occupancies**

	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 6
Sales Floors and Showrooms	25 cfm/person ²	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system	5 cfm/occupant outside air with total ² 15 cfm/occupant	7 cfm/person ⁵	25 cfm/person smoking and 5 nonsmoking ⁵
Dressing Rooms	25 cfm/person ²		5 cfm/occupant outside air with total ² 15 cfm/occupant	7 cfm/person	25 cfm/person smoking and 5 nonsmoking
Malls	10 cfm/person ³		5 cfm/occupant outside air with total ⁴ 15 cfm/occupant	7 cfm/person @ 40/1000 sq. ft.	10 cfm/person smoking and 5 nonsmoking @ 20/1000 sq. ft.
Shipping Area	15 cfm/person @ 3.3/1000 sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 3.3/1000 sq. ft.	15 cfm/person @ 10/1000 sq. ft.	10 cfm/person smoking and 5 nonsmoking @ 10/1000 sq. ft.
Storage Area	25 cfm/person @ 3.3/1000 sq. ft.		5 cfm/occupant outside air with total 15 cfm/occupant @ 3.3/1000 sq. ft.	5 cfm/person @ 5/1000 sq. ft.	25 cfm/person smoking and 5 nonsmoking @ 15/1000 sq. ft.
(continued)					

ASHRAE 62-1989 7	Massachusetts	New York	South Florida	Wisconsin	Comments
0.30 cfm/sq. ft. basement and street levels and 0.20 cfm/sq. ft. upper floors	Adopts 1987 NMC which has not been changed for these uses by the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with < 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁸ of at least 2 ach with at least 10 cfm/occupant of outside air. Base on 30 gross sq. ft./person for street floor and basement sales areas. See Appendix 3B for other occupancy provisions	See Appendix 3A for applicable code provisions	1 Recirculate $\leq 67\%$ except $\leq 85\%$ with effective absorption/filtration but ≥ 5 cfm/person outside air
0.20 cfm/sq. ft.					2 @ 33.3/1000 sq. ft. for basement and ground grade floor and 16.6 for upper floors
0.20 cfm/sq. ft.					3 (0.00007 X gross leaseable area in sq. ft. except anchor stores) + 25) = sq. ft./person. To be ≥ 30 but ≤ 50
0.15 cfm/sq. ft.					4 @ 33.3/1000 sq. ft. gross $\leq 150,000$, 25/1000 sq. ft. gross for $\leq 350,000$, and 20/1000 sq. ft. gross for 350,000. Do not count anchor stores in gross leasable area
0.15 cfm/sq. ft.					5 @ 30/1000 sq. ft. for basement and ground floor and 20 for upper floors
					6 Recirculate $\leq 67\%$ except more allowed based on absorption or filtration efficiency but ≥ 5 cfm/person outside air
					7 Outside air. Recirculation allowed based on air quality procedure
					8 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised

**Required Ventilation Air
Quantities for Mercantile
Occupancies (Continued)**

	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 3
Warehouse	10 cfm/person @ 3.3/1000 sq. ft.	Provide mechanical ventilation at least equal to require- ments for natural ventilation or an approved air circulation and treatment system	5 cfm/occupant outside air with total 15 cfm/occupant @ 2/1000 sq. ft.	7 cfm/person @ 5/ 1000 sq. ft.	10 cfm/person smoking and 5 nonsmoking @ 5/ 1000 sq. ft.
Pet Shops	1 cfm/sq. ft.		5 cfm/occupant outside air with total ² 15 cfm/occu- pant	1 cfm/sq. ft.	1 cfm/sq. ft.
Florists	25 cfm/person @		5 cfm/occupant outside air with total ² 15 cfm/occu- pant	5 cfm/person @ 10/1000 sq. ft.	25 cfm/person smoking and 5 nonsmoking @ 10/ 1000 sq. ft.
Supermarkets and Meat Processing	5 cfm/person @		5 cfm/occupant outside air with total ² 15 cfm/occu- pant	5 cfm/person @ 10/1000 sq. ft.	5 cfm/person @ 10/1000 sq. ft.

ASHRAE 62-1989 4	Massachusetts	New York	South Florida	Wisconsin	Comments
0.05 cfm/sq. ft.	Adopts 1987 NMC which has not been changed for these uses in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided with < 75% recirculated. Cannot recirculate air supplied to kitchens, lavatories, toilet rooms, bathrooms, restrooms, laboratories, and garages	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	Satisfy natural ventilation provisions or provide mechanical ventilation ⁵ of at least 2 ach with at least 10 cfm/occupant of outside air. See Appendix 3B for occupancy provisions	See Appendix 3A for applicable code provisions	1 Recirculate \leq 67% except \leq 85% with effective absorption/filtration but \geq 5 cfm/person outside air
1 cfm/sq. ft.					2 @ 33.3/1000 sq. ft. for basement and ground (grade) floor and 16.6 for upper floors
15 cfm/person @ 8/1000 sq. ft.					3 Recirculate \leq 67% except more allowed based on absorption/filtration efficiency but \geq 5 cfm/person outside air
15 cfm/person @ 8/1000 sq. ft. for supermarket and 10/1000 sq. ft. for meat processing					4 Outside air. Recirculation allowed based on air quality procedure
					5 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised

Required Ventilation Air Quantities for Hotels, Motels, Resorts, and Dormitories

	NBC/NMC 1	SBC	UBC	ASHRAE 62-1973 1	ASHRAE 62-1981 2
Bedrooms (Single and Double)	30 cfm/room	Provide mechanical ventilation at least equal to requirements for natural ventilation or an approved air circulation and treatment system	2 ach total with 0.4 ach as outside air	7 cfm/person @ 5/1000 sq. ft.	30 cfm/person smoking and 15 nonsmoking @ 5/1000 sq. ft.
Living Rooms (Suites)	50 cfm/room		2 ach total with 0.4 ach as outside air	10 cfm/person @ 20/1000 sq. ft.	50 cfm/person smoking and 25 nonsmoking @ 20/1000 sq. ft.
Bathrooms (Public)	75 cfm/water closet or urinal and < 85 recirculation		4 ach exhaust to outside	15 cfm/person @ 100/1000 sq. ft.	75 cfm/stall or urinal
Bathrooms (Non-public)	50 cfm/water closet or urinal		5 ach connected to outside	20 cfm/person	50 cfm/room
Exits and Corridors	0.02 cfm/sq. ft.		2 ach total with 0.4 ach as outside air	5 cfm/person @ 5/1000 sq. ft.	0.02 cfm/sq. ft.
Elevators	15 cfm/person		Not addressed	7 cfm/person	15 cfm
Dormitory Sleeping Areas	30 cfm/room		2 ach total with 0.4 ach as outside air	7 cfm/person @ 20/1000 sq. ft.	30 cfm/person smoking and 15 nonsmoking @ 5/1000 sq. ft.

ASHRAE 62-1989 3	Massachusetts	New York	South Florida	Wisconsin	Comments
30 cfm/room	Adopts 1987 NMC which has not been changed for these used in the 1990 edition. Glazed areas of windows and exterior doors in habitable rooms need not be openable when mechanical ventilation at 2 ach provided. For bath and toilet rooms provide 12 ach without recirculation	State uniform fire prevention and building code allows mechanical ventilation providing outdoor air or an outdoor air and recirculated air mixture in accordance with the state energy code. The state energy code refers to generally accepted standards which are considered as ASHRAE 62-1989 by the New York State Energy Office. Note kitchens need not have windows and may therefore be required to have mechanical exhaust ventilation	For other than required exits and emergency egress openings mechanical ventilation ⁴ can be provided in lieu of openable glazed areas. Such mechanical ventilation must be capable of producing 2 ach except 5 ach in bathrooms, water closet compartments, and similar rooms	See Appendix 3A for applicable code provisions	1 Recirculate $\leq 67\%$ except $\leq 85\%$ with effective absorption/filtration but ≥ 5 cfm/person outside air
30 cfm/room					2 Recirculate $\leq 67\%$ except more allowed based on absorption/filtration efficiency but ≥ 5 cfm/person outside air
50 cfm/water closet or urinal					3 Outside air. Recirculation allowed based on air quality procedure
35 cfm/room					4 Defined as forced outside air supply or air conditioning. Air conditioned spaces must be provided with outside air per ASHRAE standards and Florida Energy Code which references ASHRAE Standard 62 revised
0.05 cfm/sq. ft.					
1 cfm/sq. ft.					
15 cfm/person @ 20/1000 sq. ft.					

Appendix 3A

Wisconsin

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

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

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

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

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

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

1. Spot heating.
2. Buildings where the requirement for outside air is waived in accordance with § ILHR 64.05(2)(b).
3. Buildings utilizing percentage of openings as specified in § ILHR 64.05, Table 1.

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

(5) Recirculation and transfer of air. (a) Recirculation. No air contaminated by any source other than human occupancy shall be recirculated, except within the same ventilation classification.

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

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

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

(a) Outdoor openings located below grade. Outdoor openings below grade will not be accepted unless there is a clear space outside of the opening having a width not less than 1-1/2 times the distance below grade at the bottom of the opening.

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

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

Part III--Ventilation and Air Standards

ILHR 64.11 Ventilation and air standards. The quantity of air used to ventilate a given space during periods of occupancy shall always be sufficient to maintain the standards of air distribution, air movement, recirculation, 64.12 to 64.19.

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

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

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

(4) "Tempered air." Air transferred from a heated or cooled before distribution.

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

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

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

(2) Tempered Air Supply Depending on Negative Pressure. A supply of tempered air, depending on a negative pressure within the space, will be permitted in foundries, steel fabricating shops and similar areas.

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

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

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

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

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

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

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

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

(3) Air-Cleansing Materials. Contaminated water shall not be used or recirculated through sprays affecting air used for ventilating purposes.

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

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

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

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

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.

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

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

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

PART VIII--Occupancy Requirements

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

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

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

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

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

ILHR 64.05 Table 1

Ventilation Requirements¹

Basis of Capacity

Use or Occupancy	Minimum Inside Temp. ² °F	Ventilation Classification ²	Determination of # of Persons ³ Net sq. ft/person	% of Openings ⁴	CFM/net sq.ft. Floor Area	Applicable Occupancy Code § ILHR #
<u>Factories, office and mercantile buildings</u>						
Barber and beauty salons	67	(b)	20	3	--	64.54
(where hair spray is used)	67	(d)	20	--	--	64.18
Canning factories	60	(b)	75	3	--	64.54, 64.68
Conference rooms	67	(b)	7	3	--	64.54
Court rooms	67	(b)	6	3	--	64.54
Factories and machine shops	60	(b)	75	3	--	64.54
First aid rooms	67	(b)	6	3	--	64.54
Flammable liquids storage	NMR	(d)	--	--	--	64.18
Foundries and boiler shops	50	(b)	75	3	--	64.13, 64.54
<u>Funeral homes:</u>						
Chapel	67	(b)	6	3	--	64.54
Embalming room	67	(d)	--	--	2	64.54
Offices	67	(b)	75	3	--	64.54
<u>Places of worship, entertainment and recreation (accommodate less than 100 persons)</u>						
	*	(b)	*	3	--	64.54
Printing establishments	60	(b)	--	3	--	64.18, 64.54
Retail establishments (basement)	65	(b)	40	3	--	64.54
(other floors)	65	(b)	60	3	--	64.54
Shopping malls corridor areas (except mercantile areas)	NMR	(g)	Aggregate capacity of stores served by mall	--	--	64.54
Security vaults (occupied)	65	(a)	300	--	--	64.54
Warehouses	NMR	--	--	--	--	64.18, 64.54
<u>Theaters and places of assembly (which) accommodate more than 100 persons</u>						
<u>Arenas and field houses</u>						
(use seated area)	60	(a)	6	--	--	64.55
Armory drill floors	55	(b)	30	3	--	64.55
Assembly halls (other than church)	67	(a)	6	--	--	64.55
Bowling alleys	67	(a)	15	--	--	Based on occ. areas
Cafeterias, dining areas, restaurants						
billiard rooms	67	(a)	15	--	--	64.55
<u>Churches and places of worship</u>						
Chapels	67	(b)	6	3	--	64.55 (3)
Dining and social rooms	67	(b)	15	3	--	64.55 (3)
Nave or auditorium	67	(b)	6	3	--	64.55 (3)
Sunday school rooms	67	(b)	20	3	--	64.55 (3)

Club rooms (seated)	67	(a)	6	--	--	64.55
(unseated)	67	(a)	15	--	--	64.55
Dance halls	67	(a)	15	--	--	64.55
Ice skating rinks (indoor)	NMR	(a)	15	--	--	64.55
Ice resurfacing (indoor)	NMR	(d)	--	--	--	64.18, 64.55
Lodge halls	65	(a)	15	--	--	64.55
Roller skating rinks (indoor)	50	(a)	15	--	--	64.55
Taverns	67	(a)	20	--	--	64.55
Tennis courts (indoor)	60	(a)	--	--	--	64.55
Theaters	67	(a)	6	--	--	64.55
Lobbies	65	(a)	15	--	--	64.55
Lounge rooms	67	(a)	15	--	--	64.55
Motion picture booths	60	(a) or (c)	--	--	2	64.55 (5)
<u>Health Care Facilities</u> See ILHR 64.57						
<u>Schools and other places of instruction</u>						
Administrative office space	67	(b)	75	3	--	64.56
Arts, crafts, drafting rooms	67	(a)	30	--	--	64.56
Classrooms	67	(a)	20	--	--	64.56
<u>Gymnasiums, field houses, auditoriums,</u>						
theaters (fixed seats)	67	(a)	6	--	--	64.56
Bleachers	--	(a)	2.75 or 8"/LF	--	--	64.56
Locker and shower rooms	70	(c) or (d)	--	--	2	64.65
<u>Gymnasiums, field houses, auditoriums</u>						
theaters (nonseated areas)	56	(a)	75	--	--	64.56
Home economics	67	(a)	30	--	--	64.56
Cooking	67	(d)	--	--	200/CA	64.67
Kitchens	60	(c) or (d)	--	--	2	64.67
Laboratories (science)	67	(a)	6	--	--	64.56
Lecture halls	67	(a)	6	--	--	64.56
Library and resource centers	67	(a)	20	--	--	64.56
Reading rooms	67	(a)	20	--	--	64.56
Stack areas	67	(a) or (d)	100	--	1/4	64.56
Lunchrooms	65	(a)	10	--	--	64.56
Museums and art galleries	67	(a)	40	--	--	64.56
Music rooms (instrumental)	67	(a)	20	--	--	64.56
(vocal)	67	(a)	10	--	--	64.56
Special education	67	(a)	35	--	--	64.56
<u>Study halls, common areas with nonfixed seating</u>						
Toilet rooms	65	(d)	--	--	2 or 60/TF	64.56
<u>Vocational shops:</u>						
with vehicle service and repair	60	(c) or (d)	--	--	1/4	64.18
without vehicle service and repair	60	(a)	50	--	--	64.18
Wardrobes	NMR	(d)	--	--	2	64.65

<u>Detention and correctional facilities</u>						
Sleeping rooms	67	(b)	--	4	--	64.58
<u>Residential occupancies</u>						
Living and sleeping areas	67	(f)	--	4	--	64.59
Day care facilities	67	(b)	35	4	--	64.60
<u>Garages and service stations</u>						
Automobile showrooms:						
Less than 6 vehicles	60	(b)	--	1	--	64.64
6 more vehicles	60	(c) or (d)	--	--	1/2	64.64
Garages: less than 6 vehicles	NMR	(b)	--	3	--	64.62, 64.63
Garages: 6 or more vehicles	NMR	(c) or (d)	--	--	1/2	64.63
Repair areas	60	(c) or (d)	--	--	1/4	64.61
Vehicle service buildings	60	(c) or (d)	--	--	1/2	64.62
<u>General sanitation and service areas</u>						
Chlorine storage rooms	NMR	(d)	--	--	1	64.65
Janitor closets	NMR	(d)	--	--	2	64.65
Locker rooms and shower rooms	70	(c) or (d)	--	--	2	64.65
Toilet rooms	65	(d)	--	--	2 or 60/TF	64.65
Toilet rooms (w/outdoor stadium)	50	(d)	--	--	2 or 60/TF	64.65
<u>Laundries</u>	60	(c)	--	--	2	64.65
<u>Natorium</u>	76	(c)	--	--	1 or 2/ pool sf	64.66
<u>Kitchens</u>	60	(c) or (d)	--	--	2	64.67
<u>Seasonal occupancies</u>						
Camps and lodges:						
Dining and recreational areas	NMR	(b)	15	3	--	64.68
Living and sleeping areas	NMR	(f)	--	4	--	64.68
Club houses	NMR	(b)	15	3	--	64.68
Drive-ins	NMR	(b)	15	3	--	64.68
Kitchens	NMR	(c) or (d)	--	--	2	64.67
Outdoor toilets	NMR	(d)	--	--	2	64.65

CA - Cooking appliance.

LF - Lineal foot.

NMR - No minimum requirements.

TF - Toilet facilities (water closets and urinals)

*See theaters and places of assembly for inside design temperature and net square feet per person.

¹Ventilation requirements. See § ILHR 64.06, 64.07 and 64.08 for mechanical, natural and exhaust ventilation systems; and § ILHR 64 11 to 64.18 for ventilation and air standards.

²Ventilation classifications.

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

(b) Requires a supply of outside air and an equal amount of exhaust ventilation be provided

at the rate of 5 CPM per person and a minimum air movement of 6 air changes per hour, or a percentage of openings.

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

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

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

(f) Requires a percentage of openings.

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

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

⁴Percent of openings. See § ILHR 64.07 for special considerations on natural ventilation.

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

(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 § ILHR 64.05, Table 1.

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

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

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

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

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

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

(3) Exhaust Systems and Heat Recovery. (a) An exhaust system, as specified in § ILHR 64.54(3), shall be provided for all equipment and processes that

create dust, fumes, vapors and gases injurious to health.

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

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

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

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

(2) General. (a) The heating, ventilating and air conditioning systems of all occupancies within the scope of this section shall be designed, operated and maintained as specified in sections 2, 7.29A. to D., 8.12A. to C., 9.2L., 9.4I., 9.5M. and 9.6J, depending upon the occupancy of the Guidelines for Construction and Equipment for Hospitals and Medical Facilities, DHHS Publication No. (HRS-M-HF)84.1.

(b) The heating, ventilating and air conditioning systems shall also be designed, operated and maintained as specified in the applicable sections of the following standards as referenced in DHHS Publication No. (HRS-M-HF)84.1.:

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

2. ASHRAE Handbook of Fundamentals; and

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

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

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

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

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

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

places of abode.

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

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

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

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

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

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

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

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

(b) Nonmechanical exhaust. A noncombustible flexible tube or hose to more than 10 feet long, connected to the engine exhaust (tail pipe) and terminating outside the building, may be used in lieu of the requirements stated in par. (a).

(4) Miscellaneous repair areas. Areas involved in the servicing of small internal combustion engines such as lawnmowers, snowmobiles, chainsaws, cycles, boat engines, and similar types of engines, and battery charging areas, shall be provided with at least 3/4 cubic foot per minute of outside air per square foot of enclosed service floor area and an equivalent exhaust. Exhaust from battery charging areas shall be from the top of the area.

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

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

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

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

(b) Buildings or portions of buildings having a capacity of and used exclusively for washing 2 or more vehicles simultaneously shall be exhausted at not less than 1/2 cubic foot per minute per square foot of floor area based on that portion of the floor located between the termination of the conveyor system and the vehicle exit door. A supply of makeup air is not required for this exhaust.

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

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

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

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

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

ILHR 64.64 Vehicle showrooms. (1) Scope. This classification includes all vehicles showrooms with offices and occupancies unless designed as part of the vehicle garage adjacent to repair or vehicle storage areas where all vehicles displayed in the showroom are without batteries and fuel tanks are empty and free of fumes.

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

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

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

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

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

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

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

(a) Does not allow recirculation; and

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

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

(a) Exhaust ventilation. Exhaust ventilation shall be provided for all areas of this class unless otherwise exempted. The volume of air exhausted shall be provided at a rate of not less than 2 cubic feet per minute per square foot of floor area, or 60 cubic feet per minute per fixture (water closets and urinals). Mechanical exhaust ventilation shall be installed in toilet rooms having more than one fixture (water closets and urinals). The effectiveness of the exhaust shall be greater than the supply.

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

1. Exception. Mechanical exhaust ventilation may be omitted from toilet

rooms or bathrooms having one water closet or urinal except in taverns and restaurants, or from janitor closets having one service sink or receptor, where an approved ductless air circulating and treatment device is provided.

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

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

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

Appendix 3B

South Florida

3109 Group G (Mercantile and Business) Occupancies

3109.1 General: (a) Application. Means of egress for Group G Occupancies comply with 3101, 3102, 3103 and this section.

Table 31-D
Classification of Group G-1 (Mercantile) Uses

Class	Area and Description
A	> 30,000 ft. ² or occupying more than 3 levels including all balconies and mezzanines.
B	3000 < Area < 30,000 ft. ² or smaller stores with a balcony or mezzanine but occupying not more than 3 levels, including all balconies and mezzanines.
C	≤ 3000 ft. ²

(b) Mixed Occupancies: (1) Combined Business and Mercantile: In any building occupied both for business and mercantile purposes, the requirements of Section 510 shall be met.

Exception: Where mercantile and business sections of the building are effectively segregated, exit facilities may be treated separately.

(2) Combined Mercantile and residential: (aa) No dwelling unit shall have its sole means of egress through any mercantile occupancy in the same building.

(bb) No multiple dwelling occupancy shall be located above a mercantile occupancy.

Exceptions: (1) Where the dwelling occupancy and its exits are separated from the mercantile occupancy by construction having a fire resistance rating of not less than 1 hour.

(2) Where the mercantile occupancy is protected throughout by an approved automatic sprinkler system in accordance with Chapter 38.

(c) Occupant Load: (1) For purposes of determining required exits, the occupant load of business buildings or parts of the buildings used for mercantile purposes shall be not less than the following.

(aa) For street floors and floors below the street floor, one person for each 30 sq. ft. gross floor area of sales space. In stores with no street floor, as defined in Chapter 4, but with access directly from the street by stairs or escalators, the principal floor at the point of entrance to the store shall be considered the street floor.

Exception: In stores where, due to differences in grade of streets on different

sides, there are two or more floors directly accessible from streets, not including alleys or similar back streets, for the purpose of determining occupant load, each such floor shall be considered a street floor. The occupant load factor shall be one person for each 40 sq. ft. gross floor area of sales space.

(bb) For upper floors, used for sales, one person for each 60 sq. ft. gross floor area of sales space.

(cc) For floors or portions of floors used only for offices, one person for each 100 sq. ft. gross floor area of office space.

(dd) For floors or portions of floors used only for storage, receiving, shipping and not open to the general public, one person for each 300 sq. ft. gross area of storage, receiving, or shipping space.

(ee) For floors or portions of floors used for assembly purposes, occupant load shall be determined in accordance with Sections 3104 through 3112.

(ff) For mail buildings, occupant load shall be determined in accordance with (2)(aa) through (ee) above.

Exception: The covered mall, when considered a pedestrian way, shall not be assessed an occupant load. However, means of egress from the mall shall be provided for an occupant load determined by dividing the gross leasable area (not including anchor stores) by the appropriate occupant load factor listed in Table 31-E. Each individual tenant space shall have means of egress to the outside and/or the mall based on occupant loads figured utilizing all of the above. Each individual anchor store shall have means of egress independent of the covered mall.

Table 31-E
Occupant Loads for Mall Buildings

Gross Leasable Areas (sq. ft.)	Occupant Load Factor
Less than 150,000	30
Over 150,000 but less than 200,000	35
Over 200,000 but less than 250,000	40
Over 250,000 but less than 300,000	45
Over 300,000 but less than 400,000	50
Over 400,000	55

(3) In the case of mezzanines or balconies open to the floor below, or unprotected vertical openings between floors as permitted by the exceptions in 3109.3(c) the occupant load (or area) of the mezzanine or other subsidiary floor level shall be added to that of the street floor for the purpose of determining required exits, provided, however, that in no case shall the total number of exit units be less than would be required if all vertical openings were enclosed.

SECTION 4

Exhaust/Supply Air

Private Dwelling Units and Public Facilities	NBC/NMC	SBC/SMC	UBC/UMC	ASHRAE 62-1973	ASHRAE 62-1981
Clothes Dryers	Exhaust per manufacturer through independent vent system. Provide makeup air for commercial systems exhausting > 200 cfm	≥ 4 in. I.D. duct ≤ 25 ft. from dryer to wall or roof cap	≥ 4 in. diameter duct for domestic dryers ≤ 14 ft. long or per mfg's installation instructions. Install commercial dryers per manufacturer's instructions	Not addressed	Not addressed
Cooking Appliances (Residential Type)	Exhaust air having contaminants at ≥ 33 cfm, ≥ 15 cfm when effective absorption/filtration provided	Exhaust hoods not required in a dwelling unit but when installed, vent to outside	Exhaust hoods not required	Not addressed	Not addressed
Combustion Air	40 cu. ft./1000 Btuh input rating. When building has < 0.5 ach provide openings directly to outdoors through horizontal ducts at 1 sq. in./2000 Btuh. For direct horizontal openings through a wall and vertical openings provide 1 sq. in./4000 Btuh. May use mechanical ventilation system when supply increased at 1 cfm/3000 Btuh	2 sq. in./1000 Btuh input but ≥ 200 sq. in. for solid fuel equipment. For liquid and gas fuel in unconfined spaces infiltration is adequate. When in confined spaces provide 2 openings at 1 sq. in./1000 Btuh input rating but ≥ 100 sq. in. or when air is from outdoors provide 2 openings ≥ 19 sq. in. and ≥ 1 sq. in./4000 Btuh input rating except ≥ 1 sq. in./2000 Btuh for horizontal ducts. For buildings of unusually tight construction provide ≥ 19 sq. in. opening but ≥ 1 sq. in./5000 Btuh input rating. Alternate methods by special engineering may be approved	For gas and liquid burning ≥ 50 cu. ft. room volume/1000 Btuh input rating or provide ≥ 1 sq. in./5000 Btuh opening to outdoors or freely communicating spaces if unconfined. If confined and air is from indoors ≥ 1 sq. in./1000 Btuh input rating but 2 openings ≥ 100 sq. in. If confined and air from outdoors communicates with openings ≥ 1 sq. in./4000 Btuh for vertical ducts or ≥ 1 sq. in./2000 Btuh for horizontal ducts. When combined inside and outside air provide 2 openings ≥ 1 sq. in./1000 Btuh to indoors and ≥ 1 sq. in./5000 Btuh to outdoors	Not addressed	Not addressed

ASHRAE 62-1989	Massachusetts	New York	South Florida	Wisconsin	Comments
Not addressed	Exhaust to outside per mfg's instructions when in habitable room or in room with other fuel burning appliances	Addressed by reference to ANSI Standards	Not addressed	Not addressed	1 For 1 & 2 family dwelling others addressed by 1987 NMC which is essentially equivalent to 1989 shown for NMC
Not addressed	Not addressed	Not specifically addressed	Can use ducted or ductless range hoods	Not addressed	2 For 1 & 2 family dwelling see Appendix 4A for other buildings
Not addressed	If appliance room volume < 1/20 of Btuh input provide additional combustion air through 2 sq. in./1000 Btuh input but ≥ 200 sq. in. (may be 1 sq. in./1000 when compartment area > 2 times appliance area but ≥ 100 sq. in.). When unusually tight construction in areas where 20° F temperatures prevail and compartment volume < 16 times appliance volume, provide 1 sq. in./4000 Btuh for direct opening or vertical duct, 1 sq. in./2000 Btuh for horizontal ducts, or 1 sq. in./1000 Btuh to interior. When compartment volume > 16 times appliance volume, change inputs above to 5000, 2500, and 2000 Btuh respectively ¹	When $\leq 250,000$ Btuh individual or combined rating supply air by ≥ 1 opening to exterior or interior. When > 250,000 Btuh provide fixed openings to exterior. Make openings large enough to provide sufficient combustion and ventilation air	References NFPA 54 (National Fuel Gas Code)	For solid fuel and using indoor air provide 2 openings each ≥ 1 sq. in./1000 Btuh input and for outdoor air 2 openings each > 1 sq. in./4000 Btuh input. For other fuel burning heating equipment and in unconfined spaces infiltration adequate when room volume $\geq 1/20$ maximum Burner Btuh input. Design any openings from exterior to unconfined spaces at > 1 sq. in./5000 Btuh input. For those in confined spaces provide as for solid fuel above ²	

Food Service	NBC/NMC	SBC/SMC	UBC/UMC	ASHRAE 62-1973	ASHRAE 62-1981
Food Service Equipment Exhaust	<p>≥ 100 cfm/sq. ft. hood area for canopy hood attached to wall and</p> <p>≥ 150 cfm/sq. ft. hood area for canopy hoods exposed on all sides. ≥ 300 cfm/lineal ft. for non-canopy hoods</p>	<p>≥ 100 cfm/sq. ft. hood area for canopy hood attached to wall and</p> <p>≥ 150 cfm/sq. ft. hood area for canopy hood open on all sides. ≥ 300 cfm/lineal ft. cooking surface for backshelf hoods</p>	See footnote 1	Not addressed	Not addressed
Food Service Equipment Makeup Air	About equal to exhaust	Supply rate equal to volume removed	Supply rate equal to exhaust. Do not use windows and doors. Can use compensation hoods which must obtain ≥ 20% of exhaust air from kitchen	Not addressed	Not addressed

ASHRAE 62-1989	Massachusetts	New York	South Florida	Wisconsin	Comments
Not addressed	See NMC entry	References NFPA 96	References NFPA 96	> 2 cfm/sq. ft. floor area. Cfm > 150 times canopy hood area. Open cfm > 100 times canopy wall hood area > 350 fpm for slotted-type hood. Cfm > 300 times length for non- canopy hood	1 When serving charcoal, solid fuel etc type equipment ≥ 200 cfm/sq. ft. hood area for canopy hood attached to wall and ≥ 300 cfm/sq. ft. hood area for canopy hood open on all sides or $\geq [100 \times \text{hood}$ perimeter open (ft.) \times distance from lower hood lip to cooking surface (ft.)]. When serving high temperature applications same as above except 1/2 values of 200 and 300. When serving medium tempera- ture applications same as above except values are 75, 100, and 50. When serving low temperature values same as above except values are 50, 75, and 50. ≥ 300 cfm/lineal ft. for noncanopy type hoods. May reduce above values by 20% when all appliances are electric
Not addressed	See NMC entry			Provide replace- ment air to equal exhaust	

Theaters	NBC/NMC	SBC/SMC	UBC/UMC	ASHRAE 62-1973	ASHRAE 62-1981
Motion Picture Projectors	Directly connect exhaust discharge to mechanical exhaust system at manufacturer's rating. When without exhaust connection ≥ 200 cfm/lamp for electric air and ≥ 300 cfm/lamp for Xenon with 130° F lamp housing limitation. Ventilate per NFPA 40 when cellulose nitrate film used	Provide adequate air supply inlets to supply air equal to that exhausted. May exhaust through lamp exhaust. Ventilate per NFPA 40 when cellulose nitrate film is used	Provide adequate air inlets for new distributed air throughout room equal to that exhausted. Provide lamp exhaust ≥ 200 cfm/lamp for electric air and ≥ 300 cfm/lamp for Xenon with 130° F lamp housing limitation	Not addressed	Not addressed
Dry Cleaning Equipment	Exhaust system to maintain ≥ 100 fpm velocity across loading door face	For type I and II systems provide 20 ach	Not specifically addressed	Not addressed	Not addressed

ASHRAE 62-1989	Massachusetts	New York	South Florida	Wisconsin
Not addressed	See NMC entry	Provide with supply and exhaust ventilation	References NFPA 40 for cellulose nitrate film	≥ 2 cfm/sq. ft. floor area or > 5 cfm/person or 6 ach outside air supply and exhaust

Not addressed	See NMC entry	Not addressed	3 ach	Not addressed
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Appendix 4A

Wisconsin

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

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

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

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

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

(d) **Combustion air by infiltration.** If the heating equipment is not required to be located in a fire-resistive room, combustion air may be provided by means of infiltration where the total area of outdoor openings is greater than 3% of the floor area in which the equipment is located, or where 150% of the air required for theoretical complete combustion is no greater than 1/4 air change govern the design.

Table 64.09

Atmospheric Combustion	Combustion Air Intakes Ducted from the Outside to an Interior Room or Fireplace	Combustion Air Intakes Located at the Outside Wall of an Exterior Room
Gas-fired, all occupancies except industrial	1 sq. in./1000 Btu/hr.	1 sq.in./2000 Btu/hr.
Gas-fired, industrial occupancies	1 sq. in./1000 Btu/hr.	1 sq.in./5000 Btu/hr.
Oil-fired, all occupancies	1 sq.in./1000 Btu/hr.	1 sq.in./2000 Btu/hr.
Solid-fuel fired equipment and fireplaces, all occupancies	1 sq. in./1000 Btu/hr. for furnace type units. 1/2 of the chimney connector area for free standing and fireplace type units. In accordance with equipment listing, if listing includes combustion air provisions.	