

SI- The Metrics International System of Units

The International System of Units (SI) is a modernized version of the metric system established by international agreement. The metric system of measurement was developed during the French Revolution and was first promoted in the U.S. by Thomas Jefferson. Its use was legalized in the U.S. in 1866. In 1902, proposed congressional legislation requiring the U.S. Government to use the metric system exclusively was defeated by a single vote.

SI provides a logical and interconnected framework for all measurements in science, industry, and commerce. The metric system is much simpler to use than the existing English system since all its units of measurement are divisible by 10.

Conversion Factors

Please note: For best printing results, set your Page Setup's Orientation to Landscape before printing.

The following list provides the conversion relationship between U.S. customary units and SI (International System) units. The proper conversion procedure is to multiply the specified value on the

left (primarily U.S. customary values) by the conversion factor exactly as given below and then round to

the appropriate number of significant digits desired. For example, to convert 11.4 ft to meters:
11.4 X

0.3048 = 3.47472, which rounds to 3.47 meters. Do not round either value before performing the multiplication, as accuracy would be reduced. A complete guide to the SI system and its use can be

found in ASTM E 380, Metric Practice.

Note that [Convert.exe](#) uses the [1959 conversion factors for distance](#) i.e. the 1959 definitions of inch and

foot and their derived measurements, the ton to kilogram conversion factor differs from the conversion

factor published on this page by 1 in the 7th digit, the Fahrenheit to Kelvin conversion factor differs by

0.017 degree Kelvin, the BTU/hour to watt conversion differs by 3 in the 4th digit, and the ft/sec² to

m/sec² conversion differs by 1 in the 6th digit.

Conversion Symbols

The prefixes and symbols listed below are commonly used to form names and symbols of the decimal

multiples and sub multiples of the SI units.

INTERIM UNITS OF MEASURE

As suggested by Federal Standard 376B
January 27, 1993

**AS USED IN THE METRIC
STANDARD ITEM TABLE EQUIVALENT**

ACRE hectare (ha)
CUBIC FOOT cubic meter (m3)
CUBIC YARD cubic meter (m3)
GALLON/MGALLON liter (L), cubic meter (m3)
HUNDRED Hundred for traffic buttons
HUNDRED WEIGHT kilogram (kg)
LINEAR FOOT meter (m)
MBOARD FEET cubic meter (m3)
MILE kilometer (km)
NAUTICAL MILE Nautical Mile
POUND kilogram (kg) for mass
newton (N) for force
SQUARE FOOT square meter (m2)
SQUARE YARD square meter (m2)
TON tonne (t)

**UNITS OF MEASUREMENT METRIC
USED IN SPECIAL PROVISIONS EQUIVALENT
AND GENERAL SPECIAL PROVISIONS**

GAGE;GAUGE METAL THICKNESS gage (mm)
FAHRENHEIT TEMPERATURE kelvin (K) or degree Celsius (C)
FATHOM WATER DEPTH meter (m)
FOOT/LBS TORQUE newton-meter (N-m)
LBS/SQ. IN PRESSURES kilopascal (kPa)
megapascal (MPa)
(if very large number)
LBS/SQ. FT kilopascal (kPa)
LBS/SQ YD kilopascal (kPa)
INCH LINEAR millimeter (mm)
KIPS;KSI TENSION kilopascal (kPa) or
megapascal (MPa)
LBS/ACRE EROSION CONTROL kilograms/hectare
LBS/CU. FT. DENSITY kilogram per cubic meter (kg/m3)
MIL THICKNESS micrometer (um)
FT. LBS./SEC. HORSE POWER watt (W)

**UNITS OF MEASUREMENTS USED METRIC
ON CONTRACT PLANS EQUIVALENT**

DEGREES/BEARINGS No change for surveying.
STATIONING 1,000 meters = 1 station

MILEPOSTS This one is still under review
as mileposts are part of the signing
issue. Use mileposts for now, but
also
state kilometerposts.

ELEVATIONS meter (m)

UNITS OF MEASUREMENT USED IN METRIC

COMMERCIAL STANDARDS EQUIVALENT

GALS/HR or MIN (PUMPS) liters per second (L/s)

500 GALLON TANKS cubic meter (m³) but it could also possibly be
in liter (L)

55 GALLON DRUMS cubic meter (m³) or liter (L)
for liquid

94 LBS/SACK (CEMENT) kilogram (kg)

DIAMETER OF REINFORCING STEEL millimeter (mm)

LBS/FT OF REINFORCING STEEL kilogram per meter (kg/m)

BUSHEL cubic meter (m³)

Length Conversion Factors

Length

To convert from to multiply by

mile (US Statute) kilometer (km) 1.609347

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 *

Area Conversion Factors

Area

To convert from to multiply by

square foot (sq ft) square meter (sq m) 0.09290304 E

square inch (sq in) square meter (sq m) 0.00064516 E

square yard (sq yd) square meter (sq m) 0.83612736 E

acre (ac) hectare (ha) 0.4047

Volume Conversion Factors

Volume

To convert from to multiply by

cubic inch (cu in) cubic meter (cu m) 0.00001639

cubic foot (cu ft) cubic meter (cu m) 0.02831685

cubic yard (cu yd) cubic meter (cu m) 0.7645549

gallon (gal) liter 4.546

Canada liquid

gallon (gal) cubic meter (cu m) 0.004546

Canada liquid

gallon (gal) liter 3.7854118

U.S. liquid**

gallon (gal) cubic meter (cu m) 0.00378541
U.S. liquid
fluid ounce (fl oz) milliliters (ml) 29.57353
fluid ounce (fl oz) cubic meter (cu m) 0.00002957

Force Conversion Factors

Force

To convert from to multiply by

kip (1000 lb) kilogram (kg) 453.6
kip (1000 lb) newton (N) 4,448.222
pound (lb) kilogram (kg) 0.4535924
avoirdupois
pound (lb) newton (N) 4.448222

Pressure or Stress Conversion Factors

Pressure or stress

kip per square megapascal (MPa) 6.894757
inch (ksi)
pound per kilogram per 4.8824
square foot (psf) square meter (kg/sq m)
pound per square pascal (Pa) 47.88
foot (psf)
pound per square pascal (Pa) 6,894.757
inch (psi)
pound per square megapascal (MPa) 0.00689476
inch (psi)

Mass Conversion Factors

Mass (weight)

pound (lb) kilogram (kg) 0.4535924
avoirdupois
ton, 2000 lb kilogram (kg) 907.1848
grain kilogram (kg) 0.0000648

Mass (weight) per length

kip per linear kilogram per meter (kg/m) 0.001488
foot (klf)
pound per linear kilogram per meter (kg/m) 1.488
foot (plf)

Mass per volume (density)

pound per cubic kilogram per cubic 16.01846
foot (pcf) meter (kg/cu m)
pound per cubic kilogram per cubic 0.5933
yard (lb/cu yd) meter (kg/cu m)

Temperature Conversion Factors

Temperature

degree Fahrenheit (F) degree Celsius (C) $t_c = (t_F - 32) / 1.8$

degree Fahrenheit (F) kelvin (K) $t_k = (t_F + 459.7) / 1.8$
kelvin (K) degree Celsius (C) $t_c = t_k - 273.15$

Energy and heat

British thermal joule (J) 1055.056
unit(Btu)
calorie (cal) joule (J) 4.1868E
Btu/degree F x hr x ft² W/m² - degree K 5.678263
kilowatt-hour (kwh) joule (J) 3,600,000E
British thermal calories per gram 0.55556
unit per pound (Btu/lb) (cal/g)
British thermal unit watt (W) 0.2930711
per hour (Btu/hr)

Power Conversion Factors

Power

horsepower (hp) watt (W) 745.6999 E
(550 ft-lb/sec)

Velocity

mile per hour (mph) kilometer per hour(km/hr) 1.60934
mile per hour (mph) meter per second (m/s) 0.44704

Permeability

darcy centimeter per 0.000968
second (cm/sec)
feet per day (ft/day) centimeter per 0.000352
second (cm/sec)

*indicates that the factor given is exact.
**One U.S. gallon equals 0.8327 Canadian gallon.
t--A pascal equals 1.000 newton per square meter.

Note:

One U.S. gallon of water weighs 8.34 pounds (U.S.) at 60 degrees F.

One cubic foot of water weighs 62.4 pounds (U.S.).

One milliliter of water has a mass of 1 gram and has a volume of one cubic centimeter.

One U.S. bag of cement weighs 94 lbs.

More Useful Conversion Factors

USEFUL CONVERSION FACTORS

Quantity From English To Metric Multiply
Units Units by*

Length mile km 1.609347

yard m 0.9144**

foot m 0.3048**

inch mm 25.40**

Area square mile km² 2.590

acre m² 4047
 acre hectare 0.4047
 square yard m² 0.8361
 square foot m² 0.092 90
 square inch mm² 645.2
Volume acre foot m³ 1 233
 cubic yard m³ 0.7646
 cubic foot m³ 0.028 32
 cubic foot L (1000 cm³) 28.32
 100 board feet m³ 0.2360
 gallon L (1000 cm³) 3.785
Mass lb kg 0.4536
 kip (1000 lb) metric ton (1000kg) 0.4536
Mass/unit length plf kg/m 1.488
Mass/unit area psf kg/m² 4.882
Mass density pcf kg/m³ 16.02
Force lb N 4.448
 kip kN 4.448
Force/unit length plf N/m 14.59
 klf kN/m 14.59
Pressure, stress,
modules of
elasticity psf Pa 47.88
 ksf kPa 47.88
 psi kPa 6.895
 ksi MPa 6.895
Bending moment, ft-lb N . m 1.356
torque, moment of force ft-kip kN . m 1.356

 * 4 significant digits
 **denotes exact conversion