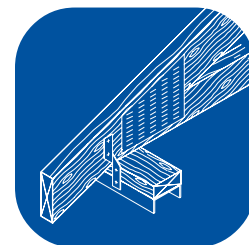


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Appendix A-Metric Conversion Factors

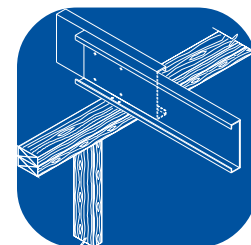
The following list provides the conversion relationship between U.S. customary units and the International System (SI) units. A complete guide to the SI system and its use can be found in ASTM E 380, Metric Practice.

To Convert from	To	Multiply by
Length		
Inch (in.)	Micrometer (mm)	25,400
Inch (in.)	Millimeter (mm)	25.4
Inch (in.)	Centimeter (cm)	2.54
Inch (in.)	Meter (m)	0.0254
Foot (ft.)	Meter (m)	0.3048
Yard (yd.)	Meter (m)	0.9144
Mile (mi.)	Kilometer (km)	1.6093
Area		
Square foot (sq. ft.)	Square meter (sq. m)	0.0929
Square inch (sq. in.)	Square centimeter (sq. cm)	6.452
Square inch (sq. in.)	Square meter (sq. m)	0.000645
Square yard (sq. yd.)	Square meter (sq. m)	0.8391
Square mile (sq. mi.)	Square kilometer (sq. km)	2.5898
Volume		
Cubic inch (cu. in.)	Cubic centimeter (cu. cm)	16.3871
Cubic inch (cu. in.)	Cubic meter (cu. m)	0.00001639
Cubic foot (cu. ft)	Cubic meter (cu. m)	0.0283
Cubic yard (cu. yd)	Cubic meter (cu. m)	0.7645
Gallon (gal.) Can. liquid	Liter	4.546
Gallon (gal.) Can. liquid	Cubic meter (cu. m)	0.004546
Gallon (gal.) U.S. liquid*	Liter	3.7854
Gallon (gal.) U.S. liquid	Cubic meter (cu. m)	0.0037854
Fluid ounce (fl. oz.)	Milliliters (ml)	29.5735
Fluid ounce (fl. oz.)	Cubic meter (cu. m)	0.00002957
Force		
Kip (1,000 lb.)	Kilogram (kg)	453.6
Kip (1,000 lb.)	Newton (N)	4,448.222
Pound (lb.)	Kilogram (kg)	0.4536
Pound (lb.)	Newton (N)	4.4482
Stress or Pressure		
Kip/square inch (ksi)	Mega Pascal (Mpa)	6.8948
Kip/square inch (ksi)	Kilogram/square centimeter (kg/sq. cm)	70.31
Pound/square inch (psi)	Kilogram/square centimeter (kg/sq. cm)	0.0703
Pound/square inch (psi)	Pascal (Pa)**	6,894.757
Pound/square inch (psi)	Mega Pascal (Mpa)	0.00689



Appendix A-Metric Conversion Factors

To Convert from	To	Multiply by
Stress or Pressure		
Pound/square foot (psf)	Kilogram/square meter (kg/sq. m)	4.8824
Pound/square foot (psf)	Pascal (Pa)	47.88
Mass (Weight)		
Pound (lb.)	Kilogram (kg)	0.4536
Ton, 2,000 lbs.	Kilogram (kg)	907.1848
Grain	Kilogram (kg)	0.0000648
Mass (Weight) per Length		
Kip per linear foot (klf)	Kilogram per meter (kg/m)	0.001488
Pound per linear foot (plf)	Kilogram per meter (kg/m)	1.488
Moment		
1 foot-pound (ft.-lb.)	Newton-meter (N-m)	1.356
Mass per Volume (Density)		
Pound per cubic foot (pcf)	Kilogram per cubic meter (kg/cu m)	16.0185
Pound per cubic yard (lb./cu. yd.)	Kilogram per cubic meter (kg/cu m)	0.5933
Velocity		
Mile per hour (mph)	Kilometer per hour (km/hr.)	1.6093
Mile per hour (mph)	Kilometer per second (km/sec.)	0.4470
Temperature		
Degree Fahrenheit (°F)	Degree Celsius (°C)	$t_c = (t_f - 32)/1.8$
Degree Fahrenheit (°F)	Degree Kelvin (°K)	$t_k = (t_f + 59.7)/1.8$
Degree Kelvin (°K)	Degree Celsius (°C)	$t_c = (t_k - 273.15)$
Degree Celsius (°C)	Degree Fahrenheit (°F)	$t_f = 1.8t_c + 32$
* One U.S. gallon equals 0.8327 Canadian gallon.		
** A Pascal equals 1,000 Newton per square meter.		
<i>The prefixes and symbols below are commonly used to form names and symbols of the decimal multiples and submultiples of the SI units.</i>		
Multiplication Factor	Prefix	Symbol
1,000,000,000 = 10 ⁹	Giga	G
1,000,000 = 10 ⁶	Mega	M
1,000 = 10 ³	Kilo	k
0.01 = 10 ⁻²	Centi	c
0.001 = 10 ⁻³	Milli	m
0.000001 = 10 ⁻⁶	Micro	μ
0.000000001 = 10 ⁻⁹	Nano	n



Glossary

Accepted Engineering Practice. An engineering approach that conforms to accepted principles, tests, technical standards, and sound judgment.

Approved. Approval by a building official, code official, design professional, or authority with jurisdiction.

Base Metal Thickness. The thickness of bare steel exclusive of all coatings.

Basic Wind Speed. The 3-second gust wind speed in accordance with the local building code or, in the absence of a building code, in accordance with ASCE 7. Wind speeds in this document are given in units of miles per hour (mph) by “3-second gust” measurements (refer to Table 2.2 to convert to fastest-mile wind speed).

Bearing Stiffener. Refer to *Web Stiffener*.

Blocking. C-shaped, track, break shape, or flat strap material attached to structural members, flat strap, or sheathing panels to transfer shear forces.

Bracing. Structural elements that are installed to provide restraint or support (or both) to other framing members so that the complete assembly forms a stable structure.

Bridging. Cross-bracing or blocking placed between joists to provide lateral support.

Buckling. A kink, wrinkle, bulge, or other loss in the original shape of a member due to compression, bending, bearing, or shear loads.

Ceiling Joist. A horizontal structural framing member that supports ceiling components and that may be subject to attic loads.

Clip Angle. An L-shaped short piece of steel (normally with a 90-degree bend) typically used for connections.

Cripple Stud. A stud that is placed between a header and a window or door head track, a header and wall top track, or a window sill and a bottom track to provide a backing to attach finishing and sheathing material.

C-Shape. A cold-formed steel shape used for structural and nonstructural framing members consisting of a web, two flanges, and two lips (edge stiffeners). The name comes from the member’s C-shaped cross-sectional configuration. It is also called a “C-section.” Web depth measurements are taken to the outside of the flanges. Flange width measurements also use outside dimensions.

Design Professional. An individual who is registered or licensed to practice his or her respective design profession

as defined by the statutory requirements of the state in which the project is to be constructed.

Design Thickness. The steel thickness used in design which is equal to the minimum base metal thickness divided by 0.95.

Diaphragm. A floor, ceiling, or roof assembly designed to resist in-plane forces (e.g., wind or seismic loads).

Dwelling. Any building that contains one or two dwelling units for living purposes.

Eave Overhang. The horizontal projection of the roof measured from the outside face of the exterior wall framing to the outside edge of the roof.

Flange. That portion of the C-shape framing member or track that is perpendicular to the web.

Flat Strap. Sheet steel cut to a specified width without any bends and typically used for bracing and transferring loads by tension.

Floor Joist. A horizontal structural framing member that supports floor loads and superimposed vertical loads.

Foundation. The structural elements through which the load of a structure is transmitted to earth.

Gauge. A unit of measurement traditionally used to describe the nominal thickness of steel. The lower the gauge the greater the thickness.

Grade. The finished ground level adjoining the building at exterior walls.

Ground Snow Load. Measured load on the ground due to snow accumulation developed from a statistical analysis of weather records expected to be exceeded once every 50 years at a given site.

Header. A horizontal structural framing member used over floor, roof, or wall openings to transfer loads around the opening to supporting structural framing members.

High Seismic Area. An area where the Seismic Design Category is D_1 or higher.

High-Wind Area. An area where basic wind speeds are equal to 110 mph (177 km/hr) up to and including 130 mph (209 km/hr).

In-Line Framing. Framing method where all vertical and horizontal load-carrying members are aligned when required to transfer loads properly.



Jack Stud. A stud that does not span the full height of the wall and provides bearing for headers.

King Stud. A stud adjacent to a jack stud that spans the full height of the wall and supports vertical and lateral loads.

Lateral Load. A horizontal force created by wind or earthquake that acts on a structure or its components.

Lip. That part of a C-shape framing member that extends from the flange as a stiffening element at 90 degrees to the flange (Edge Stiffener).

Loads, Live and Dead. Dead loads are the weight of the walls, partitions, framing, floors, ceilings, roofs, and all other permanent construction entering into and becoming a part of a building. Live loads are transient and sustained loads usually created by people and furnishing, respectively.

Material Thickness (Steel). The base metal thickness excluding any protective coatings. Thickness is expressed in mils (1/1000 of an inch).

Metallic-Coated Steel. Steel that has a metallic coating for protection against corrosion. The level of protection is measured by the weight of the metallic coating applied to the surface area of the steel. Typical zinc-based coatings are galvanizing, galvalume, or galfan.

Mil. A unit of measurement used in measuring the thickness of thin steel elements. One mil equals 1/1000 of an inch (e.g., 33 mil = 0.033 inch).

Multiple Span. The span made by a continuous member with intermediate supports.

Nonstructural Stud. A member in a steel framed wall system that is limited to a lateral (transverse) load of not more than 5 lb./ft.² (240 Pa); a superimposed vertical load, exclusive of sheathing materials, of not more than 100 lb./ft. (1460 N/m); or a superimposed vertical load of not more than 200 lbs (890 N).

Punchout. A hole or opening in the web of a steel-framing member. A punchout may be made during the manufacturing process or in the field.

Rake Overhang. The horizontal projection of the roof measured from the outside face of a gable endwall to the outside edge of the roof.

Ridge. The horizontal line formed by the joining of the top edges of two sloping roof surfaces.

Rim Joist. A horizontal structural member that is connected to the end of a floor joist.

Roof Rafter. A horizontal or sloped structural framing member that supports roof loads.

Roof Snow Load. Uniform live load on the roof due to snow accumulation; equivalent to 70% of the ground snow load for one- and two-family dwellings.

Seismic Design Category (SDC). A classification assigned to a building based on the building's importance and the severity of the design earthquake ground motion at the building site as given in the local building code or, in the absence of a building code, as given in ASCE 7.

Shear Wall. A wall assembly designed to resist lateral forces from wind or seismic loads acting parallel to the plane of the wall.

Single Span. The span made by one continuous structural member without any intermediate supports.

Span. The clear horizontal distance between bearing supports.

Story. That portion of the building included between the upper surface of any floor and the upper surface of the floor next above, except that the top-most story shall be that habitable portion of a building included between the upper surface of the top-most floor and the ceiling or roof above.

Story above Grade. Any story with its finished floor surface entirely above grade except that a basement shall be considered as a story above grade when the finished surface of the floor above the basement is (a) more than 6 feet (1.8 m) above the grade plane, (b) more than 6 feet (1.8 m) above the finished ground level for more than 50 percent of the total building perimeter, or (c) more than 12 feet (3.7 m) above the finished ground level at any point.

Strap. Flat or coiled sheet steel material typically used for bracing and blocking that transfers loads by tension and/or shear.

Structural Member. A floor joist, rim joist, structural stud, wall track in a structural wall, wall plate in structural wall, ceiling joist, roof rafter, header, or other member that is designed or intended to carry loads.

Structural Stud. A stud in an exterior wall or an interior stud that supports superimposed vertical loads and may transfer lateral loads. Includes full-height wall studs, king studs, jack studs, and cripple studs.

Structural Sheathing. The covering (e.g., plywood or oriented strand board) used directly over structural members (e.g., joists) to distribute loads, brace walls, and generally strengthen the assembly.



Stud. A vertical framing member in a wall system or assembly.

Townhouse. Attached single-family dwelling units constructed in a row with each unit separated by fire walls at property lines.

Track. A framing member consisting of only a web and two flanges. Track web depth measurements are taken to the inside of the flanges.

Truss. A coplanar system of structural members joined together at their ends usually to construct a series of triangles that form a stable beam-like framework.

Wall Height. The clear vertical distance between the finished floor and the finished ceiling. Where a finished floor does not exist (i.e., crawlspace), the wall height is the clear vertical distance between the interior finish grade and the finished ceiling.

Web. The part of a C-shape or track that connects the two flanges.

Web Crippling. The localized permanent (inelastic) deformation of the web member subjected to concentrated load or reaction at bearing supports.

Web Opening. See “Punchout.”

Web Perforation. See “Punchout.”

Web Stiffener. Additional material that is attached to the web to strengthen the member against web crippling. Also called bearing or transverse stiffener.

Wind Exposure. Wind exposure in accordance with the local building code or, in the absence of a building code, in accordance with ASCE 7. For the purpose of this document, Exposures A/B represents urban, suburban, or wooded terrain. Exposure C represents open terrain with scattered obstructions.

U.S. Department of Housing and Urban Development

HUD User

PO Box 23268

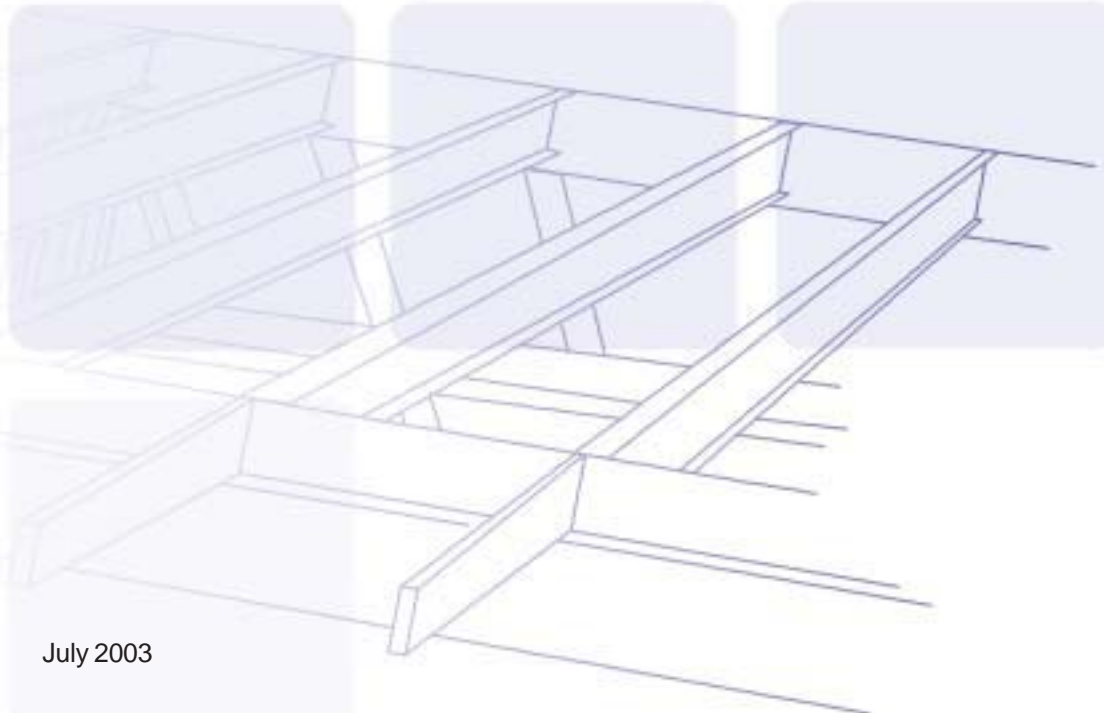
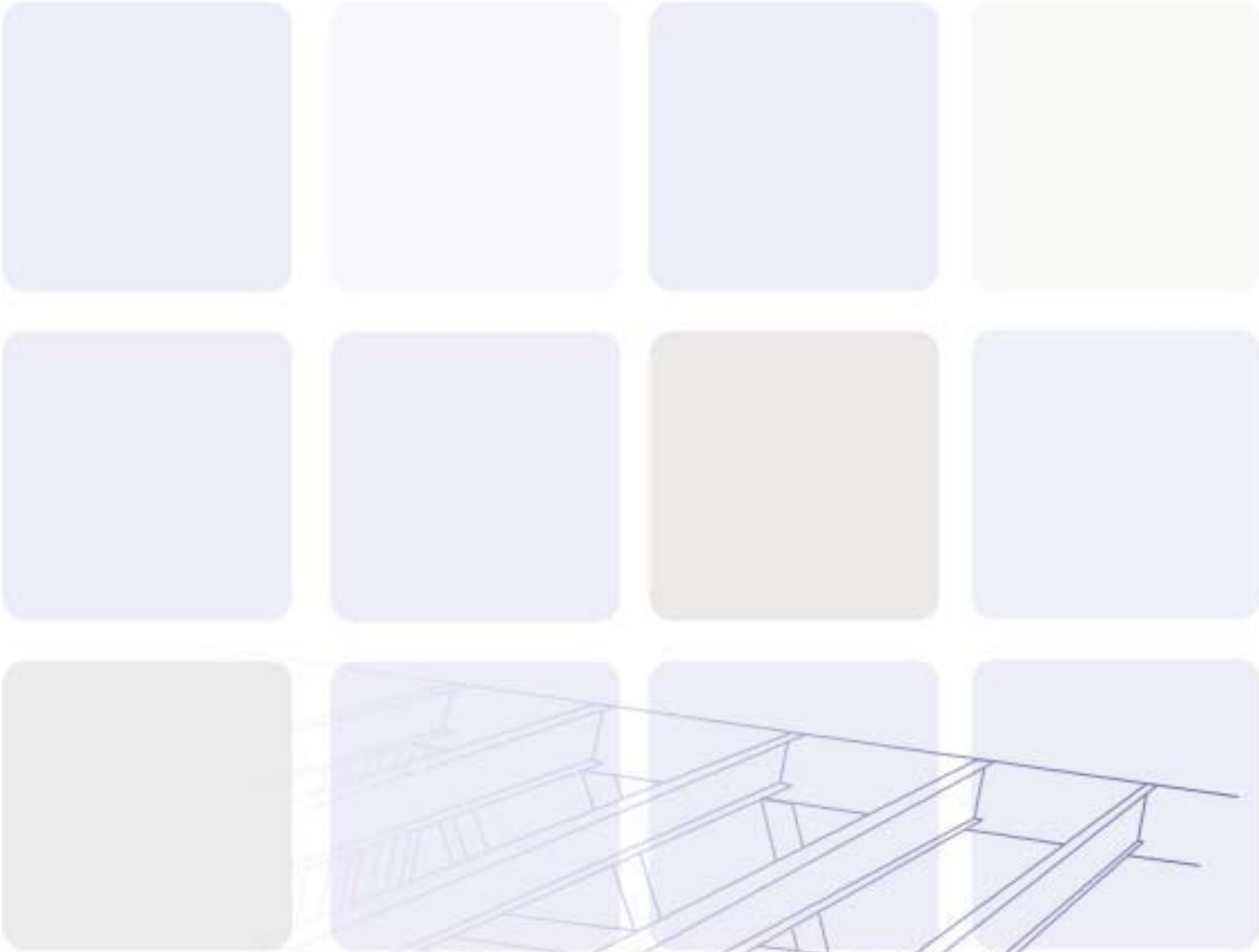
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July 2003