Wisconsin Administrative Code

Rules of
INDUSTRY, LABOR AND HUMAN RELATIONS

UNIFORM DWELLING CODE

Cite the rules in this Code as
(for example)
section Ind 20.01 Wis. Adm. Code

INDUSTRY, LABOR AND HUMAN RELATIONS
201 East Washington Avenue
Madison, Wisconsin 53702
INTRODUCTION

Purpose and Structure

The legislature, by section 35.93 and chapter 227, Wis. Stats., directed the publication of the rules of administrative agencies having rule-making authority in a loose-leaf, continual revision system known as the WISCONSIN ADMINISTRATIVE CODE. The code is kept current by means of new and replacement pages. The pages are issued monthly, together with notices of hearings, notices of proposed rules, emergency rules, new rules, instructions for insertion of new material, and other information relating to administrative rules. This monthly service is called the WISCONSIN ADMINISTRATIVE REGISTER, and comes to the subscriber after the 25th of each month.

Availability

The complete code and the upkeep service are distributed to the county law libraries; to the libraries of the University of Wisconsin Law School and Marquette University Law School; to the State Historical Society; to the Legislative Reference Bureau and to the State Law Library, and to certain designated public libraries throughout the state.

The sale and distribution of the code and of its parts is handled by Department of Administration, Document Sales and Distribution, 202 S. Thornton Ave., Madison, Wisconsin 53702.

Table of Contents

Each code with more than one chapter will have a table of chapters. After the title of each chapter will be the page numbers on which the chapter begins. Each chapter will have a table of sections. When a chapter has more than 10 sections and is over 10 pages in length the page number which that particular section begins on will be inserted after the title of the section.

History Notes

Each page of the code as it was originally filed and printed pursuant to the 1955 legislation, is dated "1-2-56": A rule which is amended or created subsequent to the original printing date is followed by a history note indicating the date and number of the REGISTER in which it was published and the date on which the amendment or the rule became effective. The absence of a history note at the end of a section indicates that the rule has remained unchanged since the original printing in 1956. The date line at the bottom of the page indicates the month in which the page was released. Some common abbreviations used in the history notes are: cr. = created, am. = amended, r. = repeal, recre. = recreate, renum. = renumber, eff. = effective and emerg. = emergency.

In some instances an entire chapter has been repealed and recreated subsequent to the original printing date. When this occurs a history note has been placed at the beginning of the chapter to contain this information. A separate history note appears after each section indicating the date when the revision became effective.

Index

The index for the complete Wisconsin Administrative Code will be found at the end of the last volume. It will be recompiled, reprinted and distributed annually. Some codes have a separate index prepared by the agency involved. See the Building Code for an example.
INDUSTRY, LABOR & HUMAN RELATIONS

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PART I—PURPOSE AND SCOPE

Ind 20.01 Purpose. The purpose of this code is to establish uniform statewide construction standards and inspection procedures for one- and 2-family dwellings and manufactured buildings for dwellings in accordance with the requirements of ss. 101.60 and 101.70, Stats.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 20.02 Scope. The provisions of this code shall apply to the construction and inspection procedures used for all new one- and 2-family dwellings and manufactured buildings for dwellings.

(1) MUNICIPAL ORDINANCES. (a) No municipality shall adopt an ordinance on any subject falling within the scope of this code including, but not limited to, establishing restrictions on the occupancy of dwellings for any reason other than noncompliance with the provisions of this code as set forth in section Ind 20.10 (3). This code does not apply to occupancy requirements occurring after the first occupancy for residential purposes following the final inspection referred to in section Ind 20.10 (1) (b) 3.

(b) This code shall not be construed to affect local requirements relating to land use, zoning, fire districts, side, front and rear setback requirements, property line requirements or other similar requirements. This code shall not affect the right of municipalities to establish safety regulations for the protection of the public from hazards at the job site.
(c) Any municipality may, by ordinance, require permits and fees for any construction, additions, alterations or repairs not within the scope of this code.

(2) LEGAL RESPONSIBILITY. The department or the municipality having jurisdiction shall not assume legal responsibility for the design or construction of dwellings.

(3) RETROACTIVITY. The provisions of this code are not retroactive.

(4) INNOVATIVE DWELLINGS. No part of this code is intended to prohibit or discourage the construction of innovative dwellings such as a dwelling built below ground, a geodesic dome, a concrete house, a fiberglass house or any other nonconventional structure.

(5) LANDSCAPING. The scope of this code does not extend to driveways, sidewalks, landscaping and other similar features not having an impact on the dwelling structure.

(6) LICENSING. No licenses or special permits shall be required for persons obtaining building permits for or performing work on dwellings.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 20.03 Effective date. The effective date of chapter Ind 22 of this code is December 1, 1978. Chapters Ind 20, 21, 23, 24 and 25 shall become effective 6 months after the date of publication.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 20.04 Applications. (1) NEW DWELLINGS. The provisions of this code shall apply to all dwellings and dwelling units, the initial construction of which was commenced on or after the effective date of this code. Additions and alterations to dwellings covered by this code shall comply with the provisions of this code at the time the permit for the addition or alteration is issued.

(2) RECREATIONAL DWELLINGS. Recreational dwellings, the initial construction of which was commenced on or after the effective date of this code, shall comply with all structural requirements of this code. The installation of any permanent heating, air conditioning, electrical or plumbing systems shall not be required; however, if such systems are installed, those systems shall comply with the provisions of this code. Any addition or alteration to such recreational dwelling or system therein shall comply with the provisions of the code at the time the permit for the addition or alteration is issued.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 20.05 Exemptions. (1) EXISTING DWELLINGS. The provisions of this code shall not apply to dwellings and dwelling units, the construction of which was commenced prior to the effective date of this code, or to additions or alterations to such dwellings.

(2) MULTIFAMILY DWELLINGS. The provisions of this code shall not apply to residences occupied by 3 or more families living independently or occupied by 2 such families and used also for business purposes.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART II—JURISDICTION

Ind 20.06 Procedure for municipalities exercising jurisdiction. (1) MUNICIPAL JURISDICTION. Pursuant to ss. 101.65 and 101.76, Stats., cities, villages, towns and counties may exercise jurisdiction over the construction and inspection of new dwellings. Municipalities intending to exercise jurisdiction shall adopt the Uniform Dwelling Code in its entirety. No additional standards within the scope of this code shall be adopted by the municipality unless specific approval has been granted by the department pursuant to section Ind 20.20. No such municipality shall exercise jurisdiction except in accordance with the following procedure.

(a) Intent to exercise jurisdiction. Municipalities intending to exercise jurisdiction shall notify the department, in writing, at least 30 days prior to the date upon which the municipality intends to exercise jurisdiction under this code. The notification of intent shall include a statement by the municipality as to which of the following methods will be used for enforcement:

1. Individual municipal enforcement.
2. Joint municipal enforcement.
3. Contract with certified inspector or independent inspection agency.
5. Contract with the department.
(b) Submission of ordinances. Municipalities intending to exercise jurisdiction shall submit all ordinances adopting the Uniform Dwelling Code to the department at the same time as the notice of intent. The department shall promptly inform the municipality whether an ordinance complies with the provisions of this code. A municipality may appeal a determination by the department that an ordinance does not comply with the code. Any such appeal shall follow the procedure set out in section Ind 20.21 (2).

(c) Passage of ordinances. A certified copy of all adopted ordinances and subsequent amendments thereto shall be filed with the department within 30 days after adoption.

Note: Municipalities adopting the model ordinance shall be considered to be in compliance with the provisions of this code and may exercise jurisdiction.

(2) County jurisdiction. A county ordinance shall apply in any city, village or town which has not enacted ordinances pursuant to this section. No county ordinance shall apply until after 30 days after the effective date of this code unless a municipality within the county informs the department of its intent to have this code administered and enforced by the county. This section shall not be construed to prevent or prohibit any municipality from enacting and administering this code at any time after the effective date of this code.

(3) Departmental jurisdiction. Pursuant to ss. 101.63 and 101.73, Stats., the department will administer and enforce this code in any municipality which has not adopted, or is not covered by, an ordinance adopted in accordance with this section.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART III—DEFINITIONS

Ind 20.07 Definitions. (1) Accessory building. Accessory building means a detached building, not used as a dwelling unit but is incidental to that of the main building and which is located on the same lot. Accessory building does not mean farm building.

(2) Addition. Addition means new construction performed on a dwelling which increases the outside dimensions of the dwelling.

(3) Allowable stress. Allowable stress means the specified maximum permissible stress of a material expressed in load per unit area.

(4) Alteration. Alteration means a substantial change or modification other than an addition or repair to a dwelling or to systems involved within a dwelling.

(5) Approved or approval. Approved means an approval by the department or its authorized representative. (Approval is not to be construed as an assumpion of any legal responsibility for the design or construction of the dwelling or building component.)

(6) Attic. Attic means a space under the roof and above the ceiling of the topmost part of a dwelling.

(7) Balcony. A balcony is a landing or porch projecting from the wall of a building.

(8) Basement. Basement means that portion of a dwelling between floor and ceiling which is below or partly below and partly above grade but so located that the vertical distance from the grade to the floor below is more than the vertical distance from grade to ceiling.

(9) Building component. Building component means any subsystem, subassemblage or other system designed for use in or as part of a structure which may include structural, electrical, mechanical, plumbing and fire protection systems and other systems affecting health and safety.

(10) Building system. Building system means plans, specifications and documentation for a system of manufactured building or for a type or a system of building components, which may include structural, electrical, mechanical, plumbing and variations which are submitted as part of the building system.

(11) Ceiling height. Ceiling height means the clear vertical distance from the finished floor to the finished ceiling.

(12) Certified inspector. Certified inspector means a person certified by the department to engage in the administration and enforcement of this code.

(13) Chimney. A chimney is one or more vertical, or nearly so, passageways or flues for the purpose of conveying flue gases to the atmosphere.

(14) Chimney connector. Same as smoke pipe.

(15) Closed construction. Closed construction means any building, building component, assembly or system manufactured in such a manner that it cannot be inspected before installation at the building site without disassembly, damage or destruction.


(17) Coefficient of performance (COP). Cooling or heating. Coefficient of performance (COP) is the ratio of the rate of net heat removal or net heat output to the rate of total energy input, expressed in consistent units and under designated rating conditions.

(18) Combustion efficiency. Combustion efficiency is expressed in percentage and is defined as 100 minus stack losses in percent of heat input. Stack losses are a) loss due to sensible heat in dry flue gas, b) loss due to incomplete combustion, and c) loss due to sensible and latent heat in moisture formed by combustion of hydrogen in the fuel.

(19) Compliance assurance program. Compliance assurance program means the detailed system documentation and methods of assuring that manufactured dwellings and dwelling components are manufactured, stored, transported, assembled, handled and installed in accordance with this code.

(20) Cooling load. Cooling load is the rate at which heat must be removed from the space to maintain a selected indoor air temperature during periods of design outdoor weather conditions.

(21) Dead load. Dead load means the vertical load due to all permanent structural and nonstructural components of the building such as
joints, rafters, sheathing, finishes and construction assemblies such as walls, partitions, floors, ceilings and roofs, and systems.

(22) DEGREE DAY, HEATING. Degree days are figured as the number of degrees the mean outdoor temperature deviates from 65°F each day during the heating season.

Note: For example, if on December 15, the low temperature was +30°F and the high temperature was +50°F, the mean temperature would equal (30° + 50°) / 2 = 40°; therefore, 65° - 40° = 25 degree days.

(23) DEPARTMENT. Department means the department of industry, labor and human relations.

(24) DETACHED BUILDING. Detached building means any building which is not physically connected to the dwelling.

(25) DWELLING. Dwelling means any building, the initial construction of which is commenced on or after the effective date of this code, which contains one or 2 dwelling units.

(26) DWELLING, EXISTING. An existing dwelling is a dwelling erected prior to the effective date of this code, one for which a valid building permit exists, or one for which lawful construction has commenced prior to the effective date of this code.

(27) DWELLING UNIT. Dwelling unit means a structure, or that part of a structure, which is used or intended to be used as a home, residence or sleeping place by one person or by 2 or more persons maintaining a common household, to the exclusion of all others.

(28) ENERGY EFFICIENCY RATIO. The energy efficiency ratio is the ratio of net cooling capacity in Btu per hour to total rate of electric input, in watts, under designated operating conditions.

(29) EXIST. Exit means a continuous and unobstructed means of egress to a street, alley or open court and includes intervening doors, doorways, corridors, halls, balconies, ramps, fire escapes, stairways and windows.

(30) FARM OPERATION. The farm operation is the planting and cultivating of the soil and growing of farm products substantially all of which have been planted or produced on the farm premises.

Note: According to s. 101.04 (11), Stats., the farm operation includes the management, conserving, improving and maintaining of the premises, tools, equipment improvements and the exchange of labor or services with other farmers; the processing, drying, packing, packaging, freezing, grading, storing, delivery to storage, carrying to market or to a currier for transportation to market and distributing directly to the consumer; the clearing of such premises and the salvaging of timber and the management and use of wood lots thereon but does not include logging, limbing and wood cutting operations unless the operations are conducted as an accessory to other farm operations.

(31) FARM PREMISES. The farm premises is defined to be the area which is planted and cultivated. The farm premises does not include greenhouses, structures or other areas unless used principally for the production of food or farm products.

(32) FARM PRODUCTS. Farm products are defined as agricultural, horticultural and arbicultural crops. Animals considered within the definition of agricultural include livestock, bees, poultry, fur-bearing animals, and wildlife or aquatic life.
(47) **Landing.** Landing means the level portion of a stairs located within a flight of stairs or located at the base and foot of a stairs.

(48) **Listed and Listing.** Listed and listing means equipment or building components which are tested by an independent testing agency and accepted by the department.

(49) **Live Load.** Live load means the weight superimposed on the floors, roof and structural and nonstructural components of the dwelling through use and by snow, ice or rain.

(50) **Loft.** Loft means an upper room or floor which is open to the floor below.

(51) **Manufacture.** Manufacture means the process of making, fabricating, constructing, forming or assembling a product from raw, unfinished, semifinished or finished materials.

(52) **Manufactured building.** (a) Manufactured building means any structure or component thereof which is intended for use as a dwelling and:

1. Is of closed construction and fabricated or assembled on site or off site in manufacturing facilities for installation, connection or assembly and installation at the building site; or

2. Is a building of open construction which is made or assembled in manufacturing facilities away from the building site for installation, connection, or assembly and installation on the building site and for which certification is sought by the manufacturer.

(b) The term manufactured building does not include a building of open construction which is not subject to section Ind 20.07 (52) (a) 2.

A single or double width mobile home is not considered a manufactured building and is not subject to this code.

(53) **Masonry units (hollow) and (solid).** (a) **Hollow unit.** A hollow unit is a masonry unit in which the net cross-sectional area parallel to the bearing face is less than 75% of the gross cross-sectional area.

(b) **Solid unit.** Masonry units having net cross-sectional areas of 75% or more of the gross cross-sectional area are classified as solid units.

(54) **Multi-wythe wall.** A multi-wythe wall is a masonry wall composed of 2 or more wythes of masonry units tied or bonded together.

(55) **Municipality.** Municipality means any city, village, town or county in this state.

(56) **Open construction.** Open construction means any building, building component, assembly or system manufactured in such a manner that it can be readily inspected at the building site without disassembly, damage or destruction.

(57) **Owner.** Owner means any person having a legal or equitable interest in the dwelling.

(58) **Perm.** Perm is the designation for the unit permeance which is a substitute for the unit, one grain per (hour) (square foot) (inch of mercury vapor pressure difference).
expressed in units of Btu per hour (square foot) (degree F). It is the time rate of heat flow. The U-value applies to combinations of different materials used in series along the heat flow path and also to single materials that comprise a building section, and includes cavity air spaces and surface air films on both sides. The lower the U-value of a material, the more difficult it is for heat to flow through the material.

(75) Throat. The throat of a fireplace is the slot-like opening above the firebox through which flames, smoke and other products of combustion pass into the smoke chamber.

(76) Vent. Vent means a vertical flue or passageway to vent fuel-burning appliances.

(77) Vent connector. A vent connector is a connector between a fuel-burning appliance and the chimney or vent.

(78) Window. Window means a glazed opening in an exterior wall, including glazed portions of doors, within a conditioned space.

(79) Wisconsin insignia. Wisconsin insignia means a device or seal approved by the department to certify compliance with this code.

PART IV—APPROVAL AND INSPECTION OF ONE- AND 2-FAMILY DWELLINGS

Ind 20.08 Wisconsin uniform building permit. A Wisconsin uniform building permit shall be obtained from the department or the municipality administering and enforcing this code before any on-site construction within the scope of this code is commenced, except where a permit to start construction has been issued in accordance with section Ind 20.09 (5) (b) 2. A Wisconsin uniform building permit shall not be required for repairs.

Note: Section Ind 20.09 (5) (b) 2 permits the issuance of a footing and foundation permit prior to the issuance of the Wisconsin uniform building permit.

History: Cr. Register, November, 1978, No. 287, eff. 6-1-80.

Ind 20.09 Procedures for obtaining uniform building permit. (1) Application for a Wisconsin uniform building permit. Application for a Wisconsin uniform building permit shall be on the forms obtained from the department or the municipality administering and enforcing this code. No application shall be accepted that does not contain all the information requested on the form.

Note 1: See appendix for a copy of the Wisconsin uniform building permit and application.

Note 2: Any municipality exercising jurisdiction may require reasonable supplementary information not contained in the Wisconsin building permit application.

(2) Filing of the Wisconsin uniform building permit application. The Wisconsin uniform building permit application shall be filed with the municipality administering and enforcing this code or its authorized representative. The municipality shall promptly forward a copy of all applications to the department. If no municipality administers and enforces the code, the application shall be filed with the department or its authorized representative.

Note: Section 101.64, Stats., permits the department to collect and publish data.

(3) Fees. (a) Municipal fees. Fees shall be submitted to the municipality at the time the Wisconsin uniform building permit application is filed. The municipality shall, by ordinance, determine fees to cover expenses for plan examination, inspection and the issuance of the Wisconsin uniform building permit. The municipality shall collect and send to the department the fee for the Wisconsin uniform building permit in accordance with Wis. Adm. Code sec 69.21.

(b) Department fees. Where the department administers and enforces the code, the fees for plan examination, inspection, and the issuance of the Wisconsin uniform building permit, in accordance with section Ind 69.21, shall be submitted to the department, or its authorized representative, at the time the Wisconsin uniform building permit application is filed.

(4) Submission of plans. At least 2 sets of plans for all one- and 2-family dwellings shall be submitted to the department, or the municipality administering and enforcing this code, for examination and approval at the time the Wisconsin uniform building permit application is filed. A municipality exercising jurisdiction may require a third set of plans at its option.

(a) Required building plans. The required building plans shall be legible and drawn to scale or dimensioned and shall include the following:

1. Plot plan. The plot plan shall show the location of the dwelling and any other buildings, wells and disposal systems on the property with respect to property lines.

2. Floor plans. Floor plans shall be provided for each floor. The size and location of all rooms, doors, windows, structural features, exit passageways and stairs shall be indicated. The location of plumbing fixtures, chimneys, and heating and cooling appliances, and, when requested, a heating distribution layout shall be included.

3. Elevations. The elevations shall contain information on the exterior appearance of the building, indicate the location, size and configuration of doors, windows, roof, chimneys, exterior grade, footings and foundation walls, and include the type of exterior materials.

(b) Data required. All required plans submitted for approval shall be accompanied by sufficient data and information to determine if the dwelling will meet the requirements of this code. The data and information for determining compliance with the energy conservation standards shall be submitted on forms provided by the department or other approved forms.

(c) Master plans. Where a dwelling is intended to be identically and repetitively constructed at different locations, a master plan may be submitted for approval. The plans shall include floor plans, elevations and data as required in section Ind 20.09 (4) (a) 2. and if the plans conform to the provisions of the code, an approval and a master plan application to the department. If no municipality administers and enforces the code, the application shall be filed with the department or its authorized representative.
number shall be issued. The number issued may be used in lieu of submitting building plans for each location. A plot plan shall be submitted for each location at the time of application for the Wisconsin uniform building permit.

(5) Approval of plans and issuance of permits. (a) Plan approval. If the department, or the municipality administering and enforcing the code, determines that the plans submitted for a one- or 2-family dwelling substantially conform to the provisions of this code and other legal requirements, an approval shall be issued. The plans shall be stamped "conditionally approved" by a certified inspector or certified independent inspection agency. One copy shall be returned to the applicant; one copy shall be retained by the department or the municipality administering and enforcing the code. The conditions of approval shall be indicated by a letter or on the permit. All conditions of the approval shall be met during construction.

(b) Issuance of permits. 1. Uniform building permit. The Wisconsin uniform building permit shall be issued if the requirements for filing and fees are satisfied and the plans have been conditionally approved. The permit shall expire 24 months after issuance if construction has not commenced. The municipality issuing the Wisconsin uniform building permit shall send a copy of the application to the department.

2. Permit to start construction of footings and foundation. Construction may begin on footings and foundations prior to issuance of the Wisconsin uniform building permit where a permit to start construction is obtained. Upon submission of the application for a permit to start construction, a plot plan, complete footing and foundation information including exterior grading, and a fee, the department or the municipality enforcing this code may issue a permit to start construction of the footings and foundation. The issuance of a permit to start construction shall not influence the approval or denial of the application.

(c) Posting of permit. The Wisconsin uniform building permit shall be posted in a conspicuous place at the dwelling site.

(6) Disapproval of plans and denial of permits. If the department, or the municipality administering and enforcing the code, determines that the Wisconsin uniform building permit application or the plans do not substantially conform to the provisions of this code or other legal requirements are not met, approval shall be denied.

(a) Denial of application. A copy of the "denied" application, accompanied by a written statement specifying the reasons for denial, shall be sent to the applicant and to the owner as specified on the Wisconsin uniform building permit application.

(b) Stamping of plans. Plans which do not substantially conform to the provisions of the code shall be stamped "not approved." One copy shall be returned to the person applying for the Wisconsin uniform building permit; one copy shall be retained by the department or the municipality administering and enforcing the code.

(c) Appeals. The applicant may appeal a denial of the application in accordance with the procedure outlined in section Ind 20.21.

(7) Action to approve or deny. Action to approve or deny shall be taken promptly and in no case longer than 14 days from the date of application.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 20.10 Inspections. All inspections, for the purpose of administering and enforcing this code, shall be performed by a certified inspector or certified independent inspection agency.

(1) Required inspections. Inspections shall be conducted by the department or the municipality enforcing and enforcing this code to ascertain whether or not the construction or installations conform to the conditionally approved plans, the Wisconsin uniform building permit application and the provisions of this code and shall notify the permit holder and the owner of any violations to be corrected.

(a) Inspection notice. The applicant or an authorized representative shall, in writing or orally, request inspections of the department or the municipality administering and enforcing this code. The department, or the municipality administering and enforcing this code, shall perform the requested inspection within 48 hours after notification, except the final inspection. Construction shall not proceed beyond the point of inspection until the inspection has been completed. Construction may proceed if the inspection has not taken place within 48 hours of the notification, excluding Saturdays, Sundays and holidays, except if otherwise agreed between the applicant and the department or the municipality administering and enforcing the code.

(b) Inspection types. The following sequence of inspections shall be performed for the purpose of determining if the work complies with this code:

1. Footing and foundation inspection. The excavation shall be inspected after the placement of forms, shoring and reinforcement, where required, and prior to the placement of footing materials. Where below-grade drain tiles, waterproofing or exterior insulation is required, the foundation shall be inspected prior to backfilling.

2. Rough inspection. A rough inspection shall be performed for each inspection category listed in a. through e. of this section before the rough work is constructed but before it is concealed. All categories of work for rough inspections may be completed before the notice for inspection is provided. The applicant may request one rough inspection or individual rough inspections. A separate fee may be charged for each individual inspection.

a. General construction, including framing.

b. Rough electrical.

c. Rough plumbing.

d. Rough heating, ventilating and air conditioning.

e. Insulation.
3. Final inspection. The dwelling may not be occupied until a final inspection has been made which finds that no violations of this code exist that could reasonably be expected to affect the health and safety of the occupant.

a. The basement portion of the dwelling may be occupied prior to completion of the dwelling, but only if the basement portion to be occupied would otherwise comply with the provisions of this code, particularly those relating to construction of underground dwellings.

(c) Notice of compliance or noncompliance. Notice of compliance or noncompliance shall be written on the building permit and posted at the job site. Upon finding of noncompliance, the department or the municipality enforcing this code shall notify the applicant and the owner, in writing, of the violations to be corrected. All cited violations shall be ordered corrected within 30 days after written notification, unless an extension of time is granted pursuant to section Ind 20.21.

(3) VOLUNTARY INSPECTION. The department or its authorized representative may, at the request of the owner or the lawful occupant, enter and inspect dwellings, subject to the provisions of this code, to ascertain compliance with this code.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 20.11 Suspension or revocation of Wisconsin uniform building permit. The department, or the municipality administering and enforcing this code, may suspend or revoke any Wisconsin uniform building permit where it appears that the permit or approval was obtained through fraud or deceit, where the applicant has willfully refused to correct a violation, or where the inspector is denied access to the premises. No construction shall take place on the dwelling after suspension or revocation of the permit.

(1) Any person aggrieved by a determination made by the municipality exercising jurisdiction may appeal the decision in accordance with section Ind 20.21.

(2) Any person aggrieved by a determination made by the department may appeal the decision in accordance with section Ind 20.21.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART V—APPROVAL AND INSPECTION OF MANUFACTURED DWELLINGS AND THEIR COMPONENTS

Ind 20.12 Scope. This part shall govern the design, manufacture, installation and inspection of manufactured dwellings, manufactured building systems, and the components of the building systems displaying the Wisconsin insignia.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 20.13 Manufacture, sale and installation of dwellings. (1) Manufacture and sale. No manufactured dwelling, manufactured building system or component subject to this part shall be manufactured for use, sold for initial use or installed in this state unless it is approved by the department and it bears the Wisconsin insignia issued or a state seal or an insignia reciprocally recognized by the department.

(2) INSTALLATION. A Wisconsin uniform building permit shall be obtained in accordance with the procedures outlined in section Ind 20.09 (1), (2), (3) and (4) (a) 1. before any on-site construction falling within the scope of this code is commenced for a manufactured dwelling. The permit shall be issued in accordance with section Ind 20.09 (b) 1.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 20.14 Approval procedures. (1) APPLICATION FOR APPROVAL. An application for the approval of any manufactured dwelling, building system or component shall be submitted to the department, in the form required by the department, along with the appropriate fees in accordance with section Ind 69.21.

(2) APPROVAL OF BUILDING SYSTEMS AND COMPONENTS. (a) Approval of building systems. 1. Plans and specifications. At least 3 complete sets of building, structural, mechanical and electrical plans (including elevations, sections, details), specifications and calculations of such building system shall be submitted to the department on behalf of the manufacturer for examination and approval.

2. Compliance assurance program. Three sets of the compliance assurance program shall be submitted for examination and approval. The compliance assurance program submitted to the department on behalf of the manufacturer shall meet the standards of the NBS “Model Rules and Regulations” [Ind 20.24 (3)] or their equivalent as determined by the department.

(b) Approval of building components. 1. Plans and specifications. At least 3 complete sets of plans and specifications for manufactured dwelling building components shall be submitted to the department on behalf of the manufacturer for examination and approval.

2. Compliance assurance program. Three sets of the compliance assurance program shall be submitted to the department on behalf of the manufacturer for examination and approval. The compliance assurance program shall meet the requirements established by the department or, where applicable, be in the form of the NBS “Model Rules and Regulations” [Ind 20.24 (3)].

(3) NOTIFICATION OF APPROVAL OR DENIAL OF PLANS, SPECIFICATIONS AND COMPLIANCE ASSURANCE PROGRAM. (a) Conditional approval. If the department determines that the plans, specifications, compliance assurance program and application for approval submitted for such building system or component substantially conform to the provisions of this code, a conditional approval shall be issued. A conditional approval is issued by the department shall not constitute an assumption of any liability for the design or construction of the manufactured building.

1. Written notice. The conditional approval shall be in writing and sent to the manufacturer and the person submitting the application for approval. Any noncompliance specified in the conditional approval shall be corrected before the manufacture, sale or installation of the dwelling, building system or component.
2. Stamping of plans, specifications and compliance assurance program. Approved plans, specifications and compliance assurance programs shall be stamped "conditionally approved." At least 2 copies shall be returned to the person designated on the application for approval; one copy shall be retained by the department.

(b) Denial. If the department determines that the plans, specifications, compliance assurance program or the application for approval do not substantially conform to the provisions of this code, the application for approval shall be denied.

1. Written notice. The denial shall be in writing and sent to the manufacturer and the person submitting the application for approval. The notice shall state the reasons for denial.

2. Stamping of plans, specifications and compliance assurance program. Plans, specifications and compliance assurance programs shall be stamped "not approved." At least 2 copies shall be returned to the person submitting the application for approval; one copy shall be retained by the department.

(4) Evidence of approval. The manufacturer shall keep at each manufacturing plant where such building system or component is manufactured, one set of plans, specifications and compliance assurance program bearing the stamp of conditional approval. The conditionally approved plans, specifications and compliance assurance program shall be available for inspection by an authorized representative of the department during normal working hours.

(5) Inspections. Manufacturers shall contract with the department or an independent inspection agency to conduct in-plant inspections to assure that the building system and components manufactured are in compliance with the plans, specifications and the compliance assurance program approved by the department. All inspections, for the purpose of administering and enforcing this code, shall be performed by a certified inspector or certified independent inspection agency.

(6) Wisconsin insignia. Upon departmental approval of the plans, specifications and compliance assurance program, and satisfactory in-plant inspections of the building system and components, Wisconsin insignias shall be purchased from the department in accordance with the fee established in section Ind 69.21. A manufacturer shall be entitled to display the Wisconsin insignia on any approved system or component.

(a) Lost or damaged insignia. 1. Notification. If Wisconsin insignias become lost or damaged, the department shall be notified immediately, in writing, by the manufacturer or dealer.

2. Return of damaged insignias. If Wisconsin insignias become damaged, the insignia shall be returned to the department with the appropriate fee to obtain a new insignia.

(b) Affixing Wisconsin insignias. Each Wisconsin insignia shall be assigned and affixed to a specific manufactured dwelling or component in the manner approved by the department before the dwelling is shipped from the manufacturing plant.

(c) Insignia records. 1. Manufacturer's insignia records. The manufacturer shall keep permanent records regarding the handling of all Wisconsin insignias, including construction compliance certificates, indicating the number of Wisconsin insignias which have been affixed to manufactured dwellings or manufactured building components (or groups of components); which Wisconsin insignias have been applied to which manufactured dwelling or manufactured building component; the disposition of any damaged or rejected Wisconsin insignias; and the location and custody of all unused Wisconsin insignias. The records shall be maintained by the manufacturer or the independent inspection agency for at least 10 years. A copy of the records shall be sent to the department upon request.

2. Construction compliance certificate. Within 30 days after receiving the original Wisconsin insignias from the department, and at the end of each month thereafter, the manufacturer shall submit a construction compliance certificate, in the form determined by the department, for each manufactured dwelling intended for sale, use or installation in the state.

(d) Unit identification. Each manufactured dwelling and major transportable section or component shall be assigned a serial number. The serial number shall be located on the manufacturer's data plate.

(e) Manufacturer's data plate. The manufacturer's data plate for building systems shall contain the following information, where applicable:

1. Manufacturer's name and address;
2. Date of manufacture;
3. Serial number of unit;
4. Model designation;
5. Identification of type of gas required for appliances and directions for water and drain connections;
6. Identification of date of the codes or standards complied with;
7. State insignia number;
8. Design loads;
9. Special conditions or limitations of unit;
10. Electrical ratings; instructions and warnings on voltage, phase, size and connections of units and grounding requirements.

(7) Reciprocity. Upon request, the department will make available to any person a list of those states whose dwelling codes are considered equal to the codes established by the department and whose products are accepted reciprocally by Wisconsin.
(2) Effect of Insignia. Manufactured dwellings and manufactured building components bearing the Wisconsin insignia are deemed to comply with this code, except as to installation site requirements, regardless of the provisions of any other ordinance, rule, regulation or requirement.

(3) Right to Install. Manufactured dwellings and components bearing the Wisconsin insignia may be manufactured, offered for sale and shall be entitled to be installed anywhere in Wisconsin where the installation site complies with the other provisions of this code.

History: Cr. Register, November, 1970, No. 287, eff. 6-1-70.

Ind 20.16 Suspension and revocation of approval. The department shall suspend or revoke its approval of a manufactured building system or manufactured building component if it determines that the standards for construction or the manufacture and installation of a manufactured building system or manufactured building component do not meet this code or that such standards are not being enforced as required by this code. The procedure for suspension and revocation of approval shall be as follows:

(1) Filing of complaint. Proceedings to suspend or revoke an approval shall be initiated by the department or an independent inspection agency having a contract with the manufacturer whose approval is sought to be suspended or revoked. Initiation shall be by a written complaint filed with the department. Any alleged violation of the code shall be set forth in the complaint with particular reference to time, place and circumstances.

(2) Investigation and notification. The department may investigate alleged violations of its own initiative or upon the filing of a complaint. If it is determined that no further action is warranted, the department shall notify the persons affected. If the department determines that there is probable cause, it shall order a hearing and notify the persons affected.

(3) Mailing. Unless otherwise provided by law, all orders, notices and other papers may be served by mail to the persons affected at their last known address. If the service is refused, service may be made by sheriff without amendment of the original order, notice or other paper.

(4) Response. Upon receipt of notification of hearing from the department, the person charged with noncompliance or nonenforcement may submit to the department a written response within 30 days of the date of service. If the person charged files a timely written response, such person shall thereafter be referred to as the respondent.

(5) Conciliation agreement prior to hearing. If the department and the respondent are able to reach agreement on disposition of a complaint prior to hearing, such agreement shall:

(a) Be transmitted in writing to the secretary;

(b) Not be binding upon any party until signed by all parties and accepted by the secretary;

(c) Not be considered a waiver of any defense or admission of any fact until accepted by the secretary.

History: Cr. Register, November, 1970, No. 287, eff. 6-1-70.

Ind 20.17 Effect of suspension and revocation. (1) Hearing of Insignia. Upon suspension or revocation by the department of the approval of any manufactured dwelling or manufactured building component, no further insignia shall be attached to any dwelling or building component manufactured with respect to which the approval was suspended or revoked. Upon termination of such suspension or revocation, insignias may again be attached to the dwelling or building component manufactured after the date approval is reinstated. Should any dwelling or building component have been manufactured during the period of suspension or revocation, it shall not be entitled to bear the Wisconsin insignia unless the department has inspected, or caused to be inspected, such manufactured dwelling or manufactured building component, and is satisfied that all requirements for certification have been met.

(2) Return of insignia. The manufacturer shall return to the department all insignias allocated for a manufactured dwelling or manufactured building component no later than 30 days from the effective date of any suspension or revocation of the approval by the department. The manufacturer shall also return to the department all insignias which it determines for any reason are no longer needed.

History: Cr. Register, November, 1970, No. 287, eff. 6-1-70.

PART VI—APPROVAL OF MATERIALS

Ind 20.18 Materials. (1) Alternate materials. No provision in this code is intended to prohibit or prevent the use of any alternate material or method of construction not specifically mentioned in this code. Approval of alternate materials or methods of construction shall be obtained from the department. Requests for approval shall be accompanied by evidence showing that the alternate material or method of construction performs in a manner equal to or superior to the material or method required by the code. The department may require any
claims made regarding the equivalent performance of alternate materials or methods to be substantiated by test.

(a) Tests. The department may require that the materials, methods, systems, components, or equipment be tested to determine the suitability for the intended use. The department will accept results of tests conducted by a recognized independent testing agency. The cost of testing shall be borne by the person requesting the approval.

1. The test method used to determine the performance shall be one that is a nationally recognized standard.

2. If no nationally recognized standard exists, past performance or recognized engineering analysis may be used to determine suitability.

(2) Ungraded or Used Materials. Ungraded or used building materials may be used or reused as long as the material possesses the essential properties necessary to achieve the level of performance required by the code for the intended use. The department or the municipality enforcing this code may require tests in accordance with (1) (a) of this section.

History: Cr. Register, November, 1979, No. 267, eff. 6-1-80.

PART VII—VARIANCES, APPEALS, VIOLATIONS, PENALTIES AND SEVERABLE CLAUSES

Ind 29.19 Individual variance from a specific rule. The department may grant an individual variance to a specific rule only if the granting of such variance does not result in lowering the level of health, safety and welfare established or intended by the specific rule. The department may consider other reasonable criteria in determining whether a variance should be granted including, but not limited to, the effect of granting the variance on statewide and local uniformity.

(1) Application for variance. The applicant shall submit the application for variance to the municipality exercising jurisdiction. Where no municipality exercises jurisdiction, the application shall be submitted to the department. The following items shall be submitted when requesting a variance:

(a) A clear and concise written statement of the specific provisions of this code from which a variance is requested together with a specific statement of the procedure and materials to be used if the variance is granted.

(b) A fee to be determined by the department or the municipality exercising jurisdiction. Where the municipality administers and enforces the code, the department may require a fee for the processing of the application in addition to any municipal fee.

(2) Municipal recommendation. The municipality administering and enforcing this code shall submit all applications for variance to the department, together with a municipal recommendation concerning whether or not a variance should be granted within 10 days, excluding Saturdays, Sundays and legal holidays, after the receipt of the application. The recommendation of the municipality shall include, but not be limited to, the following items:

History: Cr. Register, November, 1979, No. 267, eff. 6-1-80.

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(a) What inspections, if any, have actually taken place with regard to the dwelling for which a variance is requested;

(b) Whether or not any correction orders have been issued with regard to the dwelling; and

(c) Whether the granting of the variance would substantially affect the health, safety or welfare of any individual within the municipality.

(3) Departmental action. Where a municipality administers and enforces the code, the department shall approve or deny applications for variance and shall mail said notification to the municipality and the applicant within 5 days, excluding Saturdays, Sundays and legal holidays, after receipt of the application for variance and recommendation is received from the municipality. Where the department administers and enforces the code, the department shall approve or deny applications for variance and shall mail said notification to the applicant within 15 days, excluding Saturdays, Sundays and legal holidays, after receipt of the application and fees by the department.

(4) Appeals. Any aggrieved applicant, or the municipality administering and enforcing the code, may appeal the determination of the department in the manner set out in ss. 101.02 (6) (e) to (i) and (8), Stats.

History: Cr. Register, November, 1979, No. 267, eff. 6-1-80.

Ind 29.20 Municipal variance from the code. Any municipality exercising or intending to exercise jurisdiction under this code may apply to the department for a variance permitting the municipality to adopt an ordinance not in conformance with this code.

(1) Application for variance. The department may grant an application only under the following circumstances:

(a) The municipality has demonstrated that the variance is necessary to protect the health, safety or welfare of individuals within the municipality because of specific climate or soil conditions generally existing within the municipality.

(b) The municipality has demonstrated that the granting of the variance, when viewed both individually and in conjunction with other variances requested by the municipality, does not impair the statewide uniformity of this code.

(2) Departmental inquiry. Prior to making a determination, the department shall solicit within the municipality and consider the statements of any interested persons as to whether or not said application should be granted.

(3) Appeals. Any municipality aggrieved by the denial of such an application may appeal such determination in accordance with the procedure set out in ss. 101.02 (6) (e) to (i) and (8), Stats.

(4) Uniformity. This section shall be strictly construed in accordance with the goal of promoting statewide uniformity.

History: Cr. Register, November, 1979, No. 267, eff. 6-1-80.
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state may impose under (1) and (2) of this section. Any municipality invoking a remedy or penalty, including forfeiture, shall promptly notify the department of the remedy or penalty being imposed and the reason therefor.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 20.23 Saving and severable clauses. If, for any reason, any one or more sections, sentences, clauses or parts of this code are held invalid, such invalidity shall not affect, impair or invalidate the remaining provisions.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART IX—ADOPTION OF STANDARDS

Ind 20.24 Adoption of standards. All dwellings are required to be designed by the method of structural analysis or the method of accepted practice outlined in each chapter of the code. Dwellings designed by the method of structural analysis shall comply with the standards and manuals listed in (1) through (6) of this section. Pursuant to s. 227.025, Stats., the attorney general and the revisor of statutes have consented to the incorporation by reference of the following standards. Copies of the standards are on file in the offices of the department, the secretary of state, the revisor of statutes and in each county law library. Copies for personal use may be obtained, at a reasonable cost, from the organizations listed.


(2) American Concrete Institute (ACI), P.O. Box 19150, Redford Station, Detroit, Michigan 48219, BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE, ACI 318-77.


History: Cr. Register, October, 1979, No. 287, eff. 6-1-80.
INDUSTRY, LABOR & HUMAN RELATIONS

Chapter Ind 21

CONSTRUCTION STANDARDS

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Part I—SCOPE

Ind 21.01 Scope. The provisions of this chapter shall apply to the design and construction of all one- and two-family dwellings.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART II—DESIGN CRITERIA

Ind 21.02 Loads and materials. Every dwelling shall be designed and constructed in accordance with the requirements of this section.

(1) Design load. Every dwelling shall be designed and constructed to support the actual dead load, live loads and wind loads acting upon it without exceeding the allowable stresses of the material.

(a) Dead loads. Every dwelling shall be designed and constructed to support the actual weight of all components and materials. Earth-sheltered dwellings shall be designed and constructed to support the actual weight of all soil loads.

(b) Live loads. 1. Floors and ceilings. Floors and ceilings shall be designed and constructed to support the minimum live loads listed in Table 21.02. The design load shall be applied uniformly over the component area.
Chapter Ind 21

CONSTRUCTION STANDARDS

PART I—SCOPE

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(b) Live loads. 1. Floors and ceilings. Floors and ceilings shall be designed and constructed to support the minimum live loads listed in Table 21.02. The design load shall be applied uniformly over the component area.
TABLE 21.02

<table>
<thead>
<tr>
<th>Component</th>
<th>Design Load (pounds per sq. ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Floors</td>
<td>40</td>
</tr>
<tr>
<td>Garage floors</td>
<td>40</td>
</tr>
<tr>
<td>Balconies</td>
<td>80</td>
</tr>
<tr>
<td>Ceilings (with storage)</td>
<td>20</td>
</tr>
<tr>
<td>Ceilings (without storage)</td>
<td>10</td>
</tr>
</tbody>
</table>

2. Snow loads. Roofs shall be designed and constructed to support the minimum snow loads listed on the zone map. The loads shall be assumed to act vertically over the roof area projected upon a horizontal plane.

(c) Wind loads. Every dwelling shall be designed and constructed to withstand a horizontal and uplift pressure of 20 pounds per square foot acting over the surface area.

(d) Fasteners. All building components shall be fastened to withstand the dead load, live load and wind load. Where the effect of the dead load exceeds the wind load effect, the dwelling need not be anchored to the foundation.

Note: See the Appendix for a schedule of fasteners.
(2) Methods of design. All dwellings shall be designed by the method of structural analysis or the method of accepted practice specified in each part of this code.

Note: See Wis. Admin. Code chapter NR 116, rules of the department of natural resources, for special requirements relating to buildings located in flood plain zones. Information regarding the elevation of the regional flood may be obtained from the local zoning official.

(3) Structural analysis standards. Structural analysis shall conform to the following nationally recognized standards.


(b) Structural steel. The design, fabrication and erection of structural steel for buildings shall conform to AISI, "Specification for Design, Fabrication and Erection of Structural Steel for Buildings" [Ind 20.24 (1)] and the provisions of the accompanying commentary for this specification.

(c) Concrete. Plain, reinforced or prestressed concrete construction shall conform to the following standards:

1. ACI Std. 318, "Building Code Requirements for Reinforced Concrete" [Ind 20.24 (2)].

Note: The following standards are recognized by the department as being good construction practice: (1) "Commentary on Building Code Requirements for Reinforced Concrete," ACI Std. 318; (2) "Recommended Practice for Selecting Proportions for Concrete," ACI Std. 311.1; (3) "Recommended Practice for Selecting Proportions for Structural Lightweight Concrete," ACI Std. 311.2; (4) "Recommended Practice for Hot Weather Concrete," ACI Std. 305; (5) "Recommended Practice for Cold Weather Concrete," ACI Std. 306; (6) "Manual of Standard Practice for Detailing Reinforced Concrete Structures," ACI Std. 318; (7) "Recommended Practice for Evaluation of Compressive Test Results of Field Concrete," ACI Std. 214; (8) "Recommended Practice for Measuring, Mixing and Placing Concrete," ACI Std. 210.1; (9) "Recommended Practice for Concrete Formwork," ACI Std. 347; (10) "Specification for the Design and Construction of Reinforced Concrete Chimneys," ACI Std. 355; (11) "Recommended Design of Joints and Connections in Precast Structural Concrete," ACI Report 318-81; (12) "Guide for Cellular Concrete Aromatic 50 cu. ft. and for Aggregate Concretes Aborted of 60 cu. ft. with Compressive Strengths Less than 2500 psi," ACI JOURNAL, 1975. (Copies of above standards may be obtained from American Concrete Institute, P.O. Box 19150, Redford Station, Detroit, Michigan 48219.)

(e) Masonry. The design and construction of masonry buildings shall conform to the "Concrete Masonry Handbook" [Ind 20.24 (5)].

History: Cr. Reg., Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.03 Exits, doors and hallways. Every dwelling unit shall be provided with at least 2 exits. One exit shall lead to grade; the remaining exit may be an exit to grade, a balcony located within 10 feet of grade, or the exit may discharge into an attached garage with an exit door leading to the exterior. The overhead garage door may not be used as the exit door. The exits shall be located as far apart as practicable.

(1) Exit doors. The main exit door shall be at least 3 feet 6 inches wide by 6 feet 4 inches high and the second exit door shall be at least 2 feet 8 inches wide by 6 feet 4 inches high. The second exit may be a sliding door. Where double doors are provided, the width of each single door shall be at least 2 feet 6 inches. The overhead garage door may not be considered as a second exit door.

(2) Interior circulation. All passageway doors to at least 50% of the bedrooms, at least one full bathroom, and the common-use areas such as kitchens, dining rooms, living rooms and family rooms shall be at least 2 feet 8 inches wide by 6 feet 4 inches high. Where cased or uncovered openings are provided in lieu of doors, the clear width of the passageway openings shall measure at least 2 feet 6 inches.

(3) Hallways. Hallways shall be at least 3 feet in width.

Note: Door hardware, finish trim and heating registers may infringe upon this dimension.

History: Cr. Reg., Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.04 Stairs. Every exterior or interior exit stairs shall conform to the requirements of this section. Ladders may be used for access to occupied loft areas of not more than 200 square feet or to storage and equipment areas. Ladders or stairs not required by this code are exempt from the requirements of this section.

(1) Minimum width. Every required exit stairs shall measure at least 3 feet 0 inches in width, except that stairs leading to basements may measure 2 feet 8 inches in width.

(2) Headroom. Every stairs shall be provided with a minimum headroom clearance of 6 feet 4 inches. The minimum clearance shall be measured vertically from a line parallel to the edge of the treads to the ceiling or soffit directly above that line.

(3) Treads and Risers. Risers shall not exceed 8-5/8 inches in height, measured vertically from tread to tread. Treads shall be at least 9 inches wide, measured horizontally from riser to riser. There shall be no variation in uniformity exceeding 3/16 inch in the depth of tread or in the height of risers. No flight of stairs shall exceed 12 feet in height vertically unless landings are provided.

(4) Landings. (a) Intermediate landings. Intermediate landings located in a flight of stairs shall be at least as wide as the stairs and shall...
measure at least 3 feet 0 inches in the direction of travel. Trim and handrails may project no more than 3-1/2 inches into the required width.

(b) Landings at the top and base of stairs. A level landing shall be provided at the top and at the base of every stairs. The landing shall be at least as wide as the stairs and shall measure at least 3 feet 0 inches in the direction of travel.

(c) Doors at landings. Where a door is provided at the head or foot of a stairs, a level landing on each side of the door shall be provided between the door and the stairs, regardless of the door swing.

1. Exception. No landing shall be required between the door and the basement stairs or stairs leading to a garage, provided the door does not swing over the stairs.

2. Exception. A storm door or screen door shall be permitted to swing over an exterior platform or sidewalk provided the platform or sidewalk is located not more than 8-1/2 inches below the floor level and the platform has a length at least equal to the width of the door.

(5) Handrails and guardrails. (a) Handrails. Every stairs of more than 3 risers shall be provided with at least one handrail. Handrails shall be provided on all open sides.

(b) Guardrails. All openings between floors, open sides of landings, platforms, balconies or porches which are more than 24 inches above grade or a floor shall be protected with guardrails.

(c) Handrail and guardrail details. 1. Height. Handrails shall be located at least 30 inches, but not more than 34 inches, above the upper surface of the tread. Guardrails shall be located at least 36 inches above the upper surface of the floor.

2. Open railings. Open guardrails or handrails shall be provided with intermediate rails or an ornamental pattern such that an object 12 inches in diameter cannot pass through.

3. Clearance. The clearance between the handrail and the wall surface shall be at least 1-1/2 inches.

(6) Winders. Winder steps may be used in required exit stairs where the length of the tread is at least 3 feet 0 inches and the winder tread measures at least 7 inches in width at a point one foot from the narrow end of the tread.

(7) Spiral stairs. Spiral stairs may be used as required exit stairs. The tread shall measure at least 26 inches from the outer edge of the supporting column to the inner edge of the handrail and at least 7 inches in width at a point one foot from the narrow end of the tread.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.06 Light and ventilation. (1) Natural light. All habitable rooms, except those located in basements, shall be provided with natural light by means of glazed openings of at least 8% of the net floor area.

(2) Ventilation. Natural or mechanical ventilation shall be provided as follows:

(a) Natural ventilation. All habitable rooms, except kitchens and bathrooms, shall be provided with natural ventilation by means of operable exterior doors or windows of at least 3.5% of the net floor area.

(b) Mechanical ventilation. Where a mechanical ventilation system is provided in lieu of operable exterior openings providing natural ventilation, the system shall be capable of providing at least one air change per hour. Exhaust ventilation shall terminate outside the building.

(c) Cold-side venting. Cold-side venting of insulation shall be provided at roof/attic, flat-roof/ceiling and sloping-roof/ceiling assemblies. Ventilation shall be provided at the rate of one square foot of free ventilating area for each 300 square feet of area. At least 50% of the vents shall be located at the soffit area.

Note: Example: The venting area required for a 1500 square foot dwelling is 1500 sq. ft. x 1/300 = 5 sq. ft.

(4) Crawl space venting. Unheated crawl spaces shall be provided with a concrete slab, roll roofing or plastic film vapor barrier and a minimum of 2 ventilators located at opposite sides of the crawl space. Ventilation shall be provided at the rate of one square foot of free ventilating area for each 1500 square feet of area.

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

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.06 Ceiling height. Habitable rooms shall have a ceiling height of at least 7 feet 0 inches. Beams or dropped ceilings may project 8 inches into that height. Habitable rooms with sloped ceilings shall have an average ceiling height of at least 6 feet 0 inches; at least 50% of the ceiling shall exceed the height of 6 feet 0 inches.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.07 Attic and crawl space access. (1) Attic. Attics shall be provided with an access opening of at least 14 by 24 inches, accessible from inside the structure.

(2) Crawl space. Crawl spaces shall be provided with an access opening of at least 14 by 24 inches.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.08 Firestopping and fire separation. (1) Firestopping. Firestopping shall be provided in the walls at each floor and ceiling to cut off vertical draft openings between stories. Holes around ducts and pipes shall also be firestopped. Firestopping shall consist of wood at least 2 inches, nominal, in thickness; 2 boards, one inch, nominal, in thickness; or one piece of 1/4-inch plywood with joints backed by another piece of plywood. Gypsum wallboard, mineral-based insulation or other rigid noncombustibles may also be used for firestopping.

(2) Fire separation. Attached garages shall be separated from the dwelling unit in accordance with the requirements of this section.

(a) Separation from habitable areas. Attached garages shall be separated from the dwelling unit by at least 1/2-hour rated construction.
1. Exception. Gypsum drywall on the garage side may be untaped provided at least ¾-inch firecode drywall is used on the garage side and all edges are tightly fitted.

2. Exception. Gypsum drywall on the garage side may be untaped provided at least ½-inch drywall is used on both sides of the wall separating the garage and the dwelling and all edges are tightly fitted.

3. Exception. Two layers of ½-inch drywall on the garage side may be untaped where no drywall is installed on the interior provided all edges are tightly fitted.

(b) Separation from nonhabitable areas. Attached garages shall be separated from the attic or other nonhabitable areas of the dwelling by a rated assembly having a minimum 20-minute finish rating.

1. Exception. Gypsum drywall on the garage side may be untaped provided at least ½-inch drywall is used on the garage side and all edges are tightly fitted.

(c) Doors. The door(s) between the garage and the dwelling unit shall be solid core, metal, or have a minimum 20-minute fire rating.

(d) Floors. Garage floors shall be of noncombustible materials and sloped toward the exterior garage door or opening, unless drained.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.09 Smoke detectors. Each dwelling shall be provided with a minimum of one approved, listed and labeled smoke detector sensing visible or invisible particles of combustion, installed in a manner and location consistent with its listing.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.10 Protection against decay and termites. (1) General. Wood used in the following locations shall be pressure treated with preservative, shall be a naturally durable, decay-resistant species and grade of lumber, or shall be protected against decay and termites.

(a) Wood joists or the bottom of wood structural floors closer than 18 inches or wood girders closer than 12 inches to exposed earth in crawl spaces or unexcavated areas.

(b) Sills which rest on concrete or masonry walls and are less than 8 inches from exposed earth.

(c) Ends of wood girders entering masonry or concrete walls and having clearances of less than ½ inch on the tops, sides and ends.

(d) Wood siding having a clearance of less than 6 inches from the earth.

(e) Wood embedded in earth.

(f) Wood used in basements as furring or finish material or in non-bearing walls need not comply with this section.

(2) Identification. All pressure-treated wood and plywood shall be identified.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART III—EXCAVATIONS

Ind 21.12 Grade. The grade shall slope away from the dwelling to provide drainage away from the dwelling.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.13 Excavations adjacent to adjoining property. (1) Notice. Any person making or causing an excavation which may affect the lateral soil support of adjoining property or buildings shall provide at least 30 days written notice to all owners of adjoining buildings of the intention to excavate. The notice shall state that adjoining buildings may require permanent protection.

(a) Exception. The 30-day time limit for written notification may be waived if such waiver is signed by the owner(s) of the adjoining properties.

(2) Responsibility for underpinning and foundation extensions. (a) Excavations less than 12 feet in depth. If the excavation is made to a depth of 12 feet or less below grade, the person making or causing the excavation shall not be responsible for any necessary underpinning or extension of the foundations of any adjoining buildings.
Wisconsin Administrative Code

(b) Excavations greater than 12 feet in depth. If the excavation is made to a depth in excess of 12 feet below grade, the owner(s) of adjoining buildings shall be responsible for any necessary underpinning or extension of the foundations of their buildings to a depth of 12 feet below grade. The person making or causing the excavation shall be responsible for any underpinning or extension of foundations below the depth of 12 feet below grade.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.14 Excavations for footings and foundations. (1) Excavations below footings and foundations. No excavation shall be made below the footing and foundation unless provisions are taken to prevent the collapse of the footing or foundation.

(2) Excavations for footings. All footings shall be located on undisturbed or compacted soil, free of organic material, unless the footings are reinforced to bridge poor soil conditions.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART IV—FOOTINGS

Ind 21.15 Footings. The dwelling shall be supported on a structural system designed to transmit and safely distribute the loads to the soil. The loads for determining the footing size shall include the weight of the roof, walls, floors, pier or column, plus the weight of the structural system and the soil over the footing. Footings shall be sized to not exceed the allowable material stresses. The bearing area shall be at least equal to the area required to transfer the loads to the supporting soil without exceeding the bearing values of the soil.

(1) Size. Unless designed by structural analysis, unreinforced concrete footings shall comply with the following requirements:

(a) Continuous footings. The minimum width of the footing on each side of the foundation wall shall measure at least 4 inches wider than the wall. The footing depth shall be at least 8 inches nominal. Footings placed in unstable soil shall be formed.

(b) Column or pier footing. The minimum width and length of column or pier footings shall measure at least 2 feet by 2 feet. The depth shall measure at least 12 inches nominal. The column shall be so placed as to provide equal projections on each side of the column.

(c) Trench footings. Footings poured integrally with the wall may be used when soil conditions permit. The minimum width shall be at least 8 inches nominal.

(d) Chimney and fireplace footings. Footing for chimneys or fireplaces shall extend at least 4 inches on each side of the chimney or fireplace. The minimum depth shall measure at least 12 inches nominal.

(e) Floating slabs. Any dwelling supported on a floating slab on grade shall be designed through structural analysis.

(2) Soil-bearing capacity. No footing or foundation shall be placed on soil with a bearing capacity of less than 2,000 pounds per square foot unless the footing or foundation has been designed through structural analysis.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.16 Frost penetration. Footings and foundations, including those for ramps and stoops, shall be placed below the frost penetration level, but in no case less than 42 inches below the ground. Such footings shall not be placed over frozen material.

(1) Exceptions. (a) Floating slabs constructed on grade need not be installed below the minimum frost penetration line provided measures have been taken to prevent frost forces from damaging the structure.

(b) Grade beams need not be installed to the minimum frost penetration line provided measures are taken to prevent frost forces from damaging the structure.

(c) Stoops or ramps need not be installed below the minimum frost penetration level provided measures are taken to prevent frost forces from damaging the structure.

(d) Footings or foundations may bear directly on rock located less than 42 inches below grade. Prior to placement, the rock shall be cleaned of all earth. All clay in the crevices of the rock shall be removed to the level of frost penetration or 1 1/2 times the width of the rock crevice. Provisions shall be taken at grade to prevent rain water from collecting along the foundation wall of the building.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.17 Drain tiles. (1) Where required. Perforated drain tiles, or equivalent shall be provided around footings located in soils where ground water levels occur above the elevation of the footing. The drain

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Analysis. The soil-bearing values of common soils may be determined through soil identification.

Note: The department will accept the soil-bearing values for the types of soil listed in the following table:

<table>
<thead>
<tr>
<th>Type of soil</th>
<th>PSF</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Wet, soft clay; very loose silt; silty clay</td>
<td>2,000</td>
</tr>
<tr>
<td>2. Loose, fine sand; medium clay; loose sandy clay soils</td>
<td>2,000</td>
</tr>
<tr>
<td>3. Silt clay; firm inorganic silt</td>
<td>3,000</td>
</tr>
<tr>
<td>4. Medium (firrn) sand; loose sandy gravel; firm sandy clay soils; hard dry clay</td>
<td>4,000</td>
</tr>
<tr>
<td>5. Dense sand and gravel; very compact mixture of clay, sand and gravel</td>
<td>6,000</td>
</tr>
<tr>
<td>6. Rock</td>
<td>12,000</td>
</tr>
</tbody>
</table>

(a) Minimum soil-bearing values. If the soil located directly under a footing or foundation overlaps a layer of soil having a smaller allowable bearing value, the smaller soil-bearing value shall be used.

(b) Unprepared fill material, organic material. No footing or foundation shall be placed upon unprepared fill material, organic soil, alluvial soil or mud unless the load will be supported. When requested, soil data shall be provided.

Note: The decomposition of organic material in landfill areas established for the disposal of organic wastes may produce odorous, toxic and explosive concentrations of gases which may seep into buildings through storm sewers and similar underground utilities unless provisions are taken to release the gases to the atmosphere.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.
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part v—foundations

ind 21.18 foundations. Foundation walls shall be designed and constructed to support the vertical loads of the dwelling, lateral soil pressure, and other loads without exceeding the allowable stresses of the materials of which the foundations are constructed.

1. concrete foundation walls. Unless designed through structural analysis, the minimum thickness of concrete foundation walls shall be determined from table 21.18-a, but in no case shall the thickness be less than the thickness of the wall it supports.

**table 21.18-a**

<table>
<thead>
<tr>
<th>concrete wall thicknesses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of concrete</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>3000 psi</td>
</tr>
<tr>
<td>unreinforced concrete</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

1 Unbalanced fill is the difference in elevation between the outside grade and the basement floor.

2 The maximum height of unbalanced fill for a 12-inch thick plain concrete wall may be increased to 12 feet provided the wall is constructed of concrete with a minimum compressive value of 4,000 psi at 28 days.

2. Masonry foundation walls. Unless designed through structural analysis, the masonry foundation walls shall be constructed in accordance with the following requirements:

(a) Unreinforced masonry wall; thickness. The minimum thickness of unreinforced masonry foundation walls shall be determined by Table 21.18-B, but in no case shall the thickness be less than the thickness of the wall it supports.

(b) reinforced masonry wall; thickness. Reinforced masonry walls shall be reinforced in accordance with the requirements of Tables 21.18-C and 21.18-D. In partially reinforced masonry walls, vertical reinforcement shall be provided on each side of any opening, at each wall corner, and at intervals indicated in the tables.

**table 21.18-b**

<table>
<thead>
<tr>
<th>wall construction nominal thickness, in., and type of unit</th>
<th>maximum depth below grade, feet, when walls support:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>frame construction</td>
</tr>
<tr>
<td>Hollow-load-bearing:</td>
<td></td>
</tr>
<tr>
<td>8&quot;</td>
<td>5&quot; (6')</td>
</tr>
<tr>
<td>10&quot;</td>
<td>6&quot; (7')</td>
</tr>
<tr>
<td>12&quot;</td>
<td>7'</td>
</tr>
<tr>
<td>Solid load-bearing:</td>
<td></td>
</tr>
<tr>
<td>8&quot;</td>
<td>5&quot; (7')</td>
</tr>
<tr>
<td>10&quot;</td>
<td>6&quot; (7')</td>
</tr>
<tr>
<td>12&quot;</td>
<td>7'</td>
</tr>
</tbody>
</table>

*In well drained sand and gravel soils, the height of the unbalanced fill may be increased to the values shown in parentheses.

**table 21.18-c**

<table>
<thead>
<tr>
<th>wall construction nominal thickness, in., and type of unit</th>
<th>total ht. of wall (feet)</th>
<th>max. pilaster spacing (inches)</th>
<th>pilaster size (nominal)</th>
<th>max. depth below grade (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-inch hollow-load-bearing</td>
<td>7.5</td>
<td>11</td>
<td>16&quot; x 16&quot;</td>
<td>6.5</td>
</tr>
<tr>
<td>8-inch hollow-load-bearing with solid pilasters or filled cells of hollow units</td>
<td>7.5</td>
<td>20</td>
<td>16&quot; x 16&quot;</td>
<td>6.5</td>
</tr>
</tbody>
</table>

**table 21.18-d**

<table>
<thead>
<tr>
<th>wall construction nominal thickness, in., and type of unit</th>
<th>total height of wall (feet)</th>
<th>reinforcement size and spacing (inches center to center)</th>
<th>max. depth below grade (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>8-inch hollow-load-bearing</td>
<td>7.0 to 8.5</td>
<td>5# bars @ 8&quot;</td>
<td>6.5</td>
</tr>
</tbody>
</table>
(3) Wood foundations. Wood foundations shall be designed and constructed in accordance with the National Forest Products Association standard, "All-Weather Wood Foundation System, Design, Fabrication, Installation Manual" [Ind 20.24 (4)] and the following exceptions. The thickness of the foundation wall shall be no less than the thickness of the wall it supports.

(a) Exceptions. 1. Section 3.3.1. Fasteners. Fasteners shall be of silicon bronze, copper or stainless steel types 304 or 316.

2. Section 6.7. Plastic film. Six-mil thick polyethylene sheathing shall be installed over the below-grade portion of exterior basement walls prior to backfilling. Joints in the polyethylene sheathing shall be lapped at least 6 inches and bonded. The top edge of the polyethylene sheathing shall be bonded to the plywood sheathing. A treated lumber or plywood strip shall be attached to the wall to cover the top edge of the polyethylene sheathing. The wood strip shall extend several inches above and below finish grade level to protect the polyethylene from exposure to light and from mechanical damage at or near grade. The joint between the strip and the wall shall be caulked full length prior to fastening the strip to the wall. Alternatively, asbestos-cement board, brick, stucco or other covering may be used in place of the wood strip. The polyethylene sheathing shall extend down to the bottom of the wood footing plate but shall not overlap or extend into the gravel footing.

(b) Materials. All lumber and plywood shall be pressure treated with preservative and labeled.

Note: The department will accept materials which meet the "Quality control Program for Soft-Wood Lumber, Timber and Plywood Pressure Treated with Water-Borne Preservatives for Ground Contact Use in Residential and Light Commercial Foundations," published by the American Wood Preservers Bureau.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART VI—FLOORS

Ind 21.19 Floor design. Floors shall support all dead loads plus the minimum unit live loads as set forth in section Ind 21.02. The live loads shall be applied to act vertically and uniformly to each square foot of horizontal floor area.

History: Cr. Register, November, 1978, No. 287, eff. 6-1-80.

Ind 21.20 Concrete floors. When concrete floors are provided, the thickness of the concrete shall measure at least 3 inches. In clay soils, a 4-inch thick base course shall be placed in the subgrade consisting of clean graded sand, gravel or crushed stone. The base course may be omitted in sand and gravel soils. Basements shall be provided with a concrete or similar type floor.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.21 Precast concrete floors. Unless designed through structural analysis, the maximum allowable stress, span or section size for precast concrete floors shall be determined from Table 21.21.
### TABLE 21.21 (continued)

#### Wood frame floors

Unless designed through structural analysis, wood frame floors shall comply with the following requirements:

1. **Floor Joists.** Wood floor joists shall comply with the requirements of section Ind 21.02 (3). The minimum live loads shall be determined from section Ind 21.02. Where sill plates are provided, the sill plates shall be fastened to the foundation.

2. **Truss Joists.** Wood truss joists shall be designed through structural analysis.

3. **Girders and Beams.** Girders and beams shall be selected from Table 21.22-A.

   - Wood girders and beams shall be fitted at the post or column. adjoining ends shall be fastened to each other to transfer horizontal loads across the joint. Beams shall also be fastened to the posts with framing anchors, angle clips, or equivalent.
   - Where intermediate beams are used, they shall rest on top of the girders, or shall be supported by ledgers or blocks fastened to the sides of the girders; or they may be supported by approved metal hangers into which the ends of the beams shall be fitted.
   - **Bearing.** The minimum bearing for wood joists and rafters shall be at least 1 1/2 inches on wood or metal and at least 3 inches on masonry or concrete. Wood beams and girders shall have at least 3 inches of bearing on masonry or concrete. Tail ends of floor joists shall not overlap the beams by more than 8 inches.

4. **Notching and Boring.** Notching and boring of beams or girders is prohibited unless determined through structural analysis.

- **Notching.** Notches located in the top or bottom of joists shall not exceed 1/6 the depth of the joist nor be located in the middle 1/3 of the span of the joist.

2. Where joists are notched on the ends, the notch shall not exceed 1/6 the depth of the joist.

- **Boring.** Holes bored in joists shall be located in the center of the joist. The diameter of the hole shall not exceed 1/3 the depth of the joist.

6. **Overhang of Floors.** (a) Floor joists which are at right angles to the supporting wall shall not be cantilevered more than 2 feet over the supporting wall and shall support only the wall and roof above it.

(b) Where floor joists are parallel to the supporting wall, a double floor joist may be used to support lookout joists extending over the wall line below. The double joist shall be located a distance of twice the overhang from the lower wall. The lookout joists shall be fastened to the double joist with metal hangers.

7. **Floor Openings.** Trimmers and headers shall be doubled when the span of the header exceeds 4 feet. Headers which span more than 6 feet shall have the ends supported by joist hangers or framing anchors, unless the ends are supported on a partition or beam. Tail joists (joists which frame into headers) more than 8 feet long shall be supported on...
<table>
<thead>
<tr>
<th>Column Spacing</th>
<th>Wood Beams(^1) (in., nominal)</th>
<th>A 36 Steel Beams(^2) (in., nominal)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zone 2</td>
<td>Zone 1</td>
</tr>
<tr>
<td>24 ft. wide house: 8 ft.</td>
<td>8x10</td>
<td>10x10</td>
</tr>
<tr>
<td>10 ft.</td>
<td>6x12</td>
<td>6x12</td>
</tr>
<tr>
<td>12 ft.</td>
<td>8x12</td>
<td>10x12</td>
</tr>
<tr>
<td>15 ft.</td>
<td>10x14</td>
<td>10x14</td>
</tr>
<tr>
<td>26 ft. wide house: 8 ft.</td>
<td>10x10</td>
<td>10x10</td>
</tr>
<tr>
<td>10 ft.</td>
<td>6x12</td>
<td>8x12</td>
</tr>
<tr>
<td>12 ft.</td>
<td>8x14</td>
<td>8x14</td>
</tr>
<tr>
<td>15 ft.</td>
<td>8x16</td>
<td>8x16</td>
</tr>
<tr>
<td>28 ft. wide house: 8 ft.</td>
<td>10x10</td>
<td>8x12</td>
</tr>
<tr>
<td>10 ft.</td>
<td>6x12</td>
<td>4x16</td>
</tr>
<tr>
<td>12 ft.</td>
<td>8x14</td>
<td>8x14</td>
</tr>
<tr>
<td>15 ft.</td>
<td>8x16</td>
<td>10x16</td>
</tr>
</tbody>
</table>

### Table 21.22-A

**Minimum Sizes for Beams and Girders of Steel or Wood**

- Wood Beams\(^1\) (in., nominal)
- A 36 Steel Beams\(^2\) (in., nominal)

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**Footnotes:**
- Wood framing anchors or on ledger strips of at least 2 inches by inches.
<table>
<thead>
<tr>
<th>Column Spacing</th>
<th>Wood Beams&lt;sup&gt;1&lt;/sup&gt;</th>
<th>A 36 Steel Beams&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Wood Beams&lt;sup&gt;1&lt;/sup&gt;</th>
<th>A 36 Steel Beams&lt;sup&gt;2&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zone 2 Zone 1</td>
<td>Zone 2 Zone 1</td>
<td>Zone 2 Zone 1</td>
<td>Zone 2 Zone 1</td>
</tr>
<tr>
<td>28 ft. wide house (cont) 15 ft.</td>
<td>— —</td>
<td>W 10x19 M 14x17.2</td>
<td>— —</td>
<td>W 14x22 W 14x26</td>
</tr>
<tr>
<td>20 ft. wide house:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 ft.</td>
<td>10x12 8x12</td>
<td>— —</td>
<td>10x12 12x12</td>
<td>— —</td>
</tr>
<tr>
<td>10 ft.</td>
<td>10x12 12x12</td>
<td>8x17.25</td>
<td>10x12 12x12</td>
<td>8x14 12x14</td>
</tr>
<tr>
<td>12 ft.</td>
<td>12x14 12x14</td>
<td>W 8x13</td>
<td>12x16 16x16</td>
<td>W 8x15 S 8x18.4</td>
</tr>
<tr>
<td>15 ft.</td>
<td>12x16 12x16</td>
<td>W 12x14</td>
<td>12x16 16x16</td>
<td>M 14x17.2 M 14x17.2</td>
</tr>
<tr>
<td>32 ft. wide house:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 ft.</td>
<td>8x12 8x12</td>
<td>— —</td>
<td>12x12 12x12</td>
<td>— —</td>
</tr>
<tr>
<td>10 ft.</td>
<td>10x12 10x12</td>
<td>W 10x11.5</td>
<td>12x14 14x14</td>
<td>W 12x14 W 12x16.5</td>
</tr>
<tr>
<td>12 ft.</td>
<td>10x14 10x14</td>
<td>W 8x13</td>
<td>10x16 16x16</td>
<td>S 8x18.4 10x17</td>
</tr>
<tr>
<td>15 ft.</td>
<td>10x16 10x16</td>
<td>W 12x14</td>
<td>12x18 12x18</td>
<td>M 14x17.2 M 12x22</td>
</tr>
</tbody>
</table>

<sup>1</sup>This table is based upon wood with a fiber bending stress of 1,000 psi. Two acceptable wood beam selections are listed for each loading condition.

<sup>2</sup>Two acceptable steel beam selections are listed for each loading condition. The first entry is the most economical selection based upon beam weight.

(8) Plywood sheathing, planks and planes. Plywood shall be limited to the allowable loads and spans shown in Table 21-22 B.

(9) Brace: Bracing shall be provided at intervals not exceeding 8 feet.

TABLE 21-22 B

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WISCONSIN ADMINISTRATIVE CODE

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31-22 B

ALLOWABLE LOADS AND SPANS FOR PLYWOOD SHEATHING

FACE GRAIN PERPENDICULAR TO SUPPORT

ROOF SHEATHING CONTINUOUS OVER TWO OR MORE SPANS AND

Table 21-22 B

<table>
<thead>
<tr>
<th>Plywood</th>
<th>Maximum Stress (psi)</th>
<th>Lead (in. per 10 feet)</th>
<th>Friction (in. per 10 feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>44</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>48</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>52</td>
<td>52</td>
<td>52</td>
<td>52</td>
</tr>
<tr>
<td>56</td>
<td>56</td>
<td>56</td>
<td>56</td>
</tr>
<tr>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>64</td>
<td>64</td>
<td>64</td>
<td>64</td>
</tr>
<tr>
<td>72</td>
<td>72</td>
<td>72</td>
<td>72</td>
</tr>
<tr>
<td>96</td>
<td>96</td>
<td>96</td>
<td>96</td>
</tr>
</tbody>
</table>

Maximum Span: 60 feet. Length shall be reduced to 1/3 of the span under less than 8 feet. Plywood shall be supported at 2 feet maximum.
TABLE 21.22-C

<table>
<thead>
<tr>
<th>Plywood Grade</th>
<th>Plywood Species Group</th>
<th>Maximum Support Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>16&quot; o.c. 2 ( 24&quot; o.c. )</td>
</tr>
<tr>
<td>Underlayment</td>
<td></td>
<td>Panel thickness (inch)</td>
</tr>
<tr>
<td>C-C plugged</td>
<td>1</td>
<td>1/2</td>
</tr>
<tr>
<td>Sande exterior type</td>
<td>2 &amp; 3</td>
<td>5/8</td>
</tr>
<tr>
<td>2-4-1</td>
<td>4</td>
<td>3/4</td>
</tr>
<tr>
<td>1, 2 &amp; 3</td>
<td>All panel groups have equal properties</td>
<td>1-1/8</td>
</tr>
<tr>
<td>Sturd-I-Floor</td>
<td>1, 2, 3 &amp; 4</td>
<td>16&quot; o.c.</td>
</tr>
</tbody>
</table>

2Spans shall be limited to values shown, based on possible effect of concentrated loads.
3Underlayment. C-C plugged, sanded exterior type: allowable uniform load based on deflection of L/360 span for spans 24 inches or less in 125 psf; and for spans 48 inches, 65 psf.
4If a 25/32-inch wood floor finish is laid perpendicular to supports, thicknesses shown for 25-inch and 20-inch spans may be used for 24-inch span.
5Except for 1/2-inch, underlayment grade and C-C plugged panels may be of nominal thickness 1/32-inch less than the nominal thicknesses shown when marked with the reduced thickness.
6The department will accept subfloor underlayment panels such as sturd-i-floor which meet the requirements of APA manufacturing specification for sturd-i-floor panels.

TABLE 21.22-D

<table>
<thead>
<tr>
<th>Joint Spacing (inches)</th>
<th>Minimum Net Thickness (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Perpendicular to Joint</td>
</tr>
<tr>
<td>24</td>
<td>11/16</td>
</tr>
<tr>
<td>18</td>
<td>5/8</td>
</tr>
</tbody>
</table>

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

TABLE 21.25-A

<table>
<thead>
<tr>
<th>Size</th>
<th>Grade</th>
<th>Max. Height (feet)</th>
<th>Supporting roof and ceiling only</th>
<th>Supporting two floors, roof and ceiling</th>
<th>Interior and non-load-bearing</th>
</tr>
</thead>
<tbody>
<tr>
<td>2x3</td>
<td>Standard &amp; better</td>
<td>8</td>
<td>16</td>
<td>N/P</td>
<td>N/P</td>
</tr>
<tr>
<td>2x4</td>
<td>or larger</td>
<td>Utility</td>
<td>8</td>
<td>24</td>
<td>16</td>
</tr>
<tr>
<td>2x4</td>
<td>Standard &amp; better</td>
<td>12</td>
<td>24</td>
<td>24</td>
<td>12</td>
</tr>
<tr>
<td>2x6</td>
<td>or larger</td>
<td>No. 3 &amp; better</td>
<td>18</td>
<td>24</td>
<td>24</td>
</tr>
</tbody>
</table>

N/P = Not permitted.

Note: A 3-story frame house with walls constructed of 2 x 4 studs would require a 12-inch stud spacing on the lowest level, a 16-inch stud spacing on the intermediate level, and a 24-inch stud spacing on the upper level.

(2) Top plates. Studs at bearing walls shall be capped with double top plates. End joints in double top plates shall be offset at least 48
INWisconsin Administrative Code

INDUSTRY, LABOR & HUMAN RELATIONS

TABLE 21.25-C
ALLOWABLE SPANS (FEET) FOR HEADERS SUPPORTING ONE FLOOR*

<table>
<thead>
<tr>
<th>House Width (feet)</th>
<th>Two 2 x 4s</th>
<th>Two 2 x 6s</th>
<th>Two 2 x 8s</th>
<th>Two 2 x 10s</th>
<th>Two 2 x 12s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zone 2/Zone 1</td>
<td>Zone 2/Zone 1</td>
<td>Zone 2/Zone 1</td>
<td>Zone 2/Zone 1</td>
<td>Zone 2/Zone 1</td>
</tr>
<tr>
<td>24</td>
<td>2.5</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>28</td>
<td>2.5</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>30</td>
<td>3</td>
<td>4</td>
<td>6</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>32</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

TABLE 21.25-D
ALLOWABLE SPANS (FEET) FOR HEADERS SUPPORTING ONE FLOOR AND ROOF/CEILING ASSEMBLY*

<table>
<thead>
<tr>
<th>House Width (feet)</th>
<th>Two 2 x 4s</th>
<th>Two 2 x 6s</th>
<th>Two 2 x 8s</th>
<th>Two 2 x 10s</th>
<th>Two 2 x 12s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zone 2/Zone 1</td>
<td>Zone 2/Zone 1</td>
<td>Zone 2/Zone 1</td>
<td>Zone 2/Zone 1</td>
<td>Zone 2/Zone 1</td>
</tr>
<tr>
<td>24</td>
<td>1.5</td>
<td>3</td>
<td>2.5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>28</td>
<td>1.5</td>
<td>2.5</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>30</td>
<td>1.5</td>
<td>2.5</td>
<td>2.5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>32</td>
<td>1.5</td>
<td>2.5</td>
<td>2</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*These tables are based on wood with a fiber bending stress of 1,000. For other species with different fiber bending stresses, multiply the span by the ratio of the actual bending stress to 1,000. Example: The average of roof/ceiling spans for a 2-8-foot wide house in zone 2, using 2 x 2 x 8 header members with a 140 psi bending stress is 4 ft. x 1400/1000 = 5.6 feet.

TABLE 21.25-E
EXPOSED PLYWOOD PANEL SIDING

<table>
<thead>
<tr>
<th>Minimum Stud Spacing (Inches)</th>
<th>Minimum Plywood Siding Applied</th>
<th>Thickness1</th>
<th>No. of Plys.</th>
<th>Over Sheathing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8&quot;</td>
<td>3</td>
<td>16</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>1/2&quot;</td>
<td>4</td>
<td>20</td>
<td>4</td>
<td>29</td>
</tr>
</tbody>
</table>

1Thickness of grooved panels is measured at bottom of grooves.

2May be 24 inches if plywood siding applied with face grain perpendicular to studs or over one of the following: (a) one-inch board sheathing; (b) 1/2-inch plywood sheathing; (c) 3/8-inch plywood sheathing with face grain of sheathing perpendicular to studs.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21 25 Masonry walls. Masonry walls shall be constructed in accordance with the requirements of this section.

Register, November, 1979, No. 287

Construction Standards
WISCONSIN ADMINISTRATIVE CODE

(1) Cold Weather Work. In cold weather, provisions shall be taken to prevent masonry from being damaged by freezing.

Note: It will be the practice of the department to accept performance with "Recommended Practices for Cold Weather Masonry Construction," available from International Masonry Institute, 823 15th Street NW, Washington, D.C. 20005.

(2) Masonry Units. All masonry units shall be free from physical defects which interfere with laying of the unit and impair the compressive strength of the unit.

(3) Types of Mortar. The type of masonry mortar to be used for various kinds of masonry work shall be determined from Table 21.26-A. The mortar shall be mixed in accordance with the proportions specified in Table 21.26-B.

(a) Surface bond mortars. Surface bond mortars for masonry walls shall be mixed in accordance with the proportions specified on the bag.

(4) Mortar Components. Mortar components shall comply with the following requirements:

(a) Water. Water shall be clean and free of deleterious amounts of acids, alkalies, or organic materials.

(b) Admixtures or mortar colors. Admixtures or mortar colors shall not be added to the mortar unless the resulting mortar conforms to the requirements of the mortar specifications. Only calcium chloride may be used as an accelerator and shall be limited to 2% by weight of the cement used. Calcium chloride may not be used for any other purpose. Only mineral oxide may be used as mortar color and shall not exceed 10% by weight of the cement used.

(c) Mixing. Mortar shall be mixed for at least 3 minutes after all ingredients have been added with the maximum amount of water to produce a workable consistency. Mortars that have stiffened due to water evaporation shall be retempered by adding water as frequently as needed to restore the required consistency. Mortars shall be used and placed in final position within 2-1/2 hours after mixing.

Note: To ensure proper mortar mixing, machine mixing is recommended.

INDUSTRY, LABOR & HUMAN RELATIONS

TABLE 21.26-A

<table>
<thead>
<tr>
<th>Kind of Masonry</th>
<th>Types of Mortar</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foundations:</td>
<td></td>
</tr>
<tr>
<td>Footings</td>
<td>M, S</td>
</tr>
<tr>
<td>Walls of solid units</td>
<td>M, S, N</td>
</tr>
<tr>
<td>Walls of hollow units</td>
<td>M, S</td>
</tr>
<tr>
<td>Hollow walls</td>
<td>M, S</td>
</tr>
<tr>
<td>Masonry other than foundation masonry:</td>
<td></td>
</tr>
<tr>
<td>Piers of solid masonry</td>
<td>M, S, N</td>
</tr>
<tr>
<td>Piers of hollow units</td>
<td>M, S</td>
</tr>
<tr>
<td>Walls of solid masonry</td>
<td>M, N, S, O</td>
</tr>
<tr>
<td>Walls of solid masonry not less than 12 in. thick or more than 20 ft. in height, supported laterally at intervals not exceeding 12 times the wall thickness</td>
<td>M, N, S, O</td>
</tr>
<tr>
<td>Walls of hollow units load-bearing or exterior, and hollow walls 12 in. or more in thickness</td>
<td>M, S, N</td>
</tr>
<tr>
<td>Hollow walls, less than 12 in. thick</td>
<td>M, S, N</td>
</tr>
<tr>
<td>Linings of existing masonry, either above or below grade</td>
<td>M, S</td>
</tr>
<tr>
<td>Masonry other than above</td>
<td>M, S, N</td>
</tr>
</tbody>
</table>

TABLE 21.26-B

MORTAR SPECIFICATIONS BY PROPORTION

| Mortar Type | Parts by Volume
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM C 270</td>
<td>Portland Cement</td>
</tr>
<tr>
<td>M</td>
<td>1</td>
</tr>
<tr>
<td>S</td>
<td>1 (Type II)</td>
</tr>
<tr>
<td>N</td>
<td>1/2 (Type II)</td>
</tr>
<tr>
<td></td>
<td>1</td>
</tr>
</tbody>
</table>

*All cements are one cubic foot per sack; lime equals 1-1/4 cubic foot per sack.

*Limited to walls with a maximum depth of 5 feet below grade.

(d) Cementitious material. Cementitious material shall conform to the standards approved by the department.

Note: The department will accept cementitious material conforming to the following standards: ASTM C91, Masonry Cement; ASTM C150, Portland Cement; ASTM C150, Portland Blast-Furnace Slag Cement, ASTM C307, Hydrated Lime for Masonry Purposes; and ASTM C5, Quick Lime for Structural Purposes.

(e) Aggregates. Aggregates for use in masonry mortar shall consist of natural sand or manufactured sand and shall be graded.

Note: The department will accept aggregates in accordance with ASTM C144.
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(5) Cavity wall. (a) Corbeling. Cavity wall construction may be supported on an 8-inch foundation wall provided the 8-inch wall is corbelled with solid masonry to the width of the cavity wall. Individual corbels shall not exceed 2 inches nor more than one-third the height of each corbeled unit.

(b) Projections. The projection of a wall beyond the edge of a supporting member other than masonry, such as a shelf angle or edge of a beam, shall not exceed 1 1/2 inches, unless at least 1/4 the mass of the wythe of masonry involved is located directly over the load-carrying member.

(c) Flashing. In exterior hollow walls exposed to the weather, flashing shall be installed at the bottom of the cavity so as to drain any water outward. Open vertical joints or weep holes of 3/4-inch minimum diameter shall be provided in the facing just above the flashing at a horizontal spacing not exceeding 3 feet.

(6) Openings and lintels. (a) Openings. The masonry above openings shall be supported. The bearing length of structural elements which support the masonry above the opening shall be not less than 4 inches.

(b) Lintels. Unless designed through structural analysis, lintels shall be provided in accordance with Table 21.26-C.

TABLE 21.26-C

<table>
<thead>
<tr>
<th>Size of Steel Angle1, 2</th>
<th>No Story Above</th>
<th>One Story Above</th>
<th>Two Stories Above</th>
<th>No. of 1/2&quot; or Equivalent Reinforcing Bars2</th>
</tr>
</thead>
<tbody>
<tr>
<td>L 3 x 3 x 1/4</td>
<td>6&quot; - 0&quot;</td>
<td>3&quot; - 0&quot;</td>
<td>3&quot; - 0&quot;</td>
<td>1</td>
</tr>
<tr>
<td>L 4 x 3 x 1/4</td>
<td>8&quot; - 0&quot;</td>
<td>5&quot; - 0&quot;</td>
<td>3&quot; - 0&quot;</td>
<td>1</td>
</tr>
<tr>
<td>L 6 x 3-1/2 x 1/4</td>
<td>14&quot; - 0&quot;</td>
<td>8&quot; - 0&quot;</td>
<td>3&quot; - 6&quot;</td>
<td>2</td>
</tr>
<tr>
<td>2 - L 6 x 3-1/4 x 1/4</td>
<td>20&quot; - 0&quot;</td>
<td>11&quot; - 0&quot;</td>
<td>5&quot; - 0&quot;</td>
<td>4</td>
</tr>
</tbody>
</table>

1Long leg of the angle shall be placed in a vertical position.

2Depth of reinforced lintels shall be not less than 6 inches and all cells of hollow masonry lintels shall be grooved solid. Reinforcing bars shall extend not less than 6 inches into the support.

(7) Masonry Veneers. (a) Veneer over frame construction. 1. Masonry veneers may be corbelled over the foundation wall, but the corbeling shall not exceed one inch.

2. An air space shall be provided between the veneer and the sheathing.

3. Where no brick ledge is formed in the foundation wall, a 30-pound asphalt-saturated felt or corrosion-resistant metal base flashing shall extend over the top of the foundation wall from the outside face of the

Ind 21

wall and shall extend at least 6 inches up on the wood sheathing under the building paper or water-resistant sheathing.

4. Weepholes shall be provided at the bottom masonry course at intervals of approximately 4 feet.

(b) Veneer over masonry back-up. A 30-pound asphalt-saturated felt or corrosion-resistant metal base flashing at the bottom of the veneer shall extend over the top of the foundation and up at least 6 inches and be embedded in the back-up course. Weepholes, at approximately every 3 feet, shall be provided.

(8) Veneer anchorage. All veneers, supports and attachments shall be mechanically or adhesively anchored.

(a) Mechanical anchorage. All anchors shall be corrosion-resistant.

1. Conventional size veneer (one square foot or less) shall be securely attached to its backing by anchors the equivalent of No. 22 U.S. gauge corrugated sheet steel 3/8-inch wide with at least one such tie located in every square foot of wall. Ties shall be embedded 2 inches in a masonry joint and nailed to the framing with an 8d nail.

2. Large size veneer (greater than one square foot) shall be securely attached with anchors equivalent of not less than 3/4-inch diameter bolts in accordance with either of the following:

a. Each unit individually anchored to the supporting framework with at least 3 anchors.

b. Individual units doweled to each other at all horizontal joints and anchored to the backing at all horizontal and vertical joints so that one anchor is provided for every 6 square feet of wall surface.

(b) Adhesive anchorage. Veneer may be cemented to a masonry or concrete wall or to exterior Portland cement plaster in high rib galvanized metal lath with an adhesive, provided that the bond is sufficient to withstand a shearing stress of 50 psf after curing for 28 days.

(9) Bearing. (a) Concentrated loads. Beams, girders, trusses, joists and other members producing concentrated loads shall bear a minimum of 3 inches on one of the following:

1. Concrete beam. The equivalent of a nominally reinforced 2,500 psi concrete beam 8 inches in height.

2. Solid masonry. At least 8 inches in height of masonry composed of solid masonry units with all voids and joints completely filled with mortar.

3. Metal plate. A metal plate of sufficient thickness and size to distribute the load to masonry units. For piers and columns, the bearing plate shall not exceed 60% of the cross-sectional area of the pier or column and the resultant reaction of all vertical and horizontal loads shall fall within the middle third of the member.

4. Bond beam. The bond beam shall be the equivalent of not less than an 8-inch lintel (bond beam) block with 2 No. 4 bars embedded in high strength mortar fill or equivalent. The loads shall bear on the fill.

Register, November, 1978, No. 287
(b) Continuous loads. Joists, trusses and beams other than wood, spaced 4 feet or more on center and 40 feet in length, slabs or other members causing continuous loads shall be transmitted to masonry with a minimum bearing of 3 inches upon solid masonry at least 2-1/2 inches in height, or as indicated for concentrated loads.

(c) Stack bond walls. Concentrated loads shall be distributed into masonry laid in stack bond by a concrete beam or bond beam as defined in (a). For masonry of solid units, 2 additional rows of continuous tie assembly may be used instead of a concrete beam or bond beam.

(d) Support of wood floor members. Where a wood structural member is buried in masonry for support, it shall be firecut or a self-releasing device shall be used. Where the end of a wood structural member is built into an exterior wall, a 3/8-inch air space shall be provided at the sides, top and end of such member.

(10) Bonding. Unless designed through structural analysis, all masonry walls shall be bonded as follows:

(a) Single wythe walls. Masonry units in single-wythe walls shall be lapped at least 2 inches or one-third the height of the masonry unit, whichever is greater, or through the use of continuous tie assemblies spaced at 18-inch vertical intervals.

(b) Multi-wythe walls. Adjacent wythes shall be bonded with continuous tie assemblies spaced at vertical intervals not exceeding 16 inches; or individual ties of at least 3/16-inch diameter for each 4-1/2 square feet of wall area, spaced at a maximum vertical distance of 18 inches and a maximum horizontal distance of 36 inches; or bonded with a full course of masonry headers every seventh course. The clear distance between bond courses shall not exceed 18 inches for solid masonry units and 24 inches for hollow masonry units. Hollow walls shall not be bonded with headers.

(11) Bolts and anchors. The allowable shear on steel bolts and anchors shall not exceed the values given in Table 21.26.

---

### TABLE 21.26

<table>
<thead>
<tr>
<th>Bolt or Anchor Diameter (inches)</th>
<th>Embedment (inches)</th>
<th>Allowable Shear (pounds)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1/4</td>
<td>4</td>
<td>270</td>
</tr>
<tr>
<td>3/8</td>
<td>4</td>
<td>410</td>
</tr>
<tr>
<td>1/2</td>
<td>4</td>
<td>550</td>
</tr>
<tr>
<td>5/8</td>
<td>4</td>
<td>700</td>
</tr>
<tr>
<td>3/4</td>
<td>5</td>
<td>1100</td>
</tr>
<tr>
<td>7/8</td>
<td>6</td>
<td>1500</td>
</tr>
<tr>
<td>1</td>
<td>7</td>
<td>1850</td>
</tr>
<tr>
<td>1-1/8</td>
<td>8</td>
<td>2250</td>
</tr>
</tbody>
</table>

*Bolts and anchors shall be solidly embedded in mortar or grout.

(12) Joints. (a) The maximum thickness of a mortar joint shall be 1/2 inch.

(b) Except for head joints used for weepholes and ventilation, solid masonry units shall be laid to achieve full head and bed joints.

(c) Hollow masonry units shall be laid with full head joints and full bed joints under the full bearing areas of the face shells and under webs where the adjacent cells are to be filled with grout.

(13) Cleaning. Chemical cleaning agents shall be prevented from harming the metal reinforcement of structural components and shall not be of a strength which will adversely affect the mortar.

(14) Damp proofing. Masonry foundation walls of basements in clay type soils shall be made damp proof by the application to the exterior surfaces of a continuous coat of at least 3/8-inch thick portland cement and sand coat mortar, or a type M mortar troweled smooth. Surface bonding material, 3/8-inch thick, applied to the exterior surfaces, may also be used.

*History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.*

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### PART VIII—ROOF AND CEILINGS

Ind 21.27 Roof design. (1) Roof loads. Roof and roof/ceiling assemblies shall support all dead loads plus the minimum live loads as set forth in section Ind 21.02.

(2) Uplift and suction forces. Roofs shall withstand a pressure of at least 20 pounds per square foot acting upward normal to the roof surface. Roof overhangs, eaves, canopies and cornices shall withstand an upward wind pressure of at least 20 pounds per square foot applied to the entire exposed area.

(a) Anchorage. Roofs shall be anchored to walls and columns to resist uplift.
(b) Stress increase. All stresses may be increased by a maximum of one third for wind forces.

(3) Water. All roofs shall be designed and constructed to assure drainage of water.

(a) Roofing. Roofing shall be installed to shed water. Underlayment shall be provided under shingles. Fasteners shall be corrosion-resistant.

(b) Eave protection for shingles and shakes. Sheet metal, asphalt-impregnated felt paper or similar eave protection shall be provided on roof slopes of less than 4:12 (18.4°), extending from the edge of the roof a minimum distance of 2 feet 6 inches up the roof slope to a line not less than 12 inches inside the inner face of the exterior wall; except over unheated garages or porches.

(4) Flashing. Flashings shall be installed at the junction of chimneys and roofs, in all valleys, and around all roof openings.

(a) Valley flashing. Open valleys. Open valleys shall be flashed with at least No. 28 gauge galvanized, corrosion-resistant sheet metal, 16 inches wide, or a layer of at least 50-pound roll roofing, 16 inches wide, placed over a layer of 15-pound roofing underlayment. Flashing sections shall be overlapped by at least 4 inches.

Closed valleys. Where shingles are laced or woven over the valley, the valley shall be flashed with at least one layer of 50-pound roofing, at least 20 inches wide, over the layer of 15-pound roofing underlayment.

(b) Chimney flashing. Chimney crickets shall be installed where the upper side of a chimney is more than 30 inches wide on a sloping roof. The intersection of the cricket and the chimney shall be flashed and counter-flashed to a height of at least 6 inches.

2. Chimneys not exceeding 30 inches wide shall be flashed and counter-flashed to a height of at least 6 inches.

3. Chimney sides shall be flashed to a height of at least 4 inches.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 21.25 Roof and ceiling wood framing. Unless designed through structural analysis, wood rafters and ceiling joists, and components, shall comply with the requirements of section Ind 21.02 (5).

(1) Roof rafters. Where rafters meet to form a ridge, the rafters shall be placed directly opposite and secured to each other or to a ridge board one inch, nominal, in thickness. Where rafters are offset more than the thickness of the rafter, a ridge board 2 inches, nominal, in thickness shall be used.

(2) Anchorage. Roofs shall be anchored to resist horizontal thrust and uplift. Provisions shall be taken to absorb the horizontal thrust produced by the sloping roof, rafters or beams through collar ties installed in the upper third of the roof rafters on every third pair of rafters; or through the use of cross ties connecting beams; or through the use of metal straps or metal plates located at the ridge which tie the roof beams together. Rafters shall be notched to fit the exterior wall plate and fastened to the wall.

(3) Ceiling Joists. Ceiling joists shall be nailed to exterior walls and to the ends of rafters. Where joining over interior partitions, they shall be nailed to the plate or to each other. Where ceiling joists are placed at right angles to the rafters, as in flat or hip roofs, the lookout joint or ties shall be fastened to the parallel ceiling joists or rafters.

(4) Valley and hip rafters; ladders. (a) Valley rafters. Where no bearing is provided under valley rafters at the intersection of roof areas, the valley rafters shall be doubled in thickness and shall be at least 2 inches deeper than the required common rafter to permit full bearing at the beveled end. Where rafters are provided at different elevations, care should be taken to provide vertical support for the interior end of the lower ridge board.

(b) Hip rafters. Where no bearing is provided under hip rafters, the hip rafters shall be of the same thickness as common rafters and shall be at least 2 inches deeper to permit full contact with the jack rafter.

(c) Ladders. Overhangs at gable end walls shall be provided with ladders (rafters which extend over the wall) which are fastened to the wall and to the first rafter parallel to the gable end wall.

(5) Trussed rafters and trusses. Trussed rafters and prefabricated trusses shall be designed through structural analysis. Truss members shall not be cut, bored or notched unless designed through structural analysis.

(6) Notching and boring. Notching and boring of beams or girders is prohibited unless determined through structural analysis.

(a) Notching. Notches located in the top or bottom of joists shall not exceed 1/6 the depth of the joist or be located in the middle third of the span of the joist.

2. Where joists are notched on the ends, the notch shall not exceed 1/4 the depth of the joist.

(b) Boring. Holes bored in joists shall be located in the center of the joist. The diameter of the hole shall not exceed one third the depth of the joist.

(7) Roof sheathing, boards and planking. (a) Plywood sheathing. Plywood sheathing shall be grade marked and stamped and limited to the allowable loads and spans indicated in tables 21.22-B and 21.29-A.

(b) Roof boards. Roof boards shall comply with the minimum thicknesses shown in Table 21.28-B.

(c) Roof planks. Roof planks shall be tongue and groove or splined and at least 2 inches, nominal, in thickness. Planks shall terminate over beams unless the joint is end matched. The planks shall be laid so that no continuous line of joints will occur except at points of support. Planks shall be nailed or fastened to each beam.
TABLE 21.28-A

ALLOWABLE LOADS AND SPANS FOR PLYWOOD ROOF SHEATHING CONTINUOUS OVER TWO OR MORE SPANS AND FACE GRAIN PARALLEL TO SUPPORTS

<table>
<thead>
<tr>
<th>Species</th>
<th>Thickness (inches)</th>
<th>No. of Pans</th>
<th>Span (inches)</th>
<th>Total Load (psf)</th>
<th>Live Load (psf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Structural I</td>
<td>1/2</td>
<td>4</td>
<td>24</td>
<td>35</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>1/2</td>
<td>5</td>
<td>24</td>
<td>55</td>
<td>40</td>
</tr>
<tr>
<td>Other grades</td>
<td>1/2</td>
<td>5</td>
<td>24</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>covered in</td>
<td></td>
<td>5/8</td>
<td>24</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>PS-1</td>
<td></td>
<td>5/8</td>
<td>24</td>
<td>60</td>
<td>45</td>
</tr>
</tbody>
</table>

1. Uniform load deflection limitations: 1/180 of span under live load plus dead load, 1/360 under live load only. Edges shall be blocked with lumber or other approved type of edge support.

TABLE 21.28-B

MINIMUM THICKNESS OF ROOF BOARDS

<table>
<thead>
<tr>
<th>Rafter Spacing (inches)</th>
<th>Minimum Net Thickness (inches)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solid Sheathing</td>
<td>Spaced Sheathing</td>
</tr>
<tr>
<td>24</td>
<td>5/8</td>
</tr>
</tbody>
</table>

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART IX—FIREPLACE REQUIREMENTS

Ind 21.29 Masonry fireplaces. Masonry fireplaces shall be constructed of masonry, stone or reinforced concrete.

(1) Flue size. The fireplace flue size shall be based on the type of flue and the fireplace opening indicated in Table 21.29.

TABLE 21.29

MINIMUM FLUE SIZE FOR MASONRY FIREPLACES

<table>
<thead>
<tr>
<th>Type of Flue</th>
<th>Minimum Cross-Sectional Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Round</td>
<td>1/12 of fireplace opening</td>
</tr>
<tr>
<td>Square or rectangular</td>
<td>1/10 of fireplace opening</td>
</tr>
<tr>
<td>Lined with firebrick</td>
<td>1/8 of fireplace opening</td>
</tr>
</tbody>
</table>

(2) Termination of chimney. Masonry chimneys shall extend at least 3 feet above the highest point where the chimney passes through the roof and at least 2 feet higher than any portion of the dwelling within 10 feet of the chimney.

(3) Firebox materials. The firebox shall be of the preformed metal type, at least 1/4-inch thick; or shall be lined with firebrick, at least 2 inches thick and laid in thin joints of refractory cement. The back and sidewalls of the firebox, including the lining, shall be at least 8 inches nominally thick, at least 4 inches shall be solid masonry.

(4) Lintel. Masonry over the fireplace opening shall be supported by a lintel of noncombustible material.

(5) Ducts. Warm-air circulating ducts used with steel fireplace units shall be constructed of masonry or metal.

(6) Hearth. Fireplace hearths shall be constructed of noncombustible material and extend at least 8 inches on each side of the fireplace opening and 16 inches from the firebox.

(7) Dampers. Dampers shall be made of cast iron or at least No. 12 gauge sheet metal. The area of the damper opening shall be at least 90% of the required flue area when in the open position.

(8) Hoods. Metal hoods, used as a part of a fireplace, shall be constructed of at least No. 19 gauge corrosion-resistant metal with all seams and connections of smokeproof construction. The hood shall be sloped at an angle of 45° or less from the vertical and shall extend horizontally at least 6 inches beyond the firebox limits. Metal hoods shall be kept a minimum of 18 inches from the combustible materials unless approved for reduced clearances.

Note: The department will accept dampers and hoods listed by nationally recognized laboratories.

(9) Flue liners. Masonry chimneys shall be provided with fireclay flue liners of at least 1/2-inch thickness. The thickness of the masonry chimney wall shall be at least 4 inches. Flue liners shall be laid in a full mortar bed of refractory cement. If the flue liners are separated from the exterior shell by more than 4 inches, each individual flue shall be wrapped by 4 inches of masonry.
(10) **Cleanout openings.** Fireplaces with ash dumps shall be provided with cleanout openings at the base. Doors and frames of the opening shall be made of ferrous materials.

(11) **Mantel shelves.** Woodwork or other combustible materials shall not be placed within 6 inches of the fireplace opening. Combustible materials located within 12 inches of the fireplace opening shall not project more than ½-inch for each inch distance from the opening.

(12) **Chimney caps.** Precast or cast-in-place concrete caps shall have a minimum thickness of 2 inches and a minimum of one inch overhang. A minimum of a ¼-inch soft joint shall be used between flues and caps and shall be caulked or sealed.

(13) **Framing around fireplaces.** All wood headers, joists, beams, rafters and studs shall be located at least 2 inches from the outside face of the chimney or fireplace masonry and at least 6 inches from the inside surface of the flue lining. All spaces between the framing and the fireplace shall be firestopped with noncombustible material.

**History: Cr. Register, November, 1979, No. 297, eff. 6-1-80.**

**Ind 21.30 Factory built fireplaces.** Factory-built fireplaces consisting of a fire chamber assembly, one or more chimney sections, a roof assembly and other parts shall be tested and listed by a nationally recognized testing laboratory.

(1) **Fireplace assembly and maintenance.** The fireplace assembly shall be erected and maintained in accordance with the conditions of the listing.

(2) **Distance from combustibles.** Portions of the manufactured chimney extending through combustible floors or roof/ceiling assemblies shall be installed in accordance with the distances listed on the chimney in order to prevent contact with combustible materials.

(3) **Hearth extensions.** Hearth extensions of not less than ½-inch thick asbestos, hollow metal, stone, tile or other approved material shall be provided.

**Note:** Hearth extensions should extend not less than 18 inches in front of and at least 8 inches beyond both sides of the fireplace opening.

**History: Cr. Register, November, 1979, No. 297, eff. 6-1-80.**

**Ind 21.31 Factory-built fireplace stoves.** Factory-built fireplace stoves, consisting of a free-standing chamber assembly, shall be tested and listed by a nationally recognized testing laboratory. The assembly shall be erected and maintained in accordance with the listing.

**History: Cr. Register, November, 1979, No. 297, eff. 6-1-80.**
### ENERGY CONSERVATION

#### Part I—Scope and Purpose

| Ind 22.01 Scope | Ind 22.09 Temperature control |
| Ind 22.02 Purpose | Ind 22.10 Zone control |

#### Part II—Definitions

| Ind 22.03 Definitions | Ind 22.11 Duct and pipe insulation |
| Ind 22.04 Design Criteria | Ind 22.12 Equipment efficiencies |
| Ind 22.05 Indoor and outdoor temperatures | Ind 22.13 Electronic ignition and automatic flue dampering |
| Ind 22.06 Moisture control | Part VI Buildings Utilizing Solar, Wind or Other Nondepletable Energy Sources |
| Ind 22.07 Insulation standards | Ind 22.14 Innovative designs |
| Ind 22.08 Air leakage | Ind 22.15 Documentation |

#### Part V—Heating and Air Conditioning Equipment and Systems

- Selection of equipment

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### PART I—SCOPE AND PURPOSE

**Ind. 22.01 Scope.** The provisions of this chapter shall apply to all newly constructed conventional and manufactured one- and two-family dwellings.

**Note:** The energy code is not intended to apply to dwellings exclusively using a renewable source of energy, such as wood or solar heat.

**History:** Cr. Register, May, 1978, No. 269, eff. 12-1-78.

**Ind 22.02 Purpose.** (1) The purpose of this chapter is to provide design requirements which will improve the utilization of energy in one- and two-family dwellings as defined in section Ind 22.01, including minimum requirements for materials and methods of construction and for heating, cooling and air conditioning equipment and systems.

(2) The requirements of this chapter are intended to be flexible and to permit the use of innovative approaches and techniques to achieve effective utilization of energy.

(3) The requirements of this chapter are not intended to conflict with any safety or health requirements. Where such conflict occurs, the safety and health requirements shall govern.

**History:** Cr. Register, May, 1978, No. 269, eff. 12-1-78.

### PART II—DEFINITIONS

**Ind 22.03 Definitions.** (1) **COEFFICIENT OF PERFORMANCE (COP).** Cooling or heating. Coefficient of performance (COP) is the ratio of the rate of net heat removal or net heat output to the rate of total energy input, expressed in consistent units and under designated rating conditions.

(2) **Combustion efficiency.** Combustion efficiency is expressed in percentage and is defined as 100% minus stack losses in percent of heat input. Stack losses are (a) loss due to sensible heat in dry flue gas, (b)
loss due to incomplete combustion, and (c) loss due to sensible and latent heat in moisture formed by combustion of hydrogen in the fuel.

(3) COOLING LOAD. Cooling load is the rate at which heat must be removed from the space to maintain a selected indoor air temperature during periods of design outdoor weather conditions.

(4) DEGREE DAY, HEATING. Degree days are figured as the number of degrees the mean outdoor temperature deviates from 65°F each day during the heating season.

Note: For example, if, on December 15, the low temperature was +30°F and the high temperature was +50°F, the mean temperature would equal (30 + 50)/2 = +40°; therefore, 65° - 40° = 25 degree days.

(5) ENERGY EFFICIENCY RATIO. The energy efficiency ratio is the ratio of net cooling capacity in Btu per hour to total rate of electric input, in watts, under designated operating conditions.

(6) HEATED SPACE. Heated space is any space provided with a supply of heat to maintain the temperature of the space to at least 50°F. Heat supplied by convection from the energy-consuming systems may satisfy this requirement in basements if the energy-consuming systems are not insulated.

(7) HEATING LOAD. Heating load is the probable heat loss of each room or space to be heated, based on maintaining a selected indoor air temperature during periods of design outdoor weather conditions. The total heat load includes: the transmission losses of heat transmitted through the wall, floor, ceiling, glass or other surfaces; the infiltration losses or heat required to warm outdoor air which leaks in through cracks and crevices, around doors and windows, or through open doors and windows; or heat required to warm outdoor air used for ventilation.

(8) PERM. Perm is the designation for the unit permeance which is a substitute for the unit, one grain per (hour) (square foot) (inch of mercury vapor pressure difference).

(9) RESISTANCE, THERMAL (R). Thermal resistance (R) is a measure of the ability to retard the flow of heat. The R-value is the reciprocal of a heat transfer coefficient, expressed by U (R = 1/U). The higher the R-value of a material, the more difficult it is for heat to flow through the material.

(10) THERMAL TRANSMITTANCE (U). Thermal transmittance (U) is the coefficient of heat transmission or thermal transmittance (air to air) expressed in units of Btu per (hour) (square foot) (degree F). It is the time rate of heat flow. The U-value applies to combinations of different materials used in series along the heat flow path and also to single materials that comprise a building section, and includes cavity air spaces and surface air films on both sides. The lower the U-value of a material, the more difficult it is for heat to flow through the material.

History: Cr. Register, May, 1978, No. 269, eff. 12-1-78.

INDUSTRY, LABOR & HUMAN RELATIONS

PART III—DESIGN CRITERIA

Ind 22.04 Indoor and outdoor temperatures. The indoor temperatures listed in Table 22.04-A and the outdoor temperatures listed in Table 22.04-B shall be used to determine the total building heat loss or heat gain and to select the size of the heating or cooling equipment.

TABLE 22.04-A
INDOOR DESIGN TEMPERATURES

<table>
<thead>
<tr>
<th>Season</th>
<th>Temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Winter</td>
<td>70°F</td>
</tr>
<tr>
<td>Summer</td>
<td>78°F</td>
</tr>
</tbody>
</table>

History: Cr. Register, May, 1978, No. 269, eff. 12-1-78.

Ind 22.05 Moisture control. (1) VAPOR BARRIERS. Where thermal insulation is used, a vapor barrier shall be installed. The vapor barrier shall be installed on the interior side of the insulation, facing the heated interior, and behind the interior finish at the wall, ceiling and roof/ceiling assemblies. The vapor barrier shall cover the exposed insulation and interior face of studs, joists and rafters. Vapor barriers shall also be provided in crawl spaces, under slab floors, and around the exterior insulation installed around ducts in unheated areas. The transmission rate shall not exceed one perm.

(2) RELATIVE HUMIDITY. Where a power humidifier is installed, the humidifier shall be equipped with a control to regulate the relative humidity.

(3) VENTILATION. Ventilation above the ceiling/attic insulation shall be required. The free ventilating area shall be at least 1/300 of the horizontal area.

History: Cr. Register, May, 1978, No. 269, eff. 12-1-78.

PART IV—BUILDING ENVELOPE

Ind 22.06 Insulation standards. The exterior envelope of the building shall be insulated to meet the requirements of this part. More stringent overall thermal transmittance (U values) will be phased in at time intervals as specified for the designated building components.

Note: If the office of state planning and energy certifies that there is a shortage of insulating materials that are routinely used in construction of one- and two-family dwellings, the department will modify the requirements of section Ind 22.06 in accordance with the available supply of insulating material, through the promulgation of an emergency rule. When the office of state planning and energy certifies that such shortages have been remedied, the department will act to reinstate the requirements of section Ind 22.06.

(1) SLAB-ON-GRADE. The overall thermal transmittance (U value) through slab-on-grade floors shall not exceed .11 Btu per (hour) (square foot) (degree F). All slab-on-grade floors located within 24 inches of the exterior grade shall be insulated. The insulation shall extend downward from the top of the slab to below the frost depth, but not less than 18 inches; or downward vertically from the top of the slab 24 inches and 24 inches horizontally under the slab.
(2) FLOORS OVER UNHEATED AREAS. The overall thermal transmittance
(U
 value) through floors over unheated areas shall not exceed .09 Btu
per (hour) (square foot) (degree F). Insulation is not required in floors
over heated crawl space areas or basement areas.

(3) WINDOWS. All windows, except for basement windows, shall be
double glazed or have storm windows.

Note: See Table A-1 of Appendix A which was developed to serve as a guide to indicate the
percentage of glass which can be used for different types of wall construction.

(4) BOX SILL. The box sill area shall be insulated to the same level as
the wall.

(5a) ROOF/CEILINGS (effective April 1, 1979). The overall thermal
transmittance (U
 value) through roof/ceiling assemblies shall not ex-
ceed .02 Btu per (hour) (square foot) (degree F).

(6a) EXTERIOR WALLS (effective April 1, 1979). The exposed exterior
walls above grade shall be insulated in accordance with (a) or (b) and
(c).

<table>
<thead>
<tr>
<th>Zone</th>
<th>Winter Design Temp.</th>
<th>Summer Design Temp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-25</td>
<td>86</td>
</tr>
<tr>
<td>2</td>
<td>-20</td>
<td>87</td>
</tr>
<tr>
<td>3</td>
<td>-15</td>
<td>87</td>
</tr>
<tr>
<td>4</td>
<td>-10</td>
<td>89</td>
</tr>
</tbody>
</table>
that the overall heat loss for the entire building enclosure does not exceed the total heat loss resulting from complying with (1) through (8) of this section.

Note: See Appendix A for an example of the system design procedure.

(10) Accuracy of calculations. The thermal transmittance (U) values and building dimensions used in heat gain or loss calculations shall have a minimum decimal accuracy of 5 places rounded to 3, except that the U values used for calculating ceiling transmission shall have a minimum decimal accuracy of 4 places rounded to 3.

History: Cr. Register, May, 1978, No. 269, eff. 12-1-78; r. (5) and (6) eff. 3-31-79 and cr. (6a) and (6b), eff. 4-1-79; r. (6a), eff. 3-31-80 and cr. (6b), eff. 4-1-80.

Ind 22.07 Air leakage. (1) General. All windows and doors shall be constructed and installed to minimize air leakage.

(2) Doors and windows. Manufactured windows shall be constructed and installed to limit infiltration to 0.5 cubic feet per minute per foot of sash crack. The air infiltration rate of sliding glass doors shall not exceed 0.5 cubic feet per minute per square foot of door area. The air infiltration rate for swinging doors shall not exceed 1.26 cubic feet per minute per square foot of door area.

Note: The department will recognize windows and doors tested in conformance with ASTM E-283, Standard Method of Test for Rate of Air Leakage Through Exterior Curtain Walls and Doors.

(3) Exterior openings. Exterior joints around windows and door frames; between wall cavities and window or door frames; between walls and foundations; between walls and roofs; between walls and floors; between separate wall panels; at penetrations of utility services through walls, floors and roofs; and all other openings in the exterior building envelope shall be caulked, gasketed, weatherstripped or otherwise sealed.

(4) Interior openings. Openings through the top plate of frame walls shall be caulked, gasketed, packed with insulation, or otherwise sealed.

History: Cr. Register, May, 1978, No. 269, eff. 12-1-78.

PART V—HEATING AND AIR CONDITIONING EQUIPMENT AND SYSTEMS

Ind 22.08 Selection of equipment. The output capacity of the mechanical heating, cooling and air conditioning equipment shall not exceed the calculated heating load and cooling load by more than 15%, except to satisfy the next closest manufacturer’s nominal size.

History: Cr. Register, May, 1978, No. 269, eff. 12-1-78.

Ind 22.09 Temperature control. At least one thermostat for regulating the temperature of the space shall be provided for each separate system. Thermostats used to control the heating system may also be used to control the cooling system.

Note: Setting back the thermostat during periods of non-use or thermostats equipped with automatic controls which reduce the temperature during periods of non-use, conserve energy.

History: Cr. Register, May, 1978, No. 269, eff. 12-1-78.
Ind 22.10 Zone control. Each heating and cooling system shall be provided with an automatic or manually controlled damper or valve to shut off or reduce the heating or cooling to each zone or floor and to each room.

History: Cr. Register, May 1978, No. 269, eff. 12-1-78.

Ind 22.11 Duct and pipe insulation. (1) Duct insulation. All duct systems exposed to unheated spaces shall be insulated with materials having a minimum thermal resistance of $R = 5$.

(2) Pipe insulation. All heating pipes in unheated spaces and all cooling pipes in conditioned spaces shall be insulated with at least one inch of insulation. A vapor barrier on the exposed side of the insulation shall be provided on cooling pipes to prevent condensation. Pipes installed within heating and air conditioning equipment, installed in conditioned spaces, are not required to be insulated.

History: Cr. Register, May 1978, No. 269, eff. 12-1-78.

Ind 22.12 Equipment efficiencies. (1) Electrical equipment. (a) Air conditioning equipment. Air conditioning equipment shall have a minimum energy efficiency ratio (EER) of 6.1 (COP of 1.8).

(b) Heat pumps. Heat pumps shall comply with the minimum coefficients of performance set forth in Table 22.12.

TABLE 22.12
MINIMUM COP FOR HEAT PUMPS, HEATING MODE

<table>
<thead>
<tr>
<th>Source and outdoor temperature (°F)</th>
<th>Minimum COP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air source - 47 dry bulb/43 wet bulb</td>
<td>2.2</td>
</tr>
<tr>
<td>Air source - 17 dry bulb/15 wet bulb</td>
<td>1.2</td>
</tr>
<tr>
<td>Water source - 60 entering</td>
<td>2.2</td>
</tr>
</tbody>
</table>

1. The heat pump shall be installed with a control to prevent the supplementary heater from operating when the heating load can be more efficiently satisfied by the heat pump alone.

2. Supplementary heater operation is permitted during transient periods, such as start-ups, following room thermostat set point advance, and during defrost.

Note: A two-stage room thermostat, which controls the supplementary heat on its second stage, will be accepted as meeting this requirement. The cut-on temperature for the compression heating should be higher than the cut-on temperature for the supplementary heat; the cut-off temperature for the compression heating should be higher than the cut-off temperature for the supplementary heat.

(2) Combustion heating equipment. All gas-fired and oil-fired heating equipment shall have a minimum combustion efficiency of 75% at maximum rated output.

History: Cr. Register, May 1978, No. 269, eff. 12-1-78.

Ind 22.13 Electronic ignition and automatic flue dampering (effective April 1, 1979). Combustion space-heating equipment shall be provided with electronic ignition and automatic flue dampering, except

History: Cr. Register, May 1978, No. 269, eff. 12-1-78.

Sealed combustion equipment or equipment located in enclosures and provided with combustion air need not be provided with automatic flue dampering.

History: Cr. Register, May 1978, No. 269, eff. 4-1-79.

PART VI—BUILDINGS UTILIZING SOLAR, WIND OR OTHER NONDEPLETABLE ENERGY SOURCES

Ind 22.14 Innovative designs. (1) Designs utilizing nondepletable energy sources. Any innovative building or system design, or a design which utilizes solar, geothermal, wind or other nondepletable energy sources will be accepted by the department provided the design utilizes less depletable energy than determined through the accepted practice method or the system design method.

(2) Other alternative designs. Proposed alternative designs may also consider energy savings resulting from orientation of the building on the site; the geometric shape of the building; the aspect ratio (ratio of length to width); the number of stories for a given floor area; the thermal mass of the building; the exterior surface color; shading or reflections from adjacent structures; surrounding surfaces of vegetation; natural ventilation; and wind direction and speed.

History: Cr. Register, May 1978, No. 269, eff. 12-1-78.

Ind 22.15 Documentation. Proposed alternative designs shall be accompanied with an energy analysis comparing the energy utilized by the proposed design with the energy used by a design complying with Part IV.

History: Cr. Register, May 1978, No. 269, eff. 12-1-78.
INDUSTRY, LABOR AND HUMAN RELATIONS

Chapter Ind 23

HEATING, VENTILATING AND AIR CONDITIONING STANDARDS

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Part II Design
Ind 23.02 Design (p. 71)

Part III Heating Equipment
Ind 23.03 Selection of equipment (p. 72)
Ind 23.04 Types of equipment (p. 72)
Ind 23.05 Safety controls (p. 81)
Ind 23.06 Combustion air (p. 81)

Part IV Delivery Systems
Ind 23.07 Air distribution systems (p. 81)
Ind 23.08 Ductwork (p. 82)
Ind 23.09 Dampers, registers and grilles (p. 84)
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Part V Chimneys and Vents
Ind 23.11 General requirements (p. 84)
Ind 23.12 Masonry chimneys (p. 85)
Ind 23.13 Factory-built chimneys or vents (p. 86)
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Part VII Equipment Location and Operation
Ind 23.17 Equipment location (p. 89)
Ind 23.18 Operation (p. 90)

PART I—SCOPE

Ind 23.01 Scope. The provisions of this chapter shall apply to the design, installation and construction of all heating, ventilating and air conditioning systems in dwellings covered by this code.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART II—DESIGN

Ind 23.02 Design. Every dwelling shall be equipped with a heating system designed in accordance with this section. Heating equipment requirements may be waived for recreational dwellings used only during the non-heating season. Where a cooling system is provided, the cooling requirements of this section shall be met.

1. Heating and Cooling System Design. Indoor and outdoor design temperatures shall be selected from section Ind 22.04. The heating and cooling systems shall be designed to maintain the indoor design temperature at outdoor design conditions. When requested, room-by-room heat loss and heat gain calculations shall be furnished.

2. Distribution Systems. Distribution systems shall be sized and located to satisfy the heating and cooling loads of each conditioned space. When requested, a layout of the distribution system shall be furnished to show that the system meets the requirements of this code.

3. Ventilation. Habitable rooms without operable windows shall be provided with a mechanical ventilation system producing one air change per hour. All required exhaust vents shall terminate outside the structure. Ductless recirculating fans may be used if approved by the department.

Note: The department will accept designs which meet the Air Conditioning Contractors of America manual; the Mechanical Contractors Association manual; and the Sheet Metal and Air Conditioning Contractors National Association standards for heating and air conditioning systems for one- and 2-family dwellings.

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Heating, Ventilation and Air Conditioning Standards

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(4) **Controls.** The temperature rise through the equipment shall not exceed 100°F unless listed. Controls shall be provided to maintain the inside temperature. Where forced, warm-air systems are used, controls shall be installed to control air movement.

**History:** Cr. Register, November, 1979, No. 287, eff. 6-1-80.

**PART III—HEATING EQUIPMENT**

**Ind 23.03 Selection of equipment.** All heating and central cooling equipment shall be selected on the basis of air-handling capacity, pumping capacity, and thermal capacity to handle the calculated design heating or cooling load.

**History:** Cr. Register, November, 1979, No. 287, eff. 6-1-80.

**Ind 23.04 Types of equipment.** Heating and cooling appliances shall be listed by a recognized testing agency. The clearances in tables 23.04-A and 23.04-B shall apply unless otherwise shown on listed appliances.

---

### TABLE 23.04-A

<table>
<thead>
<tr>
<th>Appliance Type</th>
<th>From Top of Casing to Floor</th>
<th>From Front to Side of Wall</th>
<th>From Back to Back of Wall</th>
<th>From Sides to Sides</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Residential Type Appliances</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic Oil - 30°F</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Comb. Gas - 30°F</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Electric Heating</td>
<td>18</td>
<td>18</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>Gravity, Oil Furnaces, All Water Heaters</td>
<td>24</td>
<td>24</td>
<td>24</td>
<td>24</td>
</tr>
<tr>
<td><strong>Industrial Type Appliances</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic Oil - 30°F</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Comb. Gas - 30°F</td>
<td>36</td>
<td>36</td>
<td>36</td>
<td>36</td>
</tr>
<tr>
<td>Electric Heating</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td>Gravity, Oil Furnaces, All Water Heaters</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
</tbody>
</table>
TABLE 23.04-A (CONTINUED)

<table>
<thead>
<tr>
<th>Appliance 1</th>
<th>Above Top of Casing or</th>
<th>From Top and Sides of Warm-Air Bonnet or Plenum</th>
<th>From Front See Note 2</th>
<th>From Back</th>
<th>From Sides</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ranges - Cooking Stoves</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>9</td>
<td>24</td>
</tr>
<tr>
<td>Gas</td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Solid - Clay</td>
<td>Solid fired pot</td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>24</td>
</tr>
<tr>
<td>Solid - Un-</td>
<td>lensed firepot</td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>36</td>
</tr>
<tr>
<td>Electric</td>
<td>30</td>
<td>—</td>
<td>—</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Clothes Dryers</td>
<td>Gas</td>
<td>6</td>
<td>—</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>Electric</td>
<td>6</td>
<td>—</td>
<td>24</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Incinerators</td>
<td>Residential Types</td>
<td>26</td>
<td>40</td>
<td>36</td>
<td>36</td>
</tr>
</tbody>
</table>

1 Standard clearances may be reduced by affording protection to combustible material in accordance with Table 23.04-B.

2 Rooms which are large in comparison to the size of the appliance are those having a volume equal to at least 12 times the total volume of a furnace and at least 16 times the total volume of a boiler. If the actual ceiling height of a room is greater than 8 feet, the volume of a room should be figured on the basis of a ceiling height of 8 feet.

3 The minimum dimension should be that necessary for serving the appliance including access for cleaning and normal care, tube removal, etc.

4 For a listed oil, combination gas-oil, gas, or electric furnace this dimension may be 3 inches if the furnace limit control cannot be set higher than 250° F or this dimension may be one inch if the limit control cannot be set higher than 200° F.

5 The dimension may be 6 inches for an automatically stoker-fired forced warm-air furnace equipped with 250° F limit control and with baromteric draft control operated by draft intensity and permanently set to limit draft to a maximum intensity of 0.13 inch water gauge.

6 To combustible material or metal cabinets. If the undersides of such combustible material or metal cabinet is protected with asbestos millboard at least 3/8-inch thick covered with sheet metal of not less than No. 28 gauge, the distance may be not less than 24 inches.

7 Clearance above charging door should not be less than 48 inches.

TABLE 23.04-B
CLEARANCES, INCHES, WITH SPECIFIED FORMS OF PROTECTION

<table>
<thead>
<tr>
<th>Type of Protection</th>
<th>Applied to the combustible material unless otherwise specified and covering all surfaces within the distance specified as the required clearance with no protection.</th>
<th>Where required clearance with no protection is</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>36 inches</td>
</tr>
<tr>
<td>(a)</td>
<td>3/8-in. asbestos millboard spaced 1 in. away.</td>
<td>Above</td>
</tr>
<tr>
<td>(b)</td>
<td>0.013 in. (28 gauge) sheet metal on 3/8-in. asbestos millboard.</td>
<td>30</td>
</tr>
<tr>
<td>(c)</td>
<td>0.013 in. (28 gauge) sheet metal spaced 1 in. away.</td>
<td>24</td>
</tr>
<tr>
<td>(d)</td>
<td>0.013 in. (28 gauge) sheet metal on 3/8-in. asbestos millboard spaced 1 in. away.</td>
<td>18</td>
</tr>
<tr>
<td>(e)</td>
<td>1/8-in. asbestos cement covering on heating appliance.</td>
<td>18</td>
</tr>
<tr>
<td>(f)</td>
<td>3/8-in. asbestos millboard on 1 in. mineral fiber baffle reinforced with wire mesh or equivalent.</td>
<td>18</td>
</tr>
<tr>
<td>(g)</td>
<td>0.027 in. (22 gauge) sheet metal on 1 in. mineral fiber baffle reinforced with wire or equivalent.</td>
<td>18</td>
</tr>
<tr>
<td>(h)</td>
<td>3/8-in. asbestos millboard.</td>
<td>36</td>
</tr>
<tr>
<td>(i)</td>
<td>3/8-in. cellular asbestos.</td>
<td>36</td>
</tr>
</tbody>
</table>

*Except for the protection described in (a), all clearances should be measured from the outer surface of the appliance to the combustible material disregarding any intervening protection applied to the combustible material.

*Asbestos millboard referred to above is a different material from asbestos cement board. It is not intended that asbestos cement board be used in complying with these requirements when asbestos millboard is specified.
(1) Furnaces. The input and output capacity of furnaces shall be listed on the nameplate. All nameplates shall show evidence that the equipment has been listed by a recognized testing laboratory.

(a) Fuel supply. Furnaces shall be fired with the fuel for which they have been approved, except as provided in (1) (d) of this section. Fuels shall be supplied to the furnace in the volume and at the pressure required on the label.

(b) Unvented fuel-fired furnaces and space heaters. Unvented fuel-fired furnaces and space heaters shall be prohibited in dwellings.

(c) Vented wall furnaces. Vented wall furnaces shall not be equipped with duct extensions beyond the vertical and horizontal limits of the enclosure unless listed. Vented wall furnaces shall be located to prevent the restriction of air circulation by doors, projections, or other openings. Vented wall furnaces shall be provided with combustion air.

(d) Conversion burners. Conversion burners shall be listed by a recognized testing laboratory. The existing equipment shall be reconditioned and defective parts replaced before a conversion burner is installed. Conversion burners shall be installed in accordance with the installation instructions.

(e) Location. No furnace shall be placed in a bedroom, bathroom, closet or garage unless listed for such installation.

(2) Heat pump appliances. (a) Size. Heat pump appliances shall be sized to provide control of the wet and dry bulb temperatures during heating, cooling and maximum performance during heating. The heating balance point shall be considered to determine the outdoor temperature at which the heat pump must operate 100% of the time to offset the dwelling heat loss.

(b) Auxiliary heaters. Provisions for auxiliary heat to supplement the heat pump at outdoor temperatures below the balance point shall be provided. Auxiliary heaters shall be sized so that the heat pump auxiliary will offset the dwelling heat loss down to the heating design temperature.

(3) Boilers. Boilers shall comply with Wis. Adm. Code chapters Ind 41.42, Boiler and Pressure Vessel Code, sections Ind 41.39 and Ind 41.50 through 41.53.

Note: The department will accept equipment listed by the American Society of Mechanical Engineers, Underwriters' Laboratories, and the American Gas Association.

(4) Solid-fuel-burning appliances. Solid-fuel-burning appliances shall comply with the following requirements:

(a) Floor protection. Stoves may be installed on combustible floors provided the floor is protected with a material such as 24-gauge or thicker sheet metal, 1/4-inch or thicker asbestos millboard covered with 24-gauge sheet metal, 4-inch hollow bricks, or 4 inches of stone or concrete, or equivalent. Such protection shall extend beneath the stove, at least 12 inches beyond all sides and at least 18 inches beyond sides having a door or other similar opening. Stoves shall have a clearance of at least 4 inches to the floor.

(b) Chimneys. Wood-burning appliances shall be connected to a masonry chimney with a flue liner or an all-fuel, residential type factory-built chimney. Wood-burning equipment shall not be connected to a flue serving a fireplace or other equipment. The chimney shall be designed to create a natural draft to carry away the products of combustion or provision shall be made for mechanically maintaining constant draft during equipment operation. A cleanout opening shall be provided.

(c) Chimney connector or stovepipe. The chimney connector or stovepipe shall comply with Table 23.15-A.

(d) Damper. A manual cast iron damper to control the draft shall be provided in the chimney connector next to the appliance.

(e) Supplemental units. Supplemental wood-burning units connected to a furnace shall be connected to the warm air side of the furnace in accordance with illustrations 23.01-A, 23.01-B or 23.01-C.

1. Return air duct. The area of the return air duct shall be at least equal to the area of the warm air supply duct. The return air duct shall be of the same material as specified for supply air ducts.

2. Blower. The blower on the furnace shall maintain the manufacturer's specifications for CFM and static pressure when the supplemental unit is in operation.

3. Outside air intake. The outside air intake shall be connected to the cold air return plenum of the furnace. A volume damper shall be placed in the duct for the fresh air intake.

4. Thermostat. The thermostat control on the supplemental heating unit shall activate the blower motor at a temperature between 100° and 120° F.
**Ind 23.05 Safety controls.** High limit, maximum outlet air temperature and similar safety controls shall be provided on heating equipment.

**History:** Cr. Register, November, 1979, No. 287, eff. 6-1-80.

**Ind 23.06 Combustion air.** All fuel-burning heating equipment, except sealed combustion appliances, cooking appliances, refrigerators and clothes dryers, shall be provided with a supply of air for fuel combustion.

1. **Equipment located in unconfined spaces.** (a) **Infiltration.** Combustion air may be provided by means of infiltration where the volume of the room (measured in cubic feet) in which the burner is located is greater than 1/20 of the maximum input BTU rating of the burner (a).

   (b) **Openings.** Where exterior openings are used to provide combustion air from the outside to appliances located in unconfined spaces, the opening shall be designed to provide one square inch of area for each 5,000 BTU per hour of input rating.

2. **Equipment located in confined spaces.** Combustion air provided to equipment located in confined spaces shall be installed in accordance with the following:

   (a) **Air from inside the dwelling.** Two openings shall be provided to the equipment enclosure. One opening shall be located within 12 inches from the floor and one opening shall be located within 24 inches from the top of the room. Each opening shall provide a minimum area of one square inch per 1,000 BTU per hour input.

   (b) **Air from outside the dwelling.** Two openings shall be provided to the equipment enclosure. One opening shall be located within 12 inches from the floor and one opening shall be located within 24 inches from the top of the room. Each opening shall provide a minimum area of one square inch per 4,000 BTU per hour input.

**History:** Cr. Register, November, 1979, No. 287, eff. 6-1-80.

**PART IV—DELIVERY SYSTEMS**

**Ind 23.07 Air distribution systems.** (1) **Sizing.** All air distribution systems shall be sized using the velocities and static pressure losses listed in Table 23.07.

**TABLE 23.07**

**DUCT VELOCITIES**

<table>
<thead>
<tr>
<th>Designation</th>
<th>Maximum Static Pressure Loss (in WG/100 ft)</th>
<th>Minimum Velocity (feet/minute)</th>
<th>Maximum Velocity (feet/minute)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main trunk duct</td>
<td>.10</td>
<td>700-900</td>
<td>800-1200</td>
</tr>
<tr>
<td>Branch duct</td>
<td>.30</td>
<td>600</td>
<td>700-1000</td>
</tr>
<tr>
<td>Branch riser</td>
<td>.10</td>
<td>500</td>
<td>600-800</td>
</tr>
<tr>
<td>Outdoor intake</td>
<td>.10</td>
<td>500</td>
<td>600</td>
</tr>
<tr>
<td>Grilles or openings</td>
<td>.10</td>
<td>400</td>
<td>600</td>
</tr>
<tr>
<td>Return air dry undercuts</td>
<td>.10</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td>Return air door or wall</td>
<td>.10</td>
<td>200</td>
<td>300</td>
</tr>
</tbody>
</table>

WG = Water gauge per 100 feet.

**History:** Cr. Register, November, 1979, No. 287, eff. 6-1-80.
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TABLE 23.08-A

DUCT CONSTRUCTION MINIMUM SHEET METAL GAUGES

<table>
<thead>
<tr>
<th>Metal gauges (duct not enclosed in partitions)</th>
<th>Minimum thickness galvanized sheet</th>
<th>Minimum thickness aluminum B &amp; B gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diameter, inches</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than 12</td>
<td>30</td>
<td>26</td>
</tr>
<tr>
<td>12-14</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>15-18</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Over 18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Rectangular Ducts

<table>
<thead>
<tr>
<th>Width, inches</th>
<th>Minimum thickness galvanized sheet</th>
<th>Minimum thickness aluminum B &amp; B gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 14</td>
<td>28</td>
<td>24</td>
</tr>
<tr>
<td>14-24</td>
<td>26</td>
<td>22</td>
</tr>
<tr>
<td>25-30</td>
<td>24</td>
<td>22</td>
</tr>
<tr>
<td>Over 30</td>
<td>22</td>
<td>20</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Metal gauges (ducts enclosed in partition)</th>
<th>Minimum thickness galvanized sheet</th>
<th>Minimum thickness aluminum B &amp; B gauge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Width, inches 14 or less</td>
<td>30</td>
<td>26</td>
</tr>
<tr>
<td>Over 14</td>
<td>28</td>
<td>24</td>
</tr>
</tbody>
</table>

TABLE 23.08-B

DUCT SUPPORT MATERIAL

<table>
<thead>
<tr>
<th>Duct Type</th>
<th>Maximum Size of Diameter (Inches)</th>
<th>Duct Position</th>
<th>Hanger or Strap Size and Spacing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circular</td>
<td>10</td>
<td>Vertical</td>
<td>No. 18 gauge galvanized steel x 2&quot; @ 12&quot; o.c.</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>Horizontal</td>
<td>No. 18 gauge galvanized steel x 1&quot; or No. 18 steel wire @ 10&quot; o.c.</td>
</tr>
<tr>
<td>Rectangular</td>
<td>24</td>
<td>Vertical</td>
<td>1&quot; x 1/8&quot; galvanized steel strap @ 12&quot; o.c.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Horizontal</td>
<td>No. 18 gauge galvanized steel x 1&quot; @ 10&quot; o.c.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Vertical</td>
<td>1&quot; x 1/8&quot; galvanized steel angle @ 12&quot; o.c.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Horizontal</td>
<td>1&quot; x 1/8&quot; galvanized steel strap @ 10&quot; o.c.</td>
</tr>
</tbody>
</table>

Rectangular metal duct supports should consist of one hanger attached to one-inch wide circular bands of the duct extending around and supporting ducts exceeding 10 inches in diameter.

Note: This table does not prohibit nailing for duct support.

(4) UNDERGROUND DUCTS. Ducts, plenums and fittings constructed of asbestos cement, metal encased in concrete or ceramic, or other approved materials, may be installed in the ground. Supply air ducts installed parallel and adjacent to an outside wall shall be insulated with a moistureproof material having a resistance value of at least R-5 to a depth of at least 48 inches.

(5) METAL STANDARDS. All sheet metal ducts and fittings shall be constructed in compliance with standards approved by the department.

(6) THICKNESS. Ducts shall conform to the minimum thicknesses listed in Table 23.08-A.

(7) DUCT SUPPORT. Ductwork shall be fastened in place and braced to prevent lateral displacement in accordance with Table 23.08-B.
PART V—CHIMNEYS AND VENTS

Ind 23.11 General requirements. All heating appliances using solid, liquid or gas fuels shall be vented to the outside by an all-fuel factory-built or masonry chimney designed to remove the products of combustion. Gas fired water heaters may be connected to an approved type "B" vent. Vented wall furnaces may be connected to an approved type "BW" vent. Listed appliances with direct vent systems may also be used.

(1) TERMINATION. All chimneys or vents depending on a principle of gravity for the removal of the products of combustion shall extend at least 3 feet above the highest point where the chimneys and vents pass through the roof of the building, and at least 2 feet higher than any ridge, peak, wall, or roof within 10 feet horizontally of the chimney or vent.

(2) CHIMNEY OR VENT INLETS. Two appliances using the same type of fuel may be vented into the same flue provided the separate inlets are offset at least 12 inches vertically; or the separate inlets occur at right angles to each other; or the appliances are connected to a single inlet through a common manifold. Chimneys serving fireplaces or other solid-fuel burning appliances shall not be used to vent any other equipment or appliance.

Note: The sizes of pipe to be used for mains and risers may be selected from the ASHRAE Guide and Data Book, published by the American Society of Heating, Refrigerating and Air Conditioning Engineers, or the manuals published by the Institute of Boiler and Radiator Manufacturers or the Mechanical Contractors Association of America.

(2) EXPANSION AND CONTRACTION. The piping for the heating system shall be equipped with anchors, expansion swivels or joints, supports and similar devices to relieve stress and strain caused by temperature change of the pipe material.

(3) PIPE INSULATION. Unguarded steam, hot water supply and return piping shall be covered with insulating material where the pipes pass through occupied areas and the surface temperature exceeds 150° F.

(4) STEAM AND HOT WATER PIPES. No pipe carrying hot water or steam at a surface temperature exceeding 250° F shall be placed within one inch of any combustible material, pass through a combustible floor, ceiling or partition unless the pipe is protected by a metal sleeve one inch larger in diameter than the pipe or with approved pipe covering.

(5) BALANCING. Balancing cocks shall be provided in each circuit of a hot water distribution system.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

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Ind 23.12 Masonry chimneys. Masonry chimneys shall conform to the provisions of this section.

(1) MATERIALS. No masonry chimney shall rest upon wood. Combustible headers, beams, rafters, joists and studs shall be located at least 2 inches from the inside face of a chimney and at least 6 inches from the inside surface of the flue lining. The foundation shall be designed and built in conformity with the requirements for foundations. Masonry chimneys shall be at least 4 inches nominal in thickness.

(2) FLUE SIZE. Chimney flues for appliances shall be at least equal in area to that of the area of the connector from the appliance.

(3) MULTIPLE FLUE SEPARATION. When more than one flue is contained in the same chimney, a masonry separation of at least 4 inches nominal in thickness shall be provided between the individual flues. The flue joints shall be staggered by at least 7 inches.

(4) CORBELING. Unless designed through structural analysis, masonry chimneys shall not be corbeled from a wall more than 6 inches nor shall a masonry chimney be corbeled from a wall less than 12 inches in thickness unless it projects equally on each side of the wall. The corbeling shall not exceed one-inch projection for each brick course.

(5) INLETS. Thimbles shall be at least No. 24 manufacturer's standard gauge (10/24 inch) or 1/4-inch thick refractory material. Each chimney shall have an inlet installed at the time of construction.

(6) CLEAN-OUT OPENING. Every masonry chimney shall be provided with a clean-out opening at the base. Such openings shall be equipped with metal doors and frames arranged to remain closed when not in use.

(7) FLUE LINERS. (a) Masonry chimneys shall be lined with fireclay flue lining at least 1/2-inch thick, or with material that will resist corrosion, softening or cracking from flue gases at temperatures up to 1800° F. Flue liners shall commence at the chimney footing.

(b) Where chimneys are built for solid-fuel burning, flue liners shall be laid in a full mortar bed of refractory mortar.
(8) Chimney Caps. Precast or cast-in-place concrete caps shall have a minimum thickness of 2 inches and a minimum of one inch overhang. A minimum of a 1/4-inch soft joint shall be used between flues and caps and shall be caulked or sealed.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 23.13 Factory-built chimneys or vents. Factory-built chimneys or vents shall be of an approved type.

Note: The department recognizes as approved, factory-built chimneys or vents designated as "residential type" and building heating appliances, "R", "B", "BW", and "L" types listed by Underwriters' Laboratories, Inc.

(1) Residential type and building heating appliance. An approved "residential type" and building heating appliance" chimney or a "building heating appliance only" chimney may be used with solid, liquid or gas-fired heating appliances where the flue gas temperature does not exceed 1000°F continuously, and does not exceed 1400°F for infrequent brief periods of forced firing.

(2) Type "B". An approved type "B" gas vent may be used with a vented, recessed wall heater.

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

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 23.14 Gas vents. All gas-fired equipment shall be provided with vent pipes conforming to the requirements for smoke pipes or for gas vents as specified in section Ind 23.15 (2) (g).

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 23.15 Chimney connectors, smoke pipes and stovepipes. (1) Definition. Chimney connectors, smoke pipes or stovepipes are passages for conducting the products of combustion from a fuel-fired appliance to the chimney.

(2) Construction and installation. The construction and installation of chimney connectors shall conform with the following requirements:

(a) Concealed space. No chimney connector shall pass through any outside window, door or combustible outside wall, nor be concealed in any closet, attic or similar space.

(b) Combustible partitions. Connectors for appliances shall not pass through walls or partitions constructed of combustible material unless they are guarded at the point of passage by:

1. Metal ventilated thimbles not less than 12 inches larger in diameter than the connector;

2. Metal or burned fireclay thimbles built in brickwork or other approved fireproofing materials extending not less than 8 inches beyond all sides of the thimble.

(c) Distance from materials. No part of any chimney connector shall be placed nearer to any combustible partition or wall than the diameter of the pipe, nor nearer to any non-combustible ceiling than 1 1/2 times the diameter. The above distances may be reduced by one-half if the wall or ceiling is covered with not less than 1/4-inch asbestos board covered with sheet metal or with equivalent protection.

Note: See Table 23.04-B for reduced clearances.

(d) Multiple appliance venting. Two or more listed appliances using the same type of fuel may be connected to a common gravity-type flue provided the appliances are equipped with listed primary safety controls and listed shutoff devices and comply with the following requirements.

1. The appliances shall be located in the same story, except for engineered venting systems.

2. The appliances shall be joined at a manifold or Y-type fitting as close to the chimney as possible, unless the connector from each appliance enters a separate chimney inlet and the inlets are offset in accordance with the requirements of section Ind 23.11 (2).

3. The chimney connector and chimney flue shall be sized to accommodate the total volume of flue gases. For gas-burning appliances, the venting area shall be at least equal to the size of the largest vent connectors plus at least 50% of the area of the other vent connectors.

(e) Pitch and length. Chimney or vent connectors shall have no more than two 45° offsets with the vertical. The horizontal length shall not exceed 75% of the total vertical height of the total venting system measured from the appliance outlet. Chimney or vent connectors shall be pitched at least 1/4-inch per foot from the appliance outlet collar vent to the chimney inlet.

(f) Dampers. The use of manually operated dampers shall be prohibited in chimneys or vent connectors of all appliances except wood-burning appliances. When used, listed automatically operated dampers interlocked with the heating appliance shall be installed in accordance with the approved listing.

(g) Materials and thickness. Chimney or vent connectors serving liquid and solid fuel appliances shall conform to the type of material and thickness indicated in tables 23.15-A or 23.15-B.

(h) Clearance. Single wall metal connectors shall be installed with clearance to combustibles as indicated in Table 23.15-C. These clearances may be reduced if the combustible material is protected in accordance with the requirements of Table 23.04-B.

<table>
<thead>
<tr>
<th>Diameter of Connector</th>
<th>Galvanized Steel Gage Number</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Min. thickness (inch)</td>
</tr>
<tr>
<td>Less than 6 inches</td>
<td>.019</td>
</tr>
<tr>
<td>6 inches to less than 10 inches</td>
<td>.024</td>
</tr>
<tr>
<td>10 inches to 13 inches</td>
<td>.030</td>
</tr>
<tr>
<td>14 inches to 16 inches</td>
<td>.036</td>
</tr>
<tr>
<td>Greater than 16 inches</td>
<td>.058</td>
</tr>
</tbody>
</table>

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(c) Tanks shall have welded steel supports and be permanently installed on concrete pads or foundations.

(2) Oil Storage Tanks. (a) Oil storage tanks on the inside of any dwelling shall be located at the same level as the furnace it serves.

(b) The total storage capacity inside any dwelling shall be limited to 550 gallons in one tank, or not more than 275 gallons in each of 2 storage tanks cross-connected to a single burner.

(c) Underground tanks shall be constructed of steel or other approved noncombustible material, provided the material is compatible with fuel oil.

(d) Storage of fuel oil above ground shall not be in excess of 550 gallons. Storage tanks installed outside and above ground shall be installed on a firm and level foundation.

(e) The fuel oil tank shall be equipped with a fill pipe, vent pipe, oil gauge, oil filter and shut-off valve. The vent pipe and fill pipe shall terminate outside of the dwelling and be located at least 2 feet from any opening. The fill pipe shall be at least 2 inches in diameter and the vent pipe shall be at least 1½ inches in diameter. The vent pipe and fill pipe shall be provided with a weatherproof cap.

Note: The department will accept installations which conform with NFPA standard No. 31, Oil-Burning Equipment.

(3) Gas Piping. (a) Materials. Gas piping materials shall be black IPS wrought iron or steel or other approved piping or tubing and fittings designed for use with fuel gas. Gas valves and connections shall be approved types designed for use with fuel gas.

(b) Piping support. Gas piping shall be supported by metal straps or hooks spaced not more than 10 feet apart.

(4) Shut-off and Control Devices. (a) An accessible approved shut-off valve shall be installed ahead of the union or other connection in the fuel piping. Service valves on gas-fired equipment shall be located between 4 and 6 feet above the floor.

(b) Automatic gas-burning heating appliances shall be equipped with listed devices which will shut off the gas to the pilot light and main burner(s) in the event of pilot failure.

(c) Liquid fuel-burning appliances shall be equipped with primary safety controls which will shut off the flow of fuel to the burner(s) in the event of ignition failure.

Note: The department will accept installations conforming to NFPA standard No. 54, National Fuel Gas Code.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART VII—EQUIPMENT LOCATION AND OPERATION

Ind 23.17 Equipment location. (1) Outdoor equipment. Outdoor equipment shall be located so as to not restrict the air flow or recirculation of air. Outdoor equipment so located as to be subject to damage shall be protected.
Ind 23

(2) INDOOR EQUIPMENT. All indoor equipment shall be installed with a minimum of 24 inches of clearance for service.
History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 23.18 Operation. (1) INSTRUCTIONS. Written instructions shall be provided the owner for the operation and maintenance of the system and equipment.

(2) FINAL TEST REQUIRED. The installer shall test and balance every heating, ventilating and air conditioning system.
History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.
Chapter Ind 24

ELECTRICAL STANDARDS

Ind 24.01 Electrical standards

Ind 24.01 Electrical standards. All electrical wiring, installations, equipment and materials used in the construction of dwellings shall comply with the requirements of the Wisconsin Administrative Electrical Code, Vol. 2.

Note: Section 167.16, Stats., requires that the company furnishing the electric current obtain proof that the wiring complies with these standards before furnishing the current. Proof must be a certificate furnished by the inspection department or officer, or if there is no officer, an affidavit furnished by the person doing the wiring.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.
Chapter Ind 25

PLUMBING AND POTABLE WATER STANDARDS

Part I—Scope
Ind 25.01 Scope
Ind 25.02 Potable Water

Ind 25.03 Well water supply
Part III—Plumbing Systems
Ind 25.04 Plumbing Systems

PART I—SCOPE

Ind 25.01 Scope. All one- and 2-family dwellings shall be provided with potable water and plumbing systems in accordance with the standards listed in this chapter.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART II—POTABLE WATER

Ind 25.02 Public water supply. Each dwelling shall be provided with potable water from a public water supply when available.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

Ind 25.03 Well water supply. When a public water supply is not available, each dwelling shall be provided with a well(s) approved by the department of natural resources. Water samples from an approved well shall be tested at the state laboratory of hygiene, or a state approved laboratory, at least annually. The water supply shall be tested bacteriologically safe prior to use.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.

PART III—PLUMBING SYSTEMS

Ind 25.04 Plumbing systems. Every dwelling unit connected to a septic system or public sewer shall be provided with a water closet, a lavatory and a bathtub or shower. Each dwelling unit shall be provided with a kitchen area and every kitchen shall be provided with a sink.

1. Water-conserving fixtures. Each dwelling shall be provided with the following water-conserving fixtures:

(a) Water closets having a maximum water usage of 4 gallons or less per flush.

(b) Lavatory (washbowl) faucets having a maximum flow rate of 3 gallons per minute (gpm).

Note: This rule is not intended to apply to faucets serving kitchen sinks, laundry tubs or bathtubs.

(c) Showerheads having a maximum flow rate of 3 gallons per minute (gpm).
(2) Protection from Freezing. All plumbing fixtures, and the pipes connecting therewith, shall be properly protected against freezing so that the fixtures will be in proper condition for use at all times.

Note: See Wis. Adm. Code chapter H 62 for the design, construction and installation of plumbing systems.

History: Cr. Register, November, 1979, No. 287, eff. 6-1-80.