

CR 83-67

RULES CERTIFICATE

STATE OF WISCONSIN)
) SS
DEPT. OF INDUSTRY,)
LABOR & HUMAN RELATIONS)

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TO ALL TO WHOM THESE PRESENTS SHALL COME, GREETINGS:

I, Howard S. Bellman, Secretary of the Department of Industry, Labor and Human Relations, and custodian of the official records of said department, do hereby certify that the annexed rule(s) relating to Chs Ind 50-64 - Bldg & Htg, Vent & A/C Code - Structural Requirements were duly

(Subject)

approved and adopted by this department on 11/23/83.

(Date)

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

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the official seal of the department at _____ in the city of Madison, this 23rd day of November A.D. 1983.

Howard S. Bellman

Secretary

ORDER OF ADOPTION

Pursuant to authority vested in the Department of Industry, Labor and Human Relations by section(s) 101.02(1), 101.02(15)(h)-(j), Stats., the Department of Industry, Labor and Human Relations hereby creates; amends; repeals and recreates; and repeals and adopts rules of Wisconsin Administrative Code chapter(s):

Ind. 50-64 Building & Heating, Ventilating & Air Conditioning Code
(Number) Structural Requirements
(Title)

The attached rules shall take effect on the first day of the month following
publication in the Wisconsin Administrative Register, pursuant to section
227.026, Stats.

Adopted at Madison, Wisconsin, this 23rd
day of November, A.D., 1983.

DEPARTMENT OF INDUSTRY, LABOR AND HUMAN RELATIONS

Howard S. Bellman
Secretary



RULES in FINAL DRAFT FORM

Rule: Chs. Ind 50-64

Relating to: Building & Heating, Ventilating & Air Conditioning
Code - Structural Requirements

Clearinghouse Rule No.: 83-67

Administrative rules to repeal s. Ind 53.11 (4) (c), 53.61 (9) (a) 1. b.; to renumber ss. Ind 53.11 (4) (d) and (e); to renumber and amend s. Ind 53.61 (9) (a) 1. a.; to amend ss. Ind 50.08 (intro.), 50.10 (intro.), 50.12 (4) (a) 2. (intro), 51.27 (8), 53.13, 53.50 (2), 53.61 (9) (a) (intro.), 62.39; to repeal and recreate ss. Ind 50.12 (1) (i), 53.11 (4) (b), 53.322 (2) (bm) 6., 53.322 (3) (a) 4., 62.37; to create ss. Ind 50.07 (3), 53.11 (1) (g) 2., (i) 5., (i) 6., 53.16, 53.17, 53.322 (2) (e) relating to structural requirements for public buildings and places of employment.

* * * * *

ANALYSIS OF RULES

The proposed rules update and expand structurally-related rules of the Building and Heating, Ventilating and Air Conditioning Code. The proposal establishes requirements for the services of a registered design professional for certain antennas and tower structures. Plan submittal requirements for structural components are clarified. Adopted national standards for wood foundations are updated to current editions. New floor load categories for storage are inserted. Design load rules for cantilevers, impact loads and stability are expanded or added. The rules for masonry below grade are completely rewritten. Requirements for nonload bearing and special masonry walls are added. Design load rules for antennas and support towers are updated to the most current national standard.

The proposed rules were developed in conjunction with the Project Committee for Structural Requirements and the Building Code Advisory Review Board. The following is a listing of the members of the Project Committee and the Review Board:

Project Committee for Structural Requirements

- Orville E. Arnold, Arnold and O'Sheridan, Inc.
- Francis W. Biehl, Francis W. Biehl, Inc.
- James M. Fisher, Computerized Structural Design, Inc.
- James C. Gaskell, Warzyn Engineering, Inc.
- James F. Heidt, Klobucar Construction Company, Inc.
- Robert Kehoe, Milwaukee Sewerage Commission
- James Knothe, HSR-Madison
- Charles Salmon, University of Wisconsin-Civil Engineering

Building Code Advisory Review Board

- Sharyl Bisgard, League of Women Voters
- Ronald W. Chiapete, Wisconsin State Fire Chiefs Association
- Victor Halloran, Wisconsin Society of Architects/AIA
- Lee C. Jensen, City of Milwaukee
- James E. Knothe, Wisconsin Society of Professional Engineers
- Marshall Kuhnly, Wisconsin State AFL-CIO
- Michael G. Laskis, State Bar of Wisconsin
- Thomas Lorenz, Master Builders Association of Wisconsin, Inc.
- George J. Mark, Wisconsin Builders Association
- Donald Roth, League of Wisconsin Municipalities
- David J. Schield, Wisconsin Association of Manufacturers and Commerce
- Stephen D. Schlough, Wisconsin Department of Health and Social Services
- Richard C. Schumacher, Wisconsin Chapter, Associated General Contractors of America, Inc.
- William Shea, Building Owners and Manufacturers Association/Income Property Owners Association
- Jahn Tinglum, Wisconsin Department of Public Instruction
- Fred Wegener, Wisconsin Department of Administration, Division of State Facilities Management
- Larry J. Wills, Wisconsin Chapter, Society of Fire Protection Engineers

Pursuant to the authority vested in the state of Wisconsin's Department of Industry, Labor and Human Relations by ss. 101.02 (1) and 101.02 (15) (h) to (j), Stats., the department hereby repeals, renumbers, amends, repeals and recreates and creates rules interpreting ss. 101.02 (15) (h) to (j), Stats., as follows:

SECTION 1. Ind 50.07 (3) is created to read:

Ind 50.07 (3) ANTENNAS AND SUPPORTING TOWERS EXCEEDING 200 FEET IN HEIGHT.
The plans and specifications for antennas and supporting towers exceeding 200 feet in height shall be prepared, signed and sealed by a Wisconsin registered architect or engineer.

SECTION 2. Ind 50.08 (intro) is amended to read:

Ind 50.08 PLANS, SPECIFICATIONS AND CALCULATIONS PREPARED OUTSIDE WISCONSIN. Plans, specifications and calculations for buildings and structures ~~in accordance with the requirements of~~ under s. Ind 50.07 (2) and (3), may be prepared by an architect or engineer registered outside of the state of Wisconsin, provided the following conditions are satisfied:

SECTION 3. Ind 50.10 (intro) is amended to read:

Ind 50.10 SUPERVISION. All construction or installations ~~described in~~ under s. Ind 50.07 (2) and (3) shall be supervised by a Wisconsin registered architect or engineer, except that a Wisconsin registered designer may supervise the installation of heating, ventilating and air conditioning systems and illumination systems. The person responsible for supervision shall also be responsible for the construction and installation being in substantial compliance with the approved plans and specifications. Should the supervising architect, engineer or designer, or the department, be confronted with a nonconformance to the code during, or at the end of, construction, said parties, together with the designing architect, engineer or designer shall effect compliance or shall notify the department of the noncompliance.

SECTION 4. Ind 50.12 (1) (i) is repealed and recreated to read:

Ind 50.12 (1) (i) 1. a. Except as provided in subpar. b., department examination and approval is waived for television and radio transmitting and receiving antennas, outdoor theater screens, water tanks, display signs, observation towers, docks, piers, wharves, tents or inflatable structures used temporarily, and other similar structures; however, these structures and temporary tents shall comply with the applicable structural and other requirements of chs. Ind 50-64.

b. 1. Plan examination and approval is required for the installation of roof mounted antenna structures exceeding 20 feet in height above the roof, unless the building is otherwise exempt or plan submittal is waived.

2. Plan examination and approval is required for the installation of ground mounted antenna structures exceeding 200 feet in height.

3. Plan examination and approval is required for the installation of ground mounted antenna structures exceeding 50 feet in height if the structure is located nearer to any street, public thoroughfare or property line than the height of the structure measured from its base of the structure nearest to the street, thoroughfare or property line to the topmost point.

SECTION 5. Ind 50.12 (4) (a) 2. (intro) is amended to read:

Ind 50.12 (4) (a) 2. The building designer shall also submit the following information ~~unless it has been explicitly specified to be submitted by the component supplier with the initial building plan submittal or the component plan submittal:~~

SECTION 6. Ind 51.27 (8) is amended to read:

Ind 51.27 (8) National Forest Products Association, 1619 Massachusetts Ave. NW, Washington, D.C. 20036, NATIONAL DESIGN SPECIFICATION FOR WOOD CONSTRUCTION, ~~1977~~ 1982 edition, with amendments to sections 2.2.5.3, 4.1.7 and 4.2.2, including DESIGN VALUES FOR WOOD CONSTRUCTION, a ~~July, 1984~~ March, 1982 supplement to the ~~1977~~ 1982 edition of National Design Specification for Wood Construction; THE ALL-WEATHER WOOD FOUNDATION SYSTEM, BASIC REQUIREMENTS, Technical Report No. 7, Revised ~~1976~~ March, 1982, with amendments to Article 3.3.1 of section 3.3 ~~section 6.7, including Supplement to Technical Report No. 7, dated June 1, 1977, with amendments to Article 3.3.1 of section 3.3.~~

SECTION 7. Table 53-I, Ind 53.11 (1) (g) 2., (i) 5. and 6. are created to read:

Occupancy	PSF
2. Storage in apartment buildings	80

Occupancy	PSF
5. Walkways and elevated platforms, other than exitways, and their supports serving as access to equipment rooms and other normally unoccupied areas	60

Occupancy	PSF
6. Accessible, nonstorage attics and catwalks	25

SECTION 8. Ind 53.11 (4) (b) is repealed and recreated to read:

Ind 53.11 (4) (b) Unbalanced or partial loading for the following conditions:

1. Full load on the leeward side and one-half load on the windward side of sloped roofs having a pitch of 15° or more;

2. Full load on the end span of continuous purlin members having a tributary area of 200 square feet or less and one-half on the remaining spans; and

3. a. Except as provided in subpar. b., full load on any one portion of the roof area and one-half on the remaining portion of the roof area, in a manner to produce the greatest effects on cantilever members and the anchor spans.

b. Cantilever roof framing design shall include anchorage and supports capable of providing stability for full load applied on the cantilever without relying upon possible live load on the anchor span. Where a canopy roof is cantilevered on both sides of a single line of columns, the columns and foundation shall be designed for full load on the portion of the roof on one side of the column line and no load on the other side.

SECTION 9. Ind 53.11 (4) (c) is repealed.

SECTION 10. Ind 53.11 (4) (d) and (e) are renumbered (c) and (d), respectively.

SECTION 11. Ind 53.13 is amended to read:

Ind 53.13 IMPACT LOADS. Structural elements carrying live loads which induce impact shall have the live loads increased by the following minimum percentages in the structural design consideration of ~~such~~ the forces:

For supports of elevators	100
For traveling crane support girders, monorail supports, and their connections:	
Cab operated cranes	25
<u>Top running</u> pendant operated cranes	10
<u>Underhung and</u> monorail cranes	25
For supports of light machinery	20
For supports of vibrating machinery or power driven units	50
For hangers supporting floors and balconies	33

SECTION 12. Ind 53.16 is created to read:

Ind 53.16 STABILITY. (1) GENERAL. (a) Provisions shall be made to assure stability of the structure as a whole and lateral, torsional and local stability of all structural parts.

(b) Instability, including sway effects or lateral displacement, produced by vertical loads or vertical and lateral loads acting on the structure shall be taken into account in the design of all structures and structural members.

(2) CALCULATIONS AND TESTING. (a) Calculations verifying structural stability shall be submitted under ss. Ind 50.12 (4) (a) and (b) when requested.

(b) Bracing systems, for which the strength and stiffness cannot be calculated, shall be substantiated by test reports.

SECTION 13. Ind 53.17 is created to read:

Ind 53.17 INTERIOR NONLOAD-BEARING WALLS AND PARTITIONS. Interior nonload-bearing walls and permanent partitions more than 6 feet in height shall be designed to resist a lateral load of not less than 5 pounds per square foot of wall area. Movable or folding partitions are not required to meet the load criteria but shall be anchored to the supporting structure if their height exceeds 6 feet.

SECTION 14. Ind 53.322 (2) (bm) 6. is repealed and recreated to read:

Ind 53.322 (2) (bm) 6. Walls below grade shall comply with the requirements of par. (e).

SECTION 15. Ind 53.322 (2) (e) is created to read:

Ind 53.322 (2) (e) Walls Below Grade. Foundation walls shall be not less than 8 inches in thickness nor less than the thickness of the wall which they support. When subject to lateral pressure, foundation walls shall have lateral support at the top of the wall as specified in sub. (6). The height of wall and the depth below grade may not exceed the values specified in Table 53-IX A.

Note: The phrase "depth below grade" is intended to mean height of unbalanced fill.

1. For purposes of Table 53-IX A, "solid masonry" means solid units or hollow units with all cells grouted.

2. a. When the wall is laterally supported by vertical elements at intervals not more than 18 times the wall thickness, in addition to support at the top of the wall, the depth below grade may be one foot more than indicated in Table 53.IX A.

b. Pilasters providing lateral support shall have a width not less than 16 inches and shall project from the face of the wall not less than 1/12 the wall height. All cells of hollow units shall be filled with grout.

3. Where the height of wall or depth below grade exceeds the values indicated in Table 53.IX A, or if the wall is not laterally supported at the top, the foundation wall shall be designed in accordance with the provisions of s. Ind 53.323 for engineered masonry.

4. When a foundation wall contains an opening more than 4 feet in width or contains openings in more than 25 percent of its length, the design of the wall shall be based upon an engineering analysis.

TABLE 53-IX A
 MAXIMUM HEIGHT OF WALL AND DEPTH BELOW GRADE
 FOR MASONRY FOUNDATION WALLS^{1,2}

Foundation Wall Construction Type of Unit and Nominal Thickness (Inches)	Maximum Wall Height ³ (Feet)	Maximum Depth Below Grade ⁴ (Feet)	
		Granular Backfill with Subsurface Drainage ⁵	Clay or Silt Backfill with Sub- surface Drainage
Hollow Masonry	8	5	4-1/2
	10	6	5-1/2
	12	7	7
Solid Masonry	8	5-1/2	5
	10	6-1/2	6
	12	7	7

- ¹ Where lateral support is provided by vertical elements, see s. Ind 53.322 (2) (e) 2.
- ² The depth below grade and height of wall may exceed the values indicated if the design is based upon an engineering analysis.
- ³ Clear height between floors providing lateral support.
- ⁴ The depth below grade is determined by the height of finished grade above the basement floor or inside grade. Where exterior grade adjacent to the foundation wall is surcharged within a distance equal to the maximum depth permitted, the depth of wall shall be reduced accordingly.
- ⁵ Walls shall be provided with subsurface drainage.

SECTION 16. Ind 53.322 (3) (a) 4. is repealed and recreated to read:

Ind 53.322 (3) (a) 4. 'Special Masonry Walls.' a. The height of an exterior free standing masonry wall having no lateral support at the top or at the ends may not exceed 4 times the thickness of the wall.

Note: See s. Ind 53.322 (2) (cm) 2. for parapet walls.

b. The height of a free standing interior wall may not exceed 9 times the thickness of the wall.

SECTION 17. Ind 53.50 (2) is amended to read:

Ind 53.50 (2) LATERAL BRACING MEMBERS. (a) Individual bracing members providing lateral restraint to columns or to compression flanges of beams and girders or to compression chords of trusses shall be proportioned to resist at least 2% of the compression force ~~at the brace location~~ in the element braced unless a suitable analysis is made to determine the appropriate strength and stiffness of the bracing member.

(b) An analysis shall be conducted when bracing forces larger than 2% of the compression force are encountered in lateral bracing members, such as angles, channels and zee sections.

Note: These bracing forces may be encountered as a result of the lack of symmetry of the lateral bracing members.

SECTION 18. Ind 53.61 (9) (a) (intro) is amended to read:

Ind 53.61 (9) (a) Design. 1. The design of wood foundations and walls below grade shall be in accordance with the following adopted standard and ~~listed exceptions~~ subd. 2: "All-Weather Wood Foundation System, Basic Requirements," Technical Report No. 7 ~~under~~ s. Ind 51.27 (8)†.

SECTION 19. Ind 53.61 (9) (a) 1. a. is renumbered and amended to read:

~~1. Exceptions: a.~~ 2. Section 3.3.1. Fasteners for use in preservative treated wood shall meet the requirements of this article. Fasteners of silicon bronze or copper or stainless steel types 304 or 316, as defined by the American Iron and Steel Institute classification, shall be permitted in preservative treated wood above or below grade. Fasteners or fastener materials not otherwise permitted under this article shall be permitted if adequate comparative tests for durability, including the effects associated with wood treating chemicals, demonstrate performance equal to or greater than the specified fasteners or fastener materials.

SECTION 20. Ind 53.61 (9) (a) 1. b. is repealed.

SECTION 21. Ind 62.37 is repealed and recreated to read:

Ind 62.37 DESIGN LOADS. (1) DEAD AND ICE LOADS. The supporting tower shall be designed for the dead load of the structure and all appurtenances plus an ice load of at least 1/2-inch in radial thickness. The ice load shall be considered on all members of the structure including guys.

(2) WIND LOADS. (a) Self-supporting towers shall be designed for the wind loads specified in s. Ind 53.12.

1. Open face or latticed tower structures shall be designed for wind pressure applied to the projected area of all members, including ice, in one face multiplied by the following factors:

- a. 1.75 for towers of square cross-section; or
- b. 1.5 for towers of triangular cross-section.

2. Wind loads shall be considered basic design loads with no increase in allowable unit stresses permitted.

(b) Guyed towers shall be designed in accordance with a recognized engineering standard.

Note: "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures", EIA Standard RS-222-C, published by Electronic Industries Association, 2001 Eye Street, N.W., Washington, D.C. 20006, is an acceptable standard for the design of guyed towers and self-supporting towers.

SECTION 22. Ind 62.39 is amended to read:

~~Ind 62.39 SETBACKS. All antenna systems shall be so installed that no part of the structure will be nearer to a street, or other public thoroughfare, than the height of the antenna as measured from its platform or base to the topmost point.~~ No wires, cables, or guy wires shall extend over any street or other public thoroughfare or over any electric power or communication lines.

EFFECTIVE DATE

Pursuant to s. 227.026 (1) (intro), Stats., these rules shall take effect on the first day of the month following publication in the Wisconsin Administrative Register.
