

Common Design Loads in Building Codes

adapted from SEI/ASCE 7-10: Minimum Design Loads for Buildings and Other Structures

Minimum Concentrated Loads

| <i>Location</i> | <i>Concentrated load lb (kN)</i> |
|---|----------------------------------|
| Catwalks for maintenance access | 300 (1.33) |
| Elevator machine room grating (on area of 2 in. by 2 in. (50 mm by 50 mm)) | 300 (1.33) |
| Finish light floor plate construction (on area of 1 in. by 1 in. (25 mm by 25 mm)) | 200 (0.89) |
| Hospital floors | 1,000 (4.45) |
| Library floors | 1,000 (4.45) |
| Manufacturing | |
| Light | 2,000 (8.90) |
| Heavy | 3,000 (13.40) |
| Office floors | 2,000 (8.90) |
| Awnings and canopies | |
| Screen enclosure support frame | 200 (0.89) |
| Roofs – primary members and subject to maintenance workers | 300 (1.33) |
| School floors | 1,000 (4.45) |
| Sidewalks, vehicular driveways, and yards subject to trucking (over wheel area of 4.5 in. by 4.5 in. (114 mm x 114 mm)) | 8,000 (35.60) |
| Stairs and exit ways on area of 2 in. by 2 in. (50 mm by 50 mm) non-concurrent with uniform load | 300 (1.33) |
| Store floors | 1,000 (4.45) |

Minimum Uniformly Distributed Live Loads

| <i>Location</i> | <i>Uniform load psf (kN/m²)</i> |
|---------------------------------|---|
| Apartments (see Residential) | |
| Access floor systems | |
| Office use | 50 (2.4) |
| Computer use | 100 (4.79) |
| Armories and drill rooms | 150 (7.18) |
| Assembly areas | |
| Fixed seats (fastened to floor) | 60 (2.87) |
| Lobbies | 100 (4.79) |
| Movable seats | 100 (4.79) |
| Platforms (assembly) | 100 (4.79) |
| Stage floors | 150 (7.18) |
| Assembly areas (other) | 100 (4.79) |
| Balconies and decks | 1.5 times the live load for the area served. Not required to exceed 100 psf (4.79 kN/m ²) |
| Catwalks for maintenance access | 40 (1.92) |
| Corridors | |
| First floor | 100 (4.79) |
| Other floors | same as occupancy served except as indicated |

| <i>Location</i> | <i>Uniform load psf (kN/m²)</i> |
|--|--|
| Dining rooms and restaurants | 100 (4.79) |
| Dwellings (see Residential) | |
| Elevator machine room grating (on area of 2 in. by 2 in. (50 mm by 50 mm)) | 300 (1.33) |
| Finish light floor plate construction (on area of 1 in. by 1 in. (25 mm by 25 mm)) | 200 (0.89) |
| Fire escapes | 100 (4.79) |
| On single-family dwellings only | 40 (1.92) |
| Garages | |
| Passenger vehicles only | 40 (1.92) |
| Helipads | 60 (2.87) |
| Hospitals | |
| Operating rooms, laboratories | 60 (2.87) |
| Patient rooms | 40 (1.92) |
| Corridors above first floor | 80 (3.83) |
| Hotels (see Residential) | |
| Libraries | |
| Reading rooms | 60 (2.87) |
| Stack rooms | 150 (7.18) |
| Corridors above first floor | 80 (3.83) |
| Manufacturing | |
| Light | 125 (6.00) |
| Heavy | 250 (11.97) |
| Office buildings | |
| File and computer rooms shall be designed for heavier loads based on anticipated occupancy | |
| Lobbies and first floor corridors | 100 (4.79) |
| Offices | 50 (2.40) |
| Corridors above first floor | 80 (3.83) |
| Penal institutions | |
| Cell blocks | 40 (1.92) |
| Corridors | 100 (4.79) |
| Recreational uses | |
| Bowling alleys, poolrooms, and similar uses | 75 (3.59) |
| Dance halls and ballrooms | 100 (4.79) |
| Gymnasiums | 100 (4.79) |
| Reviewing stands, grandstands, and bleachers | 100 (4.79) |
| Stadiums and arenas with fixed seats (fastened to the floor) | 60 (2.87) |
| Residential | |
| One- and two-family dwellings | |
| Uninhabitable attics without storage | 10 (0.48) |
| Uninhabitable attics with storage | 20 (0.96) |
| Habitable attics and sleeping areas | 30 (1.44) |
| All other areas except stairs | 40 (1.92) |
| All other residential occupancies | |
| Private rooms and corridors serving them | 40 (1.92) |
| Public rooms and corridors serving them | 100 (4.79) |
| Roofs | |
| Ordinary flat, pitched, and curved roofs | 20 (0.96n) |
| Roofs used for roof gardens | 100 (4.79) |
| Roofs used for assembly purposes | Same as occupancy served |
| Roofs used for other occupancies | As approved by authority having jurisdiction |
| Awnings and canopies | |
| Fabric construction supported by a skeleton structure | 5 (0.24) nonreducible |

| <i>Location</i> | <i>Uniform load psf (kN/m²)</i> |
|---|---|
| Screen enclosure support frame | 5 (0.24) nonreducible and based on the tributary area of the roof supported by the frame |
| All other construction | 20 (0.96) |
| Schools | |
| Classrooms | 40 (1.92) |
| Corridors above first floor | 80 (3.83) |
| First-floor corridors | 100 (4.79) |
| Scuttles, skylight ribs, and accessible ceilings | 200 (0.89) |
| Sidewalks, vehicular driveways, and yards subject to trucking | 250 (11.97) |
| Stairs and exit ways | 100 (4.79) |
| One- and two-family dwellings only | 40 (1.92) |
| Storage areas above ceilings | 20 (0.96) |
| Storage warehouses (shall be designed for heavier loads if required for anticipated storage) | |
| Light | 125 (6.00) |
| Heavy | 250 (11.97) |
| Stores | |
| Retail | |
| First floor | 100 (4.79) |
| Upper floors | 75 (3.59) |
| Wholesale, all floors | 125 (6.00) |
| Walkways and elevated platforms (other than exit ways) | 60 (2.87) |
| Yards and terraces, pedestrian | 100 (4.79) |

Live load reductions are not permitted for specific types (see code).
Some occupancies must be designed for appropriate loads as approved by the authority having jurisdiction.
Library stack room floors have specified limitations (see code)
AASHTO lane loads should also be considered where appropriate.

Building Material Weights-AISC Manual of Load and Resistance Factor Design, 3rd ed.

**Table 17-12 (cont.).
Weights and Specific Gravities**

| Substance | Weight lb per cu ft | Specific Gravity | Substance | Weight lb per cu ft | Specific Gravity |
|-----------------------------|---------------------------|---------------------|------------------------------|---------------------------|---------------------|
| METALS, ALLOYS, ORES | | | TIMBER, U.S. SEASONED | | |
| Aluminum, cast, hammered | 165 | 2.55-2.75 | Moisture content by weight: | | |
| Brass, cast, rolled | 534 | 8.4-8.7 | Seasoned timber: 15 to 20% | | |
| Bronze, 7.9 to 14% Sn | 509 | 7.4-8.9 | Green timber up to 50% | | |
| Bronze, aluminum | 481 | 7.7 | Ash, white, red | 40 | 0.62-0.65 |
| Copper, cast, rolled | 556 | 8.8-9.0 | Cedar, white, red | 22 | 0.32-.038 |
| Copper ore, pyrites | 1205 | 19.25-19.3 | Chestnut | 41 | 0.66 |
| Gold, cast, hammered | 485 | 19.3 | Cypress | 30 | 0.51 |
| Iron, cast, pig | 480 | 7.6-7.9 | Fir, Douglas spruce | 32 | 0.40 |
| Iron, wrought | 468 | 7.5 | Fir, eastern | 25 | 0.40 |
| Iron, speigel-eisen | 437 | 6.7-7.3 | Elm, white | 45 | 0.72 |
| Iron, ferro-silicon | 325 | 5.2 | Hemlock | 29 | 0.42-0.52 |
| Iron ore, hematite | 160-180 | — | Hickory | 49 | 0.74-0.84 |
| Iron ore, hematite in bank | 130-160 | — | Locust | 46 | 0.73 |
| Iron ore, hematite loose | 237 | 3.6-4.0 | Maple, hard | 43 | 0.68 |
| Iron ore, limonite | 315 | 4.9-5.2 | Maple, white | 33 | 0.53 |
| Iron ore, magnetite | 172 | 2.5-3.0 | Oak, chestnut | 54 | 0.86 |
| Iron slag | 710 | 11.37 | Oak, live | 59 | 0.95 |
| Lead | 465 | 7.3-7.6 | Oak, red, black | 41 | 0.65 |
| Lead ore, galena | 112 | 7.4-1.83 | Oak, white | 46 | 0.74 |
| Magnesium, alloys | 475 | 7.2-8.0 | Pine, Oregon | 32 | 0.51 |
| Manganese ore, pyrolustite | 259 | 3.7-4.6 | Pine, red | 30 | 0.48 |
| Mercury | 849 | 13.6 | Pine, white | 26 | 0.41 |
| Monel Metal | 556 | 8.8-9.0 | Pine, yellow, long-leaf | 44 | 0.70 |
| Nickel | 565 | 8.9-9.2 | Pine, yellow, short-leaf | 38 | 0.61 |
| Platinum, cast, hammered | 1330 | 21.1-21.5 | Poplar | 30 | 0.48 |
| Silver, cast, hammered | 656 | 10.4-10.6 | Redwood, California | 26 | 0.42 |
| Steel, rolled | 490 | 7.85 | Spruce, white, black | 27 | 0.40-0.46 |
| Tin, cast, hammered | 459 | 7.2-7.5 | Walnut, black | 38 | 0.61 |
| Tin ore, cassiterite | 418 | 6.4-7.0 | Walnut, white | 26 | 0.41 |
| Zinc, cast, rolled | 440 | 6.9-7.2 | | | |
| Zinc ore, blende | 253 | 3.9-4.2 | | | |
| | | | VARIOUS LIQUIDS | | |
| | | | Alcohol, 100% | 49 | 0.79 |
| | | | Acids, muriatic 40% | 75 | 1.20 |
| | | | Acids, nitric 91% | 94 | 1.50 |
| | | | Acids, sulphuric 87% | 112 | 1.80 |
| | | | Lye, soda 66% | 106 | 1.70 |
| | | | Oil, vegetable | 58 | 0.91-0.94 |
| | | | Oil, mineral, lubricants | 57 | 0.90-0.93 |
| | | | Water, 4° C max. density | 62.428 | 1.0 |
| | | | Water, 100° C | 59.830 | 0.9584 |
| | | | Water, snow, fresh fallen | 56 | 0.88-0.92 |
| | | | Water, ice | 8 | 0.915 |
| | | | Water, sea water | 64 | 1.02-1.03 |
| | | | GASES | | |
| | | | Air, 0° C 760 mm | 0.0071 | 1.0 |
| | | | Ammonia | 0.478 | 0.5920 |
| | | | Carbon dioxide | 1.294 | 1.5291 |
| | | | Carbon monoxide | 0.781 | 0.9673 |
| | | | Gas, illuminating | .028-.036 | 0.35-0.45 |
| | | | Gas, natural | .038-.039 | 0.47-0.48 |
| | | | Hydrogen | .00559 | 0.0693 |
| | | | Nitrogen | 0.784 | 0.9714 |
| | | | Oxygen | .0892 | 1.1056 |

The specific gravities of solids and liquids refer to water at 4° C, those of gases to air at 0° C and 760 mm pressure. The weights per cubic foot are derived from average specific gravities, except where stated that weights are for bulk, heaped, or loose material, etc.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION

**Table 17-12.
Weights and Specific Gravities**

| Substance | Weight lb per cu ft | Specific Gravity | Substance | Weight lb per cu ft | Specific Gravity |
|-----------------------------------|---------------------------|---------------------|-------------------------------|---------------------------|---------------------|
| ASHLAR, MASONRY | | | MINERALS | | |
| Granite, syenite, gneiss | 165 | 2.3-3.0 | Asbestos | 153 | 2.1-2.8 |
| Limestone, marble | 160 | 2.3-2.8 | Barytes | 281 | 4.50 |
| Sandstone, bluestone | 140 | 2.1-2.4 | Basalt | 184 | 2.7-3.2 |
| | | | Bauxite | 159 | 2.55 |
| MORTAR RUBBLE | | | Borax | 109 | 1.7-1.8 |
| Granite, syenite, gneiss | 155 | 2.2-2.8 | Chalk | 137 | 1.8-2.6 |
| Limestone, marble | 150 | 2.2-2.6 | Clay, marl | 181 | 2.9 |
| Sandstone, bluestone | 130 | 2.0-2.2 | Dolomite | 159 | 2.5-2.6 |
| | | | Feldspar, orthoclase | 159 | 2.4-2.7 |
| DRY RUBBLE MASONRY | | | Gneiss, serpentine | 175 | 2.5-3.1 |
| Granite, syenite, gneiss | 130 | 1.9-2.3 | Granite, syenite | 187 | 2.8-3.2 |
| Limestone, marble | 125 | 1.9-2.1 | Greenstone, trap | 187 | 2.5-3.1 |
| Sandstone, bluestone | 110 | 1.8-1.9 | Gypsum, alabaster | 159 | 2.3-2.8 |
| | | | Hornblende | 187 | 3.0 |
| BRICK MASONRY | | | Limestone, marble | 165 | 2.5-2.8 |
| Pressed brick | 140 | 2.2-2.3 | Magnetite | 187 | 3.0 |
| Common brick | 120 | 1.8-2.0 | Phosphate rock, apatite | 200 | 3.2 |
| Soft brick | 100 | 1.5-1.7 | Porphyry | 172 | 2.6-2.9 |
| | | | Pumice, natural | 40 | 0.37-0.90 |
| CONCRETE MASONRY | | | Quartz, flint | 165 | 2.5-2.8 |
| Cement, stone, sand | 144 | 2.2-2.4 | Sandstone, bluestone | 147 | 2.2-2.5 |
| Cement, slag, etc. | 130 | 1.9-2.3 | Shale, slate | 175 | 2.7-2.9 |
| Cement, cinder, etc. | 100 | 1.5-1.7 | Soapstone, talc | 169 | 2.6-2.8 |
| | | | | | |
| VARIOUS BUILDING MATERIALS | | | STONE, QUARRIED, PILED | | |
| Ashes, cinders | 40-45 | — | Basalt, granite, gneiss | 96 | — |
| Cement, portland, loose | 90 | — | Limestone, marble, quartz | 95 | — |
| Cement, portland, set | 183 | 2.7-3.2 | Sandstone | 82 | — |
| Lime, gypsum, loose | 53-64 | — | Shale | 92 | — |
| Mortar, set | 103 | 1.4-1.9 | Greenstone, hornblende | 107 | — |
| Slags, bank slag | 67-72 | — | | | |
| Slags, bank screenings | 98-117 | — | BITUMINOUS SUBSTANCES | | |
| Slags, machine slag | 96 | — | Asphaltum | 81 | 1.1-1.5 |
| Slags, slag sand | 49-55 | — | Coal, anthracite | 97 | 1.4-1.7 |
| | | | Coal, bituminous | 84 | 1.2-1.5 |
| EARTH, ETC., EXCAVATED | | | Coal, lignite | 78 | 1.1-1.4 |
| Clay, dry | 63 | — | Coal, peat, turf, dry | 47 | 0.65-0.85 |
| Clay, damp, plastic | 110 | — | Coal, charcoal, pine | 23 | 0.28-0.44 |
| Clay and gravel, dry | 100 | — | Coal, charcoal, oak | 33 | 0.47-0.57 |
| Earth, dry, loose | 76 | — | Coal, coke | 75 | 1.0-1.4 |
| Earth, dry, packed | 95 | — | Graphite | 131 | 1.9-2.3 |
| Earth, moist, loose | 78 | — | Paraffin | 56 | 0.87-0.91 |
| Earth, moist, packed | 96 | — | Petroleum | 54 | 0.87 |
| Earth, mud, flowing | 108 | — | Petroleum, refined | 50 | 0.79-0.82 |
| Earth, mud, packed | 115 | — | Petroleum, benzine | 46 | 0.73-0.75 |
| Riprap, limestone | 80-85 | — | Petroleum, gasoline | 42 | 0.66-0.69 |
| Riprap, sandstone | 90 | — | Pitch | 69 | 1.07-1.15 |
| Riprap, shale | 105 | — | Tar, bituminous | 75 | 1.20 |
| Sand, gravel, dry, loose | 90-105 | — | | | |
| Sand, gravel, dry, packed | 100-120 | — | COAL AND COKE, PILED | | |
| Sand, gravel, wet | 118-120 | — | Coal, anthracite | 47-58 | — |
| | | | Coal, bituminous, lignite | 40-54 | — |
| EXCAVATIONS IN WATER | | | Coal, peat, turf | 20-26 | — |
| Sand or gravel | 60 | — | Coal charcoal | 10-14 | — |
| Sand and gravel and clay | 65 | — | Coal coke | 23-32 | — |
| Clay | 80 | — | | | |
| River mud | 90 | — | | | |
| Soil | 70 | — | | | |
| Stone riprap | 65 | — | | | |

The specific gravities of solids and liquids refer to water at 4° C, those of gases to air at 0° C and 760 mm pressure. The weights per cubic foot are derived from average specific gravities, except where stated that weights are for bulk, heaped, or loose material, etc.

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Table 17-13.
Weights of Building Materials

| Materials | Weight lb per sq ft | Materials | Weight lb per sq ft |
|--------------------------------|------------------------|------------------------------------|------------------------|
| CEILING | | PARTITIONS | |
| Channel suspended system | 1 | Clay tile | 17 |
| Lathing and plastering | See Partitions | 3 in. | 18 |
| Acoustical fiber tile | 1 | 4 in. | 28 |
| | | 6 in. | 34 |
| | | 8 in. | 40 |
| | | 10 in. | |
| FLOORS | | Gypsum block | |
| Steel deck | See Manufacturer | 2 in. | 9 1/2 |
| | | 3 in. | 10 1/2 |
| Concrete-Reinforced 1 in. | | 4 in. | 12 1/2 |
| Stone | 12 1/2 | 5 in. | 14 |
| Slag | 11 1/2 | 6 in. | 18 1/2 |
| Lightweight | 6 to 10 | Wood studs 2x4 | |
| | | 12-16 in. o.c. | |
| Concrete-Plain 1 in. | | Steel partitions | |
| Stone | 12 | Plaster 1 in. | |
| Slag | 11 | Cement | |
| Lightweight | 3 to 9 | Gypsum | |
| | | Lathing | |
| Fills 1 inch | | Metal | |
| Gypsum | 6 | Gypsum board 1/2 in. | 1/2 |
| Sand | 8 | | 2 |
| Cinders | 4 | | |
| Finishes | | | |
| Terrazzo 1 in. | 13 | WALLS | |
| Ceramic or Quarry Tile 3/4-in. | 10 | Brick | 40 |
| Linoleum 1/4-in. | 1 | 4 in. | 80 |
| Mastic 3/4-in. | 9 | 8 in. | 120 |
| Hardwood 7/8 in. | 4 | 12 in. | |
| Softwood 3/4-in. | 2 1/2 | Hollow concrete block | |
| | | (Heavy aggregate) | |
| ROOFS | | 4 in. | 30 |
| Copper or tin | 1 | 6 in. | 43 |
| Corrugated steel | See Manufacturer | 8 in. | 55 |
| 3-ply ready roofing | 1 | 12 1/2 in. | 80 |
| 3-ply felt and gravel | 5 1/2 | Hollow concrete block | |
| 5-ply felt and gravel | 6 | (Light aggregate) | |
| | | 4 in. | 21 |
| Shingles | | 6 in. | 30 |
| Wood | 2 | 8 in. | 38 |
| Asphalt | 3 | 12 in. | 55 |
| Clay tile | 9 to 14 | Clay tile (Load bearing) | |
| Slate 1/4 in. | 10 | 4 in. | 25 |
| | | 6 in. | 30 |
| Sheathing | | 8 in. | 33 |
| Wood 3/4 in. | 3 | 12 in. | 45 |
| Gypsum 1 in. | 4 | Stone 4 in. | 55 |
| | | Glass block 4 in. | 18 |
| Insulation 1 in. | | Window, Glass, Frame, & Sash | 8 |
| Loose | 1/2 | Curtain walls | See Manufacturer |
| Poured | 2 | Structural glass 1 in. | 15 |
| Rigid | 1 1/2 | Corrugated Cement Asbestos 1/4 in. | 3 |

For weights of other materials used in building construction, see Table 17-12.

Table 17-14.
Weights and Measures United States System

| LINEAR MEASURE | | | |
|----------------|-----------|-----------|-------------|
| Inches | Feet | Yards | Miles |
| 1.0 = | .08333 = | .02778 = | .00012626 = |
| 12.0 = | 1.0 = | .33333 = | .00018939 = |
| 36.0 = | 3.0 = | 1.0 = | .00056818 = |
| 198.0 = | 16.5 = | 5.5 = | .003125 = |
| 7,920.0 = | 660.0 = | 220.0 = | 1.0 = |
| 63,360.0 = | 5,280.0 = | 1,760.0 = | 8.0 = |
| | | 320.0 = | 1.0 = |

| SQUARE AND LAND MEASURE | | | |
|-------------------------|-------------|---------------|-------------|
| Sq. Inches | Square Feet | Square Yards | Square Rods |
| 1.0 = | .006944 = | .000772 = | |
| 144.0 = | 1.0 = | 1.11111 = | |
| 1,296.0 = | 9.0 = | 1.0 = | .03306 = |
| 39,204.0 = | 272.25 = | 30.25 = | 1.0 = |
| | 43,560.0 = | 4,840.0 = | 160.0 = |
| | | 3,097,600.0 = | 102,400.0 = |
| | | | 640.0 = |
| | | | 1.0 = |
| | | | .000098 = |
| | | | .0015625 = |
| | | | 1.0 = |

| AVOIRDUPOIS WEIGHTS | | | |
|---------------------|-------------|------------|--------------|
| Grains | Drams | Ounces | Pounds |
| 1.0 = | .06657 = | .002286 = | .000000714 = |
| 27.34375 = | 1.0 = | .0625 = | .0000195 = |
| 437.5 = | 16.0 = | 1.0 = | .0625 = |
| 7,000.0 = | 256.0 = | 16.0 = | 1.0 = |
| 14,000,000.0 = | 512,000.0 = | 32,000.0 = | 2,000.0 = |
| | | | 1.0 = |

| DRY MEASURE | | | |
|-------------|------------|-----------|----------|
| Pints | Quarts | Pecks | Bushels |
| 1.0 = | .5 = | .0625 = | .01945 = |
| 2.0 = | 1.0 = | .125 = | .03125 = |
| 16.0 = | 8.0 = | 1.0 = | .3112 = |
| 51.42827 = | 25.71314 = | 3.21414 = | 1.0 = |
| 64.0 = | 32.0 = | 4.0 = | 1.2445 = |
| | | | 1.0 = |

| LIQUID MEASURE | | | |
|----------------|-------|--------|--------------|
| Gills | Pints | Quarts | U.S. Gallons |
| 1.0 = | .25 = | .125 = | .03125 = |
| 4.0 = | 1.0 = | .5 = | .125 = |
| 8.0 = | 2.0 = | 1.0 = | .250 = |
| 32.0 = | 8.0 = | 4.0 = | 1.0 = |
| | | | 7.48052 = |
| | | | 1.0 = |