

Chapter Ind 53

STRUCTURAL REQUIREMENTS

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History: Chapter Ind 53 as it existed on December 31, 1974, was repealed and a new chapter Ind 53 was created Register, July, 1974, No. 223, effective January 1, 1975.

Ind 53.01 Scope. This chapter provides the minimum requirements for the structural design of all buildings, structures and foundations to provide safe support of all dead loads, superimposed live and special loads, without exceeding the prescribed allowable stresses or departing from accepted engineering practice.

Note: Wis. Adm. Code chapters Ind 1000-2000, Safety and Health, provides requirements for the safe assembly of materials at the construction site.

Note: References. All standards referred to in this chapter will be identified by the designation and the number of standard followed by a cross-reference. The cross-reference will give full detail of the subject name and year of standard. Example: ASTM C-55 [Ind 51.25 (16)].

History: Cr. Register, July, 1974, No. 223, eff. 1-1-75.

PART I MINIMUM ALLOWABLE LOADS

Ind 53.10 Dead loads. All buildings and structures, and parts thereof, shall be designed and constructed to support the actual dead weight of all component members in addition to the weight of partitions, ceiling finishes, floor finishes, stairways, safes and service equipment such as sprinkler systems, plumbing stacks, heating and

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air conditioning equipment, electrical equipment, elevators, flues and similar fixed equipment which become a part of the building.

Note: Unless the project owner submits a written application for waiver, the department will consider 3 pounds per square foot as minimum service equipment load.

History: Cr. Register, July, 1974, No. 223, eff. 1-1-75.

Ind 53.11 Live loads. (1) All buildings and structures, and parts thereof, shall be designed and constructed to support the superimposed live loads, specified in Table 53-I, uniformly distributed in pounds per square foot of horizontal area. These load requirements shall be considered only as a minimum. In every case where the loading is greater than this minimum, the design of the building or structure, or part thereof, shall be for the actual load and loading conditions. The most severe distribution, concentration and combination of design loads and forces shall be taken into consideration.

**TABLE 53-I
FLOOR LOADINGS**

| Occupancy | PSF |
|---|-----------------------|
| (a) Business | |
| 1. Offices | 50 |
| 2. Offices with heavy business machines, heavy files, book stacks | 100 |
| (b) Mercantile | |
| 1. Retail stores, shops, banks, restaurants, taverns, funeral homes | 100 |
| 2. Wholesale stores | 125 |
| (c) Industrial | |
| 1. Manufacturing, light | 100 |
| 2. Manufacturing, heavy | 150 |
| (d) Storage | |
| 1. Warehouse, light | 125 |
| 2. Warehouse, heavy | 250 |
| 3. Paper storage | |
| a. Compact | 50 psf per ft. of ht. |
| b. Loose | 30 psf per ft. of ht. |
| 4. Garages—storage or repair | 80 |
| or 8,000 pound axle load in any possible position (whichever produces larger stresses). | |
| 5. Parking decks | |
| a. All areas for passenger cars | 50 |
| b. Top floors, if open to sky, shall be designed for 50% of the floor load [Ind 53.11 (4)] in addition to | 50 |
| c. Express lanes and ramps with a slope of 12% or more, the vertical loading (50 psf) shall be increased by 25% | |
| d. All areas for trucks and buses | 80 |
| or 8,000 pound axle load in any possible position (whichever produces larger stresses) | |
| (e) Assembly areas | |
| 1. Armories, drill rooms | 150 |

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analysis for such buildings shall include consideration of total and differential settlements anticipated.

History: Cr. Register, July, 1974, No. 223, eff. 1-1-75.

Ind 53.27 Cut or fill slopes. (1) **PERMANENT CUT OR FILL SLOPES.** Cuts or fills adjacent to any building, structure or property line shall be so constructed or protected that they do not endanger life and/or property. Permanent cut slopes shall not be steeper than 1½ horizontal to one vertical and permanent fill slopes shall not be steeper than 2 horizontal to one vertical unless substantiating data justifying steeper slopes are submitted.

(2) **TEMPORARY CUT OR FILL SLOPES.** For temporary cuts and fills, refer to Wis. Adm. Codes chapter Ind 6—Trench, Excavation and Tunnel Construction, and chapter Ind 35—Safety in Construction.

History: Cr. Register, July, 1974, No. 223, eff. 1-1-75.

Ind 53.28 Pole foundations. Structures that use poles embedded in earth or embedded in concrete footings in the earth to resist axial and lateral loads shall have their depth of embedment determined as specified in this section.

(1) **CONSTRUCTION BACKFILL REQUIREMENTS.** The space around the pole shall be backfilled in accordance with one of the following methods:

(a) The hole shall be made 4 inches larger than the diameter or diagonal dimension of rectangular or square poles. It shall be backfilled with 2,000 psi concrete.

(b) The backfill shall be of thoroughly compacted clean sand.

(2) **ALLOWABLE LATERAL SOIL PRESSURE.** In the design of nonrestrained and restrained poles, unless a more exact soil analysis method is used, the allowable passive soil pressure shall be determined in accordance with Table 53-III.

**TABLE 53-III
ALLOWABLE LATERAL SOIL PRESSURE**

| Soil Types (see Table 53-II) | Allowable Passive Soil Pressure (p) ¹ psf per foot of depth below grade ^{2, 3} |
|------------------------------|---|
| 1 and 2 (not well drained) | 100 |
| 2 (well drained) | 150 |
| 3 (well drained) | 200 |
| 4 (well drained) | 300 |
| 5 and 6 (well drained) | 400 |

¹S_v and S_h values shall not exceed 12 times the allowable passive soil pressure (p).

²Values may be increased 33⅓% for wind loads.

³Where ½-inch horizontal movement of the pole at ground surface can be tolerated, the values shown in Table 53-III may be increased 100%, provided the individual poles are spaced a minimum distance of 6 times B center to center.

(3) **DESIGN-NONRESTRAINED POLES.** The following formula shall be used in determining the depth of embedment required to resist lateral loads where no restraint is provided at the ground surface, unless other methods are approved by the department.

$$d = \frac{A}{2} \left(1 + \sqrt{1 + \frac{4.36 h}{A}} \right)$$

where: d = depth of embedment, ft.

$$A = \frac{2.34 P}{S, B}$$

P = applied horizontal force on pole, lb.

S = $pd/3$, see Table 53-III

Note: For first approximation of "d", the following formula may be used:

$$d = \sqrt[3]{\frac{12 h P}{B p}}$$

B = diameter of concrete casing, ft.; when nonencased in concrete, diameter or diagonal dimension of square or rectangular pole, ft.

h = height above the ground, in feet, at which the force "P" is applied. If the pole has fixity at the top, such as provided by a knee brace, the force "P" acts at the inflection point. The inflection point may be assumed at $\frac{2}{3}$ of the distance from the ground to the knee brace for round poles, or $\frac{1}{2}$ of the distance from the ground to the knee brace for square poles.

p = allowable lateral passive soil pressure, psf.

Note #2: When a frame analysis is used, $h = M/P$, where M = bending moment on the pole at the ground surface.

(4) DESIGN—RESTRAINED POLES. Where restraint is provided at the ground surface, such as a rigid floor or pavement, the depth of embedment shall be in accordance with the following formula:

$$d = \sqrt{\frac{4.25 h P}{S, B}}$$

where: S = pd , see Table 53-III.

(5) MOISTURE. A preservative treatment shall be applied to poles subjected to moisture.

Note: The department will accept poles treated in accordance with the standards of the American Wood Preservers Association for preservative treatments.

History: Cr. Register, July, 1974, No. 223, eff. 1-1-75; am. (2) and (3), cr. (4), Register, December, 1976, No. 252, eff. 1-1-77; renum. (2), (3) and (4) to be (3), (4) and (5), cr. (2), Register, December, 1977, No. 264, eff. 1-1-78.

PART III MASONRY

Ind 53.30 General. (1) SCOPE. The requirements of Ind 53.30 through 53.36 herein shall apply to the design, construction and materials used in all masonry and similar work under this code.

(2) DEFINITION. Masonry as used herein shall be considered as any built-up construction or combination of building units or materials of clay, shale, concrete, stone, gypsum, glass, metal or other approved units.

(3) DIMENSIONS. Dimensions specified herein are nominal unless otherwise stated. The actual dimensions may vary from the nominal by the thickness of a mortar joint, but not more than one-half inch.

History: Cr. Register, July, 1974, No. 223, eff. 1-1-75.

Ind 53.31 Materials. (1) GENERAL REQUIREMENTS. Components used in the construction of masonry shall be as required in sections Ind 53.311 through Ind 53.316.

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