THE METRIC SYSTEM

THE METRIC CONVERSION ACT OF 1975—P.L. 94–168, amended by P.L. 100–418 (August 23, 1988)—stated that the policy of the United States is to designate the metric system as the preferred system of weights and measures for United States trade and commerce. Reference is to the International System of Unit(s) or SI (from the French "Le Système International d'Unités") as modified by the Secretary of Commerce for use in the United States.

SI differs from earlier versions of the metric system in that (1) the base units are more accurately defined and (2) specific directives and guidelines are provided for use of prefixes and for the development of combined or derived units. SI and the history of its development are described in National Bureau of Standards Special Publication 330 (as revised). Other helpful and authoritative references for the use of SI are Publication E380 (as revised) of the American Society for Testing and Materials; Publication 268 (as revised) of the American National Standards Institute/Institute of Electrical and Electronic Engineers; Publication 85–1, Metric Editorial Guide (fourth edition revised), April 1985, American National Metric Council; and Federal Standard 376A, Preferred Metric Units for General Use by the Federal Government, General Services Administration.

Aside from the fact that SI units simplify measurements and calculations, a major scientific advantage of SI is that it eases the exchange of data in the many disciplines that have used inch/pound (U.S. customary) units of measure. The term "inch/pound units" not only includes units based on the inch and the pound commonly used in the United States but also includes all other (nonmetric) units not considered part of SI.

In adopting the Metric Conservation Act, the United States officially expressed its intent to join other nations in the use of SI. The amended act expressly stated that the transition to the use of the metric system by the Federal Government shall be implemented by the end of fiscal year 1992, except to the extent that such use is impractical or is likely to cause significant inefficiencies.

To ensure timely and effective compliance with P.L. 94–168, the U.S. Geological Survey would be ready by FY 1991 to begin extending the requirement to cover all new scientific reports published in the official book series, provided the requirement does not conflict with cooperators' requirements nor detract from the clarity of reports directed to mixed audiences (interdisciplinary scientists, legislators, technical personnel such as engineers, and nonscientific personnel such as planners and the general public).

All other publications series contain subject matter of differing technical complexity directed to readers of varying technical sophistication. Products run the gamut from lay-reader, information-type releases to complex mathematical treatises, and the selection of either SI, inch/pound, or dual units for a publication in one of these series is the author's responsibility—with guidance from appropriate Division staff. The decision to use a system of units should be made in the planning stage of a publication and not when project activities are near completion. This decision is especially important where SI or dual units are to be used, because it enables project personnel to familiarize themselves with what may be a new suite of units, and it improves the accuracy of published data. If dual units are used, the numbers used first should be the ones that the measurements were made in. The Survey, however, discourages dual usage.

In light of the transition to SI, the use of conversion tables is encouraged in Survey publications to expose readers to SI and to help familiarize readers with the SI units that correspond to the inch/pound units commonly used by the Survey.

The most often read SI and inch/pound units, and factors for their conversion, are given in table 5 (less common conversions are found in most good dictionaries).

Table 5. Conversion factors for SI (metric) and inch/pound (U.S. customary) units of measurement ►

[SI (International System of Units) a modernized metric system of measurement. An asterisk after the last digit of the factor indicates that the conversion factor is exact and that all subsequent digits are zero; all other conversion factors have been rounded to four significant digits. Use of hectare (ha) as an alternative name for square hectometer (hm^2) is restricted to the measurement of small land or water areas. Use of liter (L) as a special name for cubic decimeter (dm^3) is restricted to the measurement of liquids and gases. No prefix other than milli should be used with liter. Metric ton (t) as a name for megagram (Mg) should be restricted to commercial usage, and no prefixes should be used with it]

Table 5. Conversion factors for SI (metric) and inch/pound (U.S. customary) units of measurement—Continued

A. Factors for converting SI metric units to inch/pound units

To convert from	To	Multiply by
Length		
millimeter (mm)	inch (in)	0.03937
meter (m)	foot (ft)	3.281
	yard (yd)	1.094
kilometer (km)	mile (mi)	0.6214
	mile, nautical (nmi)	0.5400
Area		
meter² (m²)	foot² (ft²)	10.76
	yard² (yd²)	1.196
	acre	0.0002471
hectometer² (km²)	acre	2.471
kilometer² (km²)	mile² (mi²)	0.3861
Volume		
centimeter³ (cm³)	inch³ (in³)	0.06102
decimeter³ (dm³)	inch³ (in³)	61.02
	pint (pt)	2.113
	quart (qt)	1.057
	gallon (gal)	0.2642
	foot³(ft³)	0.03531
meter³ (m³)	foot³ (ft³)	35.31
	yard³ (yd³)	1.308
	gallon (gal)	264.2
	barrel (bbl), (petroleum, 1 bbl=42 gal)	6.290
	acre-foot (acre-ft)	0.0008107
hectometer³ (hm³)	acre-foot (acre-ft)	810.7
kilometer³ (km³)	mile³ (mi³)	0.2399
Volume per unit time (includes flow)		
decimeter³ per second (dm³/s)	foot³ per second (ft³/s)	0.03531
	gallon per minute (gal/min)	15.85
	barrel per day (bbl/d), (petroleum)	543.4
meter³ per second (m³/s)	foot³ per second (ft³/s)	35.31
	gallon per minute (gal/min)	15,850
Mass		
gram (g)	ounce avoirdupois (oz avdp)	0.03527
kilogram (kg)	pound avoirdupois (lb avdp)	2.205
megagram (Mg)	ton, short (2,000 lb)	1.102
	ton, long (2,240 lb)	0.9842
Pressure		
kilopascal (kPa)	pound-force per inch² (lbf/in²)	0.1450
	atmosphere, standard (atm)	0.009869
	bar	0.01*
	inch of mercury at 60°F (in Hg)	0.2961
Temperature		
kelvin (K)	degree Fahrenheit (°F)	[1]
degree Celsius (°C)	degree Fahrenheit (°F)	[2]

[1]Temp °F=1.8 temp K−459.67. [2]Temp °F=1.8 temp °C+32.

Table 5. Conversion factors for SI (metric) and inch/pound (U.S. customary) units of measurement—Continued

B. Factors for converting inch/pound units to SI metric units

To convert from	To	Multiply by
Length		
inch (in)	millimeter (mm)	25.4*
foot (ft)	meter (m)	0.3048
yard (yd)	meter (m)	0.9144*
mile (mi)	kilometer (km)	1.609
mile, nautical (nmi)	kilometer (km)	1.852*
Area		
foot² (ft²)	meter² (m²)	0.09290
yard² (yd²)	meter² (m²)	0.8361
acre	meter² (m²)	4,047
	hectometer² (hm²)	0.4047
mile² (mi²)	kilometer² (km²)	2.590
Volume		
inch³ (in³)	centimeter³ (cm³)	16.39
	decimeter³ (dm³)	0.01639
foot³ (ft³)	decimeter³ (dm³)	28.32
	meter³ (m³)	0.02832
yard³ (yd³)	meter³ (m³)	0.7646
pint (pt)	decimeter³ (dm³)	0.4732
quart (qt)	decimeter³ (dm³)	0.9464
gallon (gal)	decimeter³ (dm³)	3.785
	meter³ (m³)	0.003785
barrel (bbl), (petroleum, 1 bbl=42 gal)	meter³ (m³)	0.1590
acre-foot (acre-ft)	meter³ (m³)	1,233
	hectometer³ (hm³)	0.001233
mile³ (mi³)	kilometer³ (km³)	4.168
Volume per unit time (includes flow)		
foot³ per second (ft³/s)	decimeter³ per second (dm³/s)	28.32
	meter³ per second (m³/s)	0.02832
gallon per minute (gal/min)	decimeter³ per second (dm³/s)	0.06309
	meter³ per second (m³/s)	0.00006309
barrel per day (bbl/d), (petroleum)	decimeter³ per second (dm³/s)	0.001840
Mass		
ounce avoirdupois (oz avdp)	gram (g)	28.35
pound avoirdupois (lb avdp)	kilogram (kg)	0.4536
ton, short (2,000 lb)	megagram (Mg)	0.9072
ton, long (2,240 lb)	megagram (Mg)	1.016
Pressure		
pound-force per inch² (lbf/in²)	kilopascal (kPa)	6.895
atmosphere, standard (atm)	kilopascal (kPa)	101.3
bar	kilopascal (kPa)	100.*
inch of mercury at 60°F (in Hg)	kilopascal (kPa)	3.377
Temperature		
degree Fahrenheit (°F)	kelvin (K)	[3]
degree Fahrenheit (°F)	degree Celsius (°C)	[4]

[3]Temp K=(temp °F+459.67)/1.8. [4]Temp °C=(temp °F−32)/1.8