Wisconsin Administrative Code

Rules of

DEPARTMENT OF INDUSTRY, LABOR AND HUMAN RELATIONS

BUILDING AND HEATING, VENTILATING AND AIR CONDITIONING CODE

Cite the rules in this Code as

(for example)

Wis. Adm. Code section Ind 50.01

OCTOBER 1967

DEPARTMENT OF INDUSTRY, LABOR AND HUMAN RELATIONS
Hill Farms State Office Building
4802 Sheboygan Avenue, Madison, Wisconsin 53702

Chapter Ind 50

SCOPE OF BUILDING CODE

Ind 50.001 Application. (1) NEW BUILDINGS AND ADDITIONS. This code shall apply to all new buildings, structures, and also to additions to existing buildings and structures, except as in Wis. Adm. Code, section Ind 50.03.

(2) EXISTING BUILDINGS. Buildings and structures erected prior to the effective date of the first building code (October 9, 1914) shall comply with the general orders on existing buildings, issued by the department of industry, labor and human relations.

Ind 50.01 Alterations. This code shall apply to all alterations in any building or structure which affects the structural strength, fire hazard, exits or lighting of any new or existing building or structure. This code does not apply to ordinary non-structural changes or minor repairs necessary for the maintenance of any building or structure.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63.

Ind 50.02 Change of use. (1) When the use of a building or structure is changed and the requirements for the new use are more stringent than those for the previous use then such building or structure shall be made to comply with the requirements for the new use as provided in this code.

(2) If, upon an inspection of a building or structure, it is found that its use was changed since the effective date of the first building code (October 9, 1914) and that it does not comply with the requirements of the building code in effect at the time of such change, it shall then be made to comply with the code requirements in effect at the time of change in use.

Ind 50.03 Exemption from code requirements. This code does not apply to the following buildings:

(1) Dwellings, and outbuildings in connection therewith, such as barns and private garages.

(2) Apartment buildings used exclusively as the residence of not more than 2 families.

(3) Buildings used exclusively for agricultural purposes which are not within the limits of a city or an incorporated village.

(4) Temporary buildings or sheds used exclusively for construction purposes, not exceeding 2 stories in height, and not used for living quarters.

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Ind 50.04 Local regulations. This code shall not limit the power of cities, villages and towns to make, or enforce, additional or more stringent regulations, provided the same do not conflict with this code or with any other rule of the department of industry, labor and human relations.

Enforcement

Ind 50.10 Approval of plans and specifications. (1) Complete plans and specifications for all buildings and structures in the following classifications shall be submitted to the department of industry, labor and human relations for approval before letting contracts or commencing work.

(a) Theaters and assembly halls.

(b) Schools and other places of instruction.

(c) Apartment buildings, hotels and places of detention.

(d) Hazardous occupancies.

(e) Factories, office and mercantile buildings.

(2) The submission of plans and specifications for factories, office and mercantile buildings containing less than 25,000 cubic feet total volume is waived, providing they have no floor or roof spans greater than 30 feet and are not more than 2 stories high. Buildings for which the submission of plans and specifications is waived shall comply with the requirements of this code.

(3) All plans shall be submitted in triplicate and work shall not be started until plans are approved. Complete foundation and footing plans may be submitted for approval prior to submitting the building plans if the plot plan, itemized structural loads, complete foundation or footing design calculations and schematic floor plans are included showing exits, windows and other pertinent information. The following data shall be a part of or shall accompany all plans submitted for approval. Items (h) and (i) need not accompany foundation and footing plans submitted prior to final building plans.

(a) The location and grades of adjoining streets, alleys, lot lines and any other buildings on the same lot or property.

(b) Name of owner.

(c) Intended use or uses of all rooms, and the number of persons to be accommodated therein.

(d) Assumed bearing value of soil.

(e) Assumed live loads.

(f) Assumed dead loads, itemized.

(g) Assumed unit stresses for structural materials.

(h) Stress diagrams for all trusses.

(i) Typical calculations for slabs, beams, girders and columns.

(4) Complete structural calculations shall be furnished upon request of the department of industry, labor and human relations or other authorized approving official. All plans and specifications shall be sealed or stamped by a registered architect or registered professional engineer except that plans for buildings having a total volume of less than 50,000 cubic feet shall be signed by the designer.

Scope

(5) This section shall apply to additions and alterations, as well as to new buildings, and shall also apply to all cases where there is a change of occupancy or use of a building.

(6) In cities where plans are examined, and building permits are issued, by a city building official in a manner approved by the department of industry, labor and human relations, additional approval by the department of industry, labor and human relations is not required.

(7) This section shall not apply to sanitary appliances, such as water supply and sewage disposal systems, chemical and septic toilets and similar equipment which shall be submitted for approval and installed in accordance with the regulations of the state board of health.

(8) After being approved, plans and specifications shall not be changed in any respect which may involve any provisions of this code, except with the written consent of the approving official.

(a) The approval of a plan or specification is not to be construed as the assumption of any responsibility for the design.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63; r. and recr. (3), Register, February, 1967, No. 134, eff. 3-1-67.

Ind 50.11 Evidence of approval. The architect, professional engineer, builder or owner shall keep at the building one set of plans bearing the stamp of approval.

Ind 50.12 Approval of materials, methods and devices. All materials, methods of construction and devices designed for use in the construction, alteration or equipment of buildings or structures under this code and not specifically mentioned in this code shall not be so used until approved in writing by the department of industry, labor and human relations, except sanitary appliances, which shall be approved in accordance with the state plumbing code issued by the state board of health. The data, tests and other evidence necessary to prove the merits of such material, method of construction or device shall be determined by the department of industry, labor and human relations.

Chapter Ind 51

DEFINITIONS AND STANDARDS

Ind 51.001 Fire-resistive construction. (1) A building is of fire-resistive construction if all the walls, partitions, piers, columns, floors, ceilings, roof and stairs are built of incombustible material, except as hereinafter provided, and if all metallic structural members are protected by an incombustible fire-resistive covering, all as specified in this section.

(2) All exterior and inner court walls shall be of not less than 4-hour fire-resistive construction, as specified in section Ind 51.05, except that non-load bearing exterior walls which face streets, alleys, outer or inner courts 20 feet or more in width may be constructed of incombustible panels of not less than 1-hour fire-resistive construction.

(a) Non-load bearing exterior walls which face streets, alleys, outer or inner courts 30 feet or more in width may be constructed of incombustible panels with no fire-resistive rating.

(3) Interior partitions shall be constructed of incombustible materials, except that dividing partitions in stores, offices, and similar places not exceeding 3,000 square feet in area, occupied by one tenant only, may be constructed of wood panels or similar light construction.

(a) Partitions entirely within apartments having a floor area of not more than 800 square feet shall be of 1-hour fire-resistive construction but such partitions may be constructed with wood studs as specified in section Ind 51.05. Doors in such partitions may be wood panel doors.

(4) Enclosures for elevator or dumbwaiter shafts, vent shafts, stair wells, waste paper chutes and other similar vertical shafts shall be of 2-hour fire-resistive construction as specified in section Ind 51.05, with all interior openings therein protected by fire-resistive doors or windows as specified in section Ind 51.09.

(5) Structural framework shall be of structural steel or reinforced concrete. All structural steel members, not including structural members for elevators and elevator enclosures shall be thoroughly fire-protected with not less than 4-hour fire-resistive protection for columns, beams and girders and 3-hour fire-resistive protection for floors, for all buildings more than 8 stories or 85 feet in height; and with not less than 3-hour fire-resistive protection for columns, beams and girders and 2-hour fire-resistive protection for floors, for all buildings which are 8 stories or 85 feet or less in height. All such fire-resistive protection shall be as specified in section Ind 51.04.

(6) All reinforced concrete columns, beams and girders shall be thoroughly fire-protected with 4-hour fire-resistive protection, and all floors, joists and slabs shall be thoroughly fire-protected with not less than 3-hour fire-resistive protection for all buildings more than 8 stories or 85 feet in height; and with not less than 3-hour fire-resistive protection for columns, beams and girders and 2-hour fire-resistive protection for all floors, joists and slabs, for all buildings which are 8 stories or 85 feet or less in height. All such fire-resistive protection shall be as specified in section Ind 51.04.

(7) Floor construction shall consist of any approved floor system providing not less than 3-hour fire-resistive construction for all buildings more than 8 stories or 85 feet in height; and providing not less than 2-hour fire-resistive construction, for buildings which are 8 stories or 85 feet or less in height. All such fire-resistive protection shall be as specified in section Ind 51.06.

(8) Roofs shall be constructed as specified for floors, except that wood sheathing of not less than 2 inch nominal thickness may be used for buildings not more than 8 stories or 85 feet in height when all of such sheathing is more than 25 feet distant from any floor, balcony or gallery, or wood sheathing of not less than 1 inch nominal thickness may be used at any distance not exceeding 5 feet from a 2-hour fire-resistive attic floor, and when such sheathing is covered on the outside by a fire-retardant roof covering, except as provided under occupancy requirements.

(9) Stairs and stair platforms shall be constructed of reinforced concrete, iron or steel. Brick, concrete, marble, tile, terrazzo or other hard incombustible materials may be used for the finish of treads and risers.

(10) Doors and windows may be of wood except as otherwise specified under occupancy requirements and in Wis. Adm. Code sections Ind 51.17, 51.19, 51.20 and 52.21.

(11) Projections from the building, including bays, oriels, and penthouses, together with other roof structures shall be constructed of incombustible material as specified in this section.

(12) Wood may be used for finished floors and also for trim, including picture molds, chair rails, wainscoting and baseboards, if spaces between wood sleepers and wood grounds are fire-stopped with incombustible materials.

(13) Acoustical materials may be used on ceilings and on walls from a level of 6 feet above the floor provided they are attached

directly thereto, and all spaces between wood grounds are fire-stopped with incombustible materials.

History: 1-2-56; am. (2); (2) (a); (3); (3) (a); Register, June, 1956, No. 6, eff. 7-1-56.

Ind 51.01 Mill construction. (1) In a building of mill construction the structural frame shall consist of steel or iron which shall be fire-protected, of reinforced concrete, of masonry, or of heavy timbers, except that in buildings not exceeding one story in height the structural steel or iron may have the fire-protection omitted.

(2) Exterior and court walls shall be 2-hour fire-resistive construction as specified in section Ind 51.05, except that non-load bearing exterior walls which face streets, alleys, outer or inner courts 20 feet or more in width may be constructed of incombustible panels of not less than 1-hour fire-resistive construction.

(a) Non-load bearing exterior walls which face streets, alleys, outer or inner courts 30 feet or more in width may be constructed of incombustible panels with no fire-resistive rating.

(3) All wood columns in the structural frame shall be directly superimposed, one above the other, and shall be provided with steel or cast iron caps, unless the floor or roof beams and girders are carried on blocks securely fastened to the columns and with the loads transmitted to the columns by metal ring or similar type connectors or by caps of otherwise suitable material. They shall not rest on wood bolsters or floor timbers. Wood bolsters may be used to support roof timbers. No wood column shall be less than 8 inches nominal in its least dimension, and no beam, girder or joist shall be less than 6 inches nominal in its least dimension nor less than 45 square inches in cross-sectional area. Where wood arches or wood trusses are used to support roof loads, the framing members shall not be less than 4 inches by 6 inches, nominal dimensions. In no case shall masonry or reinforced concrete be supported on wood construction except tile or concrete floor finishes not more than 3 inches in thickness.

(4) For structural steel or iron members, the fire-protection shall be not less than 3-hour fire-resistive protection for columns and not less than 2-hour fire-resistive protection for beams, girders and floor systems, as specified in section Ind 51.04.

(5) All reinforcement in concrete columns shall be fire-protected with not less than 3-hour fire-resistive protection, and all joists, beams, girders, slabs and steel floors with not less than 2-hour fire-resistive protection outside of all steel reinforcing as specified in section Ind 51.04.

(6) Wood floor construction shall be of tongues and grooves, or splined lumber not less than 3 inches nominal thickness, with a top layer of flooring of one inch nominal thickness laid thereon, or of solid lumber placed on edge and securely spiked together to make a floor not less than 4 inches nominal thickness.

(7) Roof construction shall be as specified for floors, except that the minimum nominal thickness shall be 2 inches. Roof coverings

shall be a fire-retardant roofing as specified in section Ind 51.07 and shall be required over all combustible roof construction.

(8) Enclosures for elevator or dumbwaiter shafts, vent shafts, stair wells, wastepaper chutes, and other similar vertical shafts shall be of 2-hour fire-resistive construction as specified in section Ind 51.05, with all interior openings therein protected by fire-resistive doors as specified in section Ind 51.09.

(9) Stair construction may be of wood in buildings not exceeding 3 stories in height. In buildings 4 or more stories in height all stairs and stair construction shall be as required for fire-resistive construction specified in section Ind 51.001.

(10) Doors and windows may be of wood except as otherwise specified under occupancy requirements in this code.

History: 1-2-56; am. (2); (2) (a); Register, June, 1956, No. 6, eff. 7-1-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59.

Ind 51.02 Ordinary construction. (1) A building is of ordinary construction if all enclosing walls are constructed entirely of incombustible material, and the roof has a fire-retardant covering as specified in section Ind 51.07.

(2) The interior structural framework shall be of steel, iron, reinforced concrete, masonry, or wood. Fire protection of steel, iron or wood structural members may be omitted, except that all members carrying masonry in buildings more than one story in height shall be fire protected with not less than one-hour protection as specified in section Ind 51.04.

(3) Floors, roof and partitions may be of wood but no joist, rafter, or stud shall be less than 2 inches in nominal thickness. In buildings of 4 stories or more in height, the lower side of all metal or wood floor or roof construction shall be protected by a ceiling of one-hour fire-resistive construction as specified in section Ind 51.06, unless otherwise provided under the occupancy requirements.

(4) Stairs may be of steel, iron, reinforced concrete, masonry or wood, with enclosures as specified under occupancy requirements.

(5) Bays, oriels and similar projections from the walls shall be constructed of incombustible materials as specified in this section. Penthouses and other roof structures shall be of not less than one-hour fire-resistive construction as specified in section Ind 51.06.

History: 1-2-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59.

Ind 51.03 Frame construction. (1) A building is of frame construction if the structural parts and enclosing walls are of wood, or of wood in combination with other materials. If such enclosing walls are veneered, encased or faced with stone, brick, tile, concrete, plaster or metal, the building is also termed a frame building.

Ind 51.04 Fire-resistive standards; structural members. (1) MINIMUM THICKNESS IN INCHES FOR VARIOUS FIRE-RESISTIVE MATERIALS

MINIMUM THICKNESS IN INCHES FOR VARIOUS FIRE-RESISTIVE MATERIALS

Struct. Steel Parts to be Protected	Fire Resistive Material Used	Minimum Thickness of Material in Inches for the Following Fire-Resistive Periods			
		4 Hr.	3 Hr.	2 Hr.	1 Hr.
Steel or Cast Iron Columns: All Members of Primary Trusses or Primary Girders	Concrete	2	2	1½	1
	Gunite	2	1½	1	¾
	Brick of Clay, Shale, Concrete or Sand Lime All Spaces Filled	3¾	3¾	2¼	2¼
	Clay Tile or Haydite or Waylite or Concrete Block or Gypsum Block or Poured Gypsum. All Spaces Filled. Metal Ties in Horizontal Joints	2 Thicknesses 2 Inches Each	4	2	2
	Portland Cement Plaster on Metal Lath	-------	-------	1½ with ½ air space	1
	Clay Tile, End Const. have less than 26% Voids with all Spaces Filled and Metal Ties in Horizontal Joints	3¾	3¾	1¾ No Filling	1¾ No Filling
Webs and Flanges of Steel Beams and Secondary Girders	Concrete	2	2	1½	1
	Gunite	2	1½	1	¾
	Brick of Clay, Shale, Concrete or Sand Lime	2¼	2¼	2¼	2¼
	Clay Tile, Concrete Block, Gypsum Block or Poured Gypsum	2	2	2	2
	Metal Lath and Gypsum or Portland Cement Plaster	-------	-------	1½	1
Reinforcing Steel in Columns, Beams Girders & Trusses	Concrete	1½	1½	1½	1
Reinforcing Steel in Reinforced Concrete Joists	Concrete	1¼	1¼	1	¾
Reinforcing Steel in Reinforced Concrete Slabs	Concrete	1	1	¾	¾
Reinforcing Steel in Reinforced Concrete Slabs	Gypsum	1	1	¾	¾

(2) CONCRETE. Concrete shall have a coarse aggregate of limestone, calcareous gravel, traprock, blast furnace slag, burnt clay, burnt shale or other coarse aggregates containing not more than 65% of siliceous material such as granite, sandstone, chert, flint or quartz.

(3) APPROVAL OF OTHER MATERIALS. Other materials, assemblies and thicknesses of necessary strength and durability for the use intended and which have successfully performed under tests made by a recognized laboratory in accordance with the requirements of the "Standard Specifications for Fire Tests of Building Construction and Mate-

rials" (C19–33) of the American Society for Testing Materials, shall be accepted for specific ratings in addition to those prescribed in this section.

Ind 51.05 Fire-resistive standards; walls and partitions.

(1) Wall Construction	Minimum Thickness in Inches, Face to Face			
	4 Hr.	3 Hr.	2 Hr.	1 Hr.
Solid Brick, Load Bearing, Unplastered	8	8	8	8
Solid Brick, Non-Load Bearing, Unplastered	8	8	4	4
Solid Brick, Load Bearing, Plastered Two Sides	8	8	8	8
Solid Brick, Non-Load Bearing, Plastered Two Sides	8	8	4	4
Hollow Clay Tile, Load Bearing, Unplastered	12 4-Cell	12 3-Cell	8 3-Cell	8 2-Cell
Hollow Clay Tile, Non-Load Bearing, Unplastered	12 4-Cell	8 3-Cell	6 2-Cell	4 1-Cell
Hollow Clay Tile, Load Bearing, Plastered Two Sides	12 3-Cell	8 3-Cell	8 2-Cell	8 2-Cell
Hollow Clay Tile, Non-Load Bearing, Plastered Two Sides	12 3-Cell	8 3-Cell	4 1-Cell	3 1-Cell
Concrete Block, Load Bearing, Unplastered	12	12	8	8
Concrete Block, Non-Load Bearing, Unplastered	12	12	6	4
Concrete Block, Load Bearing, Plastered Two Sides—	12	8	8	8
Concrete Block, Non-Load Bearing, Plastered Two Sides	12	8	4	3
Solid Plain Concrete, Load Bearing	8	8	8	6
Solid Plain Concrete, Non-Load Bearing	8	6	4	4
Solid Reinforced Concrete, Load Bearing	6	5	4	4
Solid Reinforced Concrete, Non-Load Bearing	6	5	4	3
Solid Gypsum Block, Non-Load Bearing, Unplastered	6	6	3	3
Solid Gypsum Block, Non-Load Bearing, Plastered Two Sides	6	4	3	3
Hollow Gypsum Block, Non-Load Bearing, Unplastered	8	8	4	4
Hollow Gypsum Block, Non-Load Bearing, Plastered Two Sides	8	8	4	4
Solid Cement or Gypsum Plaster on Metal Base, Non-Load Bearing	----	----	2	2
Hollow Partitions, Lath and Plaster shall have a minimum thickness of ⅝ inch. Lath may be of metal or ⅜ inch perforated gypsum. If constructed of wood studs, they shall be fire-stopped.	----	----	----	5

(2) Other materials, assemblies and thicknesses of necessary strength and durability for the use intended and which have successfully performed under tests made by a recognized laboratory in accordance with the requirements of the "Standard Specifications for

Fire Tests of Building Construction and Materials" (C19-33) of the American Society for Testing Materials, shall be accepted for specific ratings in addition to those prescribed in this section.

(3) Thicknesses as established in this section shall be construed as establishing minimum requirements for fire-resistance and shall not preclude the application of other requirements of this code where considerations of strength, durability or stability require greater thicknesses.

(4) Where plaster is required in this section it shall have a minimum thickness of ½ inch except that for hollow partitions the thickness shall be not less than ⅝ inch. Either Portland cement or gypsum plaster may be used.

Ind 51.06 Fire-resistive floor construction. (1) Fire-resistive floor construction shall be accepted for the following respective degrees of fire-resistive protection when constructed as specified in this section. They shall be constructed entirely of incombustible materials.

(2) FOUR-HOUR CONSTRUCTION. Four-hour fire-resistive floor construction shall consist of reinforced concrete, gypsum or solid masonry slabs or arches not less than 4 inches in thickness, or shall consist of hollow masonry slabs or arches not less than 4 inches in thickness with a top covering of not less than 2 inches of solid masonry, or shall consist of steel joists or steel floor construction protected with fire-resistive materials as tabulated in this section. Except in the case of steel joisted construction, all reinforcing, tie rods and supporting structural members in such floors shall be protected with not less than 4-hour fire-resistive construction as specified in section Ind 51.04.

(3) THREE-HOUR CONSTRUCTION. Three-hour fire-resistive floor construction shall consist of reinforced concrete, gypsum or solid masonry slabs or arches not less than 2½ inches in thickness, or shall consist of hollow masonry slabs or arches not less than 4 inches in thickness with a top covering of solid masonry not less than 1½ inches in thickness, or shall consist of steel joists or steel floor construction protected with fire-resistive materials as tabulated in this section. Except in the case of steel joisted construction all reinforcing, tie rods and supporting structural members in such floor construction shall be protected with not less than 3-hour fire-resistive construction as specified in section Ind 51.04.

(4) TWO-HOUR CONSTRUCTION. Two-hour fire-resistive floor construction shall consist of reinforced concrete, gypsum or solid masonry slabs or arches not less than 2½ inches in thickness, or shall consist of hollow masonry slabs or arches not less than 3 inches in thickness with a top covering of not less than one inch of solid masonry, or shall consist of steel joists or steel floor construction protected with fire-resistive materials as tabulated in this section. Except in the case of steel joisted construction all reinforcing, tie rods and supporting structural members in such floor construction shall be protected with not less than 2-hour fire-resistive construction as specified in section Ind 51.04.

(5) ONE-HOUR CONSTRUCTION. One-hour fire-resistive floor construction shall consist of reinforced concrete, gypsum or solid masonry

slabs not less than 2½ inches in thickness, or shall consist of hollow masonry slabs or arches not less than 3 inches in thickness with all joints in such hollow unit construction thoroughly filled with cement or gypsum mortar, or shall consist of steel joists or steel floor construction protected with fire-resistive materials as tabulated in this section, or shall consist of wood joisted construction with a double wood floor on top (the sub-floor not less than ¾ inch thick, and the total thickness of the two layers not less than 1¼ inches thick) and with a fire-resistive ceiling as tabulated in this section, securely fastened to or suspended from the under side of such joists, except that the metal lath and plaster ceiling shall not be required below the lowest floor joist over unusable space.

(6) Except in the case of steel joisted construction, all reinforcing, tie rods and supporting structural members shall be protected with not less than one-hour fire-resistive construction as specified in section Ind 51.04.

(7) MINIMUM PROTECTION FOR METAL AND WOOD JOISTS BASED ON TIME PERIODS FOR VARIOUS INSULATING MATERIALS

MINIMUM PROTECTION FOR METAL AND WOOD JOISTS BASED ON TIME PERIODS FOR VARIOUS INSULATING MATERIALS

Joists to be Protected	Insulating Material	Minimum thickness of material in inches for the following fire-resistive materials			
		4 Hr.	3 Hr.	2 Hr.	1 Hr.
Ceiling protection of steel joists, where incombustible slab not less than 2½ in. thick is placed above	Metal or wire lath and gypsum or Portland cement plaster, concrete, burned clay products or gypsum	2	1½	1	¾
	Gunite	1¼	1	¾	¾
Ceiling protection of wood joists with double floor on top	Metal or wire lath and gypsum or Portland cement plaster. ⅜ in. perforated gypsum lath, ½ in. gypsum plaster, joints reinforced with 3 in. wide strips of metal lath.				¾

(8) All flat ceilings where the ceiling protection for beams, girders or flat slabs is suspended to form a free air space between the member and the protection, the protection thickness may be ½ inch less than required in the tabulation contained in this section for flat ceiling protection, but no thickness shall be less than ¾ inch minimum protection of metal and wood joists.

(9) In any reinforced concrete floor construction which includes a metal lath and cement or gypsum plastered ceiling on the under side, not less than ¾ inch thick, the required slab thickness may be reduced ½ inch but in no case shall be less than 2½ inches thick.

Ind 51.07 Fire retardant roof coverings. (1) Fire-retardant roof coverings have no time resistance ratings by governmental testing laboratories. The Underwriters' Laboratories in their "List of In-

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spected Fire Protection Equipment and Materials" classifies their degree of fire-resistance by the letters A, B and C. Class A roof coverings have the highest resistance and Class C the lowest.

(2) Roof coverings on buildings of fire-resistive and mill construction shall be not less than Class A, or equal, those on buildings of ordinary construction shall be not less than Class B, or equal, and those on frame buildings shall be not less than Class C, or equal.

(3) The department of industry, labor and human relations will accept roof coverings for different fire-resistance values as established by, and if installed according to, the requirements of the Underwriters' Laboratories.

Note: The Underwriters' Laboratories "List of Inspected Materials" is obtainable from the Fire Insurance Rating Bureau and Fire Insurance Agencies.

(4) The department of industry, labor and human relations will approve, subject to the provisions of this section, any roof covering which has developed the required fire-resistance in tests as specified in the "Standard Specifications of Fire Tests of Building Construction and Materials" (A.S.T.M. Designation C19–33) when conducted by a nationally recognized testing laboratory.

Ind 51.08 Occupancy separations. (1) When a building is used for more than one occupancy purpose, each part of the building comprising a distinct occupancy division shall be separated from any other occupancy division as provided for under the occupancy requirements of this code.

(2) Occupancy separations shall be classed as "Absolute", "Special" and "Ordinary" and shall apply to both horizontal and vertical separations.

(a) An absolute occupancy separation shall have no openings therein and shall be of not less than 4-hour fire-resistive construction as specified in sections Ind 51.05 and Ind 51.06.

(b) A special occupancy separation shall be of not less than 3-hour fire-resistive construction as specified in sections Ind 51.05 and 51.06. All openings in walls forming such separation shall be protected on each side thereof by self-closing fire-resistive doors as specified in section Ind 51.09, and such doors shall be kept normally closed. The total width of all openings in any such separating wall in any one story shall not exceed 25% of the length of the wall in that story and no single opening shall have an area greater than 120 square feet.

1. All openings in floors forming this type of separation shall be protected by vertical enclosures extending above and below such openings. The walls of such vertical enclosures shall be of not less than 2-hour fire-resistive construction as specified in section Ind 51.05 and all openings therein shall be protected on one side thereof by self-closing one-hour fire-resistive doors as specified in section Ind 51.09 and such doors shall be kept normally closed.

(c) An ordinary occupancy separation shall be of not less than one-hour fire-resistive construction as specified in sections Ind 51.05 and 51.06. All openings in such separations shall be protected by self-

closing fire-resistive doors as specified in section Ind 51.09 and such doors shall be kept normally closed.

History: 1-2-56; r. and recr. (2) (c), Register, October, 1967, No. 142, eff. 11-1-67.

Ind 51.09 Fire-resistive doors. (1) Fire-resistive doors have no time resistance rating established by governmental agencies. It will be the policy of the department of industry, labor and human relations to approve, subject to the provisions of this section, any door given a rating by the Underwriters' Laboratories in their "Building Materials List" as class A, B, C, D and E having varying degrees of resistance, and suitable for various locations.

(2) Where fire-resistive doors are required, class A doors, or equal, shall be used for all openings in 3 and 4 hour fire-resistive walls. Class B doors, or equal, shall be used for all openings in 2-hour walls. Doors for elevator shafts shall be of class B type or equal. Class C doors, or equal, shall be used in openings in corridor partitions in fire-resistive buildings and for openings in one-hour fire-resistive partitions except that wood doors of solid flush type, 1¾ inches thick may be used in such buildings which are less than 85 feet in height. Class D and E doors, or better, shall be used in outside wall openings where required for fire escapes.

(3) All required fire-resistive doors shall be equipped with a self-closing device.

History: 1-2-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59; am. Register, December, 1962, No. 84, eff. 1-1-63.

Ind 51.10 Fire-resistive windows. (1) Windows shall be of a design approved by the department of industry, labor and human relations for the intended use as provided under occupancy classifications. The term "window" in this section shall include the frame, sash and all other parts of a complete assembly. Approved wire glass ¼ inch in thickness shall be used for glazing.

(2) Windows shall be limited to sizes for which effective fire-resistance has been demonstrated by actual fire test, and which in no case exceed 84 square feet in area and 12 feet in greatest dimension. Such windows may be combined in multiple assemblies when separated by approved metal mullions, which shall be considered non-bearing.

(3) Individual glass lights shall not exceed 720 square inches in area, and 54 inches in vertical and 48 inches in horizontal dimension.

Note: It will be the policy of the department of industry, labor and human relations to approve, subject to the provisions of this section, any window bearing the inspection manifest of the Underwriters' Laboratories for the situation of installation.

Ind 51.11 Glass block. (1) USE. Approved glass block may be used in non-load bearing panels in walls where ordinary glass will be permitted, unless specifically prohibited by occupancy requirements of this code.

(2) INSTALLATION. Glass block panels shall not exceed 144 square feet in unsupported area, with a maximum height of 20 feet and a maximum width of 20 feet. The horizontal and vertical mortar joints between each block shall be composed of one part of Portland cement, one part of lime and 4 parts of sand, or its equivalent.

(a) All panels over 6 feet in width shall be supported on each side by chases, not less than 1½ inches in depth, of metal or other incombustible material.

(b) Approved continuous metal bond ties shall be provided in each horizontal mortar joint for block of nominal 12 x 12 inch size and in at least every third joint for block of smaller dimension.

(c) Provision shall be made in all panels for expansion, using approved expansion material not less than ½ inch thick for heads and lintels and not less than ¼ inch thick for jambs.

Ind 51.12 Height of building. The height of a building is measured at the center line of its principal front, from the sidewalk grade (or, if setting back from the sidewalk, from the grade of the ground adjoining the building) to the highest part of the roof, if a flat roof, or to a point 2/3 of the height of the roof, if a gabled or hipped roof. If the grade of the lot or adjoining sidewalk in the rear or alongside of the building falls below the grade at the front, the height shall be measured at the center of the lowest side.

Ind 51.13 Basement; first floor; number of stories. A basement is a story whose floorline is below grade at any entrance or exit and whose ceiling is not more than 5 feet above grade at any such entrance or exit. The first floor is the floor next above the basement, or the lowest floor if there is no basement. The number of stories of a building includes all stories except the basement.

Ind 51.14 Street; alley; court. (1) A street is any public thoroughfare 30 feet or more in width.

(2) An alley is any public thoroughfare less than 30 feet, but not less than 10 feet, in width.

(3) A court is an open, unoccupied space other than a street or alley and bounded on one or more sides by the walls of a building.

Ind 51.15 Standard exit. (1) Every door which serves as a required exit from a public passageway, stairway or building shall be a standard exit door unless exempted by the occupancy requirements of this code.

Note: For required exits see Wis. Adm. Code sections Ind 54.06, 55.10, 56.08 and 57.09.

(2) Every standard exit door shall swing outward or toward the natural means of egress (except as below). It shall be level with the floor, and shall be so hung that, when open, it will not block any part of the required width of any other doorway, passageway, stairway or fire escape. No revolving door, and no sliding door except where it opens onto a stairway enclosure or serves as a horizontal exit, shall be considered as a standard exit door.

(3) A standard exit door shall have such fastenings or hardware that it can be opened from the inside without using a key, by pushing against a single bar or plate, or turning a single knob or handle. It shall not be barred or bolted at any time while the building is occupied.

(4) A standard exit doorway shall not be less than 6 feet 4 inches high by 3 feet 4 inches wide, except where especially provided under occupancy classifications and in Wis. Adm. Code section Ind 51.20. Where double doors are provided with or without mullions, the width of each single door may be reduced to 2 feet 6 inches.

(5) All exit doors, unless otherwise exempted by the occupancy requirements of this code, shall be plainly marked by a red illuminated translucent exit sign bearing the word EXIT or OUT in plain letters not less than 5 inches in height and in such other places as may be necessary to direct the occupants to exit doorways.

(6) Doors, windows or other openings which are not exits but which give the appearance of exits shall be effectively guarded.

(a) *Glass doors.* All glass doors shall be provided with a push bar or plate inside and outside. The push bar or plate shall be within 32 inches to 44 inches above the floor.

(b) *Glass walls panels.* Glass wall panels having a curb or sill less than 24 inches in height shall be protected by a horizontal bar or rail at least 1½ inches wide and located within 3 feet 6 inches to 4 feet 6 inches above the floor. The bar or rail assembly shall be capable of withstanding a lateral force of 100 pounds applied at any point.

(7) Safeguards for physically handicapped persons:

(a) Every public building, the construction of which is commenced after January 1, 1964, shall be so designed and constructed to provide a reasonable means of ingress and egress for physically handicapped persons with the exception of those listed in subsection (j).

(b) There shall be at least one grade or street level entrance without steps. The door shall be at least 6 feet 4 inches high and not less than 3 feet 4 inches wide and shall comply with all other requirements of this section.

(c) Where the door sill or floor is above or below grade or street level, the difference in elevation shall be accomplished by a ramp with a slope of not more than one foot of rise in 12 feet, and shall be finished with a nonslippery surface.

(d) Other grade or street level entrances not so designed or constructed shall be marked with a sign indicating the location of the entrance or exit available for wheelchair service.

(e) The ramp shall be at least 3 feet 8 inches in width of which not more than 4 inches on each side may be occupied by a handrail.

(f) All ramps shall have a handrail on each side. Handrail shall be not less than 2 feet 6 inches in height with an intermediate rail at mid-height.

(g) The floor on the inside and outside of each ramp doorway shall be level for a distance of 6 feet from the door.

(h) Every ramp shall have at least 6 feet of level clearance at the bottom.

(i) All ramps shall have a level platform at 30-ft. intervals and shall have a level platform at least 6 feet in length wherever they turn.

(j) *Exceptions:*

1. Apartment buildings with less than 20 living units.
2. Row houses.
3. Convents and monasteries.
4. Jails and other places of detention.
5. Garages, service stations, hangars, boathouses, and other buildings in the hazardous occupancy classification.
6. Factories and mercantile buildings.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63; am. (5) and cr. (7), Register, November, 1963, No. 95, eff. 12-1-63; r. and recr., Register, October, 1967, No. 142, eff. 11-1-67.

Ind 51.16 Stairways. (1) DEFINITION. By a stairway is meant one or more flights of steps and the necessary platforms connecting them to form a continuous passage from one level to another within a building or structure, except as provided in subsection (3) (b).

(2) WIDTH. Every required exit stairway, whether enclosed or not, shall be not less than 3 feet 8 inches wide of which not more than 4 inches on each side may be occupied by a handrail. Every platform shall be at least as wide as the stairway, measuring at right angles to the direction of travel. Every straight run platform shall measure at least 3 feet in the direction of travel. Wherever a door opens onto a stairway, a platform shall be provided extending at least the full width of the door in the direction of travel. *Exception:*

(a) In apartment buildings not more than 2 stories in height and having not more than 2 apartments on a floor and in rooming houses, hospitals, hotels and similar buildings not more than 2 stories in height and having not more than 6 living or sleeping rooms on a floor, such stairways shall not be less than 3 feet wide.

(b) If other stairways are provided in addition to those required by this code, such additional stairways need not conform to the width requirements of this code.

(3) HANDRAILS. All stairways and steps of more than 3 risers shall have at least one handrail. Stairways and steps 5 feet or more in width, or open on both sides, shall have a handrail on each side. Stairways and steps which are less than 5 feet in width shall have a handrail on the left hand side as one mounts the stairs and on the open side, if any.

(a) Stairways which are more than 8 feet wide shall be divided by center rails into widths not more than 8 feet nor less than 3 feet 8 inches. Rails shall be not less than 2 feet 6 inches above the nose of the treads or 3 feet 6 inches above the platform except as specified in Wis. Adm. Code section Ind 51.20. Railings on the open sides of stairways and platforms shall be provided with an intermediate member at midheight or with vertical members having a maximum spacing of 11 inches, or its equivalent in safety.

(b) Stairways on the outside of buildings and an integral part thereof, having more than 3 risers, shall have a handrail at each side, and if the stairway is more than 50 feet wide, one or more intermediate handrails shall be provided.

(c) Where an exit door leads to an outside stairway, platform or sidewalk, the level of the platform or sidewalk shall not be more than 7¾ inches below the door sill except as provided in section Ind 51.20 (4) (g).

(4) RISERS AND TREADS. All stairways and steps required as exits by this code shall have a uniform rise of not more than 7¾ inches and a uniform tread of not less than 9½ inches, measuring from tread to tread, and from riser to riser. No winders shall be used. There shall not be more than 18, nor less than 3 risers between platforms or between floor and platform and not more than 22 risers from floor to floor with no platform.

(a) Stairways and steps not required as exits by this code shall have a uniform rise of not more than 8 inches and a uniform tread of not less than 9 inches. If winders are used, the tread shall be at least 7 inches wide at a point one foot from the narrow end.

(b) For stairways to elevated walks, platforms and runways in places of employment see section Ind 1.17 of the general orders on safety issued by the department of industry, labor and human relations.

(c) The edges of all treads and the edges of all stairway landings shall be finished with a non-slippery surface not less than 3 inches in width.

History: 1-2-56; am. (2); (2) (a); (2) (b); Register, June, 1956, No. 6, eff. 7-1-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59.

Ind 51.17 Smokeproof stair tower. (1) A smokeproof stair tower shall be an enclosed stairway which is entirely cut off from the building and which is reached by means of open balconies or platforms. The stairways, landings, platforms and balconies shall be of incombustible material throughout. The enclosing walls shall be of not less than 4-hour fire-resistive construction as specified in section Ind 51.05, and the floors and ceilings of not less than 2-hour fire-resistive construction as specified in section Ind 51.06.

(2) The doors leading from the buildings to the balconies and from the balconies to the stairways shall be fire-resistive doors as specified in section Ind 51.09, and all openings within 10 feet of any balcony shall be protected with fire-resistive windows as specified in section Ind 51.10, or fire-resistive doors.

(3) Each balcony shall be open on at least one side, with a railing not less than 3'6" high on all open sides.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63.

Ind 51.18 Interior enclosed stairway. (1) An interior enclosed stairway shall be completely enclosed with walls of not less than 2-hour fire-resistive construction as specified in section Ind 51.05, except that in ordinary or frame buildings and in mill or fire-resistive buildings not more than 3 stories in height one-hour fire-resistive enclosures may be used. All doors opening into such enclosures shall be as specified in section Ind 51.09.

(2) The enclosure shall include at each floor level a portion of such floor which will be at least as wide as the stairway; and such enclosure shall also include the passageway of the first floor level (if

any) leading from the stairway to an outside door, so as to afford uninterrupted passage from the uppermost floor to such outside door without leaving the enclosure.

(3) If windows are placed in any such enclosure they shall be fixed fire-resistive windows as specified in section Ind 51.10, except in outside walls.

Ind 51.19 Horizontal exit. (1) A horizontal exit shall consist of one or more openings through or around an exterior wall or occupancy separation, or of one or more bridges or balconies connecting 2 buildings or parts of buildings entirely separated by occupancy separations as described in section Ind 51.08.

(2) Openings used in connection with horizontal exits shall be protected by fire-resistive doors as specified in section Ind 51.09. If swinging doors are installed in pairs, they shall be arranged to swing in opposite directions; with direction of travel indicated by signs, except that where the travel is in one direction only, both doors shall swing in that direction. Such doors shall be kept continuously unlocked whenever the building is occupied and be normally closed or be self-closing and equipped with fusible links.

(3) Floors in horizontal exits shall have a slope of not more than one foot in 6.

(4) All doors and windows within 10 feet of any balcony or bridge shall be fire-resistive doors as specified in Wis. Adm. Code section Ind 51.09, or fire-resistive windows as specified in section Ind 51.10, except that if such doors or windows are in the same plane, this requirement shall apply only to those within 5 feet of the balcony or bridge.

(5) The floor on each side of a horizontal exit and all passageways leading thereto shall be kept clear and unobstructed at all times.

Ind 51.20 Fire escapes. (1) LOCATION. Every fire escape shall be so located as to lead directly to a street, alley, or open court connected with a street.

(a) Every fire escape shall be placed against a blank wall if possible. If such a location is not possible then every wall opening which is less than 6 feet distant horizontally from any tread or platform of the fire escape shall be protected by a fire-resistive door as specified in section Ind 51.09 or by a fire-resistive window as specified in section Ind 51.10.

(2) EXITS TO FIRE ESCAPES. Every fire escape shall be accessible from a public passageway or shall be directly accessible from each occupied room. Exits to fire escapes shall be standard exit doors as specified in Wis. Adm. Code section Ind 51.15, except that doors to "A" fire escapes may be not less than 2 feet 6 inches wide.

(3) DESIGN AND FABRICATION. Each part of every fire escape (except counterweights for balanced stairways) shall be designed and constructed to carry a live load of 100 pounds per square foot of horizontal area over the entire fire escape. Each part of every fire escape shall be designed and constructed in accordance with the requirements of section Ind 53.16, except that the unit stresses therein

specified shall be reduced by one-fourth. The minimum sections and sizes specified below shall be increased whenever necessary so that under full load the allowable unit stresses will not be exceeded.

(a) No other material than wrought iron, soft steel or medium steel shall be used for any part of a fire escape, except for weights, separators and ornaments. No bar material less than ¼ inch thick shall be used in the construction of any fire escape, except for separators, ornaments, structural shapes over 3 inches and rigidly built up treads and platforms of approved design. In the fabrication of a fire escape, all connections or joints shall be made by riveting, bolting or welding in an approved manner. All bolts or rivets, except for ornamental work, shall be not less than ¾ inch in diameter.

(4) PLATFORMS. Each platform on an "A" fire escape shall be at least 28 inches wide; each platform on a "B" fire escape shall be at least 3 feet 4 inches wide. Such widths shall be the clear distance between stringers, measuring at the narrowest point. Each platform shall extend at least 4 inches beyond the jambs of exit opening. The above minimum widths and lengths shall be increased, wherever necessary, so that no exit door or window will, when open, block any part of the required width of the fire escape. Every platform shall consist of either,

(a) Flat bars on edge, not less than 1 x ¼ inch, but not less than 1¼ x ¼ inch where bolts and separators are used except that platforms and treads constructed of flat bars on edge may be made of material ⅛ inch in thickness provided the material is galvanized after fabrication. Bars shall not be spaced more than 1¼ inches, center to center.

(b) ½ inch or ⅝ inch square bars with sharp edge up, not more than 1½ inches, center to center.

(c) ⅝ inch round bars, not more than 1½ inches, center to center.

(d) Platform and treads may be solid if covered by a roof.

(e) The platform frame shall consist of not less than 2 x ¾ inch flat bars on edge or equivalent, provided the brackets are not more than 4 feet apart. If brackets are more than 4 feet apart, the frame shall be correspondingly stronger and stiffer. Every platform wider than 30 inches, if made of square or round bars, shall have a third frame bar through the center; if made of flat bars, the platform shall have separators and bolts through the center. Frame bars shall not project more than ¼ inch above platform bars, except around the outside of platform.

(f) There shall be a platform at each story above the first, and intermediate platforms if floors are more than 18 feet apart vertically.

(g) Platforms shall not be more than 8 inches below the door sill.

(5) BRACKETS. Brackets for a 28 inch or 30 inch platform, when spaced not more than 4 feet apart, shall be made of not less than ⅞ inch square bars or 1½ x 1½ x ¼ inch angles; such bars or angles shall be larger if the platform is wider or if the brackets are farther apart. Each bracket shall be fastened at the top to the wall by a through bolt (at least ⅞ inch diameter), nut, and washer (at least 4 inch diameter). The slope of the lower bracket bar shall be not less

than 30 degrees with the horizontal. The lower bar shall have a washer or shoulder to give sufficient bearing against the wall.

(a) The strength of the wall to which brackets are to be attached shall be carefully considered in determining the spacing, shape and inside connection of brackets, so that under full load the wall will not be unduly strained. Where it is necessary to install brackets adjacent to wall openings they shall be located at a suitable distance therefrom, or the wall shall be properly reinforced.

(6) STAIRWAYS. (a) Each stairway of an "A" fire escape shall be at least 24 inches wide between stringers; such stairway shall have a uniform rise of not more than 8 inches and a uniform run of not less than 8 inches.

(b) Each stairway of a "B" fire escape shall be at least 3 feet 4 inches wide between stringers; such stairway shall have a uniform rise of not more than 8 inches, and a uniform run of not less than 9 inches.

1. The rise is the vertical distance from the extreme edge of any step to the corresponding extreme edge of the next step. The run is the horizontal distance between the same points.

(c) Stairway stringers shall consist of either

1. A 5 inch channel or larger.
2. Two angles 2 x 2 x ¼ inch or larger.
3. Two flat bars 2 x ⅜ inch or larger.
4. One flat bar 6 x ¼ inch or larger.

5. If 2 angles or 2 flat bars are used, they shall be properly tied together by lattice bars, vertical as well as horizontal. If flat bars are used, every stairway of more than 10 risers shall have lateral bracing. The connection of stringers to platform, at top and bottom, shall be at least equal in strength to the stringers and shall safely carry the full live and dead loads. If stringers are carried by intermediate brackets, the stringers shall have a horizontal bearing on the brackets and shall be properly and securely connected thereto.

6. Treads shall consist of either flat or square bars, (not round), of the size and spacing specified for platforms. An "A" tread shall consist of at least 6 square bars, or 7 flat bars. A "B" tread shall consist of at least 7 square bars, or 8 flat bars. A "B" tread made of flat bars shall have separators and bolt through the center. A "B" tread made of square bars shall be trussed.

7. Treads and platforms may be solid if covered by a roof.

(7) BALANCED STAIRWAY. All "B" fire escapes, and all fire escapes on schools, theaters, assembly halls, and hospitals either shall reach to the ground or shall have a balanced stairway reaching to the ground. "A" fire escapes which are not on schools, theaters, assembly halls, or hospitals may terminate in a platform at least 3 feet long, located not more than 10 feet above the ground.

(a) Every balanced stairway shall conform to the requirements for other stairways except that the stringers and top rail may be lighter if they are properly trussed. The counterbalancing device shall be attached to both sides of the stairway equally, or a special attachment shall be used to prevent warping or twisting. The counterbal-

ancing device shall operate gradually and easily as the live load is applied. Cable counterweights are not permitted.

(b) Treads for "A" balanced stairways may be made as follows: two 1¼ x 1¼ x ¼ inch angles at front and back; two 1¼ x ¼ inch bars between, lying flatwise; one inch space between bars. Treads for "B" balanced stairways may be made as follows: two 1½ x 1½ x ¼ inch angles at front and back; two 1½ x ¼ inch bars between, lying flatwise; one inch space between bars. All such treads shall be strongly fastened together with cross bars not more than 14 inches apart.

(8) RAILINGS. A railing at least 42 inches in height and having 2 intermediate rails, uniformly spaced, measuring vertically from the floor of the platform, shall be provided on all open sides of platforms. Railings at least 36 inches in height, measuring vertically from the nose of the treads, shall be provided on the open sides of all stairways and on both sides of balanced stairways. Either a railing or a handrail fastened to the wall shall be provided on each side of all "B" fire escape stairways.

(a) Every railing shall have posts, not more than 5 feet apart made of not less than 1½ x 1½ x ¼ inch angles or tees, or 1¼ inch pipe; top rail not less than 1¼ x 1¼ x ¼ inch angle or equivalent; center rail not less than 1¼ x ⅜ flat bar or equivalent. All connections shall be such as to make the railing stiff; 2 bolts (⅜ inch or larger) shall be used at the foot of each post wherever possible, or at least one ½ inch bolt shall be used. Railing shall be continuous. No projections on the inside of the railing shall be permitted. Where a railing returns to the wall, it shall be fastened thereto with a through bolt (at least ⅝ inch diameter), nut, and washer; or (in reinforced concrete) with an approved insert; or the railing shall be made equally secure with a diagonal brace extending at least 3 feet horizontally and 3 feet vertically.

(b) All outside railings which are more than 60 feet above grade shall be at least 6 feet high, measuring vertically from floor of platform or from nose of step. Such railings shall be of special design approved by the department of industry, labor and human relations, having not less than 4 longitudinal rails, and vertical lattice bars not more than 8 inches apart, and proper stiffening braces or brackets.

(9) LADDER TO ROOF. Every fire escape which extends higher than the second floor shall be provided with a ladder leading from the upper platform to the roof, unless the fire escape stairway leads to the roof. The ladder shall have stringers not less than 1¼ inch pipe, or not less than 2 x ⅜ inch flat bars, at least 17 inches apart in the clear. The rungs shall be not less than ½ inch square or ⅝ inch round bars, 14 inches center to center. The stringers shall be securely tied together at intervals no greater than every fifth rung. The stringers of each ladder shall extend not less than 4 feet above the roof coping and return to within 2 feet of the roof, with the top rung of the ladder level with the coping.

(10) OTHER TYPES OF FIRE ESCAPES. Sliding or chute fire escapes may be used, upon the approval of the department of industry, labor and human relations, in place of "A" or "B" fire escapes. Every

sliding fire escape shall be provided with a ladder constructed as in subsection Ind 51.20 (9), extending from 5 feet above grade, to 4 feet above the roof coping.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63.

Ind 51.21 Standpipes. (1) CLASSES OF SERVICE. Standpipe systems are designed for 2 classes of service: (a) for use by fire departments or others trained in handling heavy streams from 2½ inch hose, and (b) for use by occupants of a building on incipient fires. These are referred to in these sections as fire departments, and first aid standpipes, respectively. The features of each system may be combined in a single equipment, if served by an automatic water supply conforming to subsection (2) (g) or (h). All threads on hose and hose connections shall be interchangeable with those of the public fire department.

(2) FIRE DEPARTMENT STANDPIPES. (a) Standpipes shall be provided for all buildings exceeding 60 feet in height. Required standpipes shall be installed as construction progresses, to make them available to the fire department in the topmost floor constructed.

(b) Standpipes shall be sufficient in number so that any part of every floor area can be reached within 30 feet by a nozzle attached to 100 feet of hose connected to the standpipe. When 2 or more standpipes are required, they shall be cross connected at the bottom, and equipped with individual controlling valves located not higher than the first story.

(c) Standpipes shall be protected against mechanical and fire damage, with outlets in stairway enclosures; where stairways are not enclosed, outlets shall be at inside or outside of outside walls, within one foot of a fire tower, interior stairway or fire escape. Dry standpipes shall be accessible for inspection and not concealed.

(d) No required standpipe shall be less than 4 inches in diameter, and not less than 6 inches in diameter for buildings exceeding 75 feet in height. Material shall be steel or wrought iron pipe with approved fittings, designed for a working pressure of 100 pounds in excess of the static pressure due to elevation. An approved 2½ inch hose valve shall be located at each story, not over 5 feet above the floor level. An approved pressure reducing device shall be installed at hose valves where the pressure would otherwise be in excess of 50 pounds. Where a standpipe is not normally under pressure, hose valves shall be equipped with a tight fitting cap on a chain and having lugs for a spanner wrench.

(e) An approved siamese connection with a check valve in each inlet shall be installed on a 4 inch pipe connecting with each standpipe system and shall be marked "To Standpipe". The elevation of the connection shall be not over 3 feet above the sidewalk or ground. An automatic drip valve shall be installed where necessary to prevent freezing. In buildings with several standpipes, more than one siamese connection may be required.

(f) Fire department standpipes need not be equipped with attached hose.

(g) Automatic water supplies will not ordinarily be required, except as provided in subsection (2) (h), or where judged necessary

by reason of the high combustibility or potential hazard of the occupancy. When required, they shall be designed to provide not less than 40 pounds flowing pressure at the top outlet, with volume for two fire streams. Any of the following supplies will be acceptable:

1. Connection to city water works system when providing required minimum volume and pressure.

2. Gravity tank of not less than 3,500 gallons capacity, elevated 50 feet above the top story.

3. Pressure tank of 5,250 gallons gross capacity (3,500 gallons water capacity).

4. Automatic pump or pumps, with combined effective capacity of 500 gallons per minute.

(h) An automatic water supply from an approved fire pump shall be provided in buildings over 150 feet high, or in buildings over 10,000 square feet in area per floor and requiring a standpipe. The capacity of the pump shall be not less than 500 gallons per minute for a 4 inch standpipe, 750 gallons per minute for 2 interconnected 4 inch or single 6 inch standpipes, and 1,000 gallons per minute for larger systems.

(3) FIRST AID STANDPIPES. (a) Standpipes shall be provided as required in sections Ind 54.14, 55.33, and 57.21.

(b) Standpipes shall be sufficient in number so that any part of every floor area can be reached within 20 feet by a nozzle attached to not more than 75 feet of hose connected to a standpipe.

Note: Standpipe outlets should be located in occupied areas, and usually at interior columns in large area buildings. Asylums and places of detention may require special arrangements. It should be possible in all cases to direct the stream into all important enclosures, such as closets, etc.

(c) No required standpipe shall be less than 2 inches in diameter, and not less than 2½ inches in diameter for buildings 5 stories or more in height. Material shall be wrought iron or steel and pipe and fittings shall be of suitable weight for the pressure used. An approved 1½ inch hose valve shall be located in each story, not more than 5 feet above the floor level; valves of the gate type shall be equipped with a suitable open drip connection. An approved pressure-reducing device shall be installed at hose valves where pressure would otherwise be over 50 pounds.

(d) Not more than 75 feet of hose shall be attached to each outlet. Hose shall be of unlined linen construction, 1½ inches in diameter, with a ½ inch nozzle attached, and shall be located in approved cabinets or racks.

(e) Water supply shall be automatic, and be designed for 70 gallons per minute for 30 minutes with 25 pounds flowing pressure at the top outlet. Such supply may be from city connection, gravity tank, pressure tank or pump.

Note: Data on the design of standpipe systems can be found in the Standards of the National Board of Fire Underwriters for the Installation of Standpipe and Hose Systems. The department of industry, labor and human relations will ordinarily approve any installation which is approved by the Underwriters.

Ind 51.22 Fire extinguishers. (1) Where fire extinguishers are required, they shall be of a type approved by the department of indus-

try, labor and human relations. All fire extinguishers shall be charged in accordance with the instructions of the manufacturer.

(2) Extinguishers shall be conspicuously located where they will always be readily accessible and so distributed as to be immediately available in event of fire. They shall be hung on hangers or set on brackets or shelves so that the top of the extinguisher is not more than 5 feet above the floor.

Note: The department of industry, labor and human relations will ordinarily approve any extinguisher which bears the Underwriters' label and which is of the size, and suitable, for the hazard for which it is intended. Consult the department of industry, labor and human relations for lists of approved extinguishers.

Ind 51.23 Automatic sprinklers. (1) Required automatic sprinkler systems shall be designed and constructed in conformity with good established practice. Only materials and devices approved by the department of industry, labor and human relations may be used. Reinstallation of used sprinkler heads is prohibited, and other second-hand devices may be installed by special permission only.

(2) Where an automatic sprinkler system is required throughout a building, supply shall be from a city water main, or from a gravity or pressure tank. If the city water supply is inadequate in either pressure or volume, a tank of not less than 5,000 gallons capacity shall be provided. The bottom of a gravity tank shall be not less than 35 feet above the under side of the roof.

(3) Where automatic sprinklers are required in a basement only, the supply shall be from a city water main. Where there is no city water supply, such basement sprinklers need not be installed; but at such time as a city supply becomes available, such required basement sprinklers shall be installed.

(4) Every basement sprinkler system shall also include sprinklers in all shafts (except elevator shafts) leading to the story above.

(5) Every sprinkler system shall have a suitable audible alarm and an approved siamese connection marked "To Automatic Sprinklers", and otherwise conforming to section Ind 51.21 (2) (e).

Note: It will be the policy of the department of industry, labor and human relations to approve equipment conforming to standards of the National Board of Fire Underwriters for Sprinkler Equipment, also materials and devices currently listed by the Underwriters' Laboratories. The commission reserves the right to order a sprinkler system in any building, regardless of height or number of persons, if the occupancy is especially hazardous.

Ind 51.24 Fire alarm systems. Interior fire alarm systems required under Wis. Adm. Code sections Ind 54.16, 56.19 and 57.22 shall be designed and constructed in conformity with the following requirements:

(1) All such alarm systems shall consist of operating stations on each floor of the building, including the basement, with bells, horns, or other approved sounding devices which are effective throughout the building. The system shall be so arranged that the operation of any one station will actuate all alarm devices connected to the system except in the case of a presignal system. Fire alarms shall be readily distinguishable from any other signalling devices used in the building. A system designed for fire alarm and paging service may be used

if the design is such that fire alarm signals will have precedence over all others.

(2) Every fire alarm system shall be electrically operated or activated by non-combustible, non-toxic gas except as provided in section Ind 56.19. Electrically operated systems shall be operated on closed circuit current under constant electrical supervision, so arranged that upon a circuit opening and remaining open or in case of a ground or short circuit in the undergrounded conductor, audible trouble signals will be given instantly. Gas activated systems shall be mechanicaly supervised and under constant gas pressure, so arranged that in case of a pressure drop an audible trouble signal will be given instantly. Means shall be provided for testing purposes.

(3) In buildings more than 3 stories in height, coded fire alarm systems shall be provided, and the systems shall be so arranged that the code transmitted shall indicate the location and the story of the structure in which the signal originated.

Exception: (a) In apartment buildings, non-coded continuous sounding fire alarm systems under constant electrical or gas activated supervision will be approved.

(4) Operating stations shall be prominently located in an accessible position at all required exit doors and required exit stairways. Operating stations shall be of an approved type and shall be conspicuously identified. All such operating stations shall be of a type, which after being operated, will indicate that an alarm has been sent therefrom until reset by an authorized means. (Operating stations having a "Break Glass" panel will be acceptable. On coded systems having a device to permanently record the transmission of an alarm, "Open Door" type stations may be used). The fire alarm operating stations shall be mounted not less than 4 feet nor more than 5 feet above the finished floor as measured from the floor to the center of the box.

(5) All such alarm systems shall be tested at least once a week and a record of such tests shall be kept.

(6) Existing fire alarm systems that are effective in operation will be accepted if approved by the department of industry, labor and human relations.

(7) The gas for operation of non-combustible, non-toxic gas activated fire alarm systems shall be supplied from approved pressure cylinders on the premises. The cylinders shall have sufficient capacity and pressure to properly operate all sounding devices connected to the system for a period of not less than 10 minutes. Cylinders shall be removed for recharging immediately after use and shall be replaced by fully charged cylinders.

(8) Spare cylinders shall be kept on the premises at all times for immediate replacement and separate cylinders for testing shall be incorporated in the system.

(9) Tubing in connection with non-combustible, non-toxic gas activated fire alarm systems shall be installed in rigid metal conduit, flexible metal conduit, or surface metal raceways where subject to mechanical injury. Non-corrosive metallic tubing not less than 3/16" in diameter which will withstand a bursting pressure of not less than

500 pounds per square inch shall be used. The maximum length of 3/16" tubing shall not exceed 300 feet between charged cylinders. All tubing and other component parts shall be installed by skilled workmen in accordance with the provisions of this code.

Note: The following sections are taken from the Wisconsin Administrative Electrical Code:

(10) The energy for the operation of electrical fire alarm systems shall be taken from sources suited to the design of the system. Batteries on systems of less than 110 volts shall not be used.

(11) A 3-wire 120–240 volt or 120–208 volt (3 phase 4 wire) service will be accepted for supervised systems provided the operating current is secured from one ungrounded conductor and the neutral, or ungrounded conductor, and the current for operating trouble signal or signals is secured from the other ungrounded conductor and the neutral or grounded conductor.

(12) Electrical wiring in connection with fire alarm systems shall be installed in rigid metal conduit, flexible metal conduit, electrical metallic tubing or surface metal raceways. Armored cable (metal) may be used where it can be fished in hollow spaces of walls or partitions in apartments or rooming houses not over 3 stories in height. Where the wiring is subject to excessive moisture or severe mechanical injury, rigid metal conduit shall be used. The smallest size conductor to be used in any fire alarm system in a building over 3 stories in height shall be No. 14 AWG or No. 16 AWG for buildings not over 3 stories in height. The wires shall be provided with insulation suitable for use on circuits not exceeding 600 volts. Fire alarm systems shall be connected to the line inside of the main service switch or to the emergency feeder through 2 single pole breakers or switches used for no other purpose and arranged so they can be locked in the "on" position, and under the supervision of a qualified person. The breaker or switches shall be identified by a red color. Two pole breakers shall not be used.

History: 1–2–56; am. (4) (a), Register, November, 1963, No. 95, eff. 12–1–63; am. Register, August, 1964, No. 104, eff. 9–1–64.

Ind 51.25 Specifications cited in this code. The specifications of the American Society for Testing and Materials referred to in this code are listed below.

(1) CLAY BUILDING BRICK. (Solid masonry units made from clay or shale.) Part 12 ASTM Designation C 62–66.

(2) SAND-LIME BUILDING BRICK. Part 12 ASTM Designation C 73–51 (1965).

(3) CONCRETE BUILDING BRICK. Part 12 ASTM Designation C 55–66T.

(4) SAMPLING AND TESTING BRICK. Part 12 ASTM Designation C 67–66.

(5) STRUCTURAL CLAY LOAD-BEARING WALL TILE. Part 12 ASTM C 34–62.

(6) SAMPLING AND TESTING STRUCTURAL CLAY TILE. Part 12 ASTM C 112–60.

(7) SAMPLING AND TESTING CONCRETE MASONRY UNITS. Part 12 ASTM Designation C 140–65T.

(8) STRUCTURAL CLAY NON-LOAD-BEARING TILE. Part 12 ASTM Designation C 56–62.

(9) STRUCTURAL CLAY FLOOR TILE. Part 12 ASTM Designation C 57–57 (1965).

(10) PORTLAND CEMENT. Part 10 ASTM Designation C 150–66.

(11) AIR-ENTRAINING PORTLAND CEMENT. Part 10 ASTM Designation C 175–66.

(12) PORTLAND BLAST-FURNACE SLAG CEMENT. Part 10 ASTM Designation C 205–64T.

(13) MASONRY CEMENT. Part 9 ASTM Designation C 91–66.

(14) QUICKLIME FOR STRUCTURAL PURPOSES. Part 9 ASTM Designation C 5–59.

(15) HYDRATED LIME FOR MASONRY PURPOSES. Part 9 ASTM Designation C 207–49 (1961).

(16) AGGREGATE FOR MASONRY MORTAR. Part 10 ASTM Designation C 144–66T.

(17) AGGREGATES FOR MASONRY GROUT. Part 10 ASTM Designation C 404–61.

(18) PORTLAND-POZZOLAN CEMENT. Part 9 ASTM Designation C 340–66T.

(19) CONCRETE AGGREGATES. Part 10 ASTM Designation C 33–66.

(20) LIGHTWEIGHT AGGREGATES FOR STRUCTURAL CONCRETE. Part 10 ASTM Designation C 330–64T

(21) BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A15–66.

(22) RAIL-STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 16–66.

(23) DEFORMED RAIL STEEL BARS FOR CONCRETE REINFORCEMENT WITH 60,000 P.S.I. MINIMUM YIELD STRENGTH. Part 4 ASTM Designation A 61–66.

(24) AXLE-STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 160–66.

(25) SPECIAL LARGE SIZE DEFORMED BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 408–66.

(26) HIGH-STRENGTH DEFORMED BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT WITH 75,000 P.S.I. MINIMUM YIELD STRENGTH. Part 4 ASTM Designation A 431–66.

(27) MINIMUM REQUIREMENTS FOR THE DEFORMATIONS OF DEFORMED STEEL BARS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 305–65.

(28) BLEEDING OF CONCRETE. Part 10 ASTM Designation C 232–58 (1966).

(29) FABRICATED STEEL BAR OR ROD MATS FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 184–65.

(30) COLD-DRAWN STEEL WIRE FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 82–66.

(31) WELDED STEEL WIRE FABRIC FOR CONCRETE REINFORCEMENT. Part 4 ASTM Designation A 185–64.

(32) UNCOATED SEVEN-WIRE STRESS-RELIEVED STRAND FOR PRESTRESSED CONCRETE. Part 4 ASTM Designation A 416–64.

(33) UNCOATED STRESS-RELIEVED WIRE FOR PRESTRESSED CONCRETE. Part 4 ASTM Designation A 421–65.

(34) STEEL FOR BRIDGES AND BUILDINGS. Part 4 ASTM Designation A 7–66.

(35) STRUCTURAL STEEL. Part 4 ASTM Designation A 36–66.

(36) FLEXURAL STRENGTH OF CONCRETE (using simple beam with third-point loading). Part 10 ASTM Designation C 78–64.

(37) WELDED AND SEAMLESS STEEL PIPE. Part 1 ASTM Designation A 53–65.

(38) CAST IRON AND DUCTILE IRON PRESSURE PIPE. Part 2 ASTM Designation A 377–66.

(39) AIR-ENTRAINING ADMIXTURES FOR CONCRETE. Part 10 ASTM Designation C 260–66T.

(40) CHEMICAL ADMIXTURES FOR CONCRETE. Part 10 ASTM Designation C 494–65T.

(41) FLY ASH FOR USE AS AN ADMIXTURE IN PORTLAND CEMENT CONCRETE. Part 10 ASTM Designation C 350–65T.

(42) RAW OR CALCINED NATURAL POZZOLANS FOR USE AS ADMIXTURES IN PORTLAND CEMENT CONCRETE. Part 10 ASTM Designation C 402–65T.

(43) METHODS AND DEFINITIONS FOR MECHANICAL TESTING OF STEEL PRODUCTS. Part 4 ASTM Designation A 370–65.

(44) DEFORMED BILLET-STEEL BARS FOR CONCRETE REINFORCEMENT WITH 60,000 P.S.I. MINIMUM YIELD STRENGTH. Part 4 ASTM Designation A 432–66.

(45) MAKING AND CURING CONCRETE COMPRESSION AND FLEXURE TEST SPECIMENS IN THE FIELD. Part 10 ASTM Designation C 31–66.

(46) COMPRESSIVE STRENGTH OF MOLDED CONCRETE CYLINDERS. Part 10 ASTM Designation C 39–66.

(47) OBTAINING AND TESTING DRILLED CORES AND SAWED BEAMS OF CONCRETE. Part 10 ASTM Designation C 42–64.

(48) READY-MIXED CONCRETE. Part 10 ASTM Designation C 94–65.

(49) SAMPLING FRESH CONCRETE. Part 10 ASTM Designation C 172–54.

(50) MAKING AND CURING CONCRETE COMPRESSION AND FLEXURE TEST SPECIMENS IN THE LABORATORY. Part 10 ASTM Designation C 192–66.

(51) SPLITTING TENSILE STRENGTH OF MOLDED CONCRETE CYLINDERS. Part 10 ASTM Designation C 496–66.

(52) METHODS OF MECHANICAL TESTINGS. Part 31 ASTM Designation E 6–66.

(53) MILD STEEL COVERED ARC-WELDING ELECTRODES. Part 4 ASTM Designation A 233–64T.

(54) RECOMMENDED PRACTICE FOR PROBABILITY SAMPLING OF MATERIALS. Part 30 ASTM Designation E 105–58.

(55) CALCIUM CHLORIDE. Part 10 ASTM Designation D 98–59.

(56) CHEMICAL ANALYSIS OF HYDRAULIC CEMENT. Part 9 ASTM Designation C 114–67.

(57) FINENESS OF PORTLAND CEMENT BY THE TURBIDIMETER. Part 9 ASTM Designation C 115–58.

(58) FINENESS OF PORTLAND CEMENT BY AIR PERMEABILITY APPARATUS. Part 9 ASTM Designation C 204–55.

(59) COMPRESSIVE STRENGTH OF HYDRAULIC CEMENT MORTARS (using 2-in. cube specimens). Part 9 ASTM Designation C 109–64.

(60) AUTOCLAVE EXPANSION OF PORTLAND CEMENT. Part 9 ASTM Designation C 151–66.

(61) SPECIFIC GRAVITY OF HYDRAULIC CEMENT. Part 9 ASTM Designation C 188–44 (1958).

(62) RESISTANCE TO ABRASION OF SMALL SIZE COARSE AGGREGATE BY USE OF THE LOS ANGELES MACHINE. Part 10 ASTM Designation C 131–66.

(63) MATERIALS FINER THAN NO. 200 SIEVE IN MINERAL AGGREGATES BY WASHING. Part 10 ASTM Designation C 117–66.

(64) FRIABLE PARTICLES IN AGGREGATES. Part 10 ASTM Designation C 142–66T.

(65) LIGHTWEIGHT PIECES IN AGGREGATES. Part 10 ASTM Designation C 123–66.

(66) ORGANIC IMPURITIES IN SANDS FOR CONCRETE. Part 10 ASTM Designation C 40–66.

(67) SIEVE OR SCREEN ANALYSIS OF FINE AND COARSE AGGREGATES. Part 10 ASTM Designation C 136–63.

(68) SOUNDNESS OF AGGREGATES BY USE OF SODIUM SULFATE OR MAGNESIUM SULFATE. Part 10 ASTM Designation C 88–63.

(69) SPECIFIC GRAVITY AND ABSORPTION OF COARSE AGGREGATE. Part 10 ASTM Designation C 127–59.

(70) SPECIFIC GRAVITY AND ABSORPTION OF FINE AGGREGATE. Part 10 ASTM Designation C 128–59.

(71) SURFACE MOISTURE IN FINE AGGREGATE. Part 10 ASTM Designation C 70–66.

(72) UNIT WEIGHT OF AGGREGATE. Part 10 ASTM Designation C 29–60.

(73) VOIDS IN AGGREGATE FOR CONCRETE. Part 10 ASTM Designation C 30–37 (1964).

(74) EFFECT OF ORGANIC IMPURITIES IN FINE AGGREGATE ON STRENGTH OF MORTAR. Part 10 ASTM Designation C 87–63T.

(75) PETROGRAPHIC EXAMINATION OF AGGREGATES FOR CONCRETE. Part 10 ASTM Designation C 295–65.

(76) POTENTIAL REACTIVITY OF AGGREGATES (CHEMICAL METHOD). Part 10 ASTM Designation C 289–66.

(77) POTENTIAL ALKALI REACTIVITY OF CEMENT-AGGREGATE COMBINATIONS (MORTAR BAR METHOD). Part 10 ASTM Designation C 227–65.

(78) TERMS RELATING TO CONCRETE AND CONCRETE AGGREGATES. Part 10 ASTM Designation C 125–66.

(79) WEIGHT PER CUBIC FOOT, YIELD, AND AIR CONTENT (GRAVIMETRIC) OF CONCRETE. Part 10 ASTM Designation C 138–63.

(80) AIR CONTENT OF FRESHLY MIXED CONCRETE BY THE VOLUMETRIC METHOD. Part 10 ASTM Designation C 173–66.

(81) AIR CONTENT OF FRESHLY MIXED CONCRETE BY PRESSURE METHOD. Part 10 ASTM Designation C 231–62.

(82) SLUMP OF PORTLAND CEMENT CONCRETE. Part 10 ASTM Designation C 143–66.

(83) FLOW OF PORTLAND CEMENT CONCRETE BY USE OF THE FLOW TABLE. Part 10 ASTM Designation C 124–39 (1966).

(84) COMPRESSIVE STRENGTH OF CONCRETE USING PORTIONS OF BEAMS BROKEN IN FLEXURE. Part 10 ASTM Designation C 116–65T.

(85) FUNDAMENTAL TRANSVERSE, LONGITUDINAL, AND TORSIONAL FREQUENCIES OF CONCRETE SPECIMENS. Part 10 ASTM Designation C 215–60.

(86) CEMENT CONTENT OF HARDENED PORTLAND CEMENT CONCRETE. Part 10 ASTM Designation C 85–66.

(87) LENGTH CHANGE OF CEMENT MORTAR AND CONCRETE. Part 10 ASTM Designation C 157–64T.

Note: The above standards may be obtained for personal use from American Society of Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103. They are available for inspection in the office of the department, the secretary of state and the revisor of statutes.

History: Cr. Register, October, 1967, No. 142, eff. 11–1–67.

Ind 51.26 Specifications cited in this code. The specifications of the American Concrete Institute referred to in this code are listed below.

(1) Building code requirements for reinforced concrete ACI 318–63.

(2) Minimum standard requirements for precast concrete floor and roof units AC1 512–67.

(3) Minimum requirements for thin-section precast concrete construction AC1 525–63.

Note: The above standards may be obtained for personal use from American Concrete Institute, 7400 Second Boulevard, Detroit, Michigan. They are available for inspection in the office of the department, the secretary of state and the revisor of statutes.

History: Cr. Register, October, 1967, No. 142, eff. 11–1–67.

Chapter Ind 52

GENERAL REQUIREMENTS

Ind 52.001 Design and supervision. (1) Every new building containing more than 50,000 cubic feet total volume, or addition to a building which by reason of such addition results in a building containing over 50,000 cubic feet total volume, or structural alteration to a building containing over 50,000 cubic feet total volume shall be designed by an architect or engineer in accordance with the provisions of this code; and shall be constructed under the supervision of an architect or engineer who shall be responsible for its erection in accordance with the plans and specifications of the designer. No change from the original plans and specifications shall be made except with the knowledge and consent of the designer, and as provided in Wis. Adm. Code section Ind 50.10.

(2) On completion of the construction, the supervising architect or engineer shall file a written statement with the department of industry, labor and human relations certifying that, to the best of his knowledge and belief, the construction has been performed in accordance with the plans and specifications approved by the department.

(3) No owner shall construct or alter any building, or portion of a building, or permit any building to be constructed or altered, except in accordance with the provisions of this section.

Note: By the term "architect" or "engineer" above is meant "registered architect" or "registered professional engineer", as defined in the Architects and Professional Engineers Registration Act, Section 101.31, Wis. Stats.

History: 1-2-56; cr. (2) Register, August, 1957, No. 20, eff. 9-1-57.

Ind 52.01 Height and class of construction. (1) All buildings higher than 75 feet above the adjacent grade shall be of fire-resistive construction.

(2) Buildings of mill construction shall not exceed a height of 75 feet in which height there shall not be more than 7 stories; provided, that the height of a building erected on sloping ground may be not to exceed 75 feet plus a vertical distance equal to the vertical change in slope along the length of any side of such building, but in no case shall such height exceed 85 feet above the adjacent finished ground level. Towers, other than tanks, spires and steeples erected as a part of the building and not used for habitation or storage may extend not to exceed 20 feet above such height limit.

(3) Buildings of ordinary construction shall not exceed a height of 50 feet in which height there shall be not more than 4 stories; provided, that the height of a building erected on sloping ground may be 50 feet plus a vertical distance equal to the vertical change in slope along and in the length of any side of such building, but in no case shall such height exceed 60 feet above the adjacent finished ground level. Towers, other than tanks, spires and steeples not exceeding 20% of the roof area, erected as a part of such building and not used for habitation or storage may extend not to exceed 15 feet above such height limit.

(4) Buildings of frame construction shall not exceed a height of 35 feet in which height there shall be not more than 2 stories, except as provided in Wis. Adm. Code section Ind 57.01; provided, that the height of a building erected on sloping ground may be 35 feet plus a vertical distance equal to the vertical change in slope along the length of any side of such building, but in no case shall such height exceed 40 feet above the adjacent finished ground level. Spires, towers, other than tanks, or steeples not exceeding 20% of the roof area, erected as a part of such building and not used for habitation or storage may extend not to exceed 20 feet above such height limit.

(5) In every building more than 4 stories in height, all doors, windows and other openings in outside walls shall be protected with fire-resistive doors or shutters as specified in Wis. Adm. Code section Ind 51.09 or fire-resistive windows as specified in section Ind 51.10, unless such openings are on streets or on alleys or outer courts 20 feet or more in width.

Ind 52.02 Windows. (1) Every room in which one or more persons live, sleep, or are employed, (except storage rooms or other rooms where the nature of the occupancy will not permit) shall be lighted by a window or windows opening directly upon a street or alley, or upon a court (as defined in Wis. Adm. Code section Ind 52.04) on the same lot with the building. The windows shall be so constructed and distributed as to afford proper light and ventilation. Every building more than 40 feet deep (measuring at right angles to the windows) shall have windows on at least 2 sides. ***Exception***:

(a) The provisions of this rule may be waived for factory, office or mercantile buildings if provisions are made for proper artificial lighting, and if ventilation is provided in accordance with the provisions of chapter Ind 59 of the building and heating, ventilating and air conditioning code.

(b) Every building more than one story in height which does not have windows opening directly upon a street in each story above the

first, shall be provided with a suitable access for fire department use. Such access shall be a window or door opening through the wall on each floor above the first story. The opening shall be at least 36 inches in width and not less than 48 inches in height with the sill not more than 32 inches above the floor. The openings shall be so spaced that there will be one opening in each 100 feet of wall length in any accessible wall of the building. This requirement for access openings for fire department use shall not apply where a building is equipped throughout with an automatic sprinkler system approved for fire protection purposes.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63; r. and recr. (1) (a), Register, October, 1967, No. 142, eff. 11-1-67.

Ind 52.03 Window cleaning. (1) Where the tops of windows to be cleaned are more than 20 feet above the floor, ground, flat roof, balcony, or permanent platform, one of the following means shall be provided to protect the window cleaners.

(a) Approved attachments for window cleaner safety belts to which belts may be fastened at each end. Said attachments shall be permanent devices that shall be firmly attached to the window frame, or to the building proper, and so designed that a standard safety belt may be attached thereto; or

(b) An approved portable platform that is projected through the window or supported from the ground, floor, roof or platform level, for the window cleaner to stand upon and that is designed, constructed, maintained and equipped with handrail and toeboard in compliance with the requirements of chapter Ind 1, rules on Safety.

(c) A suspended scaffold, swinging scaffold, swinging chair scaffold, or boatswain's chair scaffold designed, constructed, equipped and maintained in compliance with the requirements of Wis. Adm. Code chapter Ind 35, rules on Safety in Construction, or

(d) Other equally effective devices.

(e) Where the window consists of a fixed panel not more than 24 inches in width alongside a removable panel, the fixed panel may be cleaned by reaching through the opening of the removable panel. Where the window consists of a fixed panel between 2 removable panels, the fixed panel may be cleaned by reaching through the openings if such fixed panel is not more than 36 inches in width.

(2) For cleaning the insides of skylights (the highest parts of which are more than 20 feet above the floor, ground, balcony or permanent platform), to which access cannot be gained by any of the means described in Wis. Adm. Code subsection Ind 1.16 (1), scaffolds as specified in chapter Ind 35, rules on Safety in Construction, shall be provided.

(3) All equipment, including building parts and attachments, used in connection with window cleaning, shall be maintained in reasonably safe condition while in use and shall be inspected at least once each month while in use, and within 30 days before their use. It shall be the responsibility of the owner of the individual safety devices or equipment to inspect and maintain the devices or equipment belonging to him so that each will comply with the requirements of this section.

(4) Where the attachments specified in subsection (1) (a) are relied upon for compliance with the provisions of this rule, said em-

ployer shall furnish or see that there is provided, an approved suitable safety belt for each employe while cleaning windows.

Note: It will be the policy of the department of industry, labor and human relations to accept anchors and safety belts which have been tested and approved by the Underwriters' Laboratories.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63.

Ind 52.04 Definitions of courts. (1) By inner court is meant an open air shaft or court surrounded on all sides by walls.

(2) By inner lot line court is meant a court bounded on one side and both ends by walls and on the remaining side by a lot line.

(3) By outer court is meant a court bounded on 3 sides with walls and on the remaining side by a street, alley or other open space not less than 15 feet wide.

(4) By outer lot line court is meant a court with one side on a lot line and opening to a street or open space not less than 15 feet wide.

Ind 52.05 Size of courts. (1) In applying the following requirements, a building from 30 to 43 feet high shall be considered as having at least 3 stories, and each additional 13 feet shall be considered an additional story.

(2) Outer lot line courts shall be not less than 3 feet wide for a court 2 stories or less in height and 40 feet or less in length, measured from the lot line to the wall of the building. For each additional story in height, the width of such court shall be increased one foot; and for each additional 15 feet or fraction thereof in length, the width of such court shall be further increased one foot.

(3) Outer courts between wings or parts of the same building, or between different buildings on the same lot, shall be not less than 6 feet wide for a court 2 stories or less in height and 40 feet or less in length. For each additional story in height, the width of such court shall be increased one foot, and for each additional 10 feet or fraction thereof in length, the width of such court shall be further increased one foot.

(4) Where outer courts or outer lot line courts open at each end to a street or other open space not less than 15 feet wide, the above lengths may be doubled.

(5) Inner lot line courts one story high shall be not less than 4 feet wide and not less than 40 square feet in area. Inner lot line courts two stories high shall be not less than 6 feet wide and not less than 60 square feet in area. For every additional story every such inner lot line court shall be increased by at least one lineal foot in length and one lineal foot in its width.

(6) Inner courts shall be not less than 10 feet in width nor less than 150 square feet in area for courts two stories or less in height; and for every additional story every such inner court shall be increased by at least one lineal foot in its length and one lineal foot in its width.

(7) Courts shall not be covered by a roof or skylight but the entire required area shall be open and unobstructed from the bottom thereof to the sky. No fire escape or stairway shall be constructed in any court unless the court be enlarged proportionately.

(8) Walls of inner courts whose least horizontal dimension is less than one-fourth the height, shall be faced with material with a permanent white surface or shall be painted white at least every 2 years.

(9) No buildings shall be altered or enlarged to encroach upon space reserved under this code for light and air on the lots or parcels of ground on which such building is erected.

Ind 52.06 Ventilation of courts. At the bottom of every shaft or inner court there shall be sufficient access to such shaft or court to enable it to be properly cleaned out. Every inner court which is required under Wis. Adm. Code section Ind 52.02 and which is more than one story in height shall have an intake for fresh air, leading from the street or other open space. The area of such intake in square feet shall equal at least .002 of the number of cubic feet contained in said court, but such area need not be more than 50 square feet. Every intake shall be of not less than 2-hour fire-resistive construction and unless said intake is used as a passageway for persons, there shall be no openings into the same other than the inlet and outlet.

Ind 52.10 Chimneys. (1) The walls of all chimneys shall be built of brick or other approved fire-resistive material, except that a metal smokestack may be provided as specified in section Ind 52.11. No chimney shall rest upon a flooring of wood nor shall any wood be built into, or in contact with any chimney. Headers, beams, joists and studs shall not be less than 2 inches from the outside face of a chimney. The foundation of every chimney, flue, or stack, shall be designed and built in conformity with the requirements for foundations for buildings. In no case shall a chimney be corbeled out more than 8 inches from the wall and in every case the corbeling shall consist of at least 5 courses of brick. Chimneys shall extend at least 3 feet above flat roofs and not less than 2 feet above the ridge of gable and hip roofs, and lime-cement or cement mortar shall be used in the laying of chimney masonry above the roof line.

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

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

(4) Where there is more than one smokepipe connected to a flue, the connections shall be at different levels. Two or more heating units or appliances may be connected to a common smokepipe or breeching if joined by Y fittings as close as practicable to the flue. In all such

cases, the size of the breeching and the flue shall be sufficient to accommodate the total volume of flue gases.

(a) *Cleanout opening.* Every chimney shall be provided with a cleanout opening at the base. Such openings shall be equipped with metal doors and frames arranged to remain closed when not in use.

(5) Every chimney shall be designed to withstand the following wind pressure in pounds per square foot over the diametrical area:

(a) Square chimneys	30
(b) Polygonal chimneys	25
(c) Round chimneys	20

(6) Prefabricated chimneys complying with the requirements of Wis. Adm. Code section Ind 59.67 may be used in lieu of masonry chimneys if approved by the department of industry, labor and human relations and are provided with foundations as specified for masonry chimneys, or metal smokestacks or as otherwise approved.

History: 1-2-56; am. (1), r. and recr. (4), Register, August, 1957, No. 20, eff. 9-1-57; am. Register, December, 1962, No. 84, eff. 1-1-63; r. and recr. (6), Register, October, 1967, No. 142, eff. 11-1-67.

Ind 52.11 Metal smokestacks. (1) Steel or iron smokestacks may be used in place of masonry chimneys specified in section Ind 52.10, in which case the thickness of the metal shall be not less than 3/16 inch for heights up to 40 feet and ¼ inch for greater heights. Such stacks when used for manufacturing, for high pressure boilers, furnaces or other similar heating or manufacturing appliances shall be lined with fire brick for a distance of not less than 25 feet from the place where the smoke pipe enters and shall be protected on the outside up to and through the roof of the building with 8 inches of masonry, or a metal shield which provides an 8 inch ventilated air space between such shield and the stack. All stacks shall be properly guyed when the height of the stack exceeds 15 times its least diameter.

Exception:

(a) Public utility or industrial power plants are exempted from the protection requirements of this paragraph if they are of fire-resistive construction.

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

Ind 52.12 Smoke pipes. (1) No smoke pipe or breeching serving boilers, furnaces or other similar heating appliances shall pass through any floor, outside window or door, nor through any combustible roof or combustible outside wall, nor through any closet, attic or similarly concealed space.

(2) Where necessary to pass through any partition of non-fire-resistive construction, every smoke pipe shall be encased with incom-

bustible material at least 4 inches thick or with a double safety thimble made of 2 concentric rings of sheet metal with at least one inch open air space between and with the outer ring covered with at least ¼ inch asbestos.

(3) No part of any smoke pipe shall be placed nearer to any non-fire-resistive partition or wall than the diameter of the pipe, nor nearer to any non-fire-resistive ceiling than 1½ times the diameter; but the above distances may be reduced by one-half, if the wall or ceiling is covered with not less than ¼ inch asbestos board covered with sheet metal, or with equivalent protection.

Ind 52.13 Steam and hot water pipes. No steam pipe or pipe carrying hot water at a temperature exceeding 180 degrees shall be placed within one inch of any woodwork. Every such steam or hot water pipe passing through a combustible floor, ceiling or partition, shall be protected by a metal tube one inch larger in diameter than the pipe and shall be provided with a metal cap. All wooden boxes or casings enclosing steam or hot water pipes, or wooden covers to recesses in walls in which steam pipes are placed, shall be lined with metal.

Ind 52.14 Ducts. Every vertical shaft housing air ducts or a group of ducts in buildings in the theater, school, or hotel classification, shall be enclosed with incombustible material smoothly finished on the inside and having a fire-resistive rating as required for each specific situation.

History: 1–2–56; am. Register, December, 1962, No. 84, eff. 1–1–63.

Ind 52.15. History: 1–2–56; r. Register, December, 1962, No. 84, eff. 1–1–63.

Ind 52.16 Floor protection. (1) All stoves and ranges used for cooking, heating or laundry purposes using solid or liquid fuel, and which are more than 16 square feet in horizontal area or which have a flame at the bottom shall be placed on a fire-resistive floor projecting at least 2 feet on each side. If such floor rests on or is in contact with any combustible material, then the fire-resistive floor layer shall be at least 5 inches thick and shall be hollow, with air spaces running horizontally through the same. The air spaces shall be open at both ends and shall be so placed that air can circulate through them; the horizontal area of the air spaces shall equal at least one-half the horizontal area of the slab.

(2) The air spaces may be secured by using hollow tile placed end to end, or by embedding wrought or sheet iron pipes in a layer of concrete. The air spaces should parallel the short dimension of the slab.

(3) If the stove or range is raised at least 6 inches above the floor and such air space is not enclosed, then the fire-resistant floor layer may be reduced to not less than 2 inch solid thickness, without air spaces, provided it is covered with sheet metal.

(4) All stoves and ranges using solid or liquid fuel and which are not more than 16 square feet in horizontal area and not having a flame at the bottom shall, if placed on a combustible floor, be raised at least 6 inches above the floor, and such air space shall not be enclosed. Such floor shall be protected with a stove board of sheet metal or asbestos, projecting at least one foot on all sides.

(5) Gas ranges, domestic hot water heaters and hot plates shall be supported at least 6 inches above any wood floor or other combustible material and, if less than 12 inches above the floor, the wood shall be protected by a metal shield, or such equipment may rest on a masonry support.

(a) The above dimension of 6 inches may be reduced to 3½ inches if the bottom is suitably protected with a metal shield.

Ind 52.17 Wall and ceiling protection. (1) All stoves and ranges used for cooking or laundry purposes and all domestic hot water heaters shall be placed at least 24 inches away from any combustible wall, partition or ceiling, except that such distance may be reduced to 12 inches if the wall, partition or ceiling is protected with at least ¼ inch asbestos board covered with sheet metal, or with an equivalent protection.

(2) The above distances may be reduced one-half in the case of stoves and ranges less than 16 square feet in area, and also in the case of gas ranges of greater area if proper insulation is incorporated in the back of the range.

Ind 52.18 Gas vents. All gas ranges, except those for domestic use, hot water heaters, and other gas fired equipment shall be provided with vent pipes conforming to the requirements for smoke pipes as specified in Wis. Adm. Code section Ind 52.12.

Ind 52.19 Gas and oil lamps; gas service. (1) Gas and oil lamps shall not be used where electricity is available, except in private apartments.

(2) Gas and oil lamps shall be placed at least 6 feet above the floor level, at least 6 inches from any combustible partition or wall, and at least 2 feet (measured from top of flame) below any combustible ceiling unless properly protected by a metal shield with at least 2 inches of air space above. Swinging brackets shall be provided with a guard or stop so that the light cannot come nearer to the partition or wall than one foot. In aisles and public passageways, every such light shall be protected by an incombustible guard unless the light is at least 7 feet above the floor. Gas and oil lights shall be kept at least 2 feet from any drape or window curtain.

(3) Every gas supply main shall have a service cock outside of the building, so placed and maintained that it can be shut off at any time without entering the building.

Ind 52.20 Electrical work. All electrical work shall conform to the requirements of the Wisconsin state electrical code of the department of industry, labor and human relations.

Note: For the design requirements for transformer vaults, see chapter E 450 of the Wisconsin state electrical code.

History: 1-2-56; am. Register, January, 1961, No. 61, eff. 2-1-61.

Ind 52.21 Location and maintenance of exits. Every exit mentioned in Wis. Adm. Code sections Ind 51.14 to 51.19, inclusive, shall lead to a street, alley or open court connected with a street. All such exits and all passageways leading to and from the same, shall be kept in good repair and unobstructed at all times.

Ind 52.22 Television and radio receiving antenna. (1) The requirements of this section shall apply to the outdoor portion of all apparatus, more than 12 feet in height, used for receiving television or radio waves.

(2) All television and radio antenna systems, including the supporting tower or mast, shall be constructed of galvanized steel or other corrosive-resistant incombustible material. Where approved by the department of industry, labor and human relations, towers constructed of wood or wood poles set in the ground may be used to support antenna systems but no wood tower or wood pole may be mounted on the roof of any building or structure.

(3) The antenna and tower shall be designed to support the dead load of the structure plus an ice load at least ½ inch in radial thickness. The ice load shall be computed only upon the wires, cables, messengers and antenna.

(a) The tower or mast shall be braced or guyed and anchored to resist a horizontal wind pressure of not less than 30 pounds for every square foot (net area) of exposed surface. Guy wires shall not be anchored to a chimney or to any roof ventilator or vent pipe.

(4) Antenna systems installed on the roof of a building shall not be supported by or attached to a chimney. All such installations shall be mounted on an independent platform or base and anchored in place. The platform or base of the tower shall be large enough to distribute the weight of the structure over sufficient roof area so the roof construction will safely support the weight of the structure in addition to the required live and dead roof loads.

(5) All antenna systems shall be so installed that no part of the structure will be nearer to a street, or other public thoroughfare, than the height of the antenna as measured from its platform or base to the topmost point. No wires, cables, or guy wires shall extend over any street or other public thoroughfare or over any electric power or communication lines.

(6) Poles used for electric power or for communication lines shall not be used for supporting or for guying any antenna system. Where antenna installations are so located that damage will be caused to adjacent power or communication lines by the falling of the antenna structure, a separate safety wire shall be attached to top of the tower and secured in a direction away from the power or communication line.

(7) Electrical installations in connection with antenna systems, including the grounding of the tower or mast, shall comply in all respects with the requirements of the Wisconsin state electrical code.

GENERAL SANITATION REQUIREMENTS

Ind 52.50 Toilet rooms required. (1) Every place of employment and public building shall have adequate toilet rooms as provided in the occupancy classifications of this code, completely enclosed and so arranged as to insure privacy.

(2) Separate toilet rooms shall be provided for employes and the general public where deemed necessary by the department of industry, labor and human relations or by the state board of health.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63.

Ind 52.51 Toilet rooms for the two sexes. (1) Where the 2 sexes are accommodated, separate toilet rooms shall be provided except

(a) In apartment houses;

(b) If approved in writing by the department of industry, labor and human relations or the state board of health, or their authorized agents, in buildings accommodating not more than 5 persons of both sexes, provided the door of such toilet room is kept locked and the key is kept in a place accessible to all such persons. But whenever the number of such persons shall exceed 5, separate toilet rooms shall be provided.

(2) Entrances to toilet rooms for the 2 sexes shall be properly separated, by screens or otherwise, and shall, wherever possible, be at least 20 feet apart; except this requirement does not apply where the entrance doors to toilet rooms used by the 2 sexes are located in an exterior wall of the building.

Ind 52.52 Sex designated. Wherever women are employed or accommodated, each toilet room shall be distinctly marked with regard to the sex which uses it, and no person shall be allowed to use a toilet room assigned to the other sex, except as provided in section Ind 52.21. The door or room labels shall be the words MEN, or WOMEN, respectively, in letters not less than one inch in height.

Ind 52.53 Location, light and ventilation. (1) Every toilet or bathroom shall be so located as to open to outside light and air, by windows or skylights opening directly upon a street, alley or court, except as provided in Wis. Adm. Code section Ind 52.54.

(2) The glass area for a toilet room containing one water closet or urinal shall be at least 4 square feet with at least 2 square feet openable.

(a) Bathrooms containing a water closet or urinal shall be considered as a toilet room.

(3) No toilet room shall have windows or ventilator openings in any elevator shaft or inner court that have windows of sleeping rooms above.

(4) Every toilet room having more than one fixture (closets and urinals) shall be ventilated in accordance with the provisions of Wis. Adm. Code section Ind. 59.48 of the building and heating, ventilating and air conditioning Code issued by the department of industry, labor and human relations, except that this requirement shall not apply to chemical or septic toilets which are installed in accordance with the provisions of the chemical toilet code or the septic toilet code issued by the state board of health.

(a) The size of gravity vent ducts, if surmounted with effective siphon type hoods, may be determined as follows: $\frac{A \times 2}{300}$ = net cross sectional area of vent duct in square feet.

Where A = floor area in the toilet room in square feet.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63; r. and recr. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 52.54 Location without outside windows; when permitted. Toilet rooms will be permitted without windows if they are ventilated in

accordance with the requirements of Wis. Adm. Code section Ind 59.48 of the building and heating, ventilating and air conditioning code issued by the department of industry, labor and human relations.

History: 1-2-56; r. and recr. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 52.55 Artificial light. Every toilet room, except in connection with private rooms or apartments, shall be artificially lighted during the entire period that the building is occupied, wherever and whenever adequate natural light is not available, so that all parts of the room, especially the toilet compartments shall be provided with artificial light intensity of not less than 2.5 foot candles at the floor level.

Ind 52.56 Size. Every toilet room shall have at least 14 square feet of floor area with a minimum width of 3 feet, and at least 100 cubic feet of air space for each water-closet and each urinal in addition to the space required for lavatories if installed within the toilet room.

Ind 52.57 Floor and base. Every toilet room, except those installed and used only in connection with private apartments, shall have the entire floor and the side walls to a height of not less than 6 inches made waterproof with ceramic tile, terrazzo, painted concrete, marble, slate, monolithic asphalt or other approved material impervious to water.

Ind 52.58 Walls and ceilings. (1) The walls and ceilings of every toilet room shall be completely covered with smooth plaster, galvanized or enameled metal, gypsum wallboard ⅜ inch in thickness with taped joints, or constructed of brick, tile or other masonry units with flush joints or other equivalent smooth, non-absorbent material. Wood may be used only if it is smooth and well covered with 2 coats of body paint and one coat of enamel paint or spar varnish. Wood shall not be used for partitions between toilet rooms nor for partitions which separate a toilet room from any room used by the opposite sex. All such partitions shall be made soundproof. This is not intended to prohibit the use of wood stud partitions between rooms if partitions are lathed and plastered on both sides.

(2) The interior surface of walls and partitions shall be of light color to improve illumination and facilitate cleaning.

History: 1-2-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59.

Ind 52.59 Enclosure of fixtures. (1) The fixtures (closets and urinals) in every toilet room shall be arranged to secure privacy in use. Water-closets shall be enclosed with partitions. Urinals shall be placed against walls and arranged individually. Individual floor type urinals shall be placed not less than 24 inches center to center and the space between urinals shall be filled flush with the front and top with non-absorbent material. *Exception:*

(a) The above requirements need not apply to toilet rooms accommodating only a single closet or urinal.

(2) A space of 6 to 12 inches shall be left between the floor and the bottom of each partition. The top of the partition shall be from

5½ to 6 feet above the floor. Doors with the top 5½ to 6 feet above the floor, and the bottom 6 to 12 inches above the floor, shall be provided for all water-closet compartments. All partitions and doors shall be of material and finish required for walls and ceilings under Wis. Adm. Code section Ind 52.58.

(3) The water-closet compartments in toilet rooms shall be not less than 30 inches in width, and shall be not less than 54 inches in depth with a clearance of not less than 24 inches between the fixture and the compartment door when closed except as specified in subsection (4). Compartment doors which are hung to swing inward shall clear the fixture not less than 2 inches.

Note: Section 146.085, Wis. Stats., provides that not more than 50% of the toilet compartments of any public toilet room of any public building, other than licensed hotels and resorts, shall be kept locked.

(4) Water-closet compartments for physically handicapped persons. (a) One toilet room for each sex in every public building or place of employment except those exempted in section Ind 51.15 (7) (j) shall have at least one water-closet compartment that is not less than 36 inches in width and at least 54 inches in depth.

(b) The door shall be not less than 32 inches in width and shall be hung to swing outward.

(c) A grab bar or handrail 33 inches high and parallel to the floor shall be provided on each side of the compartment.

History: 1-2-56; am. (3) and cr. (4), Register, November, 1963, No. 9 eff. 12-1-63.

Ind 52.60 Fixtures. (1) Only individual water-closets of porcelai or vitreous china shall be used. Water-closet seats shall be of wo or other non-heat absorbing material, and shall have a finished su face that is impervious to water or cleaning agents. In public buil ings, places of employment, and all other public places except apar ments, and guest rooms in hotels and motels, the water-closets sh have elongated bowls. All water-closets except in apartments sh have open front seats without cover.

(2) Only individual urinals of porcelain, vitreous china, or sta less steel shall be used. Such urinals shall be set into the floor, floor graded to the urinal and the urinals shall be equipped with effective automatic or foot operated flushing device.

History: 1-2-56; r. and recr. Register, September, 1959, No. 45, 10-1-59.

Ind 52.61 Protection from freezing. All water-closets and ur and the pipes connecting therewith shall be properly protected ag freezing, so that such water-closets and urinals will be in p condition for use at all times.

Ind 52.62 Disposal of sewage. (1) Each water-closet and urina each lavatory or slop sink, located in a toilet room shall be con with a sewer and water system, where such systems are ava In locations where a sewer system is not available, or cannot be available, the disposal of human waste may be accomplis follows:

(a) Sewage treatment tank and disposal system.

***Note:* For detailed requirements on such systems see state plumbi**

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(b) Where the local conditions make it impractical to install such system, outdoor toilets, as described in Wis. Adm. Code section Ind 52.63, or other facilities, such as septic toilets installed in accordance with the provisions of the septic toilet code issued by the state board of health, may be used; provided that in the case of places of employment for more than 10 persons, schools larger than 2 rooms, and apartment houses, water-flush toilets as herein described shall be provided, unless outdoor toilets or other facilities are permitted in writing by the department of industry, labor and human relations or the state board of health. In every case where chemical or septic toilets are installed, the approval of plans and specifications therefor by the state board of health shall be secured before work is started.

Ind 52.63 Outdoor toilets. (1) Outdoor toilets shall comply with Wis. Adm. Code sections Ind 52.50 to Ind 52.59, inclusive, and in addition:

(a) No privy, with or without a leaching pit or other container, shall be erected or maintained within 50 feet of any well, 10 feet of the line of any street or other public thoroughfare, 5 feet of the property line between premises or 25 feet of the door or window of any building.

(b) Located on ground that is well drained, and where there is no possibility of contaminating any drinking water supply.

(c) Provided with suitable approach, such as concrete, gravel or cinder walk.

(d) The foundations shall be of concrete or other masonry.

(e) The vault shall extend at least 6 inches above ground, be as dark as possible, and be proof against entrance by flies, rats, or other vermin. The upper portion shall be of concrete, or of brick or stone laid in cement mortar. If in poorly drained soil, the entire vault shall be of concrete, or brick, or stone, laid in cement mortar.

(f) All windows, ventilators and other openings shall be screened to prevent the entrance of flies, and all doors shall be self-closing. A separate ventilator shall be provided for the vault and shall extend from the vault to not less than one foot above the roof and be provided with an effective ventilating hood.

(g) The entire installation shall be kept clean and sanitary. Milk of lime (freshly slaked lime) or other equally effective disinfectant shall be used in the vault and in the urinal trough in sufficient quantities, and at frequent intervals. The floors, seats and urinals shall be scrubbed as often as necessary. The vault shall be cleaned out at proper intervals.

Note: See the Wisconsin code for rural school privies issued by the state board of health.

Ind 52.64 Maintenance and housekeeping. (1) MAINTENANCE OF TOILETS. Every toilet room, and every part thereof, including walls, floor, ceiling and fixture therein, shall be kept clean, efficient, and in good repair.

(2) PAPER. In every toilet room, sufficient toilet paper made of material which will not interfere with the operation of the system or obstruct the fixtures, shall be provided.

(3) DEFACEMENT. Indecent or suggestive marks, pictures, or words are forbidden in toilet rooms, and such defacement when found shall be removed at once.

(4) SERVICE CLOSETS. In buildings having 5 or more fixtures (water closets and/or urinals) a service closet shall be provided conforming with the requirements for toilet rooms.

(a) The service closet shall be supplied with mop, broom, bucket, soap, toilet paper, toweling and other equipment for sanitary upkeep of toilet rooms.

History: 1-2-56; r. and recr. (4), Register, October, 1967, No. 142, eff. 11-1-67.

Chapter Ind 53

STRUCTURAL REQUIREMENTS

Ind 53.001 Floor, roof and sidewalk loads. (1) DEAD LOADS. All buildings and structures, and parts thereof, shall be designed and constructed to support in addition to the minimum superimposed live loads specified in this section, the actual dead weight of all component members; and in addition thereto, an allowance for the weight of partitions, ceiling and floor finish, and concentrated loads such as safes, mechanical apparatus and similar equipment.

(2) LIVE LOADS. All buildings and structures, and parts thereof, shall be designed and constructed to support the following minimum superimposed live loads uniformly distributed in pounds per square foot of horizontal area in addition to the dead load:

(a) *Theaters and assembly halls with fixed seats:*

1. Auditorium 50
2. Lobbies, corridors and passageways 80
3. Stairways 80

(b) *Assembly halls without fixed seats:*

1. Auditorium 100
2. Lobbies, corridors and passageways 80
3. Stairways 80

(c) *School, library, museum classification:*

1. Instruction rooms, study rooms, reading rooms, exhibition rooms, art display rooms, laboratories 50
2. Vocational rooms 100
3. Library book stacks 100
4. Lobbies, corridors and passageways 80
5. Stairways 80

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(d) *Apartment, hotel, place of detention classification:*
1. Living rooms, sleeping rooms 40
2. Lobbies, corridors, passageways 80
3. Offices and similar areas 60
4. Stairways 80
5. Dining rooms 100

(e) *Office buildings:*
1. Offices 50
2. Commercial 100
3. Stairways 80

(f) *Mercantile establishments:*
1. All floor areas and stairways 100

(g) *Factories and workshops:*
1. All floor areas and stairways 100

(h) *Garages:*
1. All floor areas .....8000 pound axle load in any possible position or 80 pounds per square foot. (Whichever produces the greater stress.)

(i) *Grandstands, reviewing stands, bleachers:*
1. All areas 100

(j) *Stages, in theaters and assembly halls* 150

(k) *Roofs* 30

(l) *Sidewalks* 250

(3) The above live load requirements shall be considered only as a minimum. In every case where the loading is greater than this minimum, the design of the building or structure, or part thereof, shall be for the actual load and loading conditions.

(4) The following reductions in assumed live loads shall be permitted in designing girders, columns, piers and walls in fire-resistive buildings.

(a) No reduction of the assumed live load shall be allowed in the design of any slabs, joints or beams.

(b) A reduction of one per cent of the total live load used in the design of girders shall be allowed for each 20 square feet of tributary floor area, with a maximum allowable reduction of 15%. This reduction shall not be carried into the columns nor shall such reduction be used in the design of buildings to be used or occupied as warehouses or for storage purposes.

(c) For determining the total live loads carried by columns, piers and walls, the following reductions shall be permitted, based on the assumed live loads applied to the entire tributary floor area.

1. Warehouses and Storage Buildings
a. Carrying the roof 0%
b. Carrying 1 floor and roof 0%
c. Carrying 2 floors and roof 5%
d. Carrying 3 floors and roof 10%
e. Carrying 4 floors and roof 15%
f. Carrying 5 or more floors and roof 20%

2. **Manufacturing Buildings, Stores and Garages**
   a. Carrying the roof 0%
   b. Carrying 1 floor and roof 0%
   c. Carrying 2 floors and roof 10%
   d. Carrying 3 floors and roof 20%
   e. Carrying 4 or more floors and roof 30%

3. **All Other Buildings**
   a. Carrying the roof 0%
   b. Carrying 1 floor and roof 0%
   c. Carrying 2 floors and roof 10%
   d. Carrying 3 floors and roof 20%
   e. Carrying 4 floors and roof 30%
   f. Carrying 5 floors and roof 40%
   g. Carrying 6 floors and roof 45%
   h. Carrying 7 or more floors and roof 50%

(5) The following reductions in assumed live loads shall be permitted in designing columns, piers and walls in buildings of mill and ordinary construction.

(a) *Warehouses and storage buildings*
   1. Carrying the roof 0%
   2. Carrying 1 floor and roof 0%
   3. Carrying 2 floors and roof 5%
   4. Carrying 3 or more floors and roof 10%

(b) *Manufacturing buildings, stores and garages*
   1. Carrying the roof 0%
   2. Carrying 1 floor and roof 0%
   3. Carrying 2 floors and roof 10%
   4. Carrying 3 or more floors and roof 20%

(c) *All other buildings*
   1. Carrying the roof 0%
   2. Carrying 1 floor and roof 0%
   3. Carrying 2 floors and roof 10%
   4. Carrying 3 floors and roof 20%
   5. Carrying 4 or more floors and roof 30%

Ind 53.01 Wind pressure. (1) Every building shall be designed to resist a horizontal wind pressure of not less than 20 pounds for every square foot of exposed surface, in addition to the dead loads and the live loads specified above, except as provided in Wis. Adm. Code sections Ind 52.22 and 55.68 (4).

(2) If the overturning moment due to wind pressure exceeds 75% of the moment of stability of the structure due to dead load only, the structure shall be anchored to its foundations, which shall be of sufficient weight to insure the stability of the structure; and sufficient diagonal bracing or rigid connections between uprights and horizontal members shall be provided to resist distortion.

(3) The overturning moment may be disregarded in a structure less than 100 feet in height if the height does not exceed twice the width.

(4) Members subject to stresses produced by a combination of wind and other loads may be proportioned for unit stresses 33⅓% greater than those specified for dead and live load stresses, provided the section thus required is not less than that required for the combination of dead load, live load and impact (if any).

Ind 53.02 Foundations. (1) The permissible loads on natural earth shall not be more than the following, in tons per square foot:

(a) Quick sand and alluvial soils	½
(b) Soft clay	1
(c) Ordinary clay and sand together in layers, wet and spongy	2
(d) Clay or fine sand, firm and dry	3
(e) Sand, compact and well cemented	4
(f) Gravel and coarse sand, well packed	5
(g) Hard pan or shale	6
(h) Rock	Not more than 20% of the ultimate crushing strength of such rock.

(2) Where material at footing excavation level is such as to permit loads in excess of 2 tons per square foot, and the design is for loading in excess of 2 tons per square foot, 2 inch hand auger test holes shall be bored at intervals not exceeding 30 feet in any direction within the building area to a depth of at least 5 feet below the base of the footings, to determine the character of the underlying material. Allowable loading shall be in accordance with the above table for the material encountered.

(3) The maximum, or safe working load for piles shall be determined by the following formula:

$$L = \frac{2\,W\,H}{S + 0.1}$$ for steam hammer

$$L = \frac{2\,W\,H}{S + 1}$$ for drop hammer

in which formula

L = safe load in pounds
W = weight of hammer in pounds
H = fall of hammer in feet
S = penetration or sinking of the pile under the last blow, in inches.

(4) In no case shall the maximum load on a timber pile exceed 500 pounds per square inch of the section of the pile at mid-length.

Ind 53.03 Masonry construction; general requirement. The requirements of sections Ind 53.03 to Ind 53.13, inclusive, herein shall apply to the construction of all masonry footings, foundations, walls, columns, piers and similar work under this code.

Ind 53.04 Ashlar and rubble masonry. (1) The compressive stresses (pounds per square inch) in ashlar or carefully coarsed masonry and

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rubble stone masonry, due to all dead and live loads shall not exceed the following:

Kind of Stone	Type M Mortar	Type S Mortar	Type N Mortar	Type O Mortar
Ashlar Masonry:				
Granite	800	720	640	500
Limestone or marble	500	450	400	325
Sandstone or cast stone	400	360	320	250
Rubble Stone Masonry	140	120	100	80

(2) Weather resistance of stone. All natural building stone to be used in masonry exposed to the weather or frost action shall be such that the strength and structure of the stone will not be affected by the weathering or frost action.

(3) All cast stone shall be branded with a permanent identification mark of the manufacturer which shall be registered with the department of industry, labor and human relations.

History: 1–2–56; r. and recr. Register, October, 1967, No. 142, eff. 11–1–67.

(4) The average compressive strength of cast stone taken on 4 representative samples at the age of 28 days or when delivered on the job shall be not less than 5000 pounds per square inch with an individual minimum of 4500 pounds per square inch, and the average absorption of such samples shall be not more than 7% of their dry weight, with an individual maximum of 8%.

(5) Tests of cast stone specimens shall be made in accordance with specifications approved by the department of industry, labor and human relations. It will be the policy of the department of industry, labor and human relations to accept specifications for cast stone issued by the American Concrete Institute, ACI Standard 704–44.

Note: Copies of the above publication are on file in the office of the secretary of state, revisor of statutes and the department of industry, labor and human relations and may be obtained for personal use from the American Concrete Institute, 7400 Second Blvd., Detroit, Michigan.

History: 1–2–56; r. and recr. Register, October, 1967, No. 142, eff. 11–1–67.

Ind 53.05 Building brick. (1) DEFINITION. Building brick is a masonry unit, not less than 75 percent solid, having a shape approximating a rectangular prism and usually not larger than 4 inches by 4 inches by 12 inches. Brick may be made of burned clay or shale or mixtures thereof, of lime and sand or of portland cement and suitable aggregates.

(2) STRUCTURE. All building brick shall be free from cracks, laminations and other defects or deficiencies which may interfere with proper laying of the brick or impair the strength or permanence of the structure.

(3) CONCRETE BUILDING BRICK. Concrete building brick shall be manufactured from a mixture of Portland cement and approved

aggregates, such as sand, gravel, crushed stone, bituminous or anthracite cinders, burned clay or shale, or blast furnace slag.

(4) IDENTIFICATION. All building brick shall be of distinctive design or appearance, or marked so that the manufacturer is identified.

(5) CLAY BUILDING BRICK. (a) All building brick made of burned clay or shale shall conform to the following requirement and to the requirements of standard specifications for building brick (solid masonry units made from clay or shale) of the American Society for Testing and Materials. See section Ind 51.25 (1) for the ASTM designation which refers to this product or method.

	Compressive Strength (Brick Flatwise) Lbs. Per Square Inch Average Gross Area		Water Absorption By 5 Hour Boiling Percent		C/B Ratio	
Grade	Average of 5 Bricks	Individual Minimum	Average of 5 Bricks	Individual Maximum	Average of 5 Bricks	Individual Maximum
A	8000	6650	17.0	20.0	.78	.80
B	4500	3750	17.0	20.0	.78	.80
S. W.	3000	2500	17.0	20.0	.78	.80
M. W.	2500	2200	22.0	25.0	.88	.90
N. W.	1500	1250	No Limit	No Limit	No Limit	No Limit

(b) The saturation coefficient (C/B ratio) is the ratio of absorption by 24-hour submersion in water at room temperature to that after 5 hour submersion in boiling water.

(c) If the average compressive strength is greater than 8000 pounds per square inch and/or the average water absorption is less than 8% by weight after 24-hours submersion in cold water, the C/B ratio shall be waived.

(d) Grade A, B and S.W. brick shall be used in exterior and exposed locations where a high degree of resistance to frost action is desired and the exposure is such that the brick may be frozen when permeated with water.

Brick used for foundation courses, retaining walls, parapet walls and similar locations shall conform to A, B, or S.W.

(e) Grade M.W. brick may be used where exposed to temperatures below freezing but where brick are not likely to be permeated with water or where a moderate degree of resistance to frost action is permissible.

Brick conforming to this grade may be used in an exterior wall above grade.

(f) Grade N.W. brick may be used for backup or for interior construction exposed for use where no frost action occurs.

(6) CONCRETE SAND-LIME BUILDING BRICK. All building brick made from sand-lime shall conform to the following requirements and to the requirements of standard specifications for sand-lime building brick of the American Society for Testing and Materials. See sec-

tion Ind 51.25 (2) for the ASTM designation which refers to this product or method.

Designation	Minimum Compressive Strength (brick flatwise), psi, average gross area		Minimum Modulus of Rupture (brick flatwise), psi, average gross area	
	Average of 5 Brick	Individual	Average of 5 Brick	Individual
Grade SW	4500	3500	600	400
Grade MW	2500	2000	450	300
Grade NW	1500	1500	300	200

(7) CONCRETE BUILDING BRICK: All building brick made from portland cement, water, and suitable mineral aggregates shall conform to the following requirements and to the requirements of standard specifications for concrete building brick of the American Society for Testing and Materials. See section Ind 51.25 (3) for the ASTM designation which refers to this product or method.

Grade	Compressive Strength, Min., psi (brick flatwise)		Water Absorption, Max. lb. per cu. ft. (Average of 5 Units)		
	Average Gross Area		Oven-Dry Weight of Concrete, lb. per cu. ft.		
	Average of 5 Brick	Individual Brick	Over 125	From 105 to 125	105 or less
U-1, U-11	3500	3000	10	10	10
P-1, P-11	2500	2000	13	13 to 18	18
G-1, G-11	1500	1250	----------	----------	----------

(8) TESTS. Typical specimens of all types of building brick shall be tested initially to prove compliance with the provisions of this code.

(a) All concrete and sand, lime, brick shall be retested at intervals of not more than one year.

(b) All building brick manufactured from burned clay or shale shall be retested with changes in raw materials or processing and at intervals of not more than three years.

(c) Further tests may be demanded at any time there is reasonable suspicion of nonconformance to the requirements of this code.

(9) STANDARDS. The testing of all building brick shall be in accordance with the standard methods for testing brick of the American Society for Testing Materials. See section Ind 51.25 (4) for the ASTM designation which refers to this product or method.

Note: Copies of the above publications are on file in the office of the secretary of state, revisor of statutes and the department of industry, labor and human relations and may be obtained for personal use from the American Society for Testing Materials, 1916 Race Stree, Philadelphia, Pa. 19103.

History: 1-2-56; r. and recr. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.06 Hollow building units. (1) DEFINITIONS. Hollow building units are masonry units whose net cross-sectional area in any plane parallel to the bearing surface is less than 75% of its gross cross-sectional area measured in the same plane.

(a) Hollow concrete masonry units are the products of Portland cement and suitable aggregates such as sand, gravel, crushed stone, bituminous or anthracite cinders, burned clay or shale or blast furnace slag, molded to permanent form for use as masonry units in building construction. Hollow concrete masonry units with applied facings of any type shall conform to the requirements of this code.

(2) HOLLOW TILE USED IN BEARING WALLS. All hollow tile used in bearing walls shall conform to the requirements of standard specifications for structural clay load-bearing wall tile, of the American Society for Testing Materials. See section Ind 51.25 (5) for the ASTM designation which refers to this product or method.

(a) Hollow tile subject to the action of weather or soil shall be of Grade LBX, or, if used for load-bearing purposes but not subject to the action of weather or soil, shall be of grade LB or grade LBX of this specification.

(3) BRANDING. All clay tile shall be branded with a distinctive indentation on the shell. Clay tile which comply with all requirements for exterior construction and bearing walls shall have the word BEARING impressed on them. All clay tile shall bear the name, initials or trademark of the manufacturer.

(4) TESTS. Typical specimens of all sizes and designs of hollow tile used in exterior or bearing walls shall be tested originally to prove compliance with this code, and thereafter as directed by the department of industry, labor and human relations. Tile shall be sampled and tested in accordance with the standard methods of sampling and testing structural clay tile of the American Society for Testing Materials. See section Ind 51.25 (6) for the ASTM designation which refers to this product or method.

(5) HOLLOW CONCRETE MASONRY UNITS. (a) *Compressive strength.* All hollow concrete masonry units shall have a compressive strength of not less than 1000 pounds per square inch gross area as laid in the wall.

1. The average strength of any group of test specimens of hollow concrete masonry units shall not be less than the above requirement. The strength of any individual test specimen shall not be less than 900 pounds per square inch gross area.

(b) *Absorption.* Hollow concrete masonry units shall not absorb more than 14 pounds of water per cubic foot of concrete actually contained.

(c) *Branding.* At least one-third of all hollow concrete masonry units shall be branded with a distinctive indentation or waterproof stencilled mark, which shall bear the name, initials, or trademark of the manufacturer. All cubes or piles of block on the job shall be easily identified by branded block which are visible. Producers having more than one plant shall register and use a separate, distinctive brand for each plant. A facsimile of each individual brand shall be filed with the department of industry, labor and human relations.

(d) *Tests.* Typical specimens of all sizes and designs of hollow concrete masonry units shall be tested in an approved manner, originally

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to prove compliance with the requirements of this code, and thereafter as required by the department of industry, labor and human relations or its authorized agents. Hollow concrete masonry units shall be sampled and tested in accordance with the standard methods of sampling and testing of the American Society for Testing Materials. See section Ind 51.25 (7) for the ASTM designation which refers to this product or method.

(e) *Sampling.* Hollow concrete masonry units shall be done only by the department of industry, labor and human relations or their authorized agents. The time and place of sampling shall be at the discretion of the department of industry, labor and human relations or their authorized agents. It is intended that such tests will be made at intervals not to exceed one year.

1. At the time of the sampling, the producer or purchaser shall inform the sampling agent of the name and location of the approved testing laboratory to which the samples will be sent for testing. The sampling agent shall notify the department of industry, labor and human relations of the date, number, size, type and seal numbers of the samples selected. Compression tests shall be completed not later than 7 days after sealing. To validate the test, all seals must be accounted for in the laboratory report.

2. Producers having more than one plant will be considered as separate plants with separate samplings and tests for each plant.

(f) *Approvals.* Approvals following original tests will remain in effect until later tests show nonconformance with the requirements of this code. To verify compliance with these requirements, the department of industry, labor and human relations may require that tests be made at its designated laboratory.

(g) *Nonapprovals.* Nonconformance with the requirements of Wis. Adm. Code section Ind 5.306 shall be determined by the failure of 3 complete tests on a particular job, as tested in an approved manner. In the event of job nonconformance, the necessary structural correction shall be made and the producer shall be barred from supplying any more units on that project.

(h) *Certification.* Testing laboratories must apply annually for certification by the department of industry, labor and human relations. Such certification shall be based on standards established by the department of industry, labor and human relations. Only those tests that are made by a certified laboratory will be accepted. To verify compliance with these standards the department of industry, labor and human relations may require that tests be made at its designated laboratory.

1. The owner or supplier shall have the choice of selecting a certified testing laboratory for any tests at his expense.

(6) CLAY TILE USED IN NONBEARING PARTITIONS. All hollow clay tile used in nonbearing partitions shall conform to the requirements of standard specifications for structural clay non-load bearing tile of the American Society for Testing and Materials. See section Ind 51.25 (8) for the ASTM designation which refers to this product or method.

(a) *Branding.* All hollow clay tile used in nonbearing partitions shall be branded with a distinctive indentation. All hollow clay tile not suitable for use in bearing and exterior walls but used in nonbearing partitions shall have the word PARTITION impressed on them.

1. All hollow clay tile used in partition work shall bear the name, initials or trademark of the manufacturer.

(7) HOLLOW CONCRETE MASONRY UNITS USED IN NONBEARING PARTITIONS. All hollow concrete masonry units used in nonbearing partitions shall comply with the requirements of Wis. Adm. Code section Ind 53.06 (5).

(8) CLAY TILE AND HOLLOW CONCRETE MASONRY UNITS USED IN FLOOR CONSTRUCTION. (a) *General requirements.* Where clay tile and hollow concrete masonry units are used in concrete floor construction in a way that the whole or any portion of a tile or hollow concrete masonry unit is subjected to load, the requirements for such clay tile shall conform to the standard specifications for structural clay floor tile of the American Society for Testing and Materials. See section Ind 51.25 (9) for the ASTM designation which refers to clay tile. The hollow concrete masonry unit shall conform to the requirements stated in Wis. Adm. Code section Ind 53.06 (5) of the building and heating, ventilating and air conditioning code issued by the department of industry, labor and human relations.

(b) *Tile and masonry floor units.* Where hollow clay tile or hollow concrete masonry units are used in concrete floor construction in a way that no portion of a tile or block is subjected to a load, the requirements which apply to tile or block used in partitions shall apply.

(c) *Branding.* All clay tile or concrete masonry units used in floor construction shall conform to the branding requirements of subsection (5) (c).

Note: Copies of the above publications are on file in the office of the secretary of state, revisor of statutes and the department of industry, labor and human relations and may be obtained for personal use from the American Society for Testing and Materials, 1916 Race St., Philadelphia, Pa. 19103.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63; r. and recr. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.07 Allowable unit stresses in masonry. (1) The compressive stresses in masonry walls, partitions, piers and similar bearing masonry shall not exceed the values shown in the following table.

(2) In determining the stresses in the masonry, the effects of all loads and conditions of loading and the influence of all forces affecting the design and strength of the several parts shall be taken into account. Stresses shall be calculated on actual rather than nominal dimensions.

(3) In composite walls or other structural members composed of different kinds of grades of units or mortars, the maximum stress shall not exceed the allowable stress for the weakest of the combinations of units and mortars of which the member is composed.

(4) Higher stresses than herein specified may be used if tests, materials of a higher grade, or superior workmanship under approved

inspection are provided to the satisfaction of the department of industry, labor and human relations.

Type of Construction and Compressive Strength of Masonry Units	Allowable Compressive Stresses Gross Cross-Sectional Area (except as noted)			
	Type M Mortar	Type S Mortar	Type N Mortar	Type O Mortar
	psi	psi	psi	psi
Burned clay or shale brick:				
8,000 psi plus	400	350	300	200
4,500 to 8,000 psi	250	225	200	150
2,500 to 4,500 psi	175	160	140	110
1,500 to 2,500 psi	125	115	100	75
Sand-lime or concrete brick:				
2,500 psi plus	175	160	140	110
Solid concrete masonry units:				
1,800 psi plus	175	160	140	100
1,200 to 1,800 psi	125	115	100	75
Masonry of hollow units:				
1,000 psi	85	75	70	
Masonry of hollow units, cellular spaces filled (Note a)	105	95	90	
Cavity walls or masonry bonded hollow walls (Note b)				
Solid units: 2,500 psi plus	140	130	110	
Solid units: 1,500 to 2,500 psi	100	90	80	
Hollow units	70	60	55	
Grouted solid masonry of clay or shale brick; sand-lime or concrete brick: (Note c)				
4,500 psi plus	350	275	200	
2,500 to 4,500 psi	275	215	155	
1,500 to 2,500 psi	225	175	125	

Note (a) All cellular spaces filled solidly with concrete of either Type M or S mortar.
Note (b) Allowable stresses apply to the gross cross-sectional area of wall minus area of cavity between wythes. Where cavity or masonry bonded hollow walls are loaded concentrically, the allowable stresses may be increased by 25%.
Note (c) Grouted joints require that all joints be filled full with mortar. Refer to section Ind 53.08.

(5) If the design unit stress employed for any type of masonry exceeds 175, 160, 140, 110 or 75 for mortar type M, S, N, and O respectively, the plan or specification shall note the unit stress, type of mortar and kind of joint. Notification of the type and brand of masonry unit shall be filed with the department of industry, labor and human relations, including satisfactory evidence of test.

History: 1-2-56; r. and recr. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.08 Mortar and grout. (1) GENERAL REQUIREMENTS. All materials used as ingredients for mortar and grout shall conform to the following specifications of the American Society for Testing and Materials: See Ind 51.25 (10 thru 17) for the ASTM designation which refers to these products or methods.

(a) Hydrated lime mortar made with type N-normal hydrated lime for masonry purposes, after suction for 60 sec. shall have a water retention value of not less than 75% when tested in a standard mortar made from the dry hydrate or from putty made for the hydrate which has been soaked for a period of 16 to 24 hours.

(b) Hydrated lime mortar made with type S—special hydrated lime for masonry purposes shall have a water retention value of not less than 85% when tested in a standard mortar made from the dry hydrate.

(2) MORTAR. Mortar shall consist of a mixture of cementitious material and aggregate conforming to the requirements of the following table:

MORTAR PROPORTIONS BY VOLUME

Mortar Type	Parts by Volume of Portland Cement, or Portland Blast-Furnace Slag Cement	Parts by Volume of Masonry Cement	Parts by Volume of Hydrated Lime or Lime Putty	Aggregate Measured in a Damp, Loose Condition
M	1 1	1 (Type II)	$\frac{1}{4}$	Not less than $2\frac{1}{4}$ and not more than 3 times the sum of the volumes of the cements and lime used.
S	$\frac{1}{2}$ 1	1 (Type II)	Over $\frac{1}{4}$ to $\frac{1}{2}$	
N	1	1 (Type II)	Over $\frac{1}{2}$ to $1\frac{1}{4}$	
O	1	1 (Type II)	Over $1\frac{1}{4}$ to $2\frac{1}{2}$	

(3) GROUT. Grout shall be Type M, Type S, or Type N mortar to which water is added to produce consistency for pouring without segregation of constituents.

(4) MIXING. All cementitious materials and aggregate shall be thoroughly mixed with sufficient water added to produce a mortar with workable consistency.

(5) ADDITIVES: Where metal ties, anchors or reinforcement are imbedded in masonry, chloride and nitrate base salts or materials containing same shall not be used in the masonry construction.

(6) GYPSUM MORTAR. Gypsum mortar shall be composed of one part of gypsum and not more than three parts of mortar aggregate.

(7) MORTAR PERMITTED. Masonry shall be laid in mortar of the types specified in the following table:

Kind of Masonry	Types of Mortar Permitted
Masonry in contact with earth	M
Masonry above grade or interior masonry:	
Piers of solid units	M, S, or N
Piers of hollow units	M or S
Walls of solid units	M, S, N, or O
Walls of hollow units	M, S, or N
Chimneys	M, S, or N
Cavity walls or masonry bonded hollow walls	M, S, or N
Grouted solid masonry	M, S, or N
Nonbearing partitions and fireproofing	M, S, N, O or Gypsum
Gypsum tile or block	Gypsum
Fire brick	Refractory air setting Mortar.

History: 1-2-56; r. and recr. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.09 Bearing masonry walls, bearing partitions and piers. (1) GENERAL REQUIREMENTS. All masonry units used in the construction of bearing walls, bearing partitions and piers shall conform in all respects to the requirements for bearing units.

(2) UNIT STRESSES. The unit stresses in bearing masonry walls, partitions and piers shall not exceed those specified in Wis. Adm. Code sections Ind 53.04 and Ind 53.07.

(3) MORTARS. Masonry shall be laid in mortar conforming to the types specified in Wis. Adm. Code section 53.08 (6).

(4) MASONRY BOND. Masonry shall be bonded longitudinally in each wythe, transversely between wythes, and at intersections as follows:

(a) *Longitudinal bond.* Not less than 60% of the units in any transverse vertical plane shall lap the ends of units above and below a distance not less than 2 inches or one-third the height of the unit, whichever is greater, or the masonry shall be reinforced longitudinally as required for masonry laid in stack bond.

(b) *Transverse bond.* In brick masonry or in combinations of brick and other masonry units the facing and backing (adjacent wythes) shall be bonded by one of the following methods:

1. Bonding with headers. The facing and backing shall be bonded by a full header course of brick extending not less than ⅓ their length into the backing and spaced at intervals not greater than every sixth course of brick or equivalent. By equivalent is meant that ⅛ of the wall surface shall be header or bond units. The clear distance between bond courses shall not exceed 16 inches. Where the backing consists of 2 or more wythes, the headers shall extend not less than 4 inches into the most distant wythe or the backing wythe shall be bonded together with separate headers whose area and spacing conform to the foregoing.

2. Bonding with metal ties. Reinforcement for embedment in the horizontal mortar joints shall consist of metal ties conforming to section Ind 53.11 (3) (a) or of a continuous tie assembly with not less than #9 wire deformed longitudinal rods and #9 gauge cross wires. Cross wires shall be weld connected, spaced not more than 16 inches along the longitudinal rods, and shall be galvanized or coated with other approved corrosion-resistant material. The coating shall be not less than 0.8 oz. per sq. ft. Out-to-out spacing of longitudinal rods shall be approximately 2 inches less than the nominal thickness of the wall or wythe in which reinforcement is used. Tie assemblies shall be spaced at vertical intervals not exceeding 16 inches. Where the space between metal tied wythes is solidly filled with mortar, the allowable stresses and other provisions for masonry bonded walls shall apply. Where the space is not filled, metal tied walls shall conform to the allowable stresses, lateral support, thickness (excluding cavity), and height requirements for cavity walls as stated in section Ind 53.11.

(c) *Stack bond.* Load bearing walls having one or more wythes with inadequate longitudinal masonry bond shall be tied and reinforced as described in section Ind 53.09 (4) (b) 2.

1. Reinforcement for bearing walls having a single wythe shall consist of a continuous tie assembly with the equivalent of not less than #9 gauge deformed longitudinal rods and #9 gauge cross wires spaced at vertical intervals not exceeding 16 inches.

(d) *Bonding at intersections.* Where two bearing walls meet or intersect, the intersections shall be bonded by one of the following methods:

1. By laying in a true bond at least 50% of the units at the intersection.

2. By regular toothing or blocking with 8 inch maximum offsets and the joints provided with the equivalent of not less than 1¼ inch or ¼ inch by 24 metal anchors with hooked or cross pinned ends for anchorage. Such anchors shall be spaced not more than 4 feet apart.

3. By alternate details which are designed to permit differential movements at the intersections of interior and exterior walls provided such details are consistent with the requirements for lateral stability of the walls.

(5) USE OF HOLLOW CLAY TILE AND HOLLOW CONCRETE MASONRY UNITS. Approved clay tile and hollow concrete masonry units may be used in bearing walls of buildings not more than 3 stories, or 40 feet in height. In determining this height, the basement or foundation wall shall be considered a story if constructed of clay tile or concrete masonry units.

(6) LOADING. Concentrated loads shall be transmitted to hollow clay tile or hollow concrete block masonry by at least 3 courses of brick or equivalent concrete or by a metal plate of sufficient thickness and size to distribute the load to the webs and shells in such a manner as not to exceed the unit allowable stress.

(7) PARTY WALL CONSTRUCTION. Where hollow clay tile or hollow concrete masonry units are used in party walls, there shall be not less than 2 such units, each 8 inches in thickness as a minimum, used in making up the thickness of the wall unless solid masonry is used for building all chases, recesses, framing of all openings, and for the support, anchorage, and protection of all joists and beams carried into such wall.

(8) WALL CONSTRUCTION. All hollow concrete masonry units and other hollow units not designed for the same loading in either a horizontal or vertical position shall be laid with the cells in a vertical position, when used in a bearing wall.

(a) *Clay tile or concrete masonry unit construction.* In clay tile or concrete masonry unit construction, all vertical and horizontal joints designed to receive mortar or grout shall be completely filled.

(b) *Height and thickness.* All hollow concrete masonry bearing walls shall be limited to the following values:

		Thickness in Inches	Maximum Height in Feet	Maximum Roof or Floor Span in Feet	Maximum Spacing of Crosswalls or Pilasters in Feet	Pilasters Minimum Size in Inches*
Single Story		6 8 10 12	9 12 15 18	18 25 30 40	15 20 25 None Required	12 12 14 16
Top Story of Buildings Not Over 3 Story		8	10	20	30	12
Multi-Story	Upper 40 ft. or 3 Stories	12	3 Stories or 40 Feet		18	16

*Size is for lateral stability only. See section Ind 53.09 (8).

1. Masonry crosswalls or pilasters may be omitted on hollow concrete masonry bearing walls 12 inches or more in thickness where such walls are supported horizontally by floors or roofs at heights not exceeding 18 times the wall thickness.

2. Stiffened walls. Where solid masonry bearing walls are stiffened at distances not greater than 12 feet apart by masonry cross walls or by reinforced concrete floors, they may be of 12-inch thickness for the uppermost 50 feet, measured downward from the top of the wall, and shall be increased 4 inches in thickness for each successive 50 feet or fraction thereof.

3. Brick masonry bearing walls shall have a thickness of at least $\frac{1}{20}$ of their unsupported height or width, whichever is the shorter. In addition, the thickness of such bearing walls shall be not less than 6 inches for walls 10 feet or less in height and the minimum thickness shall be increased 1 inch for each successive 10 feet or fraction thereof in height.

(c) *Pilaster.* An unreinforced masonry section bonded to the adjoining wall by one of the following methods:

1. By the use of pilaster blocks by alternate course bond of masonry with adjoining wall.

2. Pilasters. The least dimension in inches for pilasters carrying beams, trusses, and girders shall be not less than 1/40 the span and the height shall not exceed 12 times the least dimension for solid or hollow masonry. Joists with spans not more than 40 feet and spacings not more than 6 feet on center shall not be considered as beams or girders if a continuous bond beam is used for spacings of over 4 feet. A bond beam made up of not less than 8 inch lintel blocks may be used if 2 No. 4 bars are embedded in 3000 p.s.i. concrete fill. An equivalent bond beam of other materials is acceptable.

3. The dimension of pilasters used for lateral stability only, shall be no less than 4 inches greater in thickness than the principal wall nor less than 16 inches in length.

(d) *Piers.* An isolated column of masonry. A bearing wall not bonded at the sides into associated masonry shall be considered a pier when its horizontal dimension measured at right angles to the thickness does not exceed four times its thickness. The least dimension shall not be less than 1/30 of the span, in inches, and the height shall not exceed 10 times the least dimension for solid or grouted masonry piers or 6 times the least dimension for hollow masonry piers.

(e) *Walls below grade.* Masonry walls which are in contact with the soil shall be of sufficient strength and thickness to resist the lateral pressure from the adjacent earth and to support their vertical loads without exceeding the allowable stresses. The minimum thickness for masonry walls below grade shall be 4 inches greater than the required thickness for the walls of the supported structures except that 12 inch walls will be accepted for buildings not more than 2 stories in height if substantial lateral support consisting of masonry walls, offsets or pilasters are provided at intervals of not to exceed 20 feet.

(f) *Stone walls.* Rough or random or coursed rubble stone walls shall be 4 inches thicker than is required by Wis. Adm. Code section 53.09 (8) (a) but in no case less than 16 inches thick.

1. Stone not less than 4 inches thick may be considered as part of the required thickness of a wall if bonded to the backing as required for brickwork, see section Ind 53.09 (4) (b) 1 or 2. No such wall shall be less than 12 inches thick.

(g) *Chases, recesses and openings.* There shall be no chases in 8 inch walls or in any pier. No chase in wall greater than 8 inches shall be deeper than ½ the wall thickness. No horizontal chase shall exceed 4 feet in length nor shall the horizontal projection of any diagonal chase exceed 4 feet. No vertical chase shall be closer than 2 feet to any pilaster, cross wall, end wall or other stiffener.

(h) *Eccentric loads.* Walls supporting eccentrically applied loads including eccentric loads produced by the deflection of floor and roof members shall be analyzed for stability and strength. Maximum unit stresses shall not exceed those specified in sections Ind 53.01 and Ind 53.07.

(i) *Design.* The minimum thickness of masonry bearing walls may be decreased, except for walls below grade, and the height or length to thickness ratio may be increased when data is submitted to the department of industry, labor and human relations which justifies a reduction in the requirements specified in this code.

History: 1–2–56; am. (12) (a), Register, June, 1956, No. 6, eff. 7–1–56; am. (4) (b), Register, August, 1957, No. 20, eff. 9–1–57; r. and recr. Register, September, 1959, No. 45, eff. 10–1–59; r. and recr. Register, October, 1967, No. 142, eff. 11–1–67.

Ind 53.10 Nonbearing masonry walls. (1) EXTERIOR NONBEARING WALLS. All exterior nonbearing walls, if constructed with one wythe of brick to the weather may be backed with S.W. or M.W. classified clay or shale brick, concrete masonry units or clay tile conforming to the requirements of sections Ind 53.05 and 53.06. If such walls are

built of concrete masonry units or clay tile, such units shall conform to the requirements of Ind 53.06.

(2) INTERIOR NONBEARING WALLS. Interior nonbearing masonry walls may be built of materials conforming with the requirements of sections Ind 53.05 and 53.06, or of gypsum block or other approved material.

(3) TYPE OF MORTAR. Mortar used in non-load-bearing masonry shall conform to the types specified in Wis. Adm. Code section 53.08 (6).

(4) MASONRY BOND AND ANCHORAGE. Exterior and interior non-load-bearing masonry walls shall be bonded longitudinally in each wythe and transversely between wythes as required for bearing walls. See section Ind 53.09 (4) (a) through (b) 2. For stone walls see section Ind 53.09 (8) (e).

(a) NON-LOAD-BEARING WALLS. Non-load-bearing walls shall be anchored to each other at intersections and to supporting masonry by means of masonry bond or corrosion-resistant corrugated metal ties or equivalent. Corrugated metal ties shall be not less than 7/8 inches wide and No. 22 gauge in thickness and shall be located at vertical intervals not more than 16 inches on center or shall be equivalent to the foregoing.

(b) *Anchorage.* Anchorage to steel or concrete supports shall be by means of not less than as specified in (a) above or equivalent methods. Anchorage at exterior walls shall be adequate to transmit wind and other lateral loads to the supports.

(c) *Stack bond.* Non-load-bearing walls, or wythes thereof, laid in stack bond or otherwise with inadequate longitudinal bond, shall be tied and reinforced as required in Wis. Adm. Code section 53.09 (4) (c) except that for interior non-load-bearing partitions the maximum spacing of joint reinforcement shall be 24 inches.

(d) *Masonry veneer.* Masonry veneer or wood frame structures shall be securely attached to the backing by corrosion-resistant corrugated metal ties, not less than No. 22 gauge in thickness and 7/8 inches in width or equivalent. One tie shall be used for at least each 2 square feet of wall area and the distance between ties shall not exceed 24 inches or by No. 13 gauge metal ties or equivalent located 36 inches horizontally and 18 inches vertically.

(5) HEIGHT AND THICKNESS—INTERIOR NONBEARING MASONRY WALLS. Walls which are supported by fire-resistive construction and have tight contact with not less than 2-hour fire-resistive construction at the top, shall be not more than 36 times their thickness in clear height. Similar nonbearing walls which contact less than 2-hour fire-resistive support at the top shall be not more than 24 times their thickness in clear height. Plastering shall be included in computing the thickness.

(6) THICKNESS OF EXTERIOR NONBEARING WALLS. The thickness of exterior nonbearing walls shall be not less than 1/7 of the clear height but in no case less than 8 inches. Where 8 inch or 10 inch

walls are used, the horizontal distance between vertical supports shall be not less than 30 times the wall thickness.

(7) WALLS BELOW GRADE. See Wis. Adm. Code section Ind 53.09 (8) (e).

(8) DESIGN. The minimum thickness of non-load-bearing walls may be decreased and the height or length to thickness ratio may be increased when data is submitted to the department of industry, labor and human relations which justifies a reduction in the requirements specified in this code.

History: 1-2-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59; r. and recr. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.11 Cavity walls. (1) LOAD-BEARING AND NON-LOAD-BEARING. Load-bearing and non-load-bearing walls of the cavity type may be built of solid or hollow masonry units or combinations thereof subject to the following requirements as well as other applicable requirements of this code. The description of a cavity wall is determined by its nominal out-to-out dimension. (a) For allowable unit stresses see Wis. Adm. Code section Ind 53.07 for masonry. In computing the unit stresses, the effective cross sectional area of the cavity walls shall be taken as the gross cross sectional area minus the area of the cavity.

(b) For mortar requirements see Wis. Adm. Code section Ind 53.08 (6).

(2) THICKNESS. The facing and backing of cavity walls shall each have a thickness of at least 4 inches and the space between the facing and backing shall be not less than 2 inches nor more than 3 inches in width. The backing wythe shall be at least as thick as the facing wythe.

(a) The maximum height between supports shall be 10 feet for 10 inch cavity walls. For other wall thicknesses, it shall not exceed 18 times the sum of the nominal thickness of the inner and outer wythes. The overall height of a 10 inch cavity wall shall not exceed 25 feet. The overall height of all other cavity walls shall not exceed 35 feet.

(3) BONDING. The facing and backing of cavity walls shall be bonded with $\frac{3}{16}$ inch diameter metal unit ties or the equivalent or with the equivalent of metal reinforcement having #9 inch longitudinal rods and #9 gauge cross wires. Metal ties shall be of corrosion-resistant metal or coated with a corrosion-resistant metal, or other approved protective coating.

(a) *Metal ties.* There shall be one $\frac{3}{16}$ inch steel rod or metal tie of equivalent strength or stiffness for not more than each 4½ square feet of wall area. Ties in alternate courses shall be staggered, the maximum vertical distance between ties shall not exceed 18 inches, and the maximum horizontal distance shall not exceed 36 inches. Ties bent to rectangular shape shall be used with hollow masonry units laid with the cells vertical; in other walls the ends of ties shall be bent to 90-degree angles, Z shaped, to provide hooks not less than 2 inches long. Additional bonding ties shall be provided at

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all openings spaced not more than 3 feet apart around the perimeter and within 12 inches of the opening.

(b) *Cross-wire ties.* Cross wires (at least #9 gauge or larger) of masonry joint reinforcement shall be spaced to provide equivalent strength and stiffness across the cavity space to that provided by ⅜ inch Z shaped ties for each 4½ square feet of wall area.

(c) *Installation.* Ties specified above shall be installed in the first mortar joint below floor and roof bearing courses.

(4) CAVITY DRAIN. In exterior walls of cavity construction, suitable flashing shall be installed at the bottom of the cavity so as to drain outwardly any water which penetrates the facing. Open vertical joints, or weep holes, shall be provided every 2 to 3 feet horizontally in the facing above the flashing.

(5) STACK BOND. Masonry joint reinforcement shall conform to the requirements as specified in this section.

(6) CAVITY WALLS BELOW GRADE. Cavity walls shall not be built below grade unless designed to resist the lateral pressure due to backfilling operations and earth pressure.

History: 1–2–56; r. and recr. Register, October, 1967, No. 142, eff. 11–1–67.

Ind 53.12 Bonding and anchoring stone and cast stone veneers. (1) For bearing walls, stone shall be bonded to the backing every 16 inches of wall height with bond courses at least 4 inches in height, and the width of bed joint used to effect the masonry bond shall be at least 4 inches.

(2) For non-bearing walls, individual stones shall be anchored to the supporting framework and dowelled to each other at all horizontal joints, and anchored to the backing at all horizontal joints and at vertical joints so that one anchor is provided for every 6 square feet of wall surface. All anchors shall be not less than ¼ square inch in cross section and made of wrought iron galvanized after forming, or of commercial bronze.

(3) The backing of all stone or cast stone bearing or non-bearing walls shall be of brick conforming to the requirements of section Ind 53.05 or other solid material weighing at least 130 pounds per cubic foot except where the stone facing is not more than 4 inches in thickness, the backing may be of hollow masonry units conforming to the requirements of section Ind 53.06, or other similar non-corrosive material.

History: 1–2–56; r. and recr. Register, September, 1959, No. 45, eff. 10–1–59.

Ind 53.13 Parapet walls. (1) Parapet walls not less than 8 inches in thickness and 2 feet in height shall be provided on all exterior walls of masonry or concrete, where such walls connect with roofs other than roofs that are of incombustible construction throughout; but this section shall not apply:

(a) To buildings where frame construction would be permitted under the provisions of this code.

(b) To walls which face streets, or alleys.

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(c) To walls where not less than 10 feet of vacant space is maintained between the wall and the boundary line between premises.

(d) To walls which are not less than 10 feet from other buildings on the same premises.

(2) All parapet walls shall be properly coped with incombustible, weatherproof material.

(3) Parapet walls not less than 8 inches in thickness and 3 feet in height shall be provided on all division and party walls of masonry or concrete where such walls connect with roofs of other than 2-hour fire-resistive construction, or better.

History: 1–2–56; am. Register, December, 1962, No. 84, eff. 1–1–63.

Ind 53.14 Concrete requirements. (1) ADOPTED STANDARDS. The following American Concrete Institute standards are adopted as part of the building, heating, ventilating and air conditioning code issued by the Wisconsin department of industry, labor and human relations. See section Ind 51.26 for the ACI designation which refers to this product or method.

(a) Building code requirements for reinforced concrete.

(b) Minimum standard requirements for precast concrete floor and roof units.

(c) Minimum requirements for thin-section precast concrete construction.

(2) RECOMMENDED STANDARDS: The following standards which are a part of the standards stated in (1) are recognized by the Wisconsin department of industry, labor and human relations as being good engineering practice but are not included as part of the building, heating, ventilating and air conditioning code issued by the Wisconsin department of industry, labor and human relations.

(a) Recommended practice for evaluation of compression tests results of field concrete.

(b) Recommended practice for cold weather concreting.

(c) Recommended practice for hot weather concreting.

(d) Recommended practice for selecting proportions for structural lightweight concrete.

(e) Manual of standard practice for detailing reinforced concrete structures.

(f) Recommended practices for welding reinforced steel, metal inserts and connections in reinforced concrete construction.

(g) Arc and gas welding in building construction.

(h) Mild steel arc-welding electrodes.

(i) Standard qualification procedure.

History: 1–2–56; r. and recr. Register, October, 1967, No. 142, eff. 11–1–67.

Ind 53.15 History: 1–2–56; r. Register, October, 1967, No. 142, eff. 11–1–67.

Ind 53.15 Reinforced gypsum concrete. (1) MATERIALS. (a) The term "gypsum" as used in this chapter shall mean calcined gypsum

manufactured from gypsum meeting the requirements of the American Society for Testing Materials' Standard Specifications for Gypsum C22-25, (American Standard A49.1-1933).

(b) Gypsum concrete shall consist of a mixture of gypsum and water, with or without wood chips, fiber or other approved aggregate.

(c) Precast gypsum concrete shall contain not more than 3% and cast-in-place gypsum concrete not more than 12½% of wood chips, shavings, or fiber measured as a percentage by weight of the dry mix.

(d) Wood chips, shavings, or fiber used in gypsum concrete shall be dry, soft wood, uniform and clean in appearance. They shall pass a 1-inch screen and shall be not more than ⅛ inch in thickness.

(e) Steel bar and wire reinforcing shall meet the requirements of Wis. Adm. Code subsection Ind 53.14.

(2) MINIMUM THICKNESS. (a) The minimum thickness of gypsum concrete in floors and roofs shall be 2 inches except the suspension system, which shall be not less than 3 inches thick. Hollow precast gypsum concrete units for roof construction shall be not less than 3 inches thick and the shell not less than ½ inch thick.

(b) Precast gypsum concrete units for floor and roof construction shall be reinforced and unless the shape or marking of the unit is such as to insure its being placed right side up, the reinforcing shall be symmetrical so that the unit can support its load either side up.

(3) DESIGN. (a) Reinforced gypsum concrete shall be designed by methods admitting of rational analysis according to established principles of mechanics, to support the loads and withstand the forces to which it is subject without exceeding the stresses allowed in this chapter for the materials thereof except as hereinafter provided. The general assumptions and principles established for reinforced concrete shall also apply to reinforced gypsum concrete insofar as they are pertinent.

(b) For precast gypsum structural units which can not be analyzed in accordance with established principles of mechanics, the safe uniformly distributed carrying capacity shall be taken as ⅙ of the total load causing failure in a full size test panel with the load applied along 2 lines each distant ¼ of the clear span from the support.

(c) Reinforced gypsum concrete shall not be used where exposed directly to the weather or where subjected to frequent or continuous wetting.

(4) STRENGTH. (a) Gypsum concrete shall be classified according to mixture, and concrete of each class shall have a minimum strength in compression as follows:

1. Class 1 Neat (Containing gypsum and water only) ..... 1800 lbs. per sq. in.
2. Class 2 Containing not more than 3% by weight of wood chips or fiber .. 1000 lbs. per sq. in.
3. Class 3 Containing not more than 12½% by weight of wood chips or fiber 500 lbs. per sq. in.

(b) The strength of gypsum concrete shall be determined by compressive tests of 5 cylinders, 6 inches in diameter and 12 inches in

length, from each 25 tons or fraction thereof. The test specimens shall be dried at a temperature of not less than 70 degrees Fahrenheit nor more than 100 degrees Fahrenheit in an atmosphere of not more than 50% relative humidity. The specimens shall be weighed at 1-day intervals until constant weight is attained. The method of testing and application of load shall be in accordance with the requirements specified in sections 19 and 20 of Standard Methods of Making Compression Tests of Concrete, A.S.T.M. C39–39. The average of the 5 specimens shall not fall below the specified minimum and in no case shall any specimen show a strength of less than 80% of the specified minimum.

(5) MODULUS OF ELASTICITY. (a) In the design of structural members of reinforced gypsum concrete the following values shall be used for the modulus of elasticity:

1. Class 1	Neat	1,000,000 lbs. per sq. in.
2. Class 2	Containing not more than 3% by weight of wood chips or fiber	600,000 lbs. per sq. in.
3. Class 3	Containing not more than 12½% by weight of wood chips or fiber	200,000 lbs. per sq. in.

(6) ALLOWABLE STRESSES. (a) In the design of structural members of reinforced gypsum concrete the stresses in the concrete shall not exceed the following allowable values:

1. Compressive stress in bending	$0.25f_c$
2. Axial compressive or bearing stress	$0.20f_c$
3. Bond stress (reinforcement anchored)	$0.02f_c$
4. Shearing stress (reinforcement anchored)	$0.02f_c$

5. In this table (f_c) indicates the compressive strength of the gypsum concrete as specified in subsection (4) (a).

(b) The tensile stresses in reinforcing steel shall be as specified for reinforced concrete made with Portland cement.

(7) SUSPENSION SYSTEM. In the construction of floors or other slabs the reinforcing shall consist of wires with continuity through multiple spans and anchored at the ends. The wires shall be supported in the top of the slab by the roof or floor beams and shall be tightly drawn down as nearly to the bottom of the slab at midspan as fire protection requirements will allow. Provision shall be made in the framing of the end bays of this system for resisting the forces due to end anchorage of the wires. The wires shall be designed for a tension in pounds per foot width of slab equal to:

$$\frac{wL^2}{8d}$$

in which

w is the total load in lbs. per sq. ft.
L is the clear span in feet
d is the sag of the wires in feet

History: 1–2–56; renum. from Ind 53.23 to be Ind 53.15, Register, October, 1967, No. 142, eff. 11–1–67.

Ind 53.16 History: 1-2-56; r. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.16 Structural steel. (1) MATERIAL. (a) *Minimum yield point.* The minimum yield point in pounds per square inch for structural steel used in buildings and structures under this code shall be as follows:

Steel for bridges and buildings, Designation A-7	33,000
Structural steel for welding, Designation A-373	32,000
Structural steel, Designation A-36	36,000
High-strength structural steel, Designation A-440	42,000—50,000
High-strength low-alloy structural manganese vanadium steel, Designation A-441	42,000—50,000
High-strength low-alloy structural steel, Designation A-242	42,000—50,000

1. Certified test reports shall be submitted as evidence of conformity with the specifications when requested by the department of industry, labor and human relations.

2. Unidentified steel, if free from surface imperfections, may be used for parts of minor importance, or for unimportant details, where the precise physical properties of the steel and its weldability would not affect the strength of the structure.

(b) *Other metals.* Cast steel shall conform to one of the following specifications:

Mild-to-medium-strength carbon-steel castings for general application, Designation A-27, Grade 65-35.

High-strength steel castings for structural purposes, Designation A-148, Grade 80-50.

1. Certified test reports shall be submitted as evidence of conformity with the specifications when requested by the department of industry, labor and human relations.

2. Steel forgings shall conform to one of the following specifications:

a. Carbon steel forgings for general industrial use, Designation A-235, Class C1, F and G. (Class C1 forgings that are to be welded shall be ordered in accordance with supplemental requirements S5 of A-235.)

b. Alloy steel forgings for general industrial use, Designation A-237, Class A.

3. Certified test reports shall be submitted as evidence of conformity with the specifications when requested by the department of industry, labor and human relations.

(c) *Rivet steel.* Rivet steel shall conform to one of the following specifications:

Structural rivet steel, Designation A-141.

High-strength structural rivet steel, Designation A-195.

High-strength structural alloy rivet steel, Designation A-406.

1. Certified test reports shall be submitted as evidence of conformity with the specifications when requested by the department of industry, labor and human relations.

(d) *Bolts.* High-strength steel bolts shall conform to one of the following specifications:

High-strength steel bolts for structural joints, Designation A-325.

Quenched and tempered alloy steel bolts and studs with suitable nuts, Designation A-354, Grade BC.

1. Other bolts shall conform to the specification for low-carbon steel externally and internally threaded standard fasteners, Designation A-307, hereinafter designated as A-307 bolts.

2. Manufacturer's certification shall be submitted as evidence of conformity with the specifications when requested by the department of industry, labor and human relations.

(e) *Filler metal for welding.* Welding electrodes for manual shielded metal arc welding shall conform to the E60 or E70 series of the specification for mild steel arc welding electrodes, Designation A-233.

1. Bare electrodes and granular fusible flux used in combinations for submerged arc welding shall be capable of producing weld metal having the following tensile properties when deposited in a multiple pass weld:

a. Grade SA-1	
Tensile strength	62,000 to 80,000 psi
Yield point, min.	45,000 psi
Elongation in 2 in., min.	25%
Reduction in area, min.	40%
b. Grade SA-2	
Tensile strength	70,000 to 90,000 psi
Yield point, min.	50,000 psi
Elongation in 2 in., min.	22%
Reduction in area, min.	40%

2. Manufacturer's certification shall be submitted as evidence of conformity with the specifications when requested by the department of industry, labor and human relations.

(2) ALLOWABLE UNIT STRESSES. All components of the structure shall be so proportioned that the unit stresses in pounds per square inch shall not exceed the following values except as specified in Wis. Adm. Code section Ind 53.01.

(a) *Structural steel.* 1. Tension. a. On the net section, except as pin holes

$$F_t = 0.60F_y$$

b. On the net section at pin holes in eyebars, pin-connected plates or built-up members

$$F_t = 0.45\ F_y$$

Note: F_t = Allowable tensile stress
F_y = Minimum yield point of type of steel used

2. Shear. On the gross section of beam and plate girder webs

$$F_v = 0.40F_y$$

3. Compression. a. On the gross section of axially loaded compression members when $\frac{1}{r}$, the largest slenderness ratio of any unbraced segment is less than C_c

(FORMULA 1)

$$F_a = \frac{\left[1 - \frac{\left(\frac{1}{r}\right)^2}{2C_c^2}\right] F_y}{F.S.}$$

Where

$$F.S. = \text{factor of safety} = \frac{5}{3} + \frac{3\left(\frac{1}{r}\right)}{8C_c} - \frac{\left(\frac{1}{r}\right)^3}{8C_c^3}$$

and

$$C_c = \sqrt{\frac{2\pi^2 E}{F_y}}$$

b. On the gross section of axially loaded columns when $\frac{1}{r}$ exceeds C_c

(FORMULA 2)

$$F_a = \frac{149{,}000{,}000}{\left(\frac{1}{r}\right)^2}$$

c. On the gross section of axially loaded bracing and secondary members, when $\frac{1}{r}$ exceeds 120

(FORMULA 3)

$$F_a = \frac{F_a \text{ (by Formula 1 or 2)}}{1.6 - \frac{1}{200r}}$$

d. On the gross area of plate girder stiffeners

$$F_a = 0.60\ F_y$$

e. On the web of rolled shapes at the toe of the fillet.

$$F_a = 0.75\ F_y$$

4. Bending. a. Tension and compression on extreme fibers of rolled shapes and built-up members having an axis of symmetry in the plane of loading and proportions meeting the requirements of compact sections, when the member is supported laterally at intervals no greater than 13 times its compression flange width

$$F_b = 0.66\ F_y$$

b. Beams and girders which meet the requirements of the prec paragraph and are continuous over supports or are rigidly fram columns by means of rivets, high-strength bolts or welds, may b portioned for 9/10 of the negative moments produced by gravity ing which are maximum at points of support provided that, for members, the maximum positive moment shall be increased by of the average negative moments. This reduction shall not ap moments produced by loading on cantilevers. If the negative m is resisted by a column rigidly framed to the beam or girder, th reduction may be used in proportioning the column for the com axial and bending loading, provided that the unit stress, due t concurrent axial load on the member, does not exceed $0.15F_y$.

c. Tension and compression on extreme fibers of unsymm members supported in the region of compression stress as speci section 4. a.

$$F_b = 0.60F_y$$

d. Tension and compression on extreme fibers of box-type m whose proportions do not meet the provisions of compact sectio do conform to the provisions of section 5—Width-Thickness Ra

$$F_b = 0.60F_y$$

e. Tension on extreme fibers of other rolled shapes, built-u bers, and plate girders.

$$F_b = 0.60F_y$$

f. Compression on extreme fibers of rolled shapes, plate girde built-up members having an axis of symmetry in the plane web (other than box-type beams and girders), the larger val puted by formulas (4) and (5), but not more than $0.60F_y$

(FORMULA 4)

$$F_b = \left[1.0 - \frac{\left(\frac{l}{r}\right)^2}{2C_c^2 C_b}\right] 0.60F_y$$

(FORMULA 5)

$$F_b = \frac{12{,}000{,}000}{\frac{ld}{A_f}}$$

where l is the unbraced length of the compression flange; radius of gyration of a tee section comprising the compressi plus 1/6 of the web area, about an axis in the plane of the is the area of the compression flange; C_c is defined in sec and C_b, which can conservatively be taken as unity, is equal

$$C_b = 1.75 - 1.05\left(\frac{M_1}{M_2}\right) + 0.3\left(\frac{M_1}{M_2}\right)^2, \text{ but not more th}$$

where M_1 is the smaller and M_2 the larger bending moment a of the unbraced length, taken about the strong axis of th

and where $\frac{M_1}{M_2}$, the ratio of end moments, is positive when M_1 and M_2 have the same sign (single curvature bending) and negative when they are of opposite signs (reverse curvature bending). When the bending moment at any point within an unbraced length is larger than that at both ends of this length the ratio $\frac{M_1}{M_2}$ shall be taken as unity.

g. Compression on extreme fibers of channels, the value computed by formula (5), but not more than

$$F_b = 0.60F_y$$

h. Tension and compression on extreme fibers of large pins.

$$F_b = 0.90F_y$$

i. Tension and compression on extreme fibers of rectangular bearing plates.

$$F_b = 0.75F_y$$

5. Bearing (on contact area). a. Milled surfaces and pins in reamed, drilled or bored holes, pounds per square inch

b. Finished stiffeners pounds per square inch

$$F_p = 0.80\ F_y$$

$$F_p = 0.90F_y$$

c. Expansion rollers and rockers, pounds per linear inch

$$F_p = \left(\frac{F_y - 13{,}000}{20{,}000}\right) 660d$$

where d is the diameter of roller rocker in inches

d. Rivets and bolts. Allowable unit tension and shear stresses on rivets, bolts and threaded parts (pounds per square inch of area of rivets before driving or unthreaded body area of bolts and threaded parts) shall be as given in table 1.

TABLE 1

Description of Fastener	Tension (F_t)	Shear (F_v)	
		Friction-type Connections	Bearing-type Connections
A141 hot-driven rivets	20,000	----------	15,000
A195 and A406 hot-driven rivets	27,000	----------	20,000
A307 bolts and threaded parts of A7 and A373 steel	14,000	----------	10,000
Threaded parts of other steels	$0.10F_y$	----------	$0.30F_y$
A325 bolts when threading is *not* excluded from shear planes	40,000	15,000	15,000
A325 bolts when threading is excluded from shear planes	40,000	15,000	22,000
A354, Grade BC, bolts when threading is *not* excluded from shear planes	50,000	20,000	20,000
A354, Grade BC, when threading is excluded from shear planes	50,000	20,000	24,000

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Allowable bearing stress on projected area of bolts in bearing-type connections and on rivets.

$$F_p = 1.35F_t$$

(Bearing stress not restricted in friction-type connections assembled with A325 and A354, Grade BC, bolts).

Welds (stress in pounds per square inch throat area).

Fillet, plug, slot and partial penetration groove welds.

Fillet, plug, slot and partial penetration groove welds made with A233 Class E60 series electrodes and fillet welds made by submerged arc welding Grade SA-1—13,600.

Fillet, plug, slot and partial penetration groove welds made with A233 Class E70 series electrodes and fillet welds made by submerged arc welding Grade SA-2—15,800.

Complete penetration groove welds.

On complete penetration groove welds the allowable tension, compression, bending, shear and bearing stresses shall be the same as those allowed by section (2) in the connected material.

e. Cast steel and steel forgings.

1. Tension (on net section) F_t 0.60F_y
2. Shear (on gross section) F_v 0.40F_y
3. Compression—same as provided under section (2) (a) 3. a.
4. Bending (on extreme fibers) F_b 0.60F_y
5. Bearing—same as provided under section (2) (a) 5.

f. Wind stresses. (See Wis. Adm. Code section Ind 53.01)

(3) COMBINED STRESSES. (a) *Axial compression and bending.* Members subject to both axial compression and bending stresses shall be proportioned to meet the requirements of both Formula (6) and Formula (7).

FORMULA (6)

$$\frac{f_a}{F_a} + \frac{C_m\, f_b}{\left(1 - \frac{f_a}{F'_e}\right) F_b} \leq 1.0$$

FORMULA (7)

$$\frac{f_a}{0.6F_y} + \frac{f_b}{F_b} \leq 1.0 \text{ (applicable only at braced points)}$$

where

F_a = axial stress that would be permitted if axial stress alone existed

F_b = bending stress that would be permitted if bending stress alone existed

$F'_e = \frac{149{,}000{,}000}{\left(\frac{l}{r_b}\right)^2}$ (May be increased 1/3 in accordance with Wis. Adm. Code section Ind 53.01)

l = actual unbraced length in the plane of bending

r_b = radius of gyration about axis of bending

f_a = computed axial stress

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f_b = computed bending stress at the point under consideration
C_m = 0.85, except as follows:

1. When $\frac{f_a}{F_a} \leq 0.15$. (For this case the member selected shall meet the limitation that

$$\frac{f_a}{F_a} + \frac{f_b}{F_b} \leq 1.0$$

2. For restrained compression members in frames braced against joint translation but not subject to transverse loading between their supports in the plane of loading, C_m may be taken as 0.6 plus 0.4 $\left(\frac{M_1}{M_2}\right)$, where $\frac{M_1}{M_2}$ is the ratio of smaller to larger moments at the ends of the critical unbraced length of the member. $\frac{M_1}{M_2}$ is positive when the unbraced length is bent in single curvature and negative when it is bent in reverse curvature.
3. For restrained compression members in frames braced against joint translation in the plane of loading and subject to transverse loading between their supports (joints) in the plane of loading, a value of C_m may be determined by rational analysis.

(b) *Shear and tension.* Rivets and bolts subject to combined shear and tension due to force applied to the connected parts, shall be so proportioned that the tension stress produced by the force shall not exceed the following:

For A141 rivets ---------- $F_t = 28{,}000 - 1.6f_v \leq 20{,}000$
For A195 and A406 rivets ---------- $F_t = 38{,}000 - 1.6f_v \leq 27{,}000$
For A307 bolts ---------- $F_t = 20{,}000 - 1.6f_v \leq 14{,}000$
For A325 bolts in bearing-type joints ---------- $F_t = 50{,}000 - 1.6f_v \leq 40{,}000$
For A354, Grade BC, bolts in bearing-type joints ---------- $F_t = 60{,}000 - 1.6f_v \leq 50{,}000$

where f_v, the shear stress produced by the same force, shall not exceed the value for shear given in section (2) 5. (d).

For bolts used in friction-type joints, the shear stress allowed in section (2) 5. (d) shall be reduced as follows:

For A 325 bolts ---------- $F_v \leq 15{,}000 \left(1 - \frac{f_t A_b}{T_b}\right)$

For A 354, Grade BC, bolts ---------- $F_v \leq 20{,}000 \left(1 - \frac{f_t A_b}{T_b}\right)$

where f_t is the tensile stress due to applied load and T_b is the proof load of the bolt.

(4) SLENDERNESS RATIOS. (a) *Definition.* In determining the slenderness ratio of an axially loaded compression member, l shall be taken as its effective length and r the corresponding radius of gyration.

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(b) *Sideway prevented.* The effective length of compression members in trusses, and in frames where lateral stability is provided by diagonal bracing, shear walls, attachment to an adjacent structure having adequate lateral stability, or by floor slabs or roof decks secured horizontally by walls or bracing systems parallel to the plane of the frame, shall be taken as the actual unbraced length, unless analysis shows that a shorter length may be used.

(c) *Sideway not prevented.* The effective length of compression members in a frame which depends upon its own bending stiffness for lateral stability, shall be determined by a rational method and shall not be less than the actual unbraced length.

(d) *Maximum ratios.* The slenderness ratio of compression members shall not exceed 200. The slenderness ratio of tension members, other than rods, preferably should not exceed:

For main members ---------- 240
For bracing and other secondary members ---------- 300

(5) WIDTH-THICKNESS RATIOS. (a) *Projecting elements under compression.* 1. Projecting elements of members subjected to axial compression or compression due to bending shall have ratios of width-to-thickness not greater than the following:

Single-angle struts; double-angle struts with separators ---- $\frac{2,400}{\sqrt{F_y}}$

Struts comprising double angles in contact; angles or plates projecting from girders, columns or other compression members; compression flanges of beams; stiffeners on plate girders $\frac{3,000}{\sqrt{F_y}}$

Stems of tees ---------- $\frac{4,000}{\sqrt{F_y}}$

2. The width of plates shall be taken from the free edge to the first row of rivets, bolts, or welds; the width of legs of angles, channels and zees, and of the stems of tees, shall be taken as the full nominal dimension; the width of flanges of beams and tees shall be taken as ½ the full nominal width. The thickness of a sloping flange shall be measured halfway between a free edge and the corresponding face of the web.

3. When a projecting element exceeds the width-to-thickness ratio prescribed in the preceding paragraph, but would conform to same and would satisfy the stress requirements with a portion of its width considered as removed, the member will be acceptable.

(b) *Compression elements supported along 2 edges.* 1. In compression members the unsupported width of web, cover or diaphragm plates, between the nearest lines of fasteners or welds, or between the roots of the flanges in case of rolled sections, shall not exceed $\frac{8,000}{\sqrt{F_y}}$ times its thickness.

2. When the unsupported width exceeds this limit, but a portion of its width no greater than $\frac{8,000}{\sqrt{F_y}}$ times the thickness would satisfy the stress requirements, the member will be considered acceptable.

3. The unsupported width of cover plates perforated with a succession of access holes, may exceed $\frac{8,000}{\sqrt{F_y}}$, but shall not exceed $\frac{10,000}{\sqrt{F_y}}$, times the thickness. The gross width of the plate less the width of the widest access hole shall be assumed available to resist compression.

(6) SIMPLE AND CONTINUOUS SPANS. (a) *Simple spans.* Beams, girders and trusses shall ordinarily be designed on the basis of simple spans whose effective length is equal to the distance between centers of gravity of the members to which they deliver their end reactions.

(b) *End restraint.* When designed on the assumption of full or partial end restraint, due to continuous, semi-continuous or cantilever action, the beams, girders and trusses, as well as the sections of the members to which they connect, shall be designed to carry the shears and moments so introduced, as well as all other forces, without exceeding at any point the unit stresses prescribed in section (2) (a); except that some non-elastic but self-limiting deformation of a part of the connection may be permitted when this is essential to the avoidance of overstressing of fasteners.

(7) DEFLECTIONS. (a) Beams and girders supporting floors and roofs shall be proportioned with due regard to the deflection produced by the design loads.

(b) Beams and girders supporting plastered ceilings shall be so proportioned that the maximum live load deflection will not exceed 1/360 of the span.

(c) The depth of beams and girders supporting flat roofs shall be not less than $\frac{F_y}{1,000,000}$ times their span length whether designed as simple or continuous spans.

(8) CONNECTIONS. (a) *Minimum connections.* Connections carrying calculated stresses, except for lacing, sag bars, and girts, shall be designed to support not less than 6,000 pounds.

(b) *Eccentric connections.* Axially stressed members meeting at a point shall have their gravity axes intersect at a point if practicable; if not, provision shall be made for bending stresses due to the eccentricity.

(c) *Placement of rivets, bolts and welds.* Except as hereinafter provided, the rivets, bolts or welds at the ends of any member transmitting axial stress into that member shall have their centers of gravity on the gravity axis of the member unless provision is made for the effect of the resulting eccentricity. Except in members subject to repeated variation in stress, disposition of fillet welds to balance the forces about the neutral axis or axes for end connections of single

angle, double angle, and similar type members is not required. Eccentricity between the gravity axes of such members and the gauge lines for their riveted or bolted end connections may be neglected.

(d) *Unrestrained members.* Except as otherwise indicated by the designer, connections of beams, girders or trusses shall be designed as flexible, and may ordinarily be proportioned for the reaction shears only. Flexible beam connections shall permit the ends of the beam to rotate sufficiently to accommodate its deflection by providing for a horizontal displacement of the top flange determined as follows:

$e = 0.007d$, when the beam is designed for full uniform load and for live load deflection not exceeding 1/360 of the span

$= \frac{f_b L}{3{,}600{,}000}$, when the beam is designed for full uniform load producing the unit stress f_b at mid-span

where

e = the horizontal displacement of the end of the top flange, in the direction of the span, in inches

f_b = the flexural unit stress in the beam at mid-span, in pounds per square inch

d = the depth of the beam, in inches

L = the span of the beam, in feet

(e) *Restrained members.* Fasteners or welds for end connections of beams, girders and trusses not conforming to the requirements of section (8) (d) shall be designed for the combined effect of end reaction shear and tensile or compressive stresses resulting from moment induced by the rigidity of the connection when the member is fully loaded.

(9) COLUMN BASES. (a) *Loads.* Proper provision shall be made to transfer the column loads and moments, if any, to the footings and foundations.

(b) *Alignment.* Column bases shall be set level and to correct elevation with full bearing on the masonry.

(c) *Finishing.* Column bases shall be finished in accordance with the following requirements:

1. Rolled steel bearing plates, 2 inches or less in thickness, may be used without planing, provided a satisfactory contact bearing is obtained; rolled steel bearing plates over 2 inches but not over 4 inches in thickness may be straightened by pressing; or, if presses are not available, by planing for all bearing surfaces (except as noted under requirement 3. of this section), to obtain a satisfactory contact bearing; rolled steel bearing plates over 4 inches in thickness shall be planed for all bearing surfaces (except as noted under requirement 3. of this section).

2. Column bases other than rolled steel bearing plates shall be planed for all bearing surfaces (except as noted under requirement 3. of this section).

3. The bottom surfaces of bearing plates and column bases which are grouted to insure full bearing contact on foundations need not be planed.

(10) SHOP PAINTING. (a) *General requirements.* Unless otherwise specified, steelwork which will be concealed by interior building finish need not be painted; steelwork to be encased in concrete shall not be painted. Unless specifically exempted, all other steelwork shall be given one coat of shop paint, applied thoroughly and evenly to dry surfaces which have been cleaned in accordance with the following paragraph, by brush, spray, roller coating, flow coating, or dipping, at the election of the fabricator.

(b) *Cleaning.* After inspection and approval and before leaving the shop, all steelwork specified to be painted shall be cleaned by hand-wire brushing, or by other methods elected by the fabricator, of loose mill scale, loose rust, weld slag or flux deposit, dirt and other foreign matter. Oil and grease deposits shall be removed by solvent. Steelwork specified to have no shop paint, after fabrication, shall be cleaned of oil or grease by solvent cleaners and shall be cleaned of dirt and other foreign material by thorough sweeping with a fiber brush.

(c) *Protection for short period of exposure.* The shop coat of paint is intended to protect the steel for only a short period of exposure, even if it is a primer for subsequent painting to be performed in the field by others.

(d) *Inaccessible surfaces.* Surfaces inaccessible after assembly shall be treated in accordance with subsection (10) (a) before assembly.

(e) *Contact surfaces.* Contact surfaces shall be cleaned in accordance with subsection (10) (a) before assembly but shall not be painted.

(f) *Finished surfaces.* Machine finished surfaces shall be protected against corrosion by a rust-inhibiting coating that can be easily removed prior to erection or which has characteristics that make removal unnecessary prior to erection.

(g) *Surfaces adjacent to field welds.* Unless otherwise provided, surfaces within 2 inches of any field weld location shall be free of materials that would prevent proper welding or produce objectionable fumes while welding is being done.

(11) ERECTION. (a) *Bracing.* The frame of steel skeleton buildings shall be carried up true and plumb, and temporary bracing shall be introduced whenever necessary to take care of all loads to which the structure may be subjected, including equipment and the operation of same. Such bracing shall be left in place as long as may be required for safety.

(b) *Carrying.* Wherever piles of material, erection equipment or other loads are carried during erection, proper provision shall be made to take care of stresses resulting from such loads.

(c) *Adequacy of temporary connections.* As erection progresses, the work shall be securely bolted, or welded, to take care of all dead load, wind and erection stresses.

(d) *Alignment.* No riveting, permanent bolting or welding shall be done until as much of the structure as will be stiffened thereby has been properly aligned.

(e) *Field welding.* Any shop paint on surfaces adjacent to joints to be field welded shall be wire brushed to reduce the paint film to a minimum.

(f) *Field painting.* Responsibility for touch-up painting and cleaning, as well as for general painting shall be allocated in accordance with accepted local practices and this allocation shall be set forth explicitly in the contract.

(12) PLASTIC DESIGN AND FABRICATION. (a) The design, fabrication and erection of structural steel for buildings and structures by the plastic design method shall conform with recognized good engineering practice as approved by the department of industry, labor and human relations.

Note: It will be the policy of the department of industry, labor and human relations to accept methods of plastic design which conform with the rules for plastic design and fabrication of structural steel issued by the American Institute of Steel Construction.

(13) WELDS. (a) *Type of welds.* Butt, fillet, plug or slot welds, or a combination of these types, may be used in making joints and joining component parts.

(b) *Qualification of weld details.* The details of all joints (including for butt welds, the groove form, root face, root spacing, etc.) to be employed under this rule without qualification shall comply with all of the requirements for joints which are accepted without qualification test by the department of industry, labor and human relations. No joint form not included in the foregoing shall be employed until it shall have been qualified to the satisfaction of the department of industry, labor and human relations.

Note: It will be the policy of the department of industry, labor and human relations to approve of weld details, processes and methods conforming to the requirements of the standard code for arc and gas welding in building construction of the American Welding Society.

(c) *Operator qualifications.* All welding shall be done by skilled workmen who shall give satisfactory proof of their skill and ability with process to be used on the proposed work.

(d) *Qualifications and inspection requirements for welding operations and operators.* 1. The state building code provides that the department of industry, labor and human relations shall determine necessary data, tests and other evidence required to prove the merits of materials, methods of construction and devices used in the construction, alteration and equipment of buildings or structures, and further, in connection with welding, requires such work to be done by skilled welders who must give satisfactory proof of their skill and ability.

2. In conformance with these provisions, the following regulations are adopted and promulgated to apply to all welding operations on buildings and structures coming within the scope of the state building code.

3. All welding operators employed as such in executive work covered by the Wisconsin state building code shall be previously qualified by tests as prescribed herein. These qualification tests shall be performed under the supervision of an approved testing laboratory or commercial testing engineer who will certify to the department of industry, labor and human relations that the operator has passed the prescribed qualification tests.

4. The department of industry, labor and human relations shall issue, to any operator who has successfully passed the prescribed qualification tests, a certificate bearing the operator's name, address and signature, and the record of the extent of his successful qualification testing. This certificate shall remain in force for one year provided the operator is engaged in welding without an interruption of more than 3 consecutive months' duration, in which latter case the certificate shall automatically become void. The renewal of a certificate shall be granted only upon successful completion of new qualification tests.

5. The procedure for qualification of welding operators shall consist essentially of tests for the making of both groove and fillet welds in 4 positions each. One test is required for each position for fillet welds, and for groove welds one test for each position in material up to and including ¾ inch thick shall be made in material ⅜ inch thick, except that if the construction involves welding of material over ¾ inch thick, one test weld shall be made for each position in material of the maximum thickness to be used, but need not exceed one inch in thickness, if a test weld is made in the maximum or one inch thickness, no test weld is necessary in the ⅜ inch thickness.

6. All welding shall be subject to examination by a competent inspector approved by the department of industry, labor and human relations, who shall certify to the department of industry, labor and human relations that all welding has been completed in accordance with the approved plans and specifications and with the provisions of the Wisconsin state building code.

Note: The methods and procedures of such inspection shall be in accordance with the provisions of section 5 of the Code for Arc and Gas Welding in Building Construction, latest edition, as published by the American Welding Society.

7. The form SB–13A "Certificate of Competency—WELDER" is issued pursuant to subsection (13) (c).

Note: Section Ind 53.24 is based on the American Institute of Steel Specification dated November 30, 1961. For members and connections subject to repeated variation of stress, plate girders, composite construction, fabrication, shop practice, and plastic design, see A.I.S.C. Specification.

(14) LIGHT GAUGE STEEL STRUCTURAL MEMBERS. (a) *Scope.* The requirements of this section shall apply to the design of structural members formed of sheet or strip steel less than 3/16 inch thick and used for load carrying purposes in buildings and structures within the scope of this code. All such structural members shall be capable of supporting all required loads without exceeding the allowable unit stresses specified in this section and shall be designed in accordance with recognized engineering practice.

(b) *Material.* 1. All steel used in the construction of buildings and structures shall be fabricated from materials of uniform quality and free from defects that would impair the strength or stability of the structure.

Note: It will be the policy of the department of industry, labor and human relations to approve, subject to the provisions of this section, steel that conforms to the following standard specifications of the American Society for Testing Materials:

a. Flat-rolled carbon steel sheets of structural quality. Designation A245
b. Hot rolled carbon strip of structural quality. Designation A303
c. High-strength low-alloy cold rolled steel sheets and strip. Designation A374
d. High-strength low-alloy hot rolled steel sheets and strip. Designation A375

2. Steel of higher strength than is covered by the above mentioned specifications may be used at the unit stresses herein specified for "other grades" of steel provided the design is based upon the minimum properties of those grades of steel as guaranteed by the manufacturer. When requested by the department of industry, labor and human relations, the manufacturer shall furnish certified data showing the properties of such grades of steel.

(c) *Basic design stress. Allowable working stresses.* 1. Tension on the net section of tension members, and tension and compression f_b on extreme fiber of flexural members shall not exceed the values specified in the following table, except as otherwise provided in this section:

Grade of Steel	Minimum Yield Point Pounds per Sq. In.	Allowable Working Stress Pounds per Sq. In.
C	33,000	20,000
B	30,000	18,000
A	25,000	15,000
Other Grades	Minimum Yield Point Divided by 1.65	

2. Compression on unstiffened elements. Compression f_c in pounds per square inch on flat unstiffened elements shall not exceed the values in accordance with the following formula:

a. For $\frac{w}{t}$ not greater than 10, $f_c = f_b$ except that when f_b exceeds 30,000 psi, the maximum $\frac{w}{t}$ ratio for which f_c may be taken equal to f_c shall not exceed $\frac{300,000}{f_b}$

b. For $\frac{w}{t}$ greater than 10 but not greater than 25 $f_c = (1.667 f_b - 8640) - (1/15) (f_b - 12950) \frac{w}{t}$

For steels with a yield point in excess of 50,000 psi, the value of f_b to be used in the determination of f_c when $\frac{w}{t}$ exceeds 10 shall be 30,000 psi.

c. For $\frac{w}{t}$ from 25 to 60

For angle struts $f_a = \frac{8{,}090{,}000}{\left(\frac{w}{t}\right)^2}$

For all other sections $f_a = 20{,}000 - 282\left(\frac{w}{t}\right)$

In the above formula $\frac{w}{t}$ = ratio of flat width to thickness of an element.

3. Allowable web shear. a. The maximum average web shear stress, v, in pounds per square inch on the gross area of a flat web shall not exceed the values in accordance with the following formula:

$$v = \frac{64{,}000{,}000}{\left(\frac{h}{t}\right)^2} \text{ with a maximum of } 2/3\ f_a.$$

In the above formula

t = web thickness

h = clear distance between flanges

f_a = allowable working stress as specified in (c).

b. Where the web consists of 2 or more sheets, each sheet shall be considered as a separate member carrying its share of the shear.

c. Maximum slenderness ratio.

1. The maximum allowable ratio $\frac{L}{r}$ of unsupported length L to radius of gyration r, of compression members shall not exceed 200.

History: 1-2-56; cr. (9) (d) 7. Register, October, 1957, No. 22, eff. 11-1-57; cr. (15), Register, September, 1959, No. 45, eff. 10-1-59; am. Register, December, 1962, No. 84, eff. 1-1-63; renum. from Ind 53.24 to be Ind 53.16, Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.17 History: 1-2-56; r. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.17 Steel joist construction. (1) DEFINITION. Steel joist construction shall consist of decks or top slabs defined in subsection (7), supported by separate steel members referred to as steel joists. Any steel member suitable for supporting floors and roofs between the main supporting girders, trusses, beams, or walls when used as hereinafter stipulated shall be known as a "steel joist". Such steel joists may be made of hot or cold formed sections, strip or sheet steel, riveted or welded together, or by expanding.

(2) LIMIT OF SPAN AND SPACING. The clear span of steel joist shall not exceed 24 times the depth of the steel portion of the steel joist.

(a) The spacing of steel joist for floors shall not exceed the safe span for the top slab or flooring. Where the joist spacing for floors exceeds 24 inches on centers, the bridging shall be adequate to distribute concentrated loads between joist. The spacing of steel joist for roofs shall not exceed the safe span of the top slab or roof deck.

(b) Where these spans or spacings are exceeded, the requirements for steel joist construction shall not apply, but the steel members shall be designed in accordance with the requirements of Wis. Adm. Code section Ind 53.16.

(3) MATERIALS. All steel joist used in the construction of buildings and structures shall be fabricated from materials of uniform quality and free from defects that would impair the strength or stability of the structure. The steel used shall conform to the following specifications:

Structural steel for bridges and buildings: Designation A-7; Minimum yield point, 33,000

Structural steel: Designation A-36; Minimum yield point, 36,000

Flat rolled carbon steel sheets of structural quality: Designation A-245; Minimum yield point, 33,000

Hot rolled carbon steel strip of structural quality: Designation A–303; Minimum yield point, 33,000

High strength low alloy manganese, Vanadium steel; Designation A-441; Minimum yield point, 42,000—50,000

High strength structural steel: Designation A–440; Minimum yield point, 42,000—50,000

(a) All steel joist shall receive one coat of asphalt base paint or an equivalent protective covering before leaving the fabricating shop.

(4) DESIGN OF STEEL JOIST. An open web steel joist shall be built up of bars or other sections, or one fabricated by expanding a rolled section shall be designed as a truss. The compressive stress in chord members and diagnonals of the joist shall not exceed those given in Wis. Adm. Code section Ind 53.16 for main members. The tensile stress shall not exceed 0.60 of the yield point of the grade of steel used in any member. The minimum shear to be used in designing the web members shall not be less than 20% of the rated end reaction at midspan and shall be increased lineally to 30% of the rated end reaction at a distance 0.35 from the end supports.

(a) A solid web steel joist shall be designed as a beam in accordance with the requirements of section Ind 53.16

(b) In the completed structure, the top chord of open web steel joist or the top flanges of solid web steel joist may be considered as being stayed laterally when the deck or top slab over the steel joist complies with the provisions of Wis. Adm. Code subsection (7).

(c) All joints and connections of an open web steel joist shall be capable of withstanding a load at least 3 times the designed load and shall be sufficiently rugged to resist the stresses incident to transportation and erection when handled in a reasonable manner.

(d) All elements of an open web joist shall have their lines of center of gravity meet at a point if practicable; if not, stresses arising from eccentricity shall be included with other stresses in designing these elements.

(e) Ends of steel joist shall be designed to resist the bending produced by the eccentricity of the reaction at the support.

(5) ERECTION. The ends of steel joist shall extend a distance of at least 4 inches on to masonry or reinforced concrete supports and at least 2½ inches on steel supports. In floor construction every third steel joist and in roof construction every steel joist supported on concrete or masonry supports shall be anchored thereto with an anchor equivalent to a ⅝ inch round bar. All steel joist supported on steel beams shall be secured thereto by welding or with an anchor made of not less than 3/16 inch bar fastened over the flanges of the supporting beams.

(a) The ends of long span steel joist shall extend a distance of not less than 6 inches on masonry or reinforced concrete supports and at least 4 inches on steel supports.

(b) During the construction period, care shall be exercised to prevent excessive concentrated or moving loads. The construction contractor shall provide for adequate distribution of such loads so that the carrying capacity of any steel joist is not exceeded during that period. When erected and bridged, the total concentrated load on any one steel joist shall not exceed 800 pounds and in the case of open web steel joist, such concentrated load shall not be imposed between panel points.

(6) BRIDGING. As soon as steel joist are erected, bridging shall be installed between the joist before the application of construction loads. This bridging shall be adequate to support the top chords or flanges against lateral movement during the construction period and shall hold the steel joist in a vertical plane passing through the bearings.

(a) Horizontal bridging shall consist of two continuous horizontal steel members, one of which is attached to the top chord and the other attached to the bottom chord. Attachment to the joist shall be made by welding or by mechanical means, and the attachments shall be capable of resisting a horizontal force of not less than 500 pounds.

The ratio of unbraced length to the least radius of gyration $\left(\frac{L}{r}\right)$ of the bridging member shall not exceed 300. Where a round bar is used for bridging the diameter shall be at least ½ inch.

(b) Diagonal cross bridging may be used for joist spacing up to 30 inches. The ratio of unbraced length to the least radius of gyration $\left(\frac{L}{r}\right)$ shall not exceed 200. Connections to the top and bottom chords of the joist shall be made by positive mechanical means or by welding.

(c) In roof construction, where the slope is perpendicular to the longitudinal axis of the joist, sag rods may be used in lieu of bridging. The rods shall not be less than ½ inch in diameter and the number of lines shall be the same as specified for bridging.

(d) In no case shall the spacing of bridging be greater than specified in the following table:

Clear Span	*Number of Lines of Bridging*
Up to 14 feet	One row near center.
14 to 21 feet	Two rows placed at 1/3 point of span.
21 to 32 feet	Three rows placed at ¼ point of span.
32 to 40 feet	Four rows placed at 1/5 point of span.
40 to 48 feet	Five rows placed at 1/6 point of span.

(e) Bridging for long span joist shall consist of cross bracing with an $\frac{L}{r}$ ratio of not more than 200. The maximum spacing of lines of bridging for long span joist shall not exceed the following:

Joist Depth in Inches	*Maximum Spacing of Lines of Bridging*
18 to 24 inches, inclusive	10 feet
Over 24 to 36 inches, inclusive	12 feet
Over 36 inches	16 feet

(7) DECKS AND TOP SLABS. Decks or top slabs over steel joist may be of concrete or gypsum poured on metal lath centering attached to the top chords or flanges of steel joist as required elsewhere in this section or on removable centering provided the top chords or flanges of the steel joist are properly stayed by the concrete or gypsum slab. Other equally suitable permanent centering may be used, provided it is substantially attached to the top chords or flanges as required elsewhere in this section and provided these attachments (or the centering itself) are securely anchored into the concrete or gypsum slab. Precast concrete or precast gypsum slabs when securely attached to the top chords or flanges and anchored thereto and brought to a firm bearing, wood decks as stipulated below, and corrugated or other steel roof decks securely anchored to the top chords or flanges may be used over steel joist. Any attachment or pair of attachments when applied shall be capable of staying the top chord or flange laterally in both directions and in the case of open web steel joist, shall be spaced not farther apart then the panel point spacing. Decks or top slabs over steel joist shall not be assumed to carry any part of the compression stress in the steel joist.

(a) Flat wood decks of single thickness of one inch nominal material shall not have a span of more than 20 inches for floors, or 30 inches for roofs. All such decks shall be securely fastened to the joist.

(b) Poured structural slabs of concrete, gypsum or other similar material shall not be less than 2 inches thick. They shall be poured upon 3/8 inch ribbed metal lath weighing not less than 4 pounds per square yard for spans not exceeding 24 inches and upon 3/4 inch rib lath weighing not less than 4.5 pounds per square yard for spans not exceeding 30 inches. Other material equally suitable as a form or centering for casting concrete or gypsum slabs may be used in place of rib lath. Rib lath or other centering which remains in place shall be substantially attached to the top chord or flange of each steel joist at intervals of not over 8 inches. Such slabs shall be reinforced with mesh or rods, in addition to the rib lath, except that when slabs are to be covered with a wood strip top floor, the rib lath or centering may, if adequate, serve also as the reinforcement.

(c) Any material used as centering for the top slab shall be installed so as not to exert an undue lateral pull on the top chords or flanges of the steel joist.

History: 1-2-56: r. and recr., Register, September, 1959, No. 45, eff. 10-1-59; am. Register, December, 1962, No. 84, eff. 1-1-63; renum. from Ind 53.25 to be Ind 53.17, Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.18 History: 1-2-56: r. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.18 Wrought iron. (1) The requirements for design, fabrication and erection of steel for buildings and structures under Wis. Adm. Code section Ind 53.16 shall apply to wrought iron, except that the following stresses in pounds per square inch shall not be exceeded:

(a) Tension on net section ---------- 12,000

(b) Compression, on short lengths or where lateral deflection is prevented ---------- 10,000
on gross section of columns

$$12{,}000 - 60\,\frac{L}{r}$$

in which L = length in inches
r = radius of gyration in inches

(c) Bending. On extreme fibers if lateral deflection is prevented ---------- 12,000

(2) Wrought iron shall conform to the Standard Specifications for Refined Wrought Iron Plates, Serial Designation A42-18.

History: 1-2-56; renum. from Ind 53.26 to be Ind 53.18, Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.19 History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63; r. Register, October, 1967, No. 142., eff. 11-1-67.

Ind 53.19 Cast iron. (1) The following unit stresses in pounds per square inch shall not be exceeded in cast iron:

(a) Tension on net section ---------- 0

(b) Compression, on short lengths or where lateral deflection is prevented ---------- 10,000
on gross section of columns

$$10{,}000 - 40\,\frac{L}{r}$$

in which L = length in inches
r = radius of gyration in inches

(c) Tension in the extreme fiber if lateral deflection is prevented ---------- 3,000

(2) The material and workmanship of cast iron members shall be equal in all respects to that described in the American Society for Testing Materials Specifications for Gray-Iron Castings, Serial Designation A48-29.

(3) All columns resting on, or supporting, other columns shall have their ends machine faced to a plane surface perpendicular to the axis.

History: 1-2-56; renum. from Ind 53.27 to be Ind 53.19, Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.20 History: 1-2-56; r. and recr. Register, August, 1957, No. 20, eff. 9-1-57; r. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 53.20 Wood construction. (1) QUALITY OF MATERIAL. The quality and design of all wood used in the construction of all buildings and structures or parts thereof, shall conform to the minimum standards under this section.

(a) All members shall be so framed, anchored, tied and braced together as to develop the maximum strength and rigidity necessary for the purpose for which they are used. No member shall be stressed in excess of the strength of its details and connections.

(b) All wood structural members shall be of sufficient quality, size and strength, as to carry their imposed loads safely and without exceeding the allowable working stresses as specified in this section.

(c) The requirements stated are a minimum standard and apply primarily to conventional types of construction.

(d) The substitution of materials other than those called for in the code will be permitted when shown by an approved authority to be equal to or better than those specified.

(e) Workmanship in fabrication, preparation, installation, joining of wood members and the connectors and mechanical devices for the fastening thereof, shall conform throughout to good engineering practice.

(f) Where wood is used in parts of a building or structure habitually exposed to moisture, ample ventilation or sufficient preservative treatment, or both, shall be provided.

(2) ALLOWABLE WORKING STRESSES. In the design of wood structural members and the construction of structures of wood, the following unit stresses in pounds per square inch shall not be exceeded.

(a) Stresses that exceed those given in the following table for the lowest grade of any species shall be used only when the higher grade of that species is identified by the grade mark or a certificate of inspection issued by a recognized lumber grading or inspection agency.

ALLOWABLE WORKING STRESSES FOR WOOD

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch				Modulus of Elasticity
				Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	
ASH, WHITE	2150 # f Grade	J & P	National Hardwood Lumber Association	1,950	130		1,550	
	1900 # f Grade	J & P-B&S		1,700	130		1,400	
	1700 # f Grade	J & P-B&S		1,550	130		1,200	1,500,000
	1450 # f Grade	J & P-B&S		1,300	110		1,050	
	1300 # f Grade	B & S		1,150	110	550	950	
BEECH	2150 # f Grade	J & P	National Hardwood Lumber Association	1,950	130		1,575	
	1900 # f Grade	J & P-B&S		1,700	130	550	1,375	1,600,000
	1700 # f Grade	J & P-B&S		1,550	130		1,225	
	1450 # f Grade	J & P-B&S		1,300	110		1,050	
BIRCH	2150 # f Grade	J & P	National Hardwood Lumber Association	1,950	130		1,575	
	1900 # f Grade	J & P-B&S		1,700	130		1,375	
	1700 # f Grade	J & P-B&S		1,550	130	550	1,225	1,600,000
	1450 # f Grade	J & P-B&S		1,300	110		1,050	
CHESTNUT	1450 # f Grade	J & P	National Hardwood Lumber Association	1,300	110		1,075	
	1200 # f Grade	J & P-B&S		1,100	110	325	850	1,000,000
	1075 # c Grade	P & T					975	
CYPRESS, SOUTHERN	1700 # f Grade	J & P-B&S	National Hardwood Lumber Association	1,550	130		1,275	
	1300 # f Grade	J & P-B&S		1,150	110	325	1,025	
	1150 # c Grade	P & T					1,300	1,200,000
	1200 # c Grade	P & T					1,075	
DOUGLAS FIR--COAST REGION	Dense Select Structural	L F	West Coast Lumber Inspection Bureau	1,950	120	410	1,400	
	Select Structural	L F		1,700	120	375	1,300	
	1500 f Industrial	L F		1,350	120	350	1,100	
	1200 f Industrial	L F		1,100	95	350	900	
	Dense Select Structural	J & P		1,950	120	410	1,500	
	Select Structural	J & P		1,700	120	375	1,400	
	Dense Construction	J & P		1,600	120	410	1,300	1,600,000
	Construction	J & P		1,350	120	350	1,100	
	Standard	J & P		1,100	95	350	900	

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ALLOWABLE WORKING STRESSES FOR WOOD—Continued

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch				Modulus of Elasticity
				Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	
DOUGLAS FIR—COAST REGION—Continued	Dense Select Structural	B & S		1,950	120	410	1,400	
	Select Structural	B & S		1,700	120	375	1,300	
	Dense Construction	B & S		1,600	120	410	1,100	
	Construction	B & S		1,350	120	350	900	
	Dense Select Structural	P & T		1,950	120	410	1,500	
	Select Structural	P & T		1,700	120	375	1,400	
	Dense Construction	P & T		1,350	120	410	1,300	
	Construction	P & T		1,100	120	350	1,100	
DOUGLAS FIR—INLAND REGION	Select Structural	J & P	Western Pine Association	1,950	130	410	1,575	1,600,000
	Structural	J & P		1,700	90	360	1,250	1,500,000
	Common Structural	J & P		1,300	85	340	1,125	1,500,000
	Select Structural	P & T		.....	.....	410	1,575	1,600,000
	Structural	P & T		.....	.....	360	1,250	1,500,000
	Common Structural	P & T		.....	.....	340	1,125	1,500,000
ELM, ROCK	2150 # f Grade	J & P	National Hardwood Lumber Association	1,950	130	.....	1,575	1,300,000
	1900 # f Grade	J & P-B&S		1,700	130	.....	1,375	
	1700 # f Grade	J & P-B&S		1,550	130	550	1,225	
	1450 # f Grade	J & P-B&S		1,300	110	.....	1,025	
	1550 # c Grade	P & T		.....	.....	.....	1,400	
	1450 # c Grade	P & T		.....	.....	.....	1,300	
	1200 # c Grade	P & T		.....	.....	.....	1,075	
GUM, BLACK & RED	1700 # f Grade	J & P	National Hardwood Lumber Association	1,550	110	.....	1,100	1,200,000
	1450 # f Grade	J & P B&S		1,300	110	325	950	
	1200 # f Grade	J & P-B&S		1,100	110	.....	800	
	1075 # c Grade	P & T		.....	.....	.....	975	
HEMLOCK, EASTERN	Select Structural	J & P-B&S	Northern Hemlock & Hardwood Manufacturers Assn.	1,200	75	.....	775	1,100,000
	Prime Structural	J & P		1,100	55	325	700	
	Common Structural	J & P		1,000	55	.....	600	
	Utility Structural	J & P		850	55	.....	550	
	Select Structural	P & T		.....	.....	.....	775	

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ALLOWABLE WORKING STRESSES FOR WOOD—Continued

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch				Modulus of Elasticity
				Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	
HEMLOCK, WEST COAST	1600 # f Select Structural	J & P	West Coast Bureau of Lumber Grades & Inspection	1,450	90	325	1,000	1,400,000
	1450 # f No. 1	J & P-B&S		1,300	90	325	975	
	1100 # f No. 2	J & P		1,000	80	325	775	
	No. 1 Hemlock Timbers	P & T		.....	.....	.....	1,000	
HICKORY	2150 # f Grade	J & P-B&S	National Hardwood Lumber Association	1,950	130	.....	1,550	1,800,000
	1900 # f Grade	J & P-B&S		1,700	130	650	1,400	
	1700 # f Grade	J & P-B&S		1,550	130	.....	1,225	
	1550 # c Grade	P & T		.....	.....	.....	1,400	
	1450 # c Grade	P & T		.....	.....	.....	1,300	
	1325 # c Grade	P & T		.....	.....	.....	1,200	
LARCH	Select Structural	J & P	Western Pine Association	1,950	130	410	1,575	1,300,000
	Structural	J & P		1,700	110	375	1,300	
	Common Structural	J & P		1,300	110	350	1,200	
	Select Structural	P & T		.....	.....	410	1,575	
	Structural	P & T		.....	.....	375	1,300	
	Common Structural	P & T		.....	.....	350	1,200	
MAPLE, HARD	2150 # f Grade	J & P	National Hardwood Lumber Association	1,950	130	.....	1,575	1,600,000
	1900 # f Grade	J & P-B&S		1,700	130	.....	1,375	
	1700 # f Grade	J & P-B&S		1,550	130	550	1,225	
	1450 # f Grade	J & P-B&S		1,300	110	.....	1,025	
	1550 # c Grade	P & T		.....	.....	.....	1,400	
	1450 # c Grade	P & T		.....	.....	.....	1,300	
	1200 # c Grade	P & T		.....	.....	.....	1,075	
OAK, RED & WHITE	2150 # f Grade	J & P	National Hardwood Lumber Association	1,950	130	.....	1,400	1,500,000
	1900 # f Grade	J & P-B&S		1,700	130	550	1,250	
	1700 # f Grade	J & P-B&S		1,550	130	.....	1,075	
	1450 # f Grade	J & P-B&S		1,300	110	.....	950	
	1300 # f Grade	B & S		1,150	110	.....	850	
	1325 # c Grade	P & T		.....	.....	.....	1,200	
	1200 # c Grade	P & T		.....	.....	.....	1,075	
	1075 # c Grade	P & T		.....	.....	.....	975	

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ALLOWABLE WORKING STRESSES FOR WOOD—Continued

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch				Modulus of Elasticity
				Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	
PINE, NORWAY	Prime Structural	J & P	Northern Hemlock & Hardwood Manufacturers Assn.	1,110	65	325	800	1,200,000
	Common Structural	J & P		1,000	65		700	
	Utility Structural	J & P		850	65		575	
PINE, SOUTHERN	Dense Structural 86 KD	2" thick only	Southern Pine Inspection Bureau	2,700	150	410	2,000	1,760,000
	Dense Structural 72 KD	2" thick only		2,250	135	410	1,800	
	Dense Structural 65 KD	2" thick only		2,000	120	410	1,600	
	Dense Structural 58 KD	2" thick only		1,850	110	410	1,500	
	No. 1 Dense KD	2" thick only		1,850	120	350	1,600	
	No. 1 KD	2" thick only		1,650	120	410	1,350	
	No. 2 Dense KD	2" thick only		1,600	110	350	1,200	
	No. 2 KD	2" thick only		1,350	110	410	1,000	
	Dense Structural 86	2" thick only		2,600	135	410	2,000	
	Dense Structural 72	2" thick only		2,100	120	410	1,600	
	Dense Structural 65	2" thick only		1,800	110	410	1,450	
	Dense Structural 58	2" thick only		1,600	95	410	1,300	
	No. 1 Dense	2" thick only		1,600	110	350	1,400	
	No. 1	2" thick only		1,350	110	410	1,200	
	No. 2 Dense	2" thick only		1,250	95	350	900	
	No. 2	2" thick only		1,100	95	410	800	
	Dense Structural 86	3" & 4" thick		2,600	135	410	2,000	
	Dense Structural 72	3" & 4" thick		2,100	120	410	1,600	
	Dense Structural 65	3" & 4" thick		1,800	110	410	1,450	
	Dense Structural 58	3" & 4" thick		1,600	95	410	1,300	
	No. 1 Dense SR	3" & 4" thick		1,600	110	350	1,400	
	No. 1 SR	3" & 4" thick		1,350	110	410	1,350	
	No. 2 Dense SR	5" thick & up		1,250	95	350	900	
	No. 2 SR	5" thick & up		1,100	95	410	800	
	Dense Structural 86		Southern Pine Inspection Bureau	2,150	135	410	1,600	1,760,000
				1,800	120	410	1,400	
				1,600	110	410	1,250	
				1,450	95	410	1,200	
				1,450	110	350		

ALLOWABLE WORKING STRESSES FOR WOOD—Continued

Species	Commercial Grade		Rules Under Which Graded	Allowable Unit Stresses in Pounds Per Square Inch: Tension and Extreme Fiber in Bending	Maximum Horizontal Shear	Compression Perpendicular to Grain	Compression Parallel to Grain	Modulus of Elasticity
PINE, SOUTHERN —Continued	No. 2 Dense SR	5" thick & up		1,250	95	410	900	
	No. 2 SR	5" thick & up		1,100	95	350	800	
	Industrial 86 KD	1", 1¼" & 1½" thick		2,350	150	350	1,750	
	Industrial 72 KD	1", 1¼" & 1½" thick		2,000	135	350	1,500	
	Industrial 65 KD	1", 1¼" & 1½" thick		1,800	120	350	1,400	
	Industrial 58 KD	1", 1¼" & 1½" thick		1,600	110	350	1,250	
	Industrial 50 KD	1", 1¼" & 1½" thick	Southern Pine Inspection Bureau	1,350	110	350	1,000	
	Industrial 86	1", 1¼" & 1½" thick		2,250	135	350	1,700	
	Industrial 72	1", 1¼" & 1½" thick		1,800	120	350	1,400	
	Industrial 65	1", 1¼" & 1½" thick		1,600	110	350	1,200	1,760,000
	Industrial 58	1", 1¼" & 1½" thick		1,350	95	350	1,100	
	Industrial 50	1", 1¼" & 1½" thick		1,100	95	350	800	
RED CEDAR, WESTERN	Structural		West Coast Lumbermen's Assn. 1-1-41	1,000	100	200	800	1,000,000
REDWOOD	Dense Structural	J & P B & S	California Redwood Association	1,550	100	290	1,300	
	Heart Structural	J & P B & S		1,150	85	----------	1,000	1,200,000
	Dense Structural	P & T		----------	----------	----------	1,300	
	Heart Structural	P & T		----------	----------	----------	1,000	
SPRUCE, EASTERN	1150 # f Structural	J & P	Northeastern Lumber Mfgrs. Assn.	1,300	100	----------	950	
	1500 # f Structural	J & P		1,150	85	270	875	1,200,000
	1200 # f Structural	J & P		1,050	85	----------	800	

ABBREVIATIONS: J & P—Joist and Plank
B & S—Beams and Stringers
P & T—Posts and Timbers

KD—Kiln Dried
SR—Stress Rated
LF—Light Framing

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(3) EXTERIOR WALLS. Walls shall be designed to carry safely not less than the designated wind load (see chapter on Working Stresses) acting inwardly or outwardly combined with the dead load and one-half the full live load, or dead and full live load, whichever is the greater.

(a) Anchorage shall be provided to resist safely the vertical lifting forces (see 1.) and to prevent any sliding or overturning. This shall include not only anchorage to the foundation, but also anchorage of the roof to the walls. Proper tying of the walls at the corners shall be required.

1. As a specific basis for design of roofs and anchorage, a suction or vertical lifting force of 20 pounds per square foot shall be used, assuming ⅔ of the dead load is acting to resist the vertical force.

(b) Ledger or ribbon boards used to support joists shall be not less than 1 by 4 inches nominal, shall be recessed into the studs, and securely nailed with not less than 2 tenpenny nails to each stud. The ends of joists adjoining studs shall be securely spiked to the studs.

(c) In bearing walls and partitions no stud shall be cut more than ⅓ its depth to receive piping and duct work. If more depth is required, the partition studs shall be increased accordingly.

(4) INTERIOR PARTITIONS. Walls shall be designed to carry safely the full dead and live loads.

(a) In stud construction the bearing partitions shall be provided at the top with double plates, each at least 2 inches (nominal) thick and of same width as the stud. When the joists are placed directly above each stud, a single top plate may be used. If properly fire stopped, studs may run through the floor and rest on girders or on partition plates.

(b) Partitions not resting upon girders, or of which the studs do not rest on partition plates below, shall have sole plates of dimensions not less than that of the studs.

(c) Partitions unsupported by walls shall be supported on girders or 2 or more joists, or on sole plates if placed at an angle to the joists.

(d) Non-bearing partitions of stud construction shall be provided with at least one 2 inch plate on top and bottom of same width as stud or be otherwise properly fire stopped at floor lines.

(e) Angles at corners where stud walls or partitions meet shall be framed solid so no lath can extend from one room to another.

(f) Openings in stud partitions and walls shall be framed around with double studs at each side and double headers across the top resting on the short stud at each end. The double header shall be placed on edge and shall be trussed above for all openings over 4 feet in width, or where more than 2 studs are cut away.

(g) Wood lath, furring or framing shall be placed not less than 2 inches from any chimney and not less than 4 inches from the back of any fireplace.

(5) FLOORS SUPPORTED ON WOODEN FRAMEWORK. When enclosing walls are of wood, each joist, beam, and girder in the wall shall be securely spiked or anchored to the wall construction so as to stay in place and to resist safely all lifts and inward and outward pressures as prescribed in this code.

(a) Girders shall be anchored to the walls and fastened to each other where they intersect or abut to resist safely an outward force equal to the wind pressure.

(b) Floor joists framing into the side of wood girders shall be supported on metal joist hangers or on a bearing strip or ledger board on the side of the girders. Size of ledger shall be at least 2 by 3 inches. The notch in the end of the joist shall be not more than ¼ of the joist depth.

(c) The ends of joists, whether resting upon girders or bearing partitions or abutted against the girders, shall be securely tied to the girders or to each other so as to resist safely an outward thrust on the walls equal to the required wind pressure, or spreading action on the roof, whichever is the greater.

(d) The top or bottom edges of joists may be notched in the outer ¼ of the length not to exceed ⅛ of the joist depth. Notching the top or bottom edge of joists will not be permitted in the middle half of the length of any joist.

(e) Header joists over 6 feet long, and tail joists over 12 feet long, shall be hung in approved stirrup irons or joist hangers.

(f) Joists under bearing partitions and running parallel thereto shall be multiple, well spiked, or separated by solid bridging not more than 16 inches on centers to permit the passage of pipes.

(g) Wood cross bridging shall be placed between joists if the span is over 8 feet. The distance between lines of bridging or between bridging and bearing shall not exceed 8 feet. Wood cross bridging properly fitted and securely nailed to joists shall be not less than 3 square inches in cross sectional area.

(h) Metal cross bridging of equal or greater strength may be used in place of the wood cross bridging.

(i) Solid bridging extending the full height of the joist shall be placed between floor joists which cross bearing partitions. Solid bridging shall be placed between joists at the edge of flooring where the attic space is only partially covered.

(6) FIRE STOPPING. Fire stops shall be provided at all intersections of interior and exterior walls with floors, ceilings and roof in such manner as to effectively cut off communication by fire through hollow concealed spaces and prevent both vertical and horizontal drafts.

(a) Furred walls shall have fire stopping placed immediately above and below the junction of any floor construction with the walls, or shall be fire stopped the full depth of the joist.

(b) All spaces between chimneys and wood framing shall be solidly filled with incombustible material at floor levels.

(c) All fire stopping as required in this section shall be not less than 2 inches in thickness and not less in width than the enclosed space within the partition except as provided for chimneys.

(7) FLOORS SUPPORTED ON MASONRY WALLS. Every girder and beam which enters, or rests on, a masonry wall shall have a bearing of at least 4 inches thereon.

(a) Wood members entering masonry party or fire walls shall be separated from the opposite side of the wall and from beams entering the opposite side of the wall by 4 inches of masonry. The ends of the joists, beams and girders shall be splayed or firecut to a bevel of not less than 3 inches in their depth.

(b) Where girders and beams enter masonry they shall be provided with wall plates, boxes or anchors of an approved self-releasing type so arranged as to leave an air space of not less than ½ inch at sides and ends of member. The ends of girders shall not be sealed in; provided, that where ends of timbers are pressure treated with creosote or other approved preservative, they may be sealed in.

(c) Anchors for each tier of joists more than 5 feet above grade shall be provided where they enter masonry walls, and also where they are parallel to masonry walls. Such anchors shall be ⅜ inch by 1¼ inch iron, or equal, not less than 20 inches long, fitted with a ⅜ inch by 6 inch pin at the wall end, and shall be spaced not more than 6 feet apart. The pin shall be placed horizontally in the wall and 4 inches from the opposite face of such wall. Such anchors shall in all cases occur on the opposite ends of the same run of joists, and where the length of joists is less than the distance across a building, the end of joists shall be lapped and spiked so as to form a continuous tie across the building. Anchors shall be placed across the top of joists that run parallel to the wall, and shall be fastened to the ends of joists below the neutral axis.

(8) WOOD TRUSSES AND BUILT-UP MEMBERS. Wood trusses and similar framing shall have all joints accurately cut and fitted together so that each bearing is true and drawn tightly to full bearing.

(a) All wood trusses shall be securely fastened to the supports and each truss shall be secured in position laterally by bracing the top and bottom chords at points not more than 25 feet apart.

(b) All girders and beams built up of strips, boards or dimension lumber shall be fastened together by glueing, nailing, spiking or bolting in a manner to develop the full strength of the parts. The stiffness of all members, and the strength of all joints, splices and laps, shall be fully developed.

(9) POST AND COLUMNS. Wood posts, when used in basements, shall bear on a cement base which shall extend at least 3 inches above the finish floor. The base shall bear directly on the post footing.

(a) Short columns are those having an $\frac{l}{d}$ ratio of 10 or less in which l = unsupported length in inches and d the least side in inches.

(b) Safe load for short columns may be obtained by the formula

$$\frac{P}{A} = S$$

in which $\frac{P}{A}$ represents the working stress for the column and S represents the safe unit compressive stress parallel to the grain given in the table of working stresses.

(c) Safe load for long columns of square or rectangular shape may be obtained by the formula:

$$\frac{P}{A} = \frac{0.30E}{\left(\frac{l}{d}\right)^2}$$

Where E is the modulus of elasticity as given in the table on working stresses. The value $\frac{P}{A}$ calculated by this formula shall in no case exceed S.

(10) STRUCTURAL GLUED LAMINATED LUMBER.

(a) The term "structural glued laminated lumber" as used herein refers only to those glued laminated structural members in which the grain of all laminations of a member is approximately parallel.

(b) The following allowable unit stresses shall be used in design of structural glued laminated members.

ALLOWABLE UNIT STRESSES FOR STRUCTURAL GLUED LAMINATED LUMBER

Species and Combinations of Lumber Grades			Allowable Unit Stresses in Pounds Per Square Inch							
Outer Laminations		Inner Laminations	Extreme Fibre in Bending "f"		Tension Parallel to Grain "t"		Compression Parallel to Grain "c"		Horizontal Shear "H"	Compression perpendicular to Grain "c"
			Laminations		Laminations		Laminations			
Grade	Number Each Side	Grade	4 to 14	15 or more	4 to 14	15 or more	4 to 14	15 or more		
DOUGLAS FIR, COAST REGION										
Select Structural	1/5 of total	Construction	2,600	2,600	2,400	2,600	2,000	2,000	165	415
Dense Construction	All	Dense Construction	2,400	2,600	2,600	2,600	2,200	2,300	165	455
Dense Construction	1/11 of total	Construction	2,400	2,600	2,200	2,400	1,900	2,000	165	455
Select Structural	One	Construction	2,200	2,600	2,400	2,600	1,900	2,000	165	415
Select Structural	1/5 of total	Standard	2,200	2,200	2,000	2,400	1,800	1,900	165	415
Select Structural	One	Standard	2,000	2,200	2,200	2,400	1,900	2,000	165	390
Construction	All	Construction	2,000	2,300	2,000	2,400	1,800	1,900	165	390
Standard	All	Standard	1,600	2,000	1,600	2,400	1,800	1,900	165	390
PINE, SOUTHERN										
No. 1	All	No. 1	2,600	2,600	2,600	2,600	2,100	2,100	200	385
B & B Dense	1/11 of total	No. 1	2,400	2,600	2,600	2,600	2,000	2,000	200	450
B & B	One	No. 2	2,400	2,400	2,600	2,600	2,000	2,000	200	385
No. 1	1/5 of total	No. 2	2,400	2,600	2,400	2,600	2,000	2,000	200	385
No. 2 Dense	All	No. 2 Dense	2,600	2,600	2,600	2,600	2,200	2,300	200	450
No. 2 Dense	1/11 of total	No. 2	2,600	2,600	2,200	2,600	1,900	2,000	200	450
No. 2	All	No. 2	1,800	2,200	2,200	2,600	1,900	2,000	200	385

The Modulus of Elasticity E is 1,800,000 pounds per square inch for dry conditions of use.
Allowable stresses are for normal conditions of load and dry conditions of use.

History: 1-2-56; am. (9); (9) (a); (9) (b); (9) (c). Register, June, 1956, No. 6, eff. 7-1-56; r. (2) and recr. (2); and cr. (10), Register, August, 1957, No. 20, eff. 9-1-57; r. and recr. (9), Register, September, 1959, No. 45, eff. 10-1-59; renum. from Ind 53.28 to be Ind 57.20, Register, October, 1967, No. 142, eff. 11-1-67.

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Chapter Ind 54

FACTORIES, OFFICE AND MERCANTILE BUILDINGS

Ind 54.001 Scope. This classification includes all factories and workshops (including all places where manual labor is employed), office buildings, telegraph and telephone offices, mercantile establishments where commodities are bought or sold, taverns, warehouses, railroad stations, exhibition buildings, and places where not more than 100 persons assemble for recreation, entertainment, worship, or dining purposes.

Ind 54.01 Construction, height and allowable area. (1) Buildings in this classification shall be of the type of construction, and shall not exceed the number of stories as specified in this section. The floor area of any such building shall not exceed that permitted for the corresponding type of construction and number of stories.

Types of Construction	Number of Stories	Maximum Floor Areas (Sq. Ft.) When Building Fronts on		
		1 Street	2 Streets	3 or more Streets
Fire-Resistive	No Restrictions			
Mill Construction	6 or 7 stories	6,000	9,000	12,000
	4 and 5 stories	10,000	15,000	18,000
	2 and 3 stories	15,000	18,000	20,000
	1 story	20,000	25,000	30,000
Ordinary Construction	4 stories	6,000	9,000	12,000
	2 and 3 stories	7,500	11,000	15,000
	1 story	12,000	15,000	20,000
Frame Construction	2 stories	5,000	6,000	7,000
	1 story	10,000	12,000	14,000

(2) When the entire building is protected by an automatic sprinkler system, the above areas may be increased 66⅔%. There shall be no area restriction in one story mill constructed buildings protected by an approved automatic sprinkler system. In one story buildings of

ordinary construction, whose contents are incombustible, and whose floors, roofs, and structural framing are of incombustible material there shall be no area restriction.

(3) No building shall be limited in area when divided into sections which do not exceed the maximum areas tabulated in this section by division walls. Such division walls shall have not less than a 4-hour fire-resistive rating as specified in Wis. Adm. Code section Ind 51.05 and shall extend 3 feet above the roof unless the roof is of fire-resistive construction. All openings in such walls shall be protected by fire-resistive doors as specified in section Ind 51.09. Such doors may normally remain open if held in that position by fusible links.

History: 1-2-56; am. (2) and (3), Register, September, 1959, No. 45, eff. 10-1-59.

Ind 54.02 Number and location of exits. (1) Every building and every story thereof shall have at least 2 exits, with the following exceptions:

(a) First and second story storage rooms not over 3000 square feet in area.

(b) The second story of a 2 story building, provided such story is used only for offices; is not over 3000 square feet in area; and has a stairway enclosed with not less than one-hour fire-resistive construction, as specified in section Ind 51.05, leading directly to the outside and not leading to the basement. Such enclosure shall be unpierced except for the entrance and exit doors.

(c) Only one exit will be required for a retail establishment or office occupancy having a floor area of not more than 600 square feet provided the entrance door opens directly to the outside, and no part of the room is more than 50 feet from the exit.

(2) Additional exits shall be provided so that no part of any factory or mercantile building having contents which are liable to burn with extreme rapidity or from which poisonous fumes may be liberated or explosions occur in case of fire, will be more than 75 feet distant from an exit. In other buildings in this classification this distance may be increased to 100 feet and where approved sprinklers are provided throughout the building, a further increase to 150 feet will be permitted. All of the above distances are to be measured along public passageways and aisles.

(3) Exits in all buildings of this classification shall be so located and distributed so as to afford the best possible egress.

History: 1-2-56; cr. (1) (c), Register, September, 1959, No. 45, eff. 10-1-59.

Ind 54.03 Type of exits. (1) At least one-half of the exits above required shall be stairways as specified in sections Ind 51.16-51.18. The other exits shall be either stairways or horizontal exits as specified in section Ind 51.19, or fire escapes as specified in section Ind 51.20. No fire escape, however, will be accepted as a required exit on any building more than 5 stories or 55 feet in height. In a 2 story building, an outside wooden stairway may be used as an exit.

(2) Every building which will accommodate more than 50 persons above the second story shall have at least 2 stairways.

(3) Wherever stairways are required under this classification, ramps with a slope not greater than one foot in 6 feet may be substituted. Ramps shall comply with all the requirements for stairways as to construction, enclosures, width, landing and lighting, and shall be surfaced with an approved non-slip material. Handrails shall not be required where the slope of the ramp is less than one foot in 10 feet.

Ind 54.04 Total width. (1) In a building not provided with horizontal exits, the total width of stairways shall be not less than the following:

(a) In ordinary or frame buildings, 60 inches per 100 persons; if sprinklered, 40 inches per 100 persons.

(b) In fire-resistive and mill buildings:

	Fire-resistive Sprinklered	Fire-resistive not Sprinklered	Mill Sprinklered	Mill not Sprinklered	
.....	30	50	40	60	in. per 100 persons on 2nd floor
plus	15	25	20	30	in. per 100 persons on 3rd floor
plus	12	20	16	24	in. per 100 persons on 4th floor
plus	9	15	12	18	in. per 100 persons on 5th floor
plus	6	10	8	12	in. per 100 persons on 6th floor
plus	3	5	4	6	in. per 100 persons on 7th floor
plus	0	0	0	0	in. per 100 persons on 8th floor and above
	but in no case shall such total width be less than				
	30	50	40	60	in. per 100 persons on any one floor.

(2) Standard fire escapes (section Ind 51.20) may be substituted for stairways to the extent of not more than ½ of the required total width, subject to the provision of section Ind 54.02.

(3) If horizontal exits (section Ind 51.19), are provided for any floor, the number of persons accommodated on such floor may be increased at the rate of 100 persons for each 40 inches of width of such exits, provided such increase shall not exceed 100% of the number of persons accommodated by the stairways.

Example: As examples of calculations under this section where the same number of persons are to be accommodated on each floor, the following table shows the number accommodated by 2 stairways of minimum width (each 44 inches wide):

(a) Frame and ordinary buildings, 147 persons total, above first story; if sprinklered, 220 persons.

(b) Fire-resistive and mill buildings:

Height of building	Fire-resistive Sprinklered	Fire-resistive not Sprinklered	Mill Sprinklered	Mill not Sprinklered	
2 stories	293	175	220	147	Persons on each floor
3 stories	195	117	147	98	Persons on each floor
4 stories	154	92	116	77	Persons on each floor
5 stories	133	80	100	67	Persons on each floor
6 stories	122	73	92	61	Persons on each floor
More than 6 stories	117	70	....	....	Persons on each floor

(4) Where one minimum stairway and one "A" fire escape are provided, take ¾ of the above numbers; subject to the limitations of section Ind 54.02.

Ind 54.05 Capacity of buildings. (1) In calculating the aggregate width of exits, the capacity of the buildings shall be established as follows:

(a) Stores, first floor and basement	30 sq. ft. per person
(b) Stores, second floor and above	60 " " " "
(c) Dining rooms, cafes, taverns, etc.	10 " " " "
(d) Places of seated assemblage	7 " " " "
(e) Warehouses	300 " " " "
(f) Factories and offices	75 " " " "

(2) The above figures are based on the net area of each occupied space. Where dining rooms, cafes, dance halls and places of seated assemblage accommodate more than 100 persons, see section Ind 55.01.

(3) In other occupancies not specified above, the capacity shall be determined by the actual number of persons liable to be accommodated therein and no greater number of persons will be permitted therein.

Ind 54.06 Exit doors. (1) Every door which serves as an exit from a room accommodating more than 10 persons, or which is an exit from a public passageway or stairway shall be a standard exit door as specified in section Ind 51.15, except that such exit door need not swing outward if it accommodates less than 25 persons, is not located at the foot of a stairway, or is not more than 4 risers above the outside grade.

(2) Every exit doorway from each floor, other than the principal entrance on the first floor, shall be indicated by an approved illuminated sign over the door bearing the word EXIT or OUT in plain letters not less than 5 inches in height.

Ind 54.07 Passageways. Where there is not direct access to outside exit doors, safe and continuous passageways, aisles or corridors leading directly to every exit shall be maintained at all times on all floors of all buildings. Every passageway, aisle or corridor shall conform in width to the rule for width of stairways as specified in section Ind 54.04. Widths shall be measured in the clear, at their narrowest points produced by any projection, radiator, pipe or other object and the required width shall be maintained clear and unobstructed at all times.

Ind 54.08 Enclosure of stairways and shafts. (1) All stairways, ramps and elevator shafts in buildings 3 or more stories in height, including landings shall be enclosed as follows:

(a) Fire-resistive buildings, not less than 2-hour fire-resistive construction as specified in section Ind 51.05.

(b) Mill constructed buildings, not less than 2-hour fire-resistive construction as specified in section Ind 51.05.

(c) Ordinary constructed buildings, not less than one-hour fire-resistive construction as specified in section Ind 51.05.

(d) Frame constructed buildings, not less than one-hour fire-resistive construction as specified in section Ind 51.05.

(2) All doors opening into such enclosures shall be as specified in section Ind 51.09, and all windows shall be of wired glass and metal frames and sash.

(3) *Exception:* Monumental stairs leading from the street floor to the second floor or to a basement used for commercial purposes need not be enclosed, provided they are effectively cut off at the second floor (and basement) by partitions having fire-resistance as specified above.

Note: **Elevators and Elevator Enclosures:** For requirements governing the installation and operation of elevators, and the construction and protection of elevator shaftways, see the elevator code issued by the department of industry, labor and human relations, which code applies to all public buildings and places of employment.

Ind 54.09 Opening to roof. Every building, or section of a building, 2 stories or more in height shall have a permanent means of access to the roof from the inside. Where such access consists of a scuttle in the roof, the opening shall be not less than 20 by 30 inches and there shall be a permanent ladder or stairway leading thereto.

Ind 54.10 Trap doors and floor openings. Every opening through any floor or through any roof used by the public or by employes shall be guarded by a substantial enclosure or rail not less than 3 feet 6 inches high. Floor openings in buildings of more than 2 stories, unless enclosed with fire-resistive enclosures as specified in section Ind 54.08 shall be protected by fire-resistive doors as specified in section Ind 51.09.

Ind 54.11 Lighting. (1) All stairways, fire escapes and exits and the passageways leading thereto when used at night shall be properly illuminated to facilitate egress. The intensity of illumination shall be not less than 2.5 foot candles.

(2) All gas jets or gas lights in factories or workshops where combustible material is used, shall be properly enclosed by globes or wire cages, or otherwise properly guarded.

Ind 54.12 Sanitary equipment. (1) Toilet facilities shall be provided and maintained in connection with every public building and place of employment under this classification.

(2) In all public buildings under this classification, separate toilet rooms shall be provided for males and females, except as in section Ind 52.51 and as otherwise provided hereunder.

(3) In public places where stimulating drinks, such as beer, wines and other alcoholic beverages, are served for consumption on the premises, except in dining rooms, restaurants and similar places where the serving of drinks is only incidental to the regular food service, and where no public bar is provided, toilet fixtures shall be provided in connection with the area served, for the sex (or sexes) served, as follows:

(a) One water-closet for every 40 females, or fraction thereof;

(b) One water-closet for every 75 males, or fraction thereof, and

(4) Where there are more than 25 males accommodated there shall be one urinal for every 50 males, or fraction thereof, in excess of 25.

(5) The numbers indicated above refer to the number of persons that can be accommodated at the same time and shall be determined on the basis specified in section Ind 54.05.

(6) In toilet rooms used by males, all water-closets shall have an elongated bowl and open front seat without cover. All urinals shall be of the type of construction specified in section Ind 52.60. Where a urinal is not provided, the water-closet shall have an elongated bowl with self-rising seat. In toilet rooms used by females, all water-closets shall have an elongated bowl and open front seats without cover.

(7) In public occupancies other than those where stimulating drinks (as defined above) are served for consumption on the premises, one water-closet of the type described above shall be provided in connection therewith for each sex accommodated. Except that a small mercantile establishment where normally not more than 25 patrons are expected to be on the premises at the same time, need have in connection therewith only one toilet room to accommodate both the public and employes.

(a) *Toilets in places of employment.* See section Ind 22.03 of the general orders on sanitation following this section.

(b) *General requirements.* For general toilet room requirements in regard to location, construction, ventilation, fixtures, etc., see sections Ind 52.50 to Ind 52.64, inclusive.

(8) Where toilet rooms used by males and females adjoin, the walls between such toilet rooms, if of studding with lath and plaster, the lath shall be of metal.

(9) DRINKING WATER. Sufficient pure drinking water piped from mains, or in sanitary containers, shall be provided in connection with every public building under this classification. Drinking fountains separate from other fixtures and constructed as provided in the state plumbing code, or individual drinking cups of a type approved by the state board of health, shall be provided, except in places where food or drink is served and in public buildings where normally not more than 25 patrons are expected to be on the premises at the same time. Drinking fountains shall not be placed in toilet rooms.

(a) For drinking water requirements in places of employment see section Ind 22.17 of the general orders on sanitation following this section. See also section 146.07, Wis. Stats., which prohibits the use of common drinking cups.

(10) WASHING FACILITIES. In every public building and in every place of employment, except as provided in section Ind 22.13, wash bowls shall be provided in connection with toilet rooms, one for every 2 water-closets or urinals, or fraction. Clean individual cloth or paper towels and soap shall be provided in connection with every lavatory installation. The installation of a towel for common use, or the use of any common towel is not permissible.

See also sections Ind 22.13 to Ind 22.15, inclusive.

History: 1-2-56; am. (3) (a) and (b) and (6), Register, September, 1959, No. 45, eff. 10-1-59.

Note: The following sections, Ind 22.03, Ind 22.13, Ind 22.14, Ind 22.15 Ind 22.17, and Ind 22.18 are taken from the general orders on sanitation issued by the department of industry, labor and human relations. For further requirements on sanitation, see that publication.

Ind 22.03 Number of closets and urinals. (1) In every place of employment, whether heretofore or hereafter constructed, one water-closet shall be provided for every 20 persons, or fraction thereof, of either sex.
(2) In addition thereto, where more than 10 males are employed, one urinal shall be provided for every 40 males, or fraction thereof. Where not more than 10 males are employed, either a urinal shall be provided or the water-closet shall have an elongated bowl and self-rising seat.
(3) The requirements in subsections (1) and (2) shall be computed on the basis of the maximum number of employes on any one shift.
(4) In all new installations, only individual urinals shall be used. Such individual urinals shall be of porcelain, vitreous china, or stainless steel, set into the floor, the floor graded to the urinal, and shall be equipped with an effective automatic tank or valve or a satisfactory foot operating flushing device.
(5) All water-closets hereafter installed shall be of the individual type having elongated bowls and open front seats.

Ind 22.13 Lavatories; location. Washing facilities shall be provided in or adjacent to every toilet room. In new installations, there shall be at least one lavatory for every 5 fixtures (closets and urinals), or fraction.

Cross reference—See section Ind 22.14 for additional requirements for places of employment.
See section Ind 22.14 on material from which lavatories shall be made and for allowable types of installations.

Note: One lavatory for every 2 or 3 fixtures is recommended.

Ind 22.14 Washing facilities for places of industrial employment. (1) LAVATORIES. (a) There shall be at least one lavatory supplied with hot and cold water provided for every 10 employes or fraction in the following places of employment:
1. In all places of employment where lead, arsenic or other poisonous or injurious materials are handled by the employes.
2. In all places of employment where food is prepared or manufactured.
3. In all other places of employment where the employes' hands become dirty or greasy.
(b) Wash rooms shall be constructed according to the requirements for toilet rooms.
(c) Twenty inches of trough wash sink, or of the edge of a circular wash fountain shall be considered the equivalent of one lavatory. The trough wash sink or circular wash fountain shall not be equipped with a plug or other stopper. Each lavatory and each 20 inches of trough wash sink shall be equipped with either a faucet or spray pipe, so connected as to supply water of the desired temperature.
(d) All lavatories shall be made of porcelain, enameled iron, or other similar impervious material.

(2) SHOWERS. Shower facilities shall be provided in accordance with the following requirements:
(a) In places of employment where poisonous or irritating materials which penetrate the clothing are handled at least one shower shall be provided for every 10 employes or fraction who handle or come in contact with such materials.
(b) In glue factories, tanneries, foundries, mines, and other places of employment where materials which penetrate the clothing are handled at least one shower for every 20 such employes, or fraction, shall be provided.
(c) Showers shall be provided with hot and cold water and be equipped with a hot and cold regulating valve. The regulating device or valve shall be plainly marked and shall be so located that the valve can be operated without standing under the shower. Supply or feed pipes to showers shall be placed overhead or protected to avoid the possibility of a person coming in contact with the hot water pipes.
(d) Each shower room or compartment shall be constructed of material impervious to moisture, and the floor under each shower head shall be of such construction, or be provided with a suitable sanitary device, so as to prevent slipping.

(3) SOAP. For all hand washing facilities in places of employment, an adequate quantity of bland, non-irritating, non-abrasive soap which shall effectively cleanse the skin shall be provided.

Ind 22.15 Towels. In all places of employment, the use of towels in common is prohibited. Where hand washing facilities are required, individual cloth towels, magazine type roll cloth towels, or paper towels shall be furnished by the employer. Electric hand dryers may be used if approved by the industrial commission.

Ind 22.17 Drinking water. (1) Every place of employment shall be supplied with sufficient pure drinking water and the faucets or outlets for the same shall be placed convenient to the employes, but not in toilet rooms. Common drinking cups are prohibited. Sanitary drinking fountains shall be installed or individual cups shall be provided by the employers.

Cross reference—See the state plumbing code for required construction of sanitary drinking fountains.

(2) Where running water is not available, a covered drinking water container equipped with a faucet or bubbler shall be provided. The container shall be cleaned and sterilized at frequent intervals and kept in a sanitary condition and in good repair.

Ind 22.18 Rest rooms. (1) A rest room shall be provided at the principal place of business (owned, leased, or rented), where 5 or more persons are employed.

(2) Rest rooms shall be furnished with a cot or couch, and shall be lighted, heated and ventilated in accordance with the applicable standards published in Wisconsin administrative codes.

(3) A toilet room shall not, under this rule, be construed to be nor may it serve as a rest room. A first aid room may serve as a rest room.

History: 1-2-56; r. and recr. Register, August, 1967, No. 140, eff. 9-1-67.

Ind 54.13 Isolation of hazards. (1) All heating boilers and furnaces, power boilers, fuel rooms, storage vaults for paints, oils, and similar combustibles and other similar hazards in a building shall be isolated from the rest of the building by at least a 2-hour fire-resistive enclosure as specified in sections Ind 51.05 and Ind 51.06; except that in buildings not more than 2 stories in height and having a floor area of not more than 3000 square feet per floor, a one-hour fire-resistive enclosure as specified in sections Ind 51.05 and Ind 51.06, or better, shall be provided.

(2) All openings shall be protected with self-closing fire-resistive doors as specified in section Ind 51.09.

(3) Space heaters, suspended furnaces, and direct-fired unit heaters, fired with various fuels, may be used without an enclosure where approved by the department of industry, labor and human relations. Where suspended furnaces and direct fired unit heaters are used without an enclosure, all such units shall be located at least 7 feet above the floor.

Ind 54.14 Standpipes and fire extinguishers. (1) For exterior standpipes see section Ind 51.21.

(2) Standard interior first aid standpipes, as specified in section Ind 51.21 shall be provided in all buildings of more than 2 stories and more than 3000 square feet undivided floor area, where flammable material or any other hazardous condition is present, unless an approved automatic sprinkler system is provided.

(3) Wherever water supply of sufficient pressure is not available, 2 standard fire extinguishers as specified in section Ind 51.22 shall be provided on each floor in place of each required interior standpipe.

Ind 54.15 Automatic sprinklers. (1) A complete automatic sprinkler system, as specified in section Ind 51.23, shall be provided in every building of this classification, except office buildings not used for mercantile purposes, where more than 50 persons are employed or accommodated above the third story except as provided below.

(2) In every such building where more than 50 persons are employed or accommodated above the second story, an automatic sprinkler system shall be provided in the basement and sub-basements, except where there is no city water supply.

(3) An office building in which one or more of the lower floors is used for mercantile purposes, shall be classed as a mercantile building, except that no sprinklers will be required in such portions of the building as are used for offices only.

(4) No sprinklers will be required in a building of fire-resistive construction whose contents are not readily combustible.

Ind 54.16 Fire alarm. A fire alarm system complying with section Ind 51.24 shall be provided in every factory or workshop where more than 10 persons are employed above the second story except buildings which are provided with a complete automatic sprinkler system and except fire-resistive buildings whose contents are practically incombustible.

Ind 54.17 Floor load signs. (1) In every factory, workshop, warehouse, or other building where material is piled, notices of a permament character shall be painted or otherwise prominently displayed, stating the live load in pounds per square foot which the floor is designed to carry. Such notices shall be placed in full view, on each floor.

(2) Where floors are always used for the storage of some particular material, the walls shall be marked to the height to which the material shall be piled without exceeding the safe load.

Ind 54.18 Signs indicating number of persons. In all buildings of this classification where 50 or more persons are accommodated on any floor above the second, notices shall be prominently displayed stating the maximum number of persons on each floor for whom stairways and other exits have been provided according to sections Ind 54.02–Ind 54.06. Such notices shall be placed in full view, on each floor.

Ind 54.19 No smoking signs. Smoking shall not be permitted in retail establishments where flammable materials are handled or sold. Suitable signs bearing the words "No Smoking" shall be erected in all places where such hazard exists.

Ind 54.20 Tents. All tents used for sales or storage purposes shall conform to the requirements specified for tents in sections Ind 55.58–Ind 55.63, inclusive, of this code.

History: Cr. Register, September, 1959, No. 45, eff. 10-1-59.

Chapter Ind 55

THEATERS AND ASSEMBLY HALLS

Ind 55.001 Theaters. In the theater classification, are included all buildings or parts of buildings, containing an assembly hall, having a stage which may be equipped with curtains or permanent or movable scenery, or which is otherwise adaptable to the showing of plays, operas, motion pictures or similar forms of entertainment.

Ind 55.01 Assembly halls. (1) In the assembly hall classification, are included all buildings, or parts of buildings, other than theaters, which will accommodate more than 100 persons for entertainment, recreation, instruction, worship or dining purposes.

(a) Every assembly hall which will accommodate not more than 100 persons shall conform to the requirements of Wis. Adm. Code chapter Ind 54, covering factories, office and mercantile buildings.

Ind 55.02 Class of construction. (1) The capacities of buildings or parts of buildings in this classification for the various types of construction shall not exceed, and shall comply, with the following requirements:

MAXIMUM CAPACITIES

Type of Construction	With Stage	Without Stage
Fire Resistive	No limit	No limit
Mill	750	1,500
Ordinary	500	1,000
Frame	300	750

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(a) *Exception.* The fire protection for structural steel supporting the roof may be omitted in one-story buildings in this classification provided the roof and its supports are of incombustible or mill construction throughout.

(2) Frame construction. Where a building of this classification is erected of frame construction, the following restrictions shall apply:

(a) Not more than one story in height without a balcony, and with no basement except a heating and fuel room enclosed with fire-resistive construction as specified in section Ind 55.29, with all interior openings protected with self-closing fire-resistive doors as specified in section Ind 51.09.

(b) Located at least 20 feet from any other building or adjoining property line.

(c) Is not built in connection with a building used for any other purpose.

(d) Is provided with foundation walls and piers of masonry construction.

(e) Where motion picture booths are required, they shall be enclosed with 2-hour fire-resistive construction.

Exception: In places of worship, a full basement and a balcony seating not more than 30 persons may be provided.

(3) Balconies accommodating more than 100. In any theater or assembly hall, balconies which accommodate more than 100 persons shall be of fire-resistive construction as specified in section Ind 51.001.

History: 1-2-56; (1); (1) (a); (2); (2) (a); (2) (b); (2) (c); (2) (d); (2) (e); (2) (f); (3); am. Register, June, 1956, No. 6, eff. 7-1-56; am. (1) (a), Register, August, 1957, No. 20, eff. 9-1-57; am. Register, January, 1961, No. 61, eff. 2-1-61.

Ind 55.03 Height above grade. (1) THEATERS. The height of the sills of the principal entrance doors to any theater, as defined in section Ind 55.001, shall be not more than 18 inches above the outside grade at that point. The floor level at the highest row of seats on the main floor shall not be more than 6 feet above the outside grade at the main entrance; the floor level at the lowest row of seats on the main floor shall be not more than 6 feet below, or above, the grade at the nearest exit.

(2) ASSEMBLY HALLS AND ROOF GARDENS ABOVE FIRST STORY. Where assembly halls are provided above the first story, the following limitation of occupancy, type of construction and exit facilities shall apply:

Type of Construction	Maximum No. of Occupants	Height Above Grade
Fire-resistive	No limit	No limit*
Mill, or Ordinary	400	2nd story or 22 feet
Mill, or Ordinary	200	3rd story or 35 feet

*One smokeproof stair tower from the level of the assembly hall leading directly to the exterior at street grade shall be provided for every 750 persons capacity, or fraction thereof. These stairways shall be at least 44 inches wide and shall be in addition to other required stairways in the building.

(3) BASEMENT ASSEMBLY HALL. An assembly hall may be placed in the basement of a fire-resistive building if the capacity does not exceed 2,500 persons or in the basement of a building of mill or ordinary construction if the capacity does not exceed 400 persons.

History: 1-2-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59.

Ind 55.04 Exposure and courts. (1) Every theater or assembly hall which accommodates more than 600 persons shall have at least 3 walls abutting on streets, alleys, or open courts.

(2) The wall containing the main entrance to any theater or assembly hall shall abut on a street. The lobby or passageway leading from the main entrance doors to the foyer or auditorium shall be direct and unobstructed and of a minimum width equal to the sum of the widths of the main entrance doors. There shall be no openings from other occupancies to such a corridor or passageway.

(3) The width of every exit court shall be at least 6 feet for an occupancy not exceeding 500 persons, and shall be increased at the rate of one foot per each 500 persons additional. Every such court shall lead to a public thoroughfare, either directly, or through a passageway of equal width, not less than 8 feet high enclosed with unpierced 4-hour fire-resistive walls, ceiling and floor as specified in sections Ind 51.05 and Ind 51.06. The floor and ceiling shall be designed for a live load of not less than 150 pounds per square foot. No such court, or passageway shall be used for storage or any other purpose whatsoever.

Ind 55.05 Separation from other occupancies. (1) Every theater and assembly hall shall be separated from any other occupancy by an absolute occupancy separation as specified in section Ind 51.08, except that a special occupancy separation as specified in section Ind 51.08 may be used between an assembly hall accommodating not more than 750 persons and any other non-hazardous occupancy. Where a special occupancy separation is permitted in this section, a single fire-resistive door may be used for the protection of openings.

(2) For assembly halls of unlimited capacity located on upper floors of fire-resistive buildings which are served by elevators, the elevator openings may be permitted under the requirements for special occupancy separation specified in section Ind 51.08, but otherwise, absolute occupancy separation is required.

(3) Where a garage which is more than 500 square feet in area, chemical laboratory or other occupancy where flammable or explosive liquids or gases are used or stored is built in connection with a building used for a theater or assembly hall, it shall be separated therefrom by means of 4-hour fire-resistive walls as specified in section Ind 51.05 and unpierced 4-hour fire-resistive floors above and below as specified in section Ind 51.06. All openings in the wall to adjoining parts of the building shall be protected by means of self-closing fire-resistive doors as specified in section Ind 51.09.

History: 1-2-56; am. Register, January, 1961, No. 61, eff. 2-1-61.

Ind 55.06 Capacity. (1) The following table includes various types of occupancy within the scope of this section, together with the method to be used in determining the capacity.

(2) No greater number of persons than the number thus established shall be permitted in any theater or assembly hall.

Use or Occupancy	Basis of Capacity
(a) Arenas and field houses	4 sq. ft. per person. Use seated areas only.
(b) Assembly halls, with stage	7 sq. ft. per person.
(c) Banquet halls	10 sq. ft. per person.
(d) Churches (auditoriums)	7 sq. ft. per person.
(e) Churches (dining rooms)	10 sq. ft. per person.
(f) Dance halls	10 sq. ft. per person.
(g) Dining rooms	10 sq. ft. per person.
(h) Gymnasiums	6 sq ft. per person for seated space.
	15 sq. ft. per person for unseated space.
(i) Lecture halls	7 sq. ft. per person.
(j) Lodge halls	6 sq. ft. per person for seated space.
	15 sq. ft. per person for unseated space.
(k) School auditoriums	7 sq. ft. per person.
(l) Skating rinks	15 sq. ft. per person.
(m) Theaters	7 sq. ft. per person.
(n) Theater lobbies	7 sq. ft. per person.

(3) The capacity of theaters and theater lobbies must be comb to determine the theater capacity.

(4) (a) Every theater or assembly hall having movable seats display a sign stating the maximum number of persons permitte code.

1. The sign shall be placed in a conspicuous place at the mai trance to each theater or assembly hall.

2. The sign shall have the following wording: "Limit (Nu Persons." The maximum number of persons shall be determin the capacity as permitted by subsection (2) and section Ind The lettering shall be white on a dark background. The letter be not less than 1½ inches in height and the number shall be n than 3 inches in height.

History: 1-2-56; cr. (4) (a), Register, July, 1966, No. 127, eff. 8

Ind 55.07 Number and location of exits. (1) Every floor a cony of a theater and assembly hall shall be provided with than 2 exits, placed as far apart as practicable and so loca if any exit is blocked, some other exit will still be availal every part.

Exception: In places of worship, only one exit will be from a balcony seating not more than 30 persons.

(2) Where more than 600 persons are accommodated, ther at least 3 exits and where more than 1,000 persons are accon there shall be at least 4 exits.

(3) Exits shall be distributed on all sides which adjoi alleys or open courts.

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Ind 55.08 Type of exits. (1) The required exits from any part of a theater or assembly hall shall be exit doorways, stairways or ramps.

(2) All exits to grade from a higher or lower level shall be stairways or approved ramps. In all theaters and in assembly halls having a capacity of more than 400 persons, where the exit rise is not more than 3 feet approved ramps shall be used. By approved ramp is meant an incline located inside the building and having a slope of not more than one foot of rise in 8 feet.

(3) Stairway exits shall be interior stairways, or smokeproof towers as specified in section Ind 51.17; except that "B" type fire escapes may be used as exits from balconies for not more than one-half the required exit width, if located against blank walls.

Ind 55.09 Stairways. (1) Every stairway in a theater or assembly hall except stairways from the main floor to the first balcony shall be enclosed as specified in sections Ind 51.17 and Ind 51.18. No storage closet shall be placed under any stairway, platform, or landing.

(a) A room may be placed under a stairway or stair landing of two-hour fire-resistive construction or better provided such room does not have combustible material or hazardous equipment stored or operated therein. All such rooms shall have a ceiling height of not less than 7 feet and the door thereto shall be a self-closing solid flush type wood door 1¾ inches in thickness or better.

(2) Stairways and steps which have more than 3 risers shall have handrails on both sides.

(3) Every stairway used by the public in a theater or assembly hall shall have a uniform rise of not more than 7½ inches and a uniform tread of not less than 10 inches, measuring from tread to tread and from riser to riser. No winders shall be used and there shall be not less than 3 nor more than 16 risers in any run.

Note. See section Ind 51.16 for general stairway requirements.
History: 1-2-56; am. Register, January, 1961, No. 61, eff. 2-1-61.

Ind 55.10 Exit doorways and doors. (1) Every required single exit doorway shall contain a standard exit door as specified in section Ind 51.15. For double doors, with or without mullions, the width of each door may be reduced to 2 feet 6 inches.

(2) No single door or leaf of a double door, shall be more than 3 feet 6 inches wide, and no 2 doors shall be hinged together.

(3) No rolling, sliding or revolving door shall be counted as an exit from any theater or assembly hall, nor shall any such door be permitted where it would be liable to be used by the public as an exit.

(4) Sills at all exit doorways shall be level and flush with adjacent inside floors and ramps. Where an aisle or passageway leads to an exit from either side of the exit doorway there shall be a level floor space at the doorway subtending the width of the aisle and the doorway.

Ind 55.11 Exit lights. (1) In every theater and assembly hall, except church auditoriums, exit lights shall be provided immediately over all exit doorways, and in such other places as may be necessary to direct the occupants to exit doorways and to a street, alley or exit court.

The installation of such exit lights shall comply in all respects with the provisions of the Wisconsin state electrical code.

(2) Every light over an exit doorway shall be a red illuminated sign bearing the word EXIT or OUT in plain letters not less than 5 inches in height.

(3) All exit lights shall remain lighted during each occupancy and until the occupants have left the building.

Ind 55.12 Width of exits. (1) The total width of exits from every theater and assembly hall, and from every part thereof, shall not be less than the following: Buildings of fire-resistive construction, 36 inches per 100 persons. Buildings of ordinary construction, 40 inches per 100 persons. Buildings of frame construction, 44 inches per 100 persons.

(2) In theaters, the width of the front entrance shall be not less than ⅓ of the total required exit width.

Ind 55.13 Seating. (1) All seats, chairs and benches shall be placed not less than 32 inches back to back measured horizontally, except that for grandstands and bleachers without back rests this dimension may be reduced to 22 inches. For benches without arms, grandstands, and bleacher seats, the seating capacity shall be established by allowing one sitting or seat to each 18 inches of length. (See section Ind 55.54).

(2) All seats, chairs, and benches, except chairs in boxes or loggias, shall be securely fastened to the floor; or if the floor is level, the seats or chairs may be fastened together in groups of 3 or more. Loose chairs or seats shall not be used unless a special permit is secured from the department of industry, labor and human relations.

(3) There shall not be more than 12 seats in a row between aisles, nor more than 6 seats in a row which has an aisle on one side only except that for grandstands or bleachers without back rests and with a railing along the front, these figures may be doubled. No aisles will be required for such grandstands or bleachers where the seats extend to the floor or ground without a railing along the front.

(a) The number of seats in a row may be increased to 100 where self-raising seats are provided which leave an unobstructed passageway between rows of not less than 18 inches in width leading to a side aisle on each side of the auditorium in which exit doorways are located at not more than 20 feet intervals to an exit corridor or exit court.

(4) No seat bench or platform on which seats are placed shall be more than 22 inches in height of riser.

(5) No seat bench, or other platform or floor area on which seats are placed, or the top seat of any bleachers shall be nearer to the ceiling than 8 feet, nor nearer to the bottom of any truss or girder than 6 feet 4 inches.

(6) The requirements of this section do not apply to restaurants, dining or dance halls.

History: 1–2–56; am. Register, January, 1961, No. 61, eff. 2–1–61.

Ind 55.14 Width of aisles. (1) Aisles having seats on both sides shall not be less than 2 feet 10 inches wide at the beginning and shall increase in width toward the exits at the rate of ¼ inch per foot of run; or the aisle may have a uniform width not less than the average width of the foregoing calculation. No wall aisle shall be less than 3 feet wide and no other straight aisle shall be less than 3 feet 6 inches wide.

(2) There shall be a cross aisle leading to each required side exit. Cross aisles shall not be less than 6 feet 8 inches back to back of adjacent rows of seats.

Ind 55.15 Lobbies and foyers. The width of lobbies and foyers shall be determined on the same basis as required for exits in section Ind 55.12, but shall in no case be less than 5 feet wide, and shall be so designed and apportioned as to prevent congestion and confusion. Lobbies and foyers which serve as means of egress shall be at least equal in combined width to the required width of the stairways, passageways, aisles or exit doorways leading to them.

Ind 55.16 Inclines and aisle steps. (1) To overcome any difference in level between courts, corridors, lobbies, passageways or aisles required, or used, in egress from a theater or an assembly hall, approved ramps as specified in section Ind 55.08 shall be employed where the difference in elevation does not exceed 3 feet, except that this requirement need not apply to balconies.

(2) Steps in balcony aisles shall extend the full width of the aisle and shall have a uniform rise and run as specified in section Ind 55.09. No handrails will be required.

Ind 55.17 Obstruction. (1) All lobbies, aisles, passageways and doorways shall be kept free from furniture, drapes, display equipment, merchandise, vending machines and other obstructions, and no person except an employe shall be allowed to stand in, or occupy, any of the aisles, passageways, corridors or lobbies during any performance or public gathering. Except that patrons may be allowed to wait in a lobby or similar space if such use does not encroach upon the required clear width of the exits. Such waiting shall be restricted to areas separated from the required exit ways by fixed railings not less than 42 inches high. In entrance lobbies only, the exit space may be divided by railings not less than 36 inches high set up in the direction of travel in an approved manner for the regulation of ingress and egress.

(2) A booth or counter for the sale of package merchandise may be placed in the lobby or foyer of a theater where there is sufficient excess space so that the front of the booth or counter can be located not less than 5 feet back of the line marking the width of the lobby or foyer required for exit purposes.

Ind 55.18 Mirrors and false openings. (1) No mirror shall be placed in any part of a theater or assembly hall used by the public for exit purposes, including lobbies, corridors, stairways, ramps or any other exit facility. Where a mirror is used in an auditorium, it shall be placed flush with the wall and with the bottom at least 7 feet above any floor, balcony, gallery or platform.

(2) No false opening or decorative device giving the appearance of a door or window, where none exists, shall be placed in any part of a theater or assembly hall used by the public.

Ind 55.19 Decorations. Fabric decorations used in theaters and assembly halls shall be flame proof.

Ind 55.20 Elevator and vent shafts. Enclosures for elevator and vent shafts shall be of 2-hour fire-resistive construction as specified in section Ind 51.05 and all openings therein protected by fire-resistive doors or windows as specified in sections Ind 51.09 and Ind 51.10.

Ind 55.21 Stage separation. (1) In every theater and assembly hall the stage shall be completely separated from the auditorium by a proscenium wall of 4-hour fire-resistive construction as specified in section Ind 51.05, except as follows:

(a) In theaters and assembly halls having a capacity not exceeding 500 persons, the proscenium wall shall be of 2-hour fire-resistive construction as specified in section Ind. 51.05, or better.

(b) In theaters and assembly halls an open stage or platform will be permitted without the proscenium wall separation from the auditorium, provided the stage or platform is not more than 6 feet higher or wider than the proscenium opening.

Ind 55.22 Proscenium wall. (1) The proscenium wall shall extend from an incombustible foundation, or from the lowest fireproof floor below the stage floor, to the highest adjoining roof, except that where a 4-hour fire-resistive wall is required it shall extend at least 2 feet above the highest adjoining roof.

(2) There shall be not more than 2 openings in the proscenium wall below the level of the auditorium floor, and not more than 2 openings other than the proscenium opening, in the proscenium wall above the level of the auditorium floor, except that in addition to the above openings there may be one opening to provide access through the proscenium wall to the orchestra pit.

(3) Each such opening shall not exceed 21 square feet in area and shall be protected by a fire-resistive door as specified in section Ind 51.09, or equal.

Ind 55.23 Proscenium curtain. (1) Where a proscenium wall is required for the separation of a stage from an auditorium, the proscenium opening if more than 60 feet in width shall be provided with a rigid metal curtain conforming to the regulations contained in Appendix P of the Building Code recommended by the National Board of Underwriters, Fifth Edition, Revised Reprint, 1934. For a proscenium opening 60 feet or less in width, a rigid metal curtain or a curtain of asbestos conforming to the following specifications, or of equivalent approved construction, shall be used.

(2) Asbestos curtains shall be substantially woven of asbestos fiber not less than 95% pure, and shall weigh not less than 2½ pounds per square yard. There shall be incorporated into the yarn before weaving, either monel metal, nickle, brass or other metal or alloy,

having not less strength than these metals at temperatures up to 1700 degrees Fahrenheit and no less resistance to corrosion at ordinary temperatures. All seams shall be vertical, shall be lapped not less than one inch and shall be sewed in 2 rows with not less than ⅛ inch pure asbestos twine. At the top and bottom of the curtain a 2½ inch (or larger) steel pipe shall be placed and shall be securely fastened in, and covered by, the curtain. The curtain shall overlap the proscenium wall not less than 12 inches at each side and at the top, and shall be guided at each side by metallic loops or rings sliding on a ⅜ inch steel cable or No. 6 U.S. standard gauge wire.

(3) In addition to any decoration, the curtain shall be painted on both sides with a mineral paint having a silicate of soda binder, which will completely fill the cloth. Filler paint shall have not less than 4 parts of casein in each 10 parts of silicate of soda. The paint shall be well brushed into the cloth so that no light or smoke can come through.

(4) For curtains of any type, the connections between curtain and wall shall be made as nearly smoke-proof as possible. Smoke grooves or pockets shall be of structural steel shapes and plates not less than ¼ inch thick. These grooves or pockets shall be not less than 14 inches deep and 6 inches wide and shall be set back from the face of the arch at least 6 inches. They shall extend from the stage floor to a point 3 feet above the top of the raised curtain, and shall be securely bolted to the proscenium wall.

(5) Provision shall be made to prevent the curtain from leaving or binding on the guides under any conditions. Appropriate limit chains shall be provided to stop the downward travel of the top of the curtain at a line not less than 12 inches above the top of the proscenium opening. No part of a curtain, nor any of the curtain guides, or equipment, shall be supported by, or fastened to, any combustible material.

(6) The hoisting apparatus for the curtain shall be designed with a factor of safety of 8 or more.

(7) Besides the regular operating mechanism, there shall be an emergency device which will allow the curtain to drop by gravity. The device shall be so arranged that it can be easily operated by hand from each side of the stage and from the fly galleries, and also that its operation will be controlled by 135 degree fusible links, or other approved heat release devices, placed on each side of the stage, and when thus operated the curtain shall descend at its normal rate of speed.

(8) The curtain and its operating mechanism shall be so designed and constructed at all points, whether specifically mentioned or not, as to form an efficient and reliable barrier against fire and smoke, according to the best practice.

(9) Detailed plans and specifications for all curtains and their operating mechanism shall be submitted to the department of industry, labor and human relations for approval before installation.

Ind 55.24 Automatic smoke outlet. Where a fireproof proscenium curtain is required, or provided, the stage shall be provided with one or more automatic smoke outlets, constructed of metal or other

incombustible material, placed near the center and above the highest part of the stage, and having a combined area equal to not less than 8% of the area of the stage floor. Vertical louver openings shall be placed not less than 3 feet above the roof and shall be not less than twice the area of the shaft. The smoke outlet shall be designed and constructed so as to open by gravity, and so as to effectively overcome the effects of neglect, rust, dirt, frost, snow, heat, twisting, or warping of the frame work. The louvers, or dampers in the openings shall be held closed by cotton or hemp cords running to the stage floor close to each stage door. Fusible links, or other approved heat release devices, shall be inserted in each cord near the outlets.

Ind 55.25 Stage vestibules. All entrances to the stage shall be vestibuled in such manner as to protect the curtain, scenery, and auditorium from drafts of air.

Ind 55.26 Footlight trough. The footlight trough shall be made of, or lined with, incombustible material.

Ind 55.27 Fireproof paint. All stage scenery, properties, curtains, and decorations made of combustible material, and all woodwork in or about the stage, shall be effectively flame-proofed.

Ind 55.28 Stage accessory rooms. (1) All dressing rooms, property rooms, and other storage or workrooms shall be built of incombustible material throughout, and shall be separated from the stage by a special occupancy separation as specified in Wis. Adm. Code section Ind 51.08.

(2) No dressing room or employes' room shall be placed more than one story below the grade line, and no dressing room shall be placed above or below the auditorium unless separated therefrom by a special occupancy separation as specified in section Ind 51.08.

Ind 55.29 Boiler and furnace rooms. (1) Every boiler or furnace room, including the breeching and fuel room, shall be enclosed with a 3-hour fire-resistive enclosure as specified in sections Ind 51.05 and 51.06, except that in case of an assembly hall accommodating not more than 300 persons, a 2-hour fire-resistive enclosure as specified in sections Ind 51.05 and 51.06 may be used. All openings shall be protected with self-closing fire-resistive doors as specified in section Ind 51.09.

(2) All appliances used for heating water which are fired with solid fuel, liquid fuel or gas shall be located in a boiler or furnace room except that gas fired booster water heaters used exclusively for sanitizing dishes and cooking utensils need not be installed in a fire-resistive enclosure.

History: 1-2-56; r. and recr. (2), Register, August, 1957, No. 20, eff. 9-1-57; am. (1), Register, September, 1959, No. 45, eff. 10-1-59.

Ind 55.30 Lights and lighting. (1) Electric lights shall be used for lighting where electric current is available. No oil lamps or other open lights shall be used in or about any stage containing scenery.

(2) No gas lighting of any kind shall be used on any stage containing scenery, nor in any property room, storage room, scene dock, or fly gallery, except in localities where electricity is not available.

(3) In all theaters and assembly halls, all stairways, passageways, and exit doors shall be properly lighted and shall remain lighted throughout every performance or entertainment and until the audience has left the building.

Ind 55.32 Sanitary equipment. (1) TOILETS AND URINALS. Separate toilet rooms in connection with the auditorium shall be provided for males and females. One water-closet shall be installed for each 200 females or fraction, and one water-closet and one urinal for each 300 males or fraction, assuming the audience to be equally divided between males and females; except that in dance halls there shall be provided one water-closet for each 100 females or fraction, one water-closet for each 300 males or fraction and one urinal for each 150 males or fraction.

(2) NUMBER OF TOILETS WHERE ALCOHOLIC BEVERAGES ARE SERVED ON PREMISES. Where stimulating drinks, such as beer, wines and other alcoholic beverages, are served for consumption on the premises, there shall be provided one water-closet for every 40 females, or fraction, one water-closet for every 150 males, or fraction, and one urinal for every 50 males, or fraction; except that where the capacity in such places exceeds 300 persons, the ratio of the number of fixtures to the number of persons accommodated in excess of 300 need be only one-half of the above.

(3) TOILETS IN CONNECTION WITH STAGE. There shall be separate water-closets provided for males and females in connection with the stage of every theater and assembly hall which is equipped for the showing of stage productions.

(4) TOILETS IN CONNECTION WITH MOTION PICTURE BOOTH. In theaters where motion picture machines are run continuously for a period of more than 2 hours without at least 10 minutes intermission for the motion picture machine operator for each 2 hour period, toilets shall be provided in direct connection with the motion picture booth.

Note: For general toilet room requirements see Wis. Adm. Code sections Ind 52.50 to Ind 52.61, inclusive.

(5) DRINKING WATER. Separate drinking fountains of a type approved by the state board of health shall be provided for the stage and auditorium where water supply is available. Drinking fountains shall not be placed in toilet rooms.

(6) WASHING FACILITIES. Washbowls shall be provided in connection with toilet rooms, one for every 2 closets and urinals or fraction.

Ind 55.33 Standpipes. Where proper water supply is available, at least one first aid standpipe, as specified in section Ind 51.21, shall be provided on the stage of every theater and assembly hall where a fire curtain is required. Each hose shall be not more than 75 feet long, and where such hose will not reach every part of the stage section additional hose connections and hose, or additional standpipes, shall be provided.

Ind 55.34 Fire extinguishers. (1) Standard fire extinguishers of an appropriate type as specified in section Ind 51.22 shall be provided for all theaters and assembly halls as follows:

(a) Two on stage, if scenery is used.

(b) One on stage, if no scenery is used.

(c) One in motion picture booth, or in ticket office if there is no booth.

(d) One in dressing room section.

(2) Extinguishers shall be properly exposed to view and always accessible.

Ind 55.35 Automatic sprinklers. In every theater and assembly hall where a proscenium curtain is required, approved automatic sprinklers, as specified in section Ind 51.23, shall be provided under the stage, under the stage roof, and in the dressing rooms, but not in the automatic smoke outlet.

Ind 55.40 Motion picture machine booths, general. Every motion picture machine using nitro-cellulose film, together with all auxiliary and associated equipment, shall be enclosed in a booth so arranged as to permit the operator to walk freely on either side and in back of the machine. At least 48 square feet in area shall be provided for one machine, and 24 square feet additional for each machine over one. The ceiling height shall be not less than 7 feet.

Ind 55.41 Construction of booth. The floor of each motion picture booth shall be constructed of masonry or reinforced concrete, or shall be covered with not less than 2 inches of fire-resistive material. The walls and ceiling shall be not less than 2-hour fire-resistive construction as specified in section Ind 51.05.

Ind 55.42 Doors. (1) The door to the booth shall be not larger than necessary for the safe and proper use and maintenance of the booth and equipment, but in no case shall its dimensions be smaller than 2 feet by 5 feet or larger than 3 feet by 7 feet. The top of the door shall be not less than 12 inches below the ceiling of the booth.

(2) The door shall be a tight-fitting self-closing fire door as specified in section Ind 51.09, shall open outwardly, and shall not be equipped with any latch.

Ind 55.43 Openings. (1) Two openings for each motion picture machine may be provided. The one for the operator's view shall not be larger than 200 square inches and the one for projection not larger than 120 square inches. Where separate stereopticon, spot, or floodlight machines are installed, not more than one opening shall be provided for each such machine for both the operator's view and the projection of light. All such openings shall be as small as practicable.

(2) Each opening shall be provided with an approved gravity shutter set into guides not less than one inch at sides and bottom, and overlapping the top of the opening by at least one inch when closed. Shutters shall be not less than No. 10 U.S. Standard gauge iron or

equivalent, arranged to move freely in guides of like material and thickness bolted to the wall. Each shutter shall be suspended by a cord, and shall be so arranged that closing is by gravity action. A fusible link shall be provided in the cord over each shutter. A link shall also be provided over each magazine, which on operating will close all shutters. A manual release shall be provided near each exit door by which all shutters can be closed simultaneously. Shutters shall not be blocked open nor held open in any manner except by the harness of cords and links as herein described.

Ind 55.44 Ventilation of booths. Every booth or room housing projection, sound or any other equipment which vitiates good air conditions or requires the attention of an attendant shall be ventilated as required by section Ind 59.43 of the building and heating, ventilating and air conditioning code issued by the department of industry, labor and human relations. Fresh air intakes in booth walls, except for outside air, shall not exceed 72 square inches in area, nor be more than 3 inches above the floor. They shall be equipped with automatic shutters as described for projection openings.

History: 1-2-56; r. and recr. Register, October, 1967, No. 142, eff. 11-1-67.

Ind 55.45 Relief outlets. Every booth or room housing projection, sound or other equipment which constitutes a fire, smoke, explosion or fuming hazard shall be equipped with one or more gravity outlets extending upward from the ceiling through the roof. The net area of such gravity relief outlets shall be equal to one per cent of the room or booth floor area, but not less than 12 inches in diameter. Such outlets shall be constructed as sheet metal ducts having double walls with ½ inch air space between, or better construction. Where a relief outlet passes through, or is within 18 inches of any combustible construction, or passes through any other occupancy, approved masonry flues as specified for chimneys, section Ind 52.10, shall be used. The relief outlets shall be equipped, at the booth or room outlets, with a gravity shutter which will open automatically under excessive heat conditions. The automatic shutter shall normally be tightly closed where mechanical exhaust ventilation is required in the same room.

Ind 55.46 Electric wiring. All lights and electric wiring, also motors, arc lamps, rheostats, and associated electrical equipment shall conform in type and arrangement to the requirements of the Wisconsin state electrical code.

Ind 55.47 Motion picture machine. Every projection machine shall be securely fastened to the floor, and together with sound head and other associated equipment, shall be of safe design. No part of the film shall be outside of a tight metal enclosure during projection, and the feed and take-up reels shall have riveted, flanged, or welded joints. A shutter shall be placed in front of the condenser, arranged so as to be closed except when held open by the operator, or by some mechanical device which will assure immediate closure when operation of the machine is stopped.

Ind 55.48 Fire protection in booth; care and use of film. (1) All shelves, furniture and fixtures shall be incombustible. No combustible material shall be permitted to be within such booth, except films and film cement not exceeding one pint. Smoking is prohibited. Heating equipment in booths shall be limited to steam, warm air, hot water or electric convection heaters with low surface temperature elements. Radiators shall be protected by ¼ inch mesh screen with the top sloped at least 45 degrees to the horizontal.

(2) Films not in process of rewinding, examination or projection shall be kept in metal containers. Up to 40 pounds of film may be kept in the projection booth in interstate commerce commission shipping containers. Excess over 40 pounds shall be kept in an approved film cabinet, but the total quantity of film in any booth shall not exceed 125 pounds.

(3) Rewinding in the projection booth is prohibited unless done in an approved enclosed type rewind machine. An approved can with self-closing hinged cover shall be provided for scrap film.

(4) Up to 125 pounds of film in addition to that permitted in a projection booth, may be kept in containers as specified above, providing this excess is in a rewind room of not less than 80 square feet area, and of the construction specified in sections Ind 55.41 and Ind 55.42. Such room shall have a vent of at least 50 square inches area extending upward to the outside of the building, with a clearance to combustible material conforming to section Ind 55.45. Furniture and heating shall be as for the projection booth, and smoking is prohibited.

Note: In the foregoing section the weight of a 1000 foot roll of 35 millimeter film is assumed as 5 pounds.

Ind 55.49 Portable booths. (1) Every portable booth used to confine the fire hazards of a motion picture machine shall be of approved design conforming to the requirements for permanent booths.

(2) Every booth used for more than 3 consecutive performances in one location will be considered a permanent booth.

Ind 55.50 Maintenance. All theaters and assembly halls, and all parts thereof, shall be kept clean, sanitary and in good repair.

GRANDSTANDS, BLEACHERS, TENTS AND PLACES OF OUTDOOR ASSEMBLY.

Ind 55.51 Grandstands. (1) Grandstands erected of frame construction shall be located at least 20 feet from any other building or adjoining property line unless the exterior walls of such adjacent building are of 2-hour fire-resistive construction or better and all openings therein are protected with fire-resistive doors and windows as specified in sections Ind 51.09 and Ind 51.10.

(2) No wood grandstand unit shall exceed 10,000 square feet in ground area or 200 feet in length.

(3) Wood grandstand units shall be placed not less than 20 feet apart or shall be separated by walls of not less than 2-hour fire-resistive construction.

(4) The highest level of seat platforms of any wood grandstands shall not be more than 20 feet. Portable grandstands or bleachers

within tents shall not be more than 12 feet above the ground or surface at the front of the grandstand.

(5) All grandstands shall be designed and constructed to conform with the structural requirements of chapter Ind 53 of this code.

(6) Seat boards and foot boards shall be designed to safely support a live load of not less than 120 pounds per lineal foot. The width of foot boards shall not be less than 7½ inches.

(7) The space under a grandstand shall be kept free from extraneous flammable materials and shall not be occupied for other than exit purposes except that such space, if enclosed with one-hour fire-resistive construction or better, may be used for non-hazardous purposes if approved in writing by the department of industry, labor and human relations.

Ind 55.52 Exits. (1) Every grandstand, balcony or tier considered separately shall be provided with at least 2 exits located as remotely from each other as practicable and leading directly to the outside at grade. If the capacity of any such structure, balcony, or tier exceeds 1,000 persons, there shall be at least 3 exits and where the capacity exceeds 4,000 persons, there shall be at least 4 exits.

(2) Exits shall be distributed uniformly to prevent congestion and shall be so located that the line of travel to an exit or to the entrance to an exit passageway is not greater than 150 feet.

(3) The total width of exits from any grandstand, balcony or tier shall not be less than 22 inches per 100 persons, except that for grandstands which are constructed of incombustible material throughout and have a closed incombustible deck under the seats, the total width of exits may be not less than 22 inches for each 500 persons or fraction.

Ind 55.53 Aisles and passageways. (1) All ramps, stairs, doorways and doors used for exit purposes shall conform to the requirements of sections Ind 55.08, 55.09 and 55.10 of this code.

(2) Aisles having seats on both sides shall not be less than 3 feet 6 inches in width and aisles having seats on one side only shall not be less than 24 inches wide. Cross aisles shall not be less than 48 inches in width. No aisles will be required for grandstands or bleachers where the seats extend to the floor or to the ground without a railing along the front.

(3) Trailer seating mounted on incombustible decking not exceeding 300 capacity each shall be provided with aisles or stairways not less than 36 inches in width.

Ind 55.54 Seating. (1) The seating arrangement shall comply with the requirements of section Ind 55.13 except that for seats without backs the horizontal distance from back to back of seats shall not be less than 22 inches. There shall be a space of not less than 12 inches between the back of each seat and the front of the seat immediately behind it. All measurement is to be taken between plumb lines.

(2) Where the same level is not used for both seat bench and foot rest, independent foot rests shall be provided.

(3) All seat boards and foot boards shall be securely fastened in place in such a manner that they cannot be accidentally displaced.

(4) Where the rise of a seat bench or platform exceeds 11 inches, intermediate steps shall be provided the full width of the aisles. Such steps shall have a rise of not more than 11 inches and a tread of not less than 10 inches *nominal width*. In no case shall the angle of seating exceed 45 degrees.

Ind 55.55 Guard rails. A substantial guard rail not less than 42 inches in height and having 2 intermediate rails shall be provided along the back and ends of all grandstands where the seats are more than 4 feet above the ground. Where the front foot rest of any grandstand is more than 2 feet above the ground, a guard rail extending not less than 36 inches above such front foot rest shall be provided.

Ind 55.56 Portable grandstands or bleachers. (1) Portable grandstands or bleachers shall be self-contained units having all necessary parts to withstand and restrain all forces which may be developed during occupancy. They shall be so designed and constructed that if any structural member essential to the strength and stability of the structure is omitted during erection, the presence of unused connections or fittings will make the omission self-evident.

(2) A portable grandstand shall not be used for public occupancy until it has been securely assembled in accordance with this requirement.

(3) Portable grandstands shall be provided with base plates, sills, floor runners, or sleepers of sufficient area and strength to support safely the total live and dead loads.

(4) Where portable grandstands rest directly on the ground, mud sills of suitable material and having sufficient area to prevent dangerous settlement shall be provided under the base plates or sleepers. All mud sills shall be properly anchored to the ground and all bearing surfaces shall be in contact.

(5) A-frames or other supports and seat stringers for portable grandstands or bleachers shall be secured to prevent accidental displacement during occupancy.

(6) Field connections to wood members shall be by means of rivets, bolts, connectors, lag screws, friction or other approved devices. Lag screws shall not be used for direct tension. The use of nails and wood screws is permissible for holding wood posts together except that they shall not be used for demountable connections.

(7) Wood members in tension shall be connected at each end by not less than 2 bolts or lag screws or by approved connectors or other approved devices. Adequate provision shall be made to prevent the splitting or shearing of wood at such connections.

(8) The following requirements shall apply to folding and movable bleachers used in places of assembly in addition to the other requirements of sections Ind 55.56 and Ind 55.57.

(a) Shop drawings, specifications and calculations or a test report made by a recognized testing agency covering each bleacher model

shall be submitted to the department o findustry, labor and human relations by an architect or professional engineer registered in Wisconsin, for approval.

(b) No required exit doors or exit passageways shall be obstructed by any bleacher installation. Floor plans, elevations, and typical structural information showing the location of bleachers, exit doors, and exit passageways, for each installation shall be submitted to the department of industry, labor and human relations in triplicate for approval before work on the installation is commenced. The plans shall be made by and bear the seal of an architect or professional engineer registered in Wisconsin.

(c) All bleachers shall be designed to resist a horizontal swaying force applied to the seats in a direction parallel to the length of the seats of at least 24 pounds per lineal foot of seats and in a direction perpendicular to the seats of not less than 10 pounds per lineal foot of seats.

(d) Seat board and foot boards shall be designed to safely support a live load of not less than 120 pounds per lineal foot.

(e) All bleachers shall be equipped with sockets or holders along the back and ends to support guard rails. A guard rail not less than 42 inches in height and having 2 intermediate rails shall be provided along the back of the top row of seats. Guard rails not less than 42 inches in height above foot boards and having an intermediate rail at mid-height shall be provided at the open end of all bleachers where the seats are more than 4 feet above the floor.

(f) The highest level of seat platforms of any forward folding or movable bleachers shall not be more than 12 rows or 11 feet above the floor.

(g) Forward folding bleachers shall be securely anchored to the floor with bolts, lag screws, or other approved devices.

History: 1-2-56; cr. (8), Register, November, 1963, No. 95, eff. 12-1-63.

Ind 55.57 Inspection. Every portable grandstand or bleacher shall be carefully inspected by a building official before each period of public occupancy and any loose connections, defective or broken members or loose supports shall be properly repaired before the structure is used. In cities or towns which do not have a building official, such inspections shall be made by the chief of the fire department or other public official designated by the department of industry, labor and human relations.

Ind 55.58 Tents. (1) For the purpose of this section, a tent is a portable, temporary shelter or a structure, the covering of which is made of pliable material.

(2) No tent shall be erected to cover more than 75% of the premises on which it is located.

(3) Tents used for assembly purposes which cover 1500 square feet or more of ground area shall be located at least 20 feet from any other structure or adjoining property lines.

(4) Stake lines of adjacent tents used for assembly purposes shall be sufficient distance from each other to provide an emergency exit

passageway not less than 6 feet in width between stake lines. Proper protection shall be provided along such stake lines to eliminate tripping hazards.

(5) Concession and other tents not used for assembly purposes need not be separated from each other and may be located less than 20 feet from other structures.

(6) This section does not apply to tents or shelters used exclusively for construction purposes.

Ind 55.59 Structural requirements. (1) Poles and other members supporting tents shall be of sufficient size and strength to support the structure safely without exceeding the stresses specified in chapter Ind 53 of this code.

(2) All tents shall be adequately guyed, supported and braced to withstand a wind pressure or suction of not less than 10 pounds per square foot.

(3) The poles, guys, stakes, fastenings, etc., shall be of sufficient strength and so attached as to resist a wind pressure of at least 20 pounds per square foot of projected area of the tent.

Ind 55.60 Flame resistance. All tents used for assembly purposes or in which animals are stabled and all other tents used by the public in places of outdoor assembly shall be effectively flame-proofed. The owner shall furnish a certificate or a test report by a recognized testing engineer or laboratory as evidence that such tents have the required flame resistance.

Ind 55.61 Fire hazards. (1) The ground enclosed by any tent used in connection with a place of outdoor assembly and for a distance of not less than 10 feet outside such structure on all sides shall be cleared of all flammable material or vegetation which will transmit fire. The premises shall be kept free from such flammable material during the period the premises are used by the public.

(2) No hay, straw, shavings or similar combustible materials other than that necessary for the current feeding and care of animals shall be permitted within any tents used for public assembly except that sawdust and shavings be used if kept damp.

(3) No smoking or unapproved open flame of any kind shall be permitted in any tent while occupied by the public. "No Smoking" signs shall be conspicuously posted in all tents open to the public.

(4) Tents shall not be used for motion picture performances unless safety film is used.

Ind 55.62 Exits. (1) Every tent occupied by the public shall have at least 2 standard exits located at or near opposite ends of the structure.

(2) In tents used for assembly purposes, exits shall be provided on 3 sides if the capacity exceeds 600 persons and on 4 sides where the capacity exceeds 1,000 persons. Exits shall be uniformly distributed but in no case shall the line of travel to an exit be greater than 150 feet.

(3) The total width of exits from a tent used for assembly purposes shall not be less than 44 inches per 100 persons. Exit openings shall comply in all respects with the requirements of Wis. Adm. Code sections Ind 55.10 and Ind 51.15 of this code.

Ind 55.63 Electrical installations. (1) Electrical systems in all places of outdoor assembly shall be installed in accordance with the requirements of the Wisconsin state electrical code. All such systems shall be maintained and operated in a safe and workmanlike manner.

(2) The electrical system and equipment shall be isolated from the public by proper elevation and guarding. All electrical fuses and switches shall be installed in approved enclosures. Cables laid on the ground or in areas traversed by the public shall be placed in trenches or protected by approved covers.

Ind 55.64 Fire extinguishing equipment. One or more fire extinguishers of approved type and size shall be provided in connection with every wood grandstand and in all tents used for assembly purposes. Such extinguishers shall be maintained in proper working order and shall be located where they are easily accessible, preferably in or near the ticket office. In large installations, additional fire extinguishing equipment shall be provided as directed by the building official.

Ind 55.65 Illumination; exit lights and signs. (1) All exits, aisles and passageways leading to exits in grandstands and other places of outdoor assembly shall be kept adequately lighted at all times when the structure is occupied by the public. Artificial illumination having an intensity of not less than 2.5 foot candles at the floor line shall be provided when natural light is inadequate.

(2) Exit lights and signs complying with the requirements of section Ind 55.11 shall be provided in all places of outdoor assembly where more than 100 persons can be accommodated.

Ind 55.66 Boiler and furnace room. Every boiler or furnace room, including the breeching and fuel room, in places of outdoor assembly, shall be enclosed with a 2-hour fire-resistive enclosure or better and all interior openings in walls forming such enclosures shall be protected by self-closing fire-resistive doors. Gas-fired appliances for heating water shall be installed in a boiler or furnace room. Chimneys shall be constructed in conformity with the requirements of section Ind 52.10 of this code.

Ind 55.67 Toilet facilities. Separate toilets shall be provided for each sex in connection with all places of outdoor assembly. Toilet rooms and equipment shall comply in all respects with the requirements of sections Ind 52.50–Ind 52.64, inclusive, of this code.

Ind 55.68 Outdoor theaters. (1) DEFINITION AND SCOPE. For the purpose of this code, an outdoor theater is a place of outdoor assembly used for the showing of plays, operas, motion pictures and similar forms of entertainment in which the audience views the performance

from self-propelled vehicles parked within the theater enclosure. The requirements of this section shall apply to outdoor theaters now in existence and to outdoor theaters hereafter constructed, except as provided in subsection (5).

(2) ENTRANCES AND EXITS. All entrances and exits for outdoor theaters shall comply with the regulations of the state highway commission for driveways from property abutting state highways and the following additional requirements:

(a) Not more than one entrance shall be provided for each access road but each such entrance may be divided into 2 roadways and channelized to properly provide for vehicles turning right or left from the highway.

(b) That portion of an entrance or exit lying within the highway right-of-way shall comply with the regulations of the authority in charge of the maintenance of the highway or in the event this authority has no regulation, it shall comply with regulations prescribed by the state highway commission.

(c) Not more than one exit shall be provided for each access highway but such exit may be suitably channelized to provide for right and left turns to the highway, and not more than one traffic lane shall be permitted for each traffic lane on the highway available to vehicles leaving the theater.

(3) VEHICLE STORAGE. (a) Sufficient area shall be provided between the highway and the ticket booth to provide storage space for vehicles equal to not less than 10% of the theater capacity. In all cases, sufficient storage space shall be provided so the vehicles will not back up on the traveled way of the highway. Storage area shall be calculated on the basis of 162 square feet per vehicle.

(b) A hold-over storage area having sufficient capacity to accommodate not less than 15% of the theater capacity shall be provided between the ticket booth and the ramp area.

(4) TOWER CONSTRUCTION. The tower supporting the motion picture screen shall be designed to resist a horizontal wind pressure of not less than 30 pounds for every square foot of exposed surface.

(5) LOCATION OF TOWER. The screen shall be so oriented that the picture is not visible from any major highway. This requirement does not apply to towers erected prior to January 1, 1952.

(6) CONCESSION AND MOTION PICTURE MACHINE BOOTH. The motion picture booth and equipment shall comply in all respects with the requirements of sections Ind 55.40–55.49, inclusive, of this code.

(a) Concession buildings in connection with outdoor theaters shall comply with the requirements of chapter Ind 54 of this code.

(7) SANITARY EQUIPMENT. Separate toilet rooms shall be provided for males and females in connection with all outdoor theaters as required by section Ind 55.32. Toilet rooms and equipment shall comply in all respects with the requirements of sections Ind 52.50–52.64 of this code.

(a) In determining the number of fixtures required for toilet rooms in connection with outdoor theaters, the capacity of the theater is

established by allowing 2¼ persons for each vehicle accommodated, exclusive of vehicles parked in the waiting or hold-over area.

(b) Where the public toilet rooms are so located that the patrons must cross the ramp area in order to reach the toilet rooms, a suitable approach or passageway leading thereto shall be maintained. Such passageways shall be properly lighted and they shall be kept free from obstructions.

(8) RAMPS AND SPEAKER EQUIPMENT. (a) Ramps shall be spaced not less than 38 feet apart. The ramps shall be so designed that any vehicle can move from its parked position to the exit driveway without being required to back up.

(b) All ramps, parking areas, entrance and exit driveways shall be properly surfaced with a gravel surfacing or better, adequate to withstand the weight of the vehicles accommodated.

(c) Where additional seating space is provided in the theater enclosure for patrons using public transportation facilities, the speaker arrangement shall be such that the sound will be confined to the immediate seating area and not broadcast beyond the theater enclosure.

(d) There shall not be less than 18 feet distance between speaker posts, measured parallel to the ramps, except in seated areas for patrons using public transportation. All electrical wiring and electrical equipment shall be installed in accordance with the provisions of the Wisconsin state electrical code. Each speaker post shall be wired with wire approved for underground use laid in trenches not less than 12 inches in depth.

(9) LIGHTING. All entrance and exit driveways shall be adequately lighted and properly marked to avoid congestion and confusion and shall remain lighted throughout the performance and until the audience has left the area.

(10) SPEED LIMIT. In every outdoor theater, notices of a permanent character shall be prominently displayed designating the maximum speed limit permitted for cars driven within the area. Parking lights shall be used when cars are moving in the theater enclosure.

(11) RUNNING OF ENGINES. At each performance, an instructive trailer shall be shown on the screen informing the patrons of the danger of carbon monoxide poisoning when the engine is running and stating that when it becomes necessary to run the engine, the windows of the vehicle should be opened at least one inch.

History: 1-2-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59.

Chapter Ind 56

SCHOOLS AND OTHER PLACES OF INSTRUCTION

Ind 56.001 Scope. The requirements of this chapter, sections Ind 56.001 to 56.19, inclusive, shall apply to all public, parochial and private schools, universities, colleges, academies, seminaries, libraries, museums and art galleries; including all buildings or parts of buildings used for the purpose of acquiring knowledge.

Ind 56.01 Maximum height. (1) No building which accommodates pupils below senior or junior high school grades shall be more than 3 stories high, nor shall the topmost floor level be more than 35 feet above the grade at any outside exit door.

(2) No building which is used as a senior or junior high school shall be more than 4 stories high, nor shall the topmost floor level be more than 48 feet above the grade at any outside exit door.

Ind 56.02 Class of construction. (1) Every building not more than one story in height may be of frame construction as specified in section Ind 51.03.

(2) Every building which is more than one story, but not more than 2 stories in height, shall be of ordinary construction as specified in section Ind 51.02, or better, except as provided in section Ind 56.03.

(3) Every building which is more than 2 stories in height shall be of fire-resistive construction as specified in section Ind 51.001 except that in a 3 story building ordinary construction, as specified in section Ind 51.02, may be used above the third floor level.

Ind 56.03 First floor fire-resistive. In all 2 story buildings having more than 4 class, study, or recitation rooms of ordinary size (750 square feet in area) on any floor, the first floor shall be of at least 2-hour fire-resistive construction as specified in section Ind 51.06 unless all of the stairways and corridors throughout the building, including stairs, walls, ceilings and floors are of at least 2-hour fire-resistive construction as specified in sections Ind 51.04 to

51.07 inclusive. In all other 2 story buildings, the basement ceiling shall be of one-hour fire-resistive construction as specified in section Ind 51.06, or better.

Ind 56.04 Subdivisions and fire stops. Every building of this classification which is built in connection with a building of a lower grade of construction shall be separated from such other building by walls of 4-hour fire-resistive construction as specified in section Ind 51.05, and all communicating openings shall be protected by fire-resistive doors as specified in section Ind 51.09 or equal. If such openings are used as a means of egress, they shall be kept normally open during the occupancy of the building.

Ind 56.05 Exposure and courts. No wall containing windows or vision area which light a class, study, recitation room or reading room shall be less than 20 feet away from any opposite building, structure, or lot line or opposite court wall.

History: 1-2-56; am. Register, January, 1961, No. 61, eff. 2-1-61.

Ind 56.06 Number, location and type of exits. (1) The number and location of exits shall be such that in case any exit is blocked at any point some other exit will still be accessible through public passageways, from every room used by the public or by the occupants generally. Except that in a high school, university, college, library or museum building not more than 2 classrooms of ordinary size (900 square feet area) may be placed between an exit and the end of the building, provided that the exit doors from such classrooms are not more than 10 feet beyond the exit.

(a) Exits shall be so distributed that the entrance to any room used for educational purposes will not be more than 100 feet distant from an exit measuring along public passageways.

(2) In buildings of more than one story, there shall be at least 2 stairway exits, each leading directly out of doors. The remaining exits shall be either such stairways or horizontal exits as specified in section Ind 51.19. Where such stairways lead to the basement they shall be enclosed below the first floor as specified in section Ind 51.18.

(3) In buildings of more than 2 stories, all stairways shall be enclosed as specified in sections Ind 51.17–51.18.

(4) Fire escapes may only be used as exits from the temporary end of incomplete or unit type buildings, as approved in writing by the department of industry, labor and human relations. Such fire escapes shall be of the "B" type where more than 100 persons can be accommodated above the first story.

(5) Handrails shall be provided on both sides of all exit stairs used by pupils.

(6) No storage closet or storage space shall be placed under any stairway, platform or landing. A room may be placed under a stairway or stair landing of two-hour fire resistive construction or better provided such room does not have any combustible material or hazardous equipment, stored or operated therein. All such rooms shall have a ceiling height of not less than 7 feet and the door thereto shall be a self-closing solid flush type wood door 1¾ inches in thickness or better.

History: 1-2-56; am. (1), cr. (1) (a), Register, September, 1959, No. 45, eff. 10-1-59; am. Register, January, 1961, No. 61, eff. 2-1-61.

Ind 56.07 Total width of exits. (1) The total width of exits from any floor shall be not less than the following rates, based on the total capacity of such floor and of the floors above.

(a) Fire-resistive buildings, 30 inches per 100 persons.

(b) Ordinary or frame buildings, 40 inches per 100 persons.

(2) Where permitted under Wis. Adm. Code section Ind 56.06, standard fire escapes may be used for not to exceed one-third of the above total widths.

(3) The capacity of a school building shall be established by the actual number of fixed seats in rooms where such are used or by the number of persons which may be accommodated. (See Wis. Adm. Code section Ind 56.11.) The capacity of a library, museum, or art gallery shall be established on the basis of 100 square feet of total floor area of the building, exclusive of stairways and elevators, to each person, except that for library reading rooms this area shall be reduced to 20 square feet per person for the space so occupied.

Ind 56.08 Exit doors. Exit doors shall comply with the requirements of Wis. Adm. Code section Ind 51.15, except that in elementary schools the width may be reduced to 3 feet. The aggregate width of exit doors shall be as required in section Ind 56.07. No single door or leaf of a double door shall be more than 42 inches wide.

Ind 56.09 Passageways. (1) Corridors and passageways shall be so designed as to prevent congestion and confusion and shall be provided with windows and artificial light so as to maintain a light intensity throughout of not less than 2.5 foot candles at the floor line whenever the building is occupied.

(2) The minimum unobstructed width of corridors and passageways which are used by the public or by the occupants generally, shall be determined in the same manner as specified for stairways in section Ind 56.07, but in no case shall this width be less than 4 feet. Corridors and passageways serving as a means of egress shall be at least equal in combined width to the required width of the stairways or passageways leading to them.

Ind 56.10 Access to attic and roof. Every building more than one story in height shall have permanent means of access to the roof and attic space from inside the building. Where a scuttle opening is provided, the opening shall be not less than 20 x 30 inches, with a permanent enclosure for a stairway or ladder leading thereto.

Ind 56.11 Floor space and ceiling height. (1) All class and recitation rooms shall have a minimum floor space of 23 square feet per person. Rooms used only for study purposes shall have a minimum floor space of 15 square feet per person.

(2) In colleges or universities, classrooms seated with tablet arm chairs or seats without desks shall have a minimum floor space of 10 square feet per person.

(3) All rooms used for educational purposes shall not be less than 9 feet high in the clear except that school buildings which have a sloping ceiling may have a ceiling height of not less than 8 feet on the

low side of the classroom provided the average ceiling height is not less than 9 feet in the clear. Beams, girders, or other structural members spaced not less than 4 feet on centers which support the ceiling construction shall not be less than 7 feet 6 inches above the floor. Toilet rooms, service rooms, store rooms and similar spaces shall not be less than 7 feet 6 inches in the clear.

History: 1-2-56; am. (3), Register, September, 1959, No. 45, eff. 10-1-59; am. Register, January, 1961, eff. 2-1-61.

Ind 56.12 Basement rooms. (1) Where classrooms in school buildings have floors more than 2 feet below the adjoining grade, such rooms shall comply with the following conditions in addition to the requirements of Wis. Adm. Code section Ind 56.11 and chapter Ind 19, Illumination Code.

(a) All walls and floors which are in contact with the soil shall be moisture-proof and insulated.

History: 1-2-56; am. Register, December, 1962, No. 84, eff. 1-1-63; am. (1) (intro. par.) Register, October, 1967, No. 142, eff. 11-1-67.

Ind 56.13 Assembly rooms. A room which seats, or which can accommodate, 100 or more persons shall conform to the requirements of chapter Ind 55 (Theaters and Assembly Halls) of this code except that the minimum width of any exit doorway used exclusively by elementary school children may be 3 feet; but in any case the aggregate width of such doorways shall be in accordance with Wis. Adm. Code chapter Ind 55.

Ind 56.14 Seats, desks and aisles. (1) Seats, chairs and desks in class, recitation, or study rooms seating more than 50 persons shall be securely fastened to the floor; or seats shall be fastened together in groups of 4 or more, or in groups of 2 seats and 2 desks. Except that this requirement shall not apply to desks and chairs used by teachers, or to chairs, tables and equipment used in kindergarten rooms.

(2) Class, recitation and study rooms shall have aisles along all walls.

(3) In elementary school rooms, the intermediate aisles shall be not less than 18 inches and the wall aisles not less than 30 inches in width.

(4) In high school rooms, and in all other class, recitation and study rooms, the intermediate aisles shall be not less than 20 inches and wall aisles not less than 30 inches in width.

(5) Where rooms are used for assembly purposes, seats and aisles shall conform to the requirements of Wis. Adm. Code sections Ind 55.13–55.17.

Ind 56.15 Heating plants. (1) In every building more than one story in height, all heating plants and fuel rooms shall be enclosed with not less than 4-hour fire-resistive construction as specified in Wis. Adm. Code sections Ind 51.05 and Ind 51.06. All openings shall be protected with self-closing fire-resistive doors as specified in section Ind 51.09.

(2) In one story buildings all heating plants and fuel rooms shall be enclosed with not less than 2-hour fire-resistive construction as

specified in sections Ind 51.05 and 51.06, except that this requirement shall not apply to buildings where jacketed stoves or school room heaters are permitted. All openings shall be protected by self-closing fire-resistive doors as specified in section Ind 51.09.

Ind 56.16 Sanitary equipment. (1) TOILETS. School buildings shall have the following toilet equipment:

(a) In high schools, one water-closet for every 30 females or fraction.

(b) One water-closet for every 60 males or fraction and one urinal for every 30 males or fraction.

(c) In junior high and elementary schools, one water-closet for every 25 females or fraction, one water-closet for every 50 males or fraction and one urinal for every 25 males or fraction.

(2) DRINKING WATER. One drinking fountain shall be installed in each story and basement, for each 6000 square feet of classroom floor area, or fraction. Drinking fountains shall not be installed in toilet rooms.

(3) WASHING FACILITIES. Lavatories shall be provided in connection with toilet rooms in the ratio of one lavatory for every 60 persons of each sex in high schools and one lavatory for every 50 persons of each sex in junior high schools and elementary schools.

(4) CLOAKROOMS AND WARDROBES. In every school building, there shall be provisions for the placing and storage of the wraps of occupants. Such provisions shall consist of wardrobes, open front wardrobes, lockers or cloak rooms constructed and arranged in a manner to insure and facilitate the ventilation and sanitation of the contents. Ventilation shall conform to the provisions of Wis. Adm. Code section Ind 58.47 of the heating, ventilating and air conditioning code.

(a) This prohibits the use of corridors and vestibules for cloak room purposes unless ventilated lockers, wardrobes, or open front wardrobes are provided. Open hooks and hangers in the corridors will not be approved.

Note: Heating and ventilation. For heating and ventilation in schools, libraries, etc., see Wis. Adm. Code Chapter Ind 59 of the Building and Heating, Ventilating and Air Conditioning code which code applies to all public buildings and places of employment.

History: 1–2–56; am. (2), (3), (4) and (4) (a), Register, September, 1959, No. 45, eff. 10–1–59.

Ind 56.17 Lighting. (1) ELECTRIC LIGHTING. Every class, study or recitation room shall be equipped with sufficient electrical lighting units to maintain the illumination required in Wis. Adm. Code chapter Ind 19, illumination code.

(2) GENERAL. All other rooms and spaces in school buildings shall be equipped with means for supplying electric illumination in the quantity required for the purpose for which the room or space is used. All electrical work shall be installed to conform to the requirements of the Wisconsin state electrical code.

(3) WINDOWS. (a) All classrooms and spaces in elementary school buildings used for instruction or study purposes shall be provided with side wall clear glass or other approved transparent material,

vision panels or windows opening directly upon a street, alley, or open court as specified in section Ind 56.05 except gymnasiums, auditoriums, cafeterias, lunch rooms, libraries, audio-visual rooms, science rooms, homemaking rooms, art rooms, music rooms, vocational shops and similar areas.

(b) The windows or vision areas shall have a total glass area of not less than 40 square feet. The sill height shall not exceed 3'6" above the floor and the horizontal width of the vision area shall not be less than 5 feet. A minimum of 10 square feet of the aggregate glass area shall be arranged to open.

(c) Glass block construction conforming with the requirements of Wis. Adm. Code section Ind 51.11 may be used in classrooms and spaces used for instruction purposes except as specified in (a) and (b).

(d) Glass block wall panels which are exposed to direct sun rays and are 5 feet or more above the floor level shall be of a type capable of directing the light rays horizontally or upward.

History: 1-2-56; am. Register, January, 1961, No. 61, eff. 2-1-61; cr. (3), Register, November, 1963, No. 95, eff. 12-1-63.

Ind 56.18 **Fire extinguishers.** In every building, standard fire extinguishers, as specified in Wis. Adm. Code section Ind 51.22, shall be provided in the proportion of one extinguisher to each 2500 square feet, or fraction, of floor area, but there shall be at least one fire extinguisher on each floor including basement. In addition to the fire extinguishers for general protection there shall be at least one extinguisher of appropriate type and size in each laboratory, shop or other vocational room. Every fire extinguisher shall be prominently exposed to view and always accessible.

Ind 56.19 **Fire alarms.** (1) Every building 2 or more stories in height and every one-story building with 6 or more classrooms and an assembly hall or gymnasium accommodating more than 100 persons shall be provided with a proper alarm system complying with Wis. Adm. Code section Ind 51.24. *Exception:*

(a) A hand-operated alarm if permanently installed and so arranged that it can be operated from any story, including the basement, may be used in school buildings not more than 2 stories in height and having not more than 2 standard size classrooms on the second floor.

Chapter Ind 57

APARTMENT BUILDINGS, HOTELS AND PLACES OF DETENTION

Ind 57.001 Scope. (1) The requirements of this chapter shall apply to all apartment buildings, row houses, rooming houses, hotels, dormitories, convents, monasteries, hospitals, children's homes, homes for the aged and infirm, nursing homes, convalescent hospitals, convalescent homes, asylums, mental hospitals, jails, and other places of abode or detention, except as provided in section Ind 57.25 (2).

(2) By *place of abode* is meant a building or part of a building, such as apartment building, row house, rooming house, hotel, dormitory, convent, hospital, as follows:

(a) Occupied as a residence of 3 or more families living independently or occupied by 2 such families and used also for business purposes, or

(b) Occupied for sleeping or lodging purposes by 3 or more persons not members of the same family.

(3) By *place of detention* is meant a building or part of a building used as a place of abode and wherein persons are forcibly confined, such as asylums, mental hospitals, and jails.

Note: The attorney general has ruled that all persons committed to an insane asylum by court order come within the meaning of the words "forcibly confined". Also that the words "forcibly confined" apply to all persons confined without their consent.

Ind 57.005 Definitions. (1) The term migrant labor camp shall mean and include the site and all structures maintained as living quarters for 6 or more seasonal or migrant agricultural, industrial or construction workers and for their dependents by any person or for him or under his control and supervision. This definition shall apply throughout Chapter Ind 57.

History: Cr. Register, July, 1967, No. 139, eff. 8-1-67.

Ind 57.01 Class of construction. (1) All places of abode which are more than 3 stories in height shall be of fire-resistive construction as specified in section Ind 51.001.

(2) All 3-story places of abode, other than hospitals and places of detention, shall be at least of ordinary construction as specified in section Ind 51.02, except that a 3-story apartment building which will accommodate not more than one family on each floor and a 3-story hotel or rooming house which will accommodate not more than 6 persons on each floor may be of frame construction as specified in section Ind 51.03, except as provided in section Ind 57.02.

(3) All places of detention shall be of fire-resistive construction throughout as specified in section Ind 51.001. All hospitals, convalescent hospitals, and nursing homes 3 or more stories in height shall be of fire-resistive construction as specified in section Ind 51.001.

History: 1-2-56; am. (3), Register, September, 1959, No. 45, eff. 10-1-59.

Ind 57.02 First floor fire-resistive. (1) In 3 story buildings, except those having not more than one family on each floor, the first floor and its supports shall be of not less than 3-hour fire-resistive construction as specified in section Ind 51.06, except that in a 3 story apartment house which will accommodate not more than 4 families, or a 3 story hotel or rooming house which will accommodate not more than 30 persons, above the first story, the basement ceiling shall be of not less than one-hour fire-resistive construction as specified in section Ind 51.06 or shall be protected by automatic sprinklers as specified in section Ind 51.23.

(2) Spaces between floor joists, below or above stud partitions where the studs extend through one or more stories, shall be fire-stopped.

Ind 57.03 Garage and business separation. (1) In every building in which a lower story is used for garage purposes, the ceiling over the garage shall be of unpierced 4-hour fire-resistive construction as specified in section Ind 51.06. Stairways from garages leading to the upper stories shall be separated from the garage area with walls of 4-hour fire-resistive construction as specified in section Ind 51.05, with openings protected as specified for special occupancy separation, section Ind 51.08.

(2) In a building more than 2 stories in height where the lower story is used for business purposes, other than the hazards listed in Chapter Ind 57 of this code, the ceiling over the lower story shall be of not less than one-hour fire-resistive construction as specified in section Ind 51.06.

Ind 57.04 Corridor and dividing partitions. (1) All 3 story places of abode which have more than one apartment or 8 rooms on any floor, shall have the public passageways enclosed with partitions of not less than one-hour fire-resistive construction as specified in section Ind 51.05. If there is more than one apartment on any floor, such apartments shall be separated by such partitions. If there are more than 8 rooms on any floor, they shall be divided by such partitions into groups of not more than 8 rooms each.

(2) Doors in such corridor partitions may be solid slab doors, 1¾ inches in thickness, and need not be self-closing.

Ind 57.05 Court walls. The walls of courts and similar interior shafts for light and air shall be of not less than 3-hour fire-resistive construction as specified in section Ind 51.05, except that when the building is permitted to be of ordinary construction, the court walls may be of one-hour fire-resistive construction.

Ind 57.06 Yards. (1) Behind every apartment house, the rear of which does not abut on an alley or street, there shall be a yard across the entire width of the lot, open and unobstructed from the ground to the sky. The width of the yard behind a 2 story building shall be either:

(a) At least 5 feet of unobstructed width; or

(b) At least 10 feet from the rear lot line to the building line, of which at least 3 feet shall be unobstructed, and the remainder may be occupied by an open (or screened) porch.

(2) For apartment houses of more than 2 stories, the unobstructed width of the entire yard shall be increased one foot for each additional story, except in the case of corner lots.

(3) No apartment house shall be placed behind any other building unless there is at least 50 feet between the buildings.

Ind 57.07 Number, location and type of exits. (1) There shall be at least 2 exits accessible from each room or apartment by means of stairways, ramps or horizontal exits. The number and location of such exits shall be such that in case any exit or passageway is blocked at any point, some other exit will still be accessible through public passageways from every room or apartment, except that in fire-resistive buildings a total area of not more than 1200 square feet may be placed between an exit and the end of the building, and except in 2 story buildings where there are not more than 2 apartments on the second floor, one exit may be through the adjoining apartment provided a connecting door containing a glass panel is provided in the partition separating the 2 apartments. The lock or locks on such doors shall be of a type which can be unlocked from either side without the use of a key.

(2) Exits shall be distributed so that the entrance to each room or apartment will be not more than 50 feet distant from an exit, measuring along public passageways, if in a building of non-fire-resistive construction, or 75 feet in a fire-resistive building.

(3) At least one-half of the required exits, in buildings of more than one story, shall be stairways as specified in section Ind 51.16. The remaining exits shall be either stairways, or horizontal exits; or fire escapes may be used as exits from floors which are not more than 40 feet above grade if they are placed against blank walls. Every building which accommodates more than one family, or 8 persons, above the second story shall have at least 2 stairways.

(4) Apartment buildings 3 stories or less in height whose floors and supporting members are of not less than 2-hour fire-resistive construction, as specified in section Ind 51.06, and which have a plan

so arranged that not more than 2 occupancies on any floor make use of a common stairway, may be constructed with one common stairway as a single exit, provided the walls between occupancies and those enclosing the stairway are of 2-hour fire-resistive construction as specified in section Ind 51.05. In this case, the stairways must be of not less than 2-hour fire-resistive construction, must lead directly to the outside and have all interior openings protected by approved fire-resistive doors as specified in section Ind 51.09.

(5) Where a jail or other place of detention wherein persons are forcibly confined is located on the upper floors of a court house or office building, at least one of the exits from the jail shall be a separate smokeproof stair tower leading directly from the jail section to the outside at street grade. This stairway shall serve only the jail area and there shall be no doors opening into it from the office or court house section of the building.

Ind 57.08 Aggregate width of exits. The aggregate width of exits shall be as provided for in section Ind 54.04.

Ind 57.09 Exit doors. Exit doors shall be as specified in section Ind 51.15; except that a door which is used by not more than 6 families, or 40 persons, shall be not less than 3 feet wide and shall not be required to open outward.

Ind 57.10 Passageways. Every public passageway leading from an exit shall be at least as wide as the required width of such exit. Every public passageway leading to an exit shall be at least 3 feet wide. The required width shall be kept clear and unobstructed at all times.

Ind 57.11 Lighting of exits. In every building which accommodates more than 4 families, or 30 persons, and in every building which accommodates transients, the public passageways and stairways and exit doors shall be illuminated from one hour after sunset to one hour before sunrise. This illumination shall include lights at all intersections of passageways, at all exits, and at the head, foot and landing of every stairway. The lights at emergency exit doors shall be red lights and shall be accompanied by a sign bearing the word "EXIT" or "OUT", in plain letters.

Ind 57.12 Enclosure of stairways and shafts. (1) In 3 story buildings all stairways shall be enclosed as provided in sections Ind 51.17 or 51.18, with one-hour fire-resistive partitions, as specified in section Ind 51.05, or better, unless the building is either of fire-resistive construction or equipped throughout with automatic sprinklers. The doors may be omitted in the stories above the basement in one stairway enclosure. In all 3 story buildings accommodating more than 2 families, or 15 persons, above the first story, all basement stairways shall be enclosed with 2-hour fire-resistive partitions as specified in section Ind 51.05.

(2) In buildings more than 3 stories in height, all stairways shall be enclosed with 2-hour fire-resistive partitions, as specified in section

Ind 51.05, except that one stairway may be unenclosed in the first and second stories, provided such stairway does not lead to the basement.

(3) In all buildings more than 2 stories in height in which the first story is used for business purposes, at least one stairway shall be enclosed in the first story with an unpierced wall of 2-hour fire-resistive construction, as specified in section Ind 51.05, and such stairway shall not connect with the basement.

(4) Every elevator shaftway, dumbwaiter shaftway, clothes chute, waste paper chute, pipe shafts and other similar vertical shafts in buildings more than 2 stories in height shall be enclosed with 2-hour fire-resistive partitions, as described in section Ind 51.05, except that for 3 story buildings, one-hour fire-resistive partitions may be used where the enclosure does not pass through a business portion. In all cases the basement enclosure shall be of not less than 4-hour fire-resistive construction.

Ind 57.13 Toilet rooms. (1) Every apartment shall have a water-closet in a bathroom or separate compartment, except that where there are apartments consisting of not more than 3 rooms, there shall be at least one water-closet for every 2 such apartments. All other buildings in this classification shall have at least one water-closet for every 10 persons or fraction thereof.

(2) Occupants of rooms with private water-closets shall not be considered in counting either the number of persons or the number of fixtures.

(3) Water-closets and urinals, and the pipes connected therewith, shall be protected against freezing as provided in section Ind 52.61.

(4) For summer occupancy of migrant labor camps between May 1 and October 15, the number of plumbing fixtures shall be provided as follows:

(a) 1 toilet for each 20 persons of each sex or fraction thereof.
(b) 1 urinal for each 40 men or fraction thereof.
(c) 1 lavatory for each 40 persons of each sex or fraction thereof.
(d) 1 shower for each 30 persons of each sex or fraction thereof.

History: 1-2-56; am. (1), (2) and (3), Register, June, 1956, No. 6, eff. 7-1-56; cr. (4), Register, July, 1967, No. 139, eff. 8-1-67.

Ind 57.14 Washing facilities. In every building of this classification where water supply is available or can be made available, there shall be at least one sink or wash bowl in connection with each toilet fixture. In apartment houses there shall be such a sink or wash bowl in each apartment.

Ind 57.15 Repairs. Every building of this classification, and all parts thereof, shall be kept in good repair and the roof shall be maintained to prevent leakage. All rainwater shall be so drained and conveyed therefrom to prevent dampness in the walls and ceilings.

Ind 57.16 Cleanliness. Every building shall be kept clean, and shall also be kept free from any accumulation of dirt, filth, rubbish, garbage, or other matter in or on the same or in the yards, courts, passages, areas or alleys connected with or belonging to the same.

Ind 57.17 Size of rooms. (1) Every sleeping room shall be of sufficient size to afford at least 400 cubic feet of air space for each occupant over 12 years of age, and 200 cubic feet for each occupant under 12 years, except that a minimum of 150 cubic feet may be provided for infants in hospital nurseries. No greater number of occupants than the number thus established, shall be permitted in any such rooms.

(2) Except that for summer occupancy of migrant labor camps between May 1 and October 15 inclusive, every sleeping room shall be of sufficient size to afford at least 300 cubic feet of air space for each occupant over 12 years of age.

History: 1-2-56; r. and recr. Register, June, 1967, No. 138, eff. 7-1-67; r. and recr. (2), Register, July, 1967, No. 139, eff. 8-1-67.

Ind 57.18 Basement rooms. (1) No living or sleeping room shall have its floor level below the adjoining yard, court, alley or street grade.

(2) No rooms wherein persons are forcibly confined shall be located in a basement.

Ind 57.19 Windows. (1) The outside windows in every sleeping or living room shall have a total sash area of at least 1/10th of the floor area of the room but not less than 12 square feet. The openable area of such windows shall be equal to not less than 5% of the floor area of the room served.

(2) Except that for summer occupancy of migrant labor camps between May 1 and October 15 inclusive, the aggregate areas of window sash and screened outside doors in every sleeping or living room shall be at least 7.5% of the floor area of the room.

History: 1-2-56; r. and recr. Register, September, 1959, No. 45, eff. 10-1-59; r. and recr. Register, June 1967, No. 138, eff. 7-1-67; r. and recr. (2), Register, July, 1967, No. 139, eff. 8-1-67.

Ind 57.20 Isolation of fire hazards. (1) All boiler and furnace rooms, including fuel rooms and breeching, all laundries, drying rooms, carpenter shops, paint shops, and other hazardous work rooms and storage rooms in hospitals and buildings accommodating transients which are more than 3 stories in height and in all asylums and other places of detention shall be enclosed with a 4-hour fire-resistive enclosure as specified in sections Ind 51.05 and 51.06. All openings shall be protected by self-closing fire-resistive doors as specified in section Ind 51.09.

(2) In all other buildings under this classification, such rooms shall be enclosed with a 2-hour fire-resistive enclosure as provided in sections Ind 51.05 and 51.06, or better, except as otherwise provided in this section.

(3) In apartment buildings not more than 2 stories in height, such rooms shall be enclosed with a one-hour fire-resistive enclosure as specified in section Ind 51.05 and 51.06, or better, except as provided in subsection (5).

(4) In one-story buildings having a floor area of not more than 3,000 square feet and 2-story buildings having a floor area of not more than 1,500 square feet per floor which are used for business purposes

and also accommodate not more than 2 families, such rooms shall be enclosed with a one-hour fire-resistive enclosure, as specified in sections Ind 51.05 and 51.06, or better.

(5) The enclosure for the heating plant may be omitted in apartment buildings not more than 2 stories in height and having not more than 2 apartments on a floor and in rooming houses not more than 2 stories in height and having not more than 8 living or sleeping rooms on a floor, provided no part of the building is used for business purposes and all interior basement stairways are enclosed with a one-hour fire-resistive enclosure as specified in sections Ind 51.05 and Ind 51.06, or better. See section Ind 57.25 for exception for row house installations. *Exception:*

(a) Gas-fired space heaters may be used in private apartments and in guest rooms in motels or tourist courts without an enclosure if approved by the department of industry, labor and human relations. Space heaters fired with liquid fuel may be used without an enclosure in motels and apartment buildings not more than one story in height.

History: 1-2-56; am. (1), Register, September, 1959, No. 45, eff. 10-1-59.

Ind 57.21 Fire protection equipment. (1) Standard first-aid standpipes shall be provided in every building which is more than 2 stories high and accommodates 20 or more transients, and in all hospitals, asylums and other places of detention.

(2) In the above buildings where adequate water supply is not available, and in buildings accommodating less than 20 transients where first-aid standpipes are not provided, a standard fire extinguisher shall be placed on each floor at the head of each stairway and at each elevator or group of elevators.

Ind 57.22 Fire alarms. (1) Every building which accommodates 20 or more persons except hospitals, places of detention, and motels not more than one story in height in which each unit has an outside door at grade level, shall be provided with a fire alarm system complying with section Ind 51.24.

(2) Every hospital which accommodates 20 or more persons shall be provided with a fire alarm complying with section Ind 51.24 except that chimes or other approved sounding devices shall be used when within hearing distance of the patients. Visual attention compelling devices may be used in hospitals where approved by the department of industry, labor and human relations.

(a) A presignal fire alarm system may be installed in hospitals or hotels when not less than 4 employes are on duty at all times to respond to fire alarms.

(b) Where presignal systems are installed, it is recommended that the fire department be called immediately after the pre-alarm signal is received.

(3) This section applies to buildings now in existence and to buildings hereafter constructed.

History: 1-2-56; am. Register, October, 1958, No. 34, eff. 11-1-58.

Ind 57.23 Scuttle. Every building more than one story in height which accommodates more than 4 families, or 30 persons, shall have

a permanent means of access to the roof from the inside. The opening shall be not less than 20 x 30 inches and there shall be a permanent ladder or stairway leading thereto.

Ind 57.24 Directions for escape. (1) In every room liable to be used by transients, a notice shall be conspicuously posted giving complete and plain directions for reaching at least 2 exits.

(2) In addition to this, a red exit light shall be provided over each exit on every floor.

Ind 57.25 Row house. (1) DEFINITION. A row house is a place of abode not more than 2 stories in height, arranged to accommodate 3 or more attached row dwelling units in which each dwelling unit is separated from the adjoining unit by an unpierced vertical occupancy separation of not less than one-hour fire-resistive construction, extending from the basement or lowest floor to the under side of the roof boards.

(2) REQUIREMENTS. (a) Each dwelling unit shall have separate entrances and exits leading directly to the outside.

(b) Heating ducts may be installed in the space between studs in the occupancy separation wall provided all such ducts are covered with ¼ inch corrugated asbestos or the equivalent protection. Heating ducts shall not be installed back to back in the occupancy separation wall.

(c) Where each living unit has a separate heating system, the requirements of sections Ind 57.20 and 57.22 need not be complied with.

(d) Each living unit shall have access to the attic from the inside by means of an opening not less than 20 x 30 inches located above the stair landing on the second floor, but the other provisions of section Ind 57.23 need not be complied with.

HAZARDOUS OCCUPANCIES

Ind 57.50 Garages. (1) DEFINITIONS. (a) A garage is a building, or part of a building, which accommodates or houses self-propelled vehicles. For the purpose of this code the term vehicle includes land, air and water vehicles.

(b) A private garage is one used in connection with a private residence for the purpose of housing self-propelled vehicles owned by the occupant of the residence and used only for personal or family service.

(2) CONSTRUCTION REQUIREMENTS. (a) All garages, except private garages, which are more than 500 square feet in area shall have walls and roof of ordinary construction, as specified in section Ind 51.02, or better, and all floors of vehicle storage rooms, salesrooms, and repair shops shall be of not less than 4-hour fire-resistive construction, as specified in section Ind 51.06.

Exception. 1. A garage not more than one story in height and 2,000 square feet in area may have walls and roof of frame construction if located at least 100 feet from any other building or boundary line between premises.

2. A hangar for the storage of not more than one airplane or a boat house for the storage of not more than one motor boat may be of frame construction if located at least 15 feet from any property line or other building.

(b) All walls, or parts of walls, nearer than 5 feet to a boundary line between premises or to any other building shall be unpierced; all walls, or parts of walls, nearer than 10 feet, but not nearer than 5 feet, to a boundary line between premises or to any other building shall have all openings therein protected by means of fire-resistive doors and windows as specified in sections Ind 51.09 and 51.10.

(c) Where a garage which is more than 500 square feet in area is built in connection with a building used for other purposes, it shall be separated therefrom by means of 4-hour fire-resistive walls as specified in section Ind 51.05 and unpierced 4-hour fire-resistive floors above and below as specified in section Ind 51.06. All openings in the walls to adjoining parts of the building shall be protected by means of self-closing fire-resistive doors as specified in section Ind 51.09. Stairways from garages leading to upper stories shall be separated from the garage area with walls of 4-hour fire-resistive construction as specified in section Ind 51.05 with all openings protected by means of self-closing fire-resistive doors as specified in section Ind 51.09.

(d) Where a garage which is less than 500 square feet in area is built in connection with a public building or place of employment under this code, the garage shall have walls and ceiling of not less than one-hour fire-resistive construction as specified in sections Ind 51.05 and Ind 51.06, and the openings to adjoining parts of the building shall be protected by means of fire-resistive doors as specified in section Ind 51.09.

(3) FIRE PROTECTION. Boilers, furnaces and all open flame equipment within garages and service stations shall be effectively separated from other areas by not less than 2-hour fire-resistive walls, floors and ceilings as specified in sections Ind 51.05 and 51.06. Such enclosures in basements shall have no openings into other basement areas. All stairways leading to such basement enclosures from the first floor shall be enclosed on the first floor with not less than 2-hour fire-resistive construction as specified in sections Ind 51.05 and Ind 51.06, and the opening thereto protected with a fire-resistive door as specified in section Ind 51.09.

(a) Suspended furnaces and direct fired unit heaters fired with liquid fuel or gas may be used without an enclosure where approved by the department of industry, labor and human relations. Where suspended furnaces or direct fired unit heaters are used without an enclosure, all such units shall be located at least 8 feet above the floor.

(b) In garages or service stations which are heated by a suspended furnace located in a utility room or storage room, the enclosing walls, floor and ceiling shall be of 2-hour fire-resistive construction unless one side of the room is left open.

(4) FLOOR PITS. There shall be no pits or other depressions in the floor of any garage area, except that this requirement shall not apply

to the shallow depressions formed to secure floor drainage, nor to catch basins installed in compliance with the provisions of the plumbing code issued by the state board of health nor to floor openings for access to regular basements.

(a) This will permit service openings in the floors of garages or service stations provided that the area below can be classed as regular basements and are ventilated in accordance with the requirements of the building, heating, ventilating and air conditioning code.

History: 1-2-56; r. and recr. (2) (c), Register, September, 1959, No. 45, eff. 10-1-59; am. Register, January, 1961, No. 61, eff. 2-1-61.

Ind 57.51 Filling stations; buildings and structures. (1) DEFINITIONS. (a) By filling station is meant one or more pumps, tanks, and other pieces of equipment used in the storage and dispensing of liquid fuels and arranged for the sale of such liquid fuels to the public.

(b) By dispensing area is meant any area within 15 feet of any pump or other dispensing equipment.

(c) By basement or open space under a floor or dispensing area is meant any space that does not have an outlet at its lowest level, at or above grade.

(2) CONSTRUCTION. (a) All buildings having a service space of more than 500 square feet in area, designed to accommodate motor driven vehicles, and all other buildings erected within 15 feet of the dispensing equipment shall be of ordinary construction as specified in section Ind 51.02, or better, except where canopies are provided over the dispensing equipment, such canopies shall be of incombustible construction throughout.

1. Pumps or other dispensing equipment serving liquid fuel to the public which are located within or under any occupied part of any building or structure shall be installed in compliance with the provisions of the flammable liquids code.

(b) Buildings not more than one story in height and not exceeding 500 square feet in area may be of frame construction if located at least 15 feet from dispensing equipment and 10 feet from the boundary lines between premises and from other buildings on the same premises.

(c) Buildings more than 500 square feet in area used as office buildings exclusively, or in connection with other non-hazardous occupancies may be of frame construction if not more than one story in height and located at least 30 feet from boundary lines between premises, from other buildings on the same premises and from the dispensing equipment.

(d) All walls, or parts of walls, in buildings under (a) which are nearer than 5 feet to a boundary line between premises or to any other building shall be unpierced; all walls, or parts of walls nearer than 10 feet, but not nearer than 5 feet, to a boundary line between premises or to any other building shall have all openings therein protected by means of fire-resistive doors and windows as specified in sections Ind 51.09 and 51.10.

(e) The main floor level of any building erected within 15 feet of equipment used to dispense liquid fuel shall not be below the level of the driveway or grade at such equipment.

(f) There shall be no basement or other open space under the floor of the dispensing area outside of the building. There shall be no basement or other open space under the floor of any filling station building, unless:

1. The main floor level is at least 6 inches above the driveway or grade at the dispensing equipment, and

2. There is no outside door, window or other wall opening to such under floor space, except fuel chutes or other similar vertical openings having a tight-fitting cover, with the bottom of such opening at least 6 inches above the driveway or grade at the dispensing equipment.

3. The floor and enclosure of the under floor space is of 4-hour fire-resistive construction as specified in sections Ind 51.05 and 51.06.

4. The under floor space is effectively vented by gravity means.

Note: For requirements applying to floor pits, see section Ind 57.50.

History: 1-2-56; am. (2) (a); cr. (2) (a) 1., Register, September, 1959, No. 45, eff. 10-1-59.

Ind 57.52 Automobile tire or battery shops. (1) Any building, or part of a building, in which tires are repaired or fitted to vehicles shall be constructed, equipped and maintained as a garage under section Ind 57.50.

(2) Any building or part of a building, in which electric storage batteries are charged, repaired, or are installed in vehicles shall be constructed, equipped and maintained as a garage under section Ind 57.50.

Ind 57.53 Automobile parking decks. (1) DEFINITION. For the purpose of this code, a parking deck is an unenclosed or partially enclosed structure used for the parking or storage of self-propelled vehicles, which are driven into the structure and are parked under their own power with no facilities for the repairing of such vehicles.

(2) CONSTRUCTION REQUIREMENTS. (a) Parking decks may be erected without enclosing walls except that unpierced enclosing walls of not less than 2-hour fire-resistive construction, as specified in Wis. Adm. Code section Ind 51.05, shall be provided on all sides which are located less then 10 feet from the boundary line between premises or from any other building.

(b) Parking decks of 4-hour fire-resistive construction shall not be limited in height or in floor area.

(c) Parking decks having floor and supporting members of 2-hour fire-resistive construction or better shall not exceed 75 feet in height or 40,000 square feet in area. This area may be increased to 50,000 square feet where the structure faces 2 streets and to 60,000 square feet where the structure faces 3 or more streets.

(d) Parking decks of unprotected incombustible construction shall not exceed 50 feet in height or 20,000 square feet in area. This area may be increased to 25,000 square feet where the structure faces 2 streets and to 30,000 square feet where it faces 3 or more streets.

(e) A continuous wheel guard not less than 10 inches in height shall be provided on all sides of the structure on all floors.

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(f) A guard rail not less than 3 feet 6 inches in height and having an intermediate rail at mid-height and a toeboard at least 6 inches high at the base, or the equivalent, shall be provided on all open sides of the structure on each floor.

(g) All parking decks and parts thereof shall be designed and constructed to support the following minimum superimposed live loads in pounds per square foot of horizontal area, in addition to the dead load:

Passenger Cars Only	*Pounds Per Square Foot*
Top floor	80
First floor	80
Intermediate floors	50
Ramps	80

Busses and Trucks	
All floor and ramp areas	8,000 pound axle load in any possible position or 80 pounds per square foot, whichever produces the greater stress.

History: Cr. Register, June, 1956, No. 6, eff. 7-1-56; cr. (2) (g), Register, August, 1957, No. 20, eff. 9-1-57; am. Register, December, 1962, No. 84, eff. 1-1-63.

Chapter Ind 59

HEATING, VENTILATING AND AIR CONDITIONING

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

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

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

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

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

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

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

Ind 59.10 Definitions. (1) "Air conditioning" is the process of treating air to control simultaneously its temperature, humidity, cleanliness and distribution to meet the requirements of the conditioned space.

(2) "Combustible" refers to a material or structure made of or surfaced with wood, compressed paper, plant fibers or other material that will ignite and burn.

(3) A "duct" is any pipe, flue, or tunnel used to convey air, gases and entrained materials. An underground duct is any part of a duct that is below the surface of the ground.

(4) A"duct furnace" is a suspended direct-fired heating appliance normally installed in air ducts. Air circulation is provided by a blower not furnished as part of the appliance.

(5) An "exhaust ventilating system" is any combination of building construction, machinery, devices or equipment, designed and operated to remove harmful gases, dusts, fumes or vitiated air, from the breathing zone of employes and frequenters.

(6) "Existing buildings" shall include buildings, structurally completed, or for which drawings have been approved prior to April 11, 1936. Buildings constructed after April 11, 1936 shall comply with requirements of the code in effect at the time the drawings were approved or construction was completed.

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

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

(9) "Hazardous piping" is any service piping conveying oxygen, flammable liquids, flammable gases or toxic gases.

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

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

Note: See definition for "space heaters".

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

(13) "Mechanical ventilation" is the process of supplying or removing air by power-driven fans or blowers.

(14) The term "new building" includes buildings, additions thereto, and alterations thereof, for which complete drawings have not been approved by the department of industry, labor and human relations, or construction is not in progress, prior to February 1, 1965.

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

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

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(17) An "occupied area" is any room, area or enclosure used by one or more persons.

(18) "Outdoor openings" may be doors, windows or skylights located in outside walls or roof and can be opened to provide natural ventilation to the occupied space. Natural ventilation is permitted through window openings arranged in conformance with Wis. Adm. Code section Ind 52.02.

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

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

(21) A (gravity or circulating type) "space heater" is a vented, self-contained free standing or wall recessed heating appliance using liquid or gas fuels.

Note: See definition for "jacketed stove".

(22) "Tempered outside air". Outside air heated before distribution.

(23) "Tempered air". Air transferred from heated area of building.

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

(a) Low static type is a direct-fired suspended, self-contained automatically controlled, vented heating appliance, having integral means for circulation of air by means of a propellor fan or fans..

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

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

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

Ind 59.20 Drawings, specifications and data. (1) DESIGN AND PREPARATION OF DRAWINGS. All drawings and data for the installation of heating, ventilating and air conditioning equipment shall be designed and prepared to satisfy the requirements of this code.

Note: See section 101.31 Wis. Stats. the provision of which regulates the practice of engineering and architecture in Wisconsin.

Designers are hereby notified that beginning on August 1, 1968, all drawings and design data to be submitted for review and approval under the provision of this code for buildings greater than 50,000 cubic feet shall be sealed or stamped by an engineer or architect registered in accordance with the laws of Wisconsin.

(2) APPROVAL OF DRAWINGS AND SPECIFICATIONS. Where heating, ventilation and air conditioning equipment is required, complete drawings, specifications, and data sheets shall be submitted to the department of industry, labor and human relations for approval. Approval shall be obtained before affected work is commenced and all work shall be executed according to the approved drawings and specifications.

Note: To expedite approval of drawings the heating and ventilation drawings should be submitted for approval with the building drawings.

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

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(a) Drawings for installations within the city limits of Milwaukee shall be submitted to the Inspector of Buildings, Milwaukee for examination and approval.

(b) The replacement of major apparatus is subject to department of industry, labor and human relations approval.

(c) A statement in triplicate, showing capacities of old and new equipment may be submitted instead of data required in subsection (7).

(3) NUMBER OF DRAWINGS AND SPECIFICATIONS. One copy of specifications and 3 complete sets of drawings shall be submitted for approval.

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

(4) APPROVAL OF CHANGES ON DRAWINGS. When it is necessary to change approved heating and ventilating drawings or specifications, revised drawings shall be approved before installation is commenced.

(5) APPROVED DRAWINGS KEPT AT BUILDING. A complete set of approved drawings shall be kept available at the job site.

(6) INFORMATION REQUIRED ON DRAWINGS AND IN SPECIFICATIONS. The lines, data and information shown on drawings for heating, ventilating and air conditioning systems submitted for approval shall be permanent, clear, legible and complete, and shall include all details and data necessary for review of the proposed installation, such as:

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

(7) DATA REQUIRED. All drawings submitted for approval shall be accompanied by sufficient data and information for the department of industry, labor and human relations to judge if the capacity of the equipment and the performance of the system will meet the requirements of this code. The following data shall be submitted:

(a) Heat loss calculated in BTU per hour.
(b) Calculated air volume at design temperature for each occupied area.
(c) Calculated direct and indirect radiation required for each occupied area.
(d) Calculations for ventilation requirements.

(e) Summation of total heating and ventilation requirements.

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

(8) FUNDAMENTAL DATA REQUIRED. When requested, additional data pertaining to design and operation of a heating and ventilating system shall be filed for approval with the department of industry, labor and human relations by the architect, engineer, designer or manufacturer before such equipment is installed or used.

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

History: Cr. Register, January, 1965, No. 109, eff. 2-1-65; am. (1), Register, May, 1966, No. 125, eff. 6-1-66; am. (1), Register, October, 1967, No. 142, eff. 11-1-67.

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

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

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

Masonry chimneys, construction---Wis. Adm. Code section Ind 52.10
Metal smoke stacks, construction--Wis. Adm. Code section Ind 52.11
Smoke pipes----------Wis. Adm. Code section Ind 52.12
Steam and hot water pipes,
protection----------Wis. Adm. Code section Ind 52.13
Vertical duct shaft, construction--Wis. Adm. Code section Ind 52.14
Boiler and furnace rooms-------Wis. Adm. Code sections Ind 54.13, Ind 55.29, 56.15, 57.20, 57.50
Heating and ventilating equipment and
wiring----------Wis. Adm. Code section E 1-E 900

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

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

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

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

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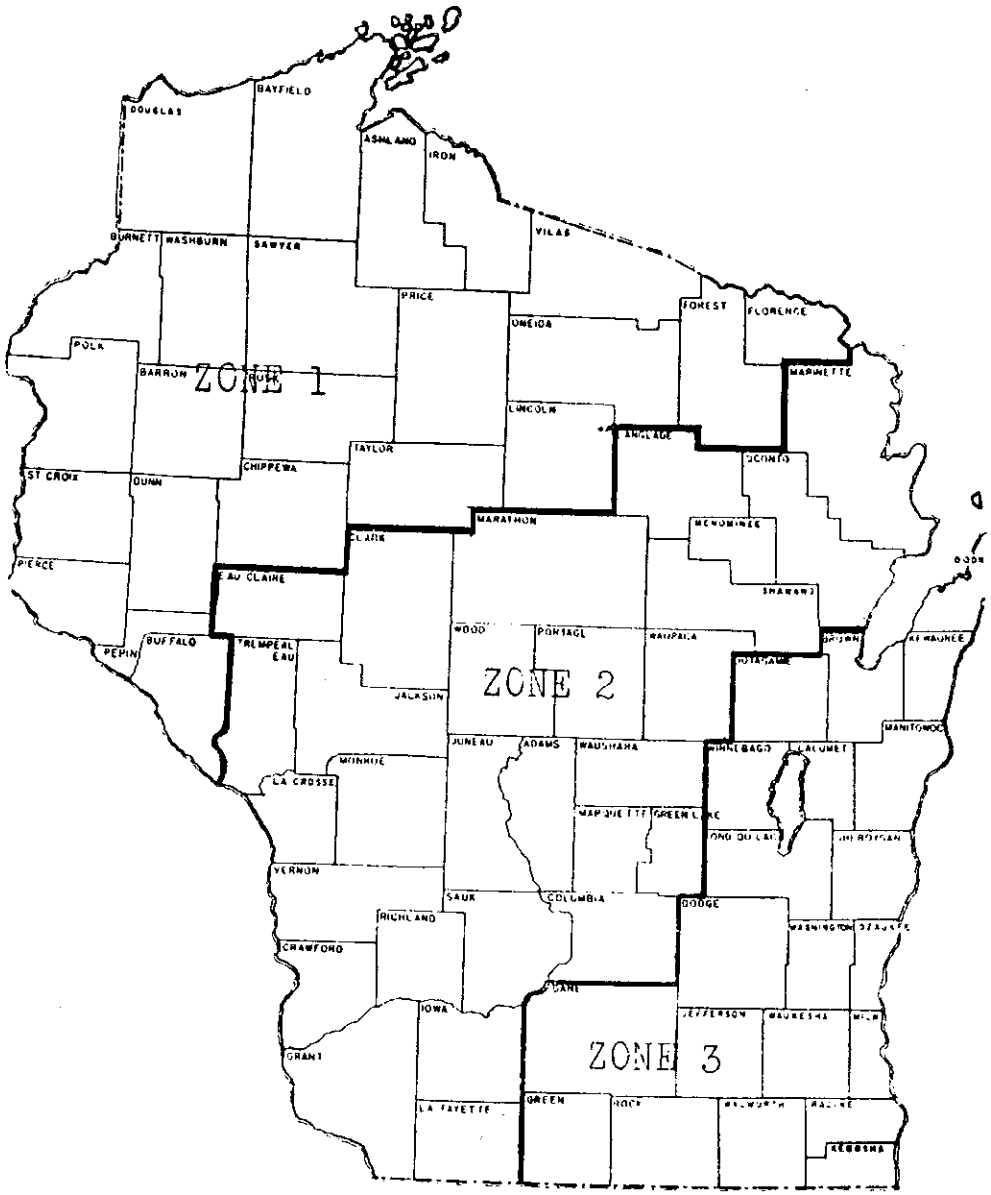
TABLE 1

MAP OF WISCONSIN SHOWING DESIGN TEMPERATURE ZONES



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

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

TABLE 2

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

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

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

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

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

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

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

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

Note: Cross reference: For requirements pertaining to all places of employment or occupancy where smoke, gas, dust, fumes, steam, vapor, industrial poisons, or other detrimental materials are used, stored, handled, or are present in the air in sufficient quantities to obstruct the vision, or to be irritating, or to be injurious to the health, safety or welfare of the employes or frequenters, see Wis. Adm. Code Ch. 20, Dusts, Fumes, Vapors and Gases issued by the department of industry, labor and human relations.

(3) GRAVITY DIRECT-INDIRECT SYSTEMS. The installation of gravity direct-indirect systems is prohibited.

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

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

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

(5) EXHAUST SYSTEM AIR DISCHARGE. Exhaust systems shall be designed to prevent contaminated air re-entering the building.

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

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

(b) Where heat gain from kitchen equipment or a process of manufacture is adequate to equal all or part of the ventilation load, the air may be recirculated and supplied mechanically within the immediate area and mixed with a quantity of outside air to temper the air supply, provided that dampers and temperature controls are installed in the system to maintain a discharge temperature of not less than 55° Fahrenheit.

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

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

(8) FINAL TEST REQUIRED. Every heating, ventilating and air conditioning system shall be tested and balanced in place by the designer or installer.

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

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

Ind 59.25 Maintenance and operation. (1) MAINTENANCE. All heating, ventilating, exhaust and air conditioning systems shall be maintained in good working order and shall be kept clean and sanitary.

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

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

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

(a) Require ventilation on an occupancy basis.

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

(c) Require exhaust.

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

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

TABLE 3

Use or Occupancy	Classification	Basis of Capacity
Arenas and field houses	(a)	4 sq. ft. per person. Use seated area only.
Armories (drill halls)	(a)	30 sq. ft. per person.
Assembly halls	(a) or (b)	7 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Banquet halls	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Bath and shower rooms	(c)	See Wis. Adm. Code section Ind 59.48.
Barber shops	(b)	20 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Beauty parlors	(b)	20 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Billiard rooms	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Bowling alleys	(a) or (b)	Seating capacity, plus 6 persons per alley. Terminate occupied area at foul line. See Wis. Adm. Code section Ind 59.51.
Brokerage board rooms	(a) or (b)	7 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Cafeterias	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Churches and places of worship	(a) or (b)	See Wis. Adm. Code section Ind 59.44.
Chapel	(a) or (b)	7 sq. ft. per person.
Dining and social rooms	(a) or (b)	15 sq. ft. per person.
Nave or auditorium	(a) or (b)	7 sq. ft. per person.
Club rooms	(a) or (b)	Depends on usage.
Dance halls	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Dining rooms	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Factories and machine shops	(b)	See Wis. Adm. Code section Ind 59.53. Also see rules of Wis. Adm. Code on Dusts, Fumes, Vapors and Gases.
First aid rest rooms	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.53.
Foundries and boiler shops	(b)	See Wis. Adm. Code section Ind 59.53. Also see rules of Wis. Adm. Code on Dusts, Fumes, Vapors and Gases.
Funeral homes		See Wis. Adm. Code section Ind 59.44.
Chapel	(a) or (b)	7 sq. ft. per person.
Garages and service stations	(d)	See Wis. Adm. Code section Ind 59.52.
General offices	(a) or (b)	See Wis. Adm. Code section Ind 59.50.
Gymnasiums and combined gymnasiums and assembly halls	(a)	6 sq. ft. per person for seated space. 15 sq. ft. per person for space not seated.
Hospitals	(a) or (b)	See Wis. Adm. Code section Ind 59.56. See Wis. Adm. Code section Ind 57.17 and Ind 57.19.
Hospitals (Mental)		See Wis. Adm. Code section Ind 59.55.
Day Rooms	(b)	See Wis. Adm. Code section Ind 57.19.
Dormitory	(b)	See Wis. Adm. Code section Ind 57.17 and Ind 57.19.
Janitor closets	(c)	See Wis. Adm. Code section Ind 59.48 and Ind 59.56.
Kitchens	(c)	See Wis. Adm. Code section Ind 59.49.
Laboratories	(a) or (c)	25 sq. ft. per person. See rules of Wis. Adm. Code on Dusts, Fumes, Vapors and Gases.
Laundries	(c)	See rules of Wis. Adm. Code on Dusts, Fumes, Vapors and Gases.
Lecture halls	(a)	7 sq. ft. per person. Use seated area only.
Library reading rooms	(a)	20 sq. ft. per person.

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Use or Occupancy	Classification	Basis of Capacity
Locker rooms	(c) or (d)	See Wis. Adm. Code section Ind 59.48 and Ind 59.53.
Lodge halls	(a) or (b)	6 sq. ft. per person for seated space. 15 sq. ft. per person for space not seated—See Wis. Adm. Code section Ind 59.51.
Mental hospitals		See Wis. Adm. Code section Ind 59.55.
Day rooms	(b)	See Wis. Adm. Code section Ind 57.19.
Dormitory	(b)	See Wis. Adm. Code section Ind 57.19.
Motion picture booth	(a) or (c)	See Wis. Adm. Code section Ind 59.43.
Penal Institutions		See Wis. Adm. Code section Ind 57.17 and Ind 57.19.
Jail cell (over-night lock-up)	(b) & (c)	6 air changes per hour.
Places of employment	(b)	75 sq. ft. per person. See Wis. Adm. Code section Ind 59.53.
Play room (unfinished areas)	(c)	23 sq. ft. per person.
Printing establishments	(b)	See Wis. Adm. Code section Ind 59.53. Also rules of Wis. Adm. Code on Dusts, Fumes, Vapors and Gases.
Restaurants	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Retail establishments	(a) or (b)	Basement: 40 sq. ft. per person. Other floors: 60 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
School all-purpose, dining and recreation rooms	(a)	15 sq. ft. per person.
School auditoriums	(a)	7 sq. ft. per person.
School classrooms	(a)	23 sq. ft. per person.
School kindergarten rooms	(a)	23 sq. ft. per person.
School lecture rooms	(a)	7 sq. ft. per person. Use seated area only.
School project rooms	(a)	23 sq. ft. per person.
School study rooms	(a)	16 sq. ft. per person.
Security vaults (occupied)	(d)	2 CFM per sq. ft.
Skating rinks	(a) or (b)	15 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Sunday School	(b)	15 sq. ft. per person.
Swimming pools	(c)	See Wis. Adm. Code section Ind 59.48.
Taverns	(a) or (b)	20 sq. ft. per person. See Wis. Adm. Code section Ind 59.51.
Theaters	(a)	7 sq. ft. per person.
Theater lobbies	(a)	15 sq. ft. per person.
Theater lounge rooms	(a)	15 sq. ft. per person.
Toilet rooms	(c)	See Wis. Adm. Code section Ind 59.48.
Vocational instruction and research	(a) or (c)	40 sq. ft. per person. See rules of Wis. Adm. Code on Dusts, Fumes, Vapors and Gases. 2 CFM per sq. ft. floor area.
Wardrobes, lockers and cloak rooms		See Wis. Adm. Code section Ind 59.48 and Ind 59.53.

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

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

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

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

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

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

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

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

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

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

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

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

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

(c) Maintain design temperature.

(7) AIR CLEANSING DEVICES. Approved air cleansing devices shall be installed in a manner to filter the outside air and recirculated air used with mechanical heating and ventilating systems except as follows:

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

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

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

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

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

Ind 59.42 Places of assembly. (1) SCOPE. This classification shall include arenas, armories, assembly halls, banquet halls, billiard rooms, bowling alleys, cafeterias, club rooms, dance halls, dining rooms, gymnasiums, lecture halls, lodge halls, playrooms, restaurants, school auditoriums, skating rinks and theaters, that will accommodate more than 100 persons.

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

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

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

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

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

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

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

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

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

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

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

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

Ind 59.44 Places of assembly for worship. (1) SCOPE. This classification shall include auditoriums, social assembly rooms, and Sunday School rooms, in churches or houses of worship. It shall also include chapels in funeral homes, parochial schools and convents.

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

space" outside of the window having a width not less than 1½ times the distance below grade at the bottom of the window.

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

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

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

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

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

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

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

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

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

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

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

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

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

Ind 59.48 General sanitation and service areas. (1) SCOPE. This classification shall include toilet rooms, locker rooms, natatoriums and shower rooms.

Note 1: For exhaust ventilation requirements in hospital service areas, see Wis. Adm. Code section Ind 59.56 (2).

Note 2: For exhaust ventilation requirements in places of employment, see Wis. Adm. Code section Ind 59.53.

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

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

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

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

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

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

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

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

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

Ind 59.49 Kitchens. (1) SCOPE. This classification includes all areas where food is prepared, except places of vocational instruction and single unit apartments in apartment buildings, hotels and motels.

(2) VENTILATION REQUIRED. (a) *Exhaust.* The exhaust ventilation required for every occupied area of this class shall not be less than 4 cubic feet per minute per square foot of floor area. For kitchens in churches, auditoriums, lodge halls and schools, the exhaust ventilation shall be not less than 2 cubic feet per minute per square foot of floor area.

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

(3) RANGE HOODS. (a) The air velocity over the face area of a single wall hood shall be not less than 100 feet per minute or 350 feet per minute through the slot opening of a double wall hood.

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

Note: See Wisconsin State Electrical Code, Volume 2.

(4) DUCTS. (a) Ducts or vents connected to range hoods and passing through any other area of the building shall be protected with not less than 2-hour fire-resistive construction. Where 2-hour fire-resistive construction cannot be provided, a manufactured or masonry chimney shall be used. The manufactured chimney shall be rated and approved for use at a flue gas temperature of not less than 1000° Fahrenheit.

Note: See Wis. Adm. Code section Ind 51.05 for various building materials having a 2-hour rating.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Ind 59.52 Garages and service stations. (1) SCOPE. Ventilation shall be provided for all repair garages, service stations, body shops or all live storage garages housing 6 or more vehicles driven by internal combustion engines.

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

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

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

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

1. The floor is at or above grade level.

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

(4) REPAIR AREAS. (a) All areas in which motor-driven vehicles are repaired shall be supplied with a volume of tempered outside air not less than ¾ cubic foot per minute per square foot of floor area. An equal volume of exhaust ventilation shall be provided and maintained. Exhaust air shall be drawn from a line not more than 18 inches above the floor.

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

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

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

(a) All service room or work room areas shall be supplied with a volume of tempered outside air not less than ½ cubic foot per minute per square foot of floor area. Provide an exhaust ventilation system having an equal capacity. Exhaust air shall be drawn from a line not more than 18 inches above the floor.

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

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

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

(c) The air exhausted from the repair, live storage and service areas shall be removed from a line not more than 18 inches above the floor through vent ducts located in areas of greatest contamination. Where gravity exhaust ventilation is provided, the vent ducts shall

extend not less than 2 feet above the high point of the roof or parapet and shall be capped with an approved siphon type roof ventilator.

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

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

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

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

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

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

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

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

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

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

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

Note 2: Exhaust air from locker rooms may be directed through the adjoining toilet or shower room.

(5) FIRST AID REST ROOMS IN PLACES OF EMPLOYMENT. Ventilation shall be provided for all areas of this class to conform to the requirements of Wis. Adm. Code section Ind 59.41. Ventilation is not required where the total sash area is greater than 10% of the floor area and the openable area is greater than 5%.

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

Ind 59.55 Penal institutions and places of detention. (1) SCOPE. This classification shall include corridors and areas of compulsory occupancy in penal institutions, mental hospitals and other places of detention.

(2) VENTILATION REQUIRED. The air movement supply and distribution for all areas of this class shall be accomplished by mechanical means and shall conform to the requirements of sections Ind 59.40 and 59.41. The air movement through the corridors shall be not less than 10 cubic feet per minute per lineal foot of corridor.

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

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

Ind 59.56 Hospitals. (1) SCOPE. This classification shall include hospitals, nursing homes, public health centers, and treatment centers where medical services are provided for treatment and care of "bedfast patients".

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

Note 2: Refer to the State Board of Health, Hospital and Related Services, for additional requirements.

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

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

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

(d) Private, semi-private wards and day rooms shall be ventilated in accordance with the requirements of Wis. Adm. Code section Ind 56.41 unless openable sash area has been provided and the content of the space is in excess of 400 cubic feet per occupant.

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

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

Ind 59.60 Outside ventilating air intakes. (1) LOCATION. (a) Outside air intake openings shall be located a distance of at least 20 feet horizontally or 10 feet vertically from vents and chimney outlets.

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

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

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

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

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

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

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

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

(6) COMBUSTION AIR INTAKES. (GRAVITY) (a) All boiler rooms and furnace rooms shall have an opening to the outside air. The free area of such opening shall be not less than 1 square inch for each 5,000 BTU per hour of fuel consumed. The minimum free area of such opening shall be not less than 100 square inches.

(b) Manually operated dampers are prohibited.

(c) Motorized dampers are acceptable when interconnected with the burner of direct-fired equipment. Flue dampers shall be open when the burner is in operation.

Note: Mechanical supply fans may be used to supply combustion air when complete design data is submitted for approval.

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

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

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

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

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

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

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

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

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

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

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

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

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

(c) One-story motels and apartment buildings.

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

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

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

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

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

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

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

(6) OIL BURNING HEATERS. Every oil burning jacketed stove or room heater shall be supplied directly from an oil supply tank having a capacity of not less than 250 gallons.

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

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

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

Ind 59.66 Space heating equipment. (1) FURNACES. (a) *Fan-furnace installations.* Forced air heating systems shall be designed to prevent a negative pressure on the heat exchanger, except where systems are designed to supply 100% tempered make-up air to replace a volume equal to that exhausted.

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

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

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

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

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

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

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

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

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

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

1. The appliance shall be suspended in an occupied space.

2. The heating appliance shall be of an approved type.

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

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

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

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

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

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

(e) Direct-fired gas appliances designed to supply 100% outside air (where the products of combustion are mixed with the comfort

air stream), may be installed in metal fabricating plants, foundries, machine shops and factories provided:

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

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

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

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

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

(3) SPACE HEATERS. (a) Space heaters are prohibited in hazardous occupancies. Space heaters may be used in motel guest rooms, individual apartments, individual offices and retail establishments, subject to the following provisions:

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

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

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

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

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

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

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

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

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

10. The burner of the appliance shall be enclosed with a metal housing so constructed that there will be no open flame and the burner housing shall be effectively guarded against personal contact. The arrangement shall be such that the shield will prevent any combustible material in the vicinity of the appliance from coming in contact with the flame or with the housing that encloses the burner.

11. Space heaters shall be located at least 6 inches from any unprotected combustible wall or partition, unless approved by the

department of industry, labor and human relations. Space heaters standing on a combustible floor shall be supported on legs securely fastened to the floor. The space under the unit shall not be enclosed.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(c) Not less than the minimum clearances shall be maintained between the electric space heating equipment and combustible mate-

rial determined in accordance with test procedures and standards approved by the department of industry, labor and human relations.

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

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

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

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

Ind 59.67 Chimneys, gas vents, mechanical draft and venting devices. (1) GENERAL REQUIREMENTS. Heating appliances using solid, liquid or gas fuels shall be vented to the outside. A natural draft chimney or other venting device shall have the height and area to remove the products of combustion.

(2) TYPES. (a) *Masonry chimney.* The design and construction of the chimney shall conform to the provisions of Wis. Adm. Code, section Ind 52.10, (Building and heating, ventilating and air conditioning code).

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

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

1. Type "A". An approved type "A" chimney may be used with solid, liquid or gas-fired heating appliances, where the flue gas temperature does not exceed 1000 degrees Fahrenheit continuously and does not exceed 1400 degrees Fahrenheit for infrequent brief periods of forced firing.

2. Type "B". An approved type "B" gas vent may be used with gas-fired appliances where the flue gas temperature does not exceed 550 degrees Fahrenheit at the outlet of the draft hood.

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

4. Type "C". A type "C" gas vent may be used with gas-fired low heat appliances (low pressure boiler, furnaces and space heaters). The vent shall be not less than No. 20 standard gauge galvanized iron or other approved corrosion-resistant material. The installation shall conform to the requirements of Wis. Adm. Code, section Ind 52.12.

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

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

(b) All chimneys or gas vents depending on a gravity principle for the removal of the products of combustion shall terminate not less than 3 feet above the highest point where they pass through the roof of the building, and at least 2 feet higher than any ridge, peak or wall within 10 feet of the chimney.

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

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

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

Ind 59.68 Fans and Blowers. (1) TYPE AND CAPACITY. Fans and blowers shall be of a type and size that will satisfy the design conditions of the heating and ventilating system. Fans and blowers shall be rated in accordance with an approved test procedure.

Note: The department of industry, labor and human relations accepts certified ratings listed by Air Moving and Conditioning Association, Inc.

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

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

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

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

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

TABLE 4

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

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

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

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

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

(4) UNDERGROUND DUCT CONSTRUCTION AND INSTALLATION. (a) All underground duct systems using cement tile, glazed clay tile and other tile having a composition of cement and minerals shall be waterproof

and shall have sufficient strength to prevent failure of duct at time of installation and while in service. All fittings shall be designed with bell and spigot or slip joint connections. All joints shall be waterproof.

(b) Metal and other approved materials not specified in (a) may be used for underground systems if encased in not less than 2 inches of concrete. The ducts shall be round, water-proof, incombustible, smooth, and of sufficient strength to prevent collapse.

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

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

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

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

(g) In addition to the requirements in subsections (4) (a), (b), (c), (d) and (e) warm air supply ducts shall be designed in compliance with allowable air velocities in Table 4. Where supply air ducts are installed parallel and adjacent to an outside wall, a moisture-proof insulating material (thermal conductance factor of .19 BTU per hour per square foot per degree Fahrenheit) shall be placed between the duct and outside wall. The insulation shall extend from bottom of floor to 2 feet below finished grade.

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

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

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

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

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

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

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2. They resist puncture, deformation or collapse.

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

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

5. They are not connected to a furnace, duct heater or similar heat-producing appliance unless a connecting duct of steel, having a length of not less than 6 feet is used to separate them from the appliance.

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

1. The duct material is approved for such use.

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

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

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

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

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

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

Note: The department of industry, labor and human relations accepts the use of flame-proofed fabric of metal or mineral and listed in Building Materials List published by Underwriters' Laboratories, Inc.

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

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

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

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

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

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

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

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

(10) VENT DUCTS, HORIZONTAL RUN. (a) Horizontal runs in vent ducts connected to siphon type roof ventilators shall be avoided wherever possible and the maximum practicable inclination shall be provided in all cases. In no case shall the horizontal run exceed 30% of the vertical run unless the room has a direct mechanical supply or the vent duct is connected to an exhaust fan.

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

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

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

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

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

(13) FIRE DAMPERS. (a) Heating and ventilating ducts shall not pass through fire walls, fire partitions, floors and air shaft walls requiring fire-resistive construction of 2-hour or better rating unless approved fire dampers or doors are installed in the opening.

Note: The department of industry, labor and human relations accepts fire damper and door test data from a nationally recognized testing laboratory, fire dampers and doors complying with specifications in duct manual published by Sheet Metal, Air Conditioning Contractors National Association, Inc. or complying with specifications in National Board of Fire Underwriters' Bulletin No. 90A.

(b) Fire dampers are prohibited in kitchen hood exhaust ducts.

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

Ind 59.70 Volume dampers and deflectors. Necessary volume dampers, splitters and deflectors shall be provided in all ducts to permit accurate balancing of the system. The dampers, splitters and deflectors shall be adjusted to satisfy the heating and ventilating requirements of the conditioned space and locked in place.

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

Ind 59.71 Outlets and returns. (1) NUMBER AND ARRANGEMENTS. The capacity, number and arrangement of outlets, returns and exhausts shall insure a uniform distribution of air.

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

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

(4) CORRIDOR VENTILATION. Air in a volume equal to the outside air required from a room may be discharged and recirculated through a corridor and exhausted through lockers, toilet rooms, kitchens, janitor closets and similar areas. Additional exhaust ventilation shall be provided where the volume of air exhausted from the corridor is less than the volume of air supplied.

Note: See Wis. Adm. Code sections Ind 59.24 (3), 59.48 (4), 59.49 (3) (b), and 59.56 (2).

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

Ind 59.72 Equipment location and protection required. Heating and ventilating equipment in gymnasiums, play rooms and similar occupied areas shall be fully recessed, and protected, or located not less than 7 feet above the floor. Heating and ventilating equipment shall not block any part of the required aisles, passageways and corridors.

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

Ind 59.74 Piping. (1) PIPE SIZES AND ARRANGEMENT. All steam and hot water supply and return piping, air-line piping and auxiliary equipment shall be of appropriate sizes, elevations and arrangements in accordance with standard engineering practice to accomplish the calculated services in practical operation, without undue noise, stress or other detriment.

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

(3) PIPE INSULATION. Steam, hot water supply and return piping in occupied areas shall be covered with not less than ½ inch insulating material, where the heat emission is objectionable or where piping is subject to freezing.

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

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

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

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