

## UNITS AND MEASURES

Fundamental measures (and their units in the SI and English systems) are:

Length	(m - meters; ft - feet)
Mass	(kg - kilograms)
Time	(s - seconds)
Temperature	(K - Kelvin; °F - degree Fahrenheit)

Derived measures (and their SI and English equivalents) are:

Area	(m <sup>2</sup> - square meters; ft <sup>2</sup> - square feet)
Volume	(m <sup>3</sup> - cubic meters; ft <sup>3</sup> - cubic feet)
Flow	(m <sup>3</sup> s <sup>-1</sup> - cms; ft <sup>3</sup> s <sup>-1</sup> - cfs [volume per time])
Force	(Newton (N) = 1 kg m s <sup>-2</sup> ; lb - pound)
Energy	(Joule (J) = 1 kg m <sup>2</sup> s <sup>-2</sup> = 1 N m ; foot pound (ft lb) )
Power	(Watt (W) = J s <sup>-1</sup> or kg m <sup>2</sup> s <sup>-3</sup> ; horsepower (HP) )
Pressure	(Pascal (Pa) = 1 N m <sup>-2</sup> ; pounds per sq in (psi) - lb in <sup>-2</sup> )

Prefixes used to construct decimal multiples of metric units

10 <sup>-1</sup> deci (d)	10 <sup>1</sup> deca (da)
10 <sup>-2</sup> centi (c)	10 <sup>2</sup> hecto (h)
10 <sup>-3</sup> milli (m)	10 <sup>3</sup> kilo (k)
10 <sup>-6</sup> micro (μ)	10 <sup>6</sup> mega (M)
10 <sup>-9</sup> nano (n)	10 <sup>9</sup> giga (G)
10 <sup>-12</sup> pico (p)	10 <sup>12</sup> tera (T)
10 <sup>-15</sup> femto (f)	10 <sup>15</sup> peta (P)
10 <sup>-18</sup> atto (a)	10 <sup>18</sup> exa (E)

Physical Constants:

Standard Gravity	$g = 9.807 \text{ m s}^{-2} = 32.174 \text{ ft s}^{-2}$
Density of water (4°C)	$1000 \text{ kg m}^{-3} = 1 \text{ g cm}^{-3}$
Specific Weight of Water (15°C)	$62.4 \text{ lb ft}^{-3} = 9800 \text{ N m}^{-3}$
Kinematic Viscosity (15°C)	$1.141 \times 10^{-6} \text{ m}^2 \text{ s}^{-1} = 1.217 \times 10^{-5} \text{ ft}^2 \text{ s}^{-1}$

Conversion formulas:

$^{\circ}\text{C} = (5/9) (^{\circ}\text{F} - 32)$	$\text{K} = ^{\circ}\text{C} + 273.15$
$^{\circ}\text{F} = (9/5) ^{\circ}\text{C} + 32$	

## Useful Conversions:

- Length:

1 inch (in) = 2.540 cm

1 foot (ft) = 0.3048 m

1 mile (mi) = 5280 feet

1 nautical mile (nmi) = 1852 m

1 furlong = 110 fathoms = 660 feet = 1/8 miles

- Mass - Weight - Force:

1 kg = 2.204623 pounds (lbs)

1 lb = 4.448 N

1 ton = 2000 lbs

1 metric ton = 1000 kg

- Time

1 day = 86400 seconds

- Area

1 acre (ac) = 43560 ft<sup>2</sup>

1 square mile (mi<sup>2</sup>) = 640 acres  
= 2.59 km<sup>2</sup>

- Volume

1 cubic centimeter (cc) = 1 milliliter (ml) 1 liter = 0.264179 gallons (gal)

1 gallon = 231 cubic inches

1 cubic foot = 7.481 gallons

1 acre-foot (ac-ft) = 43560 ft<sup>3</sup> = (43560/86400) or .504167 cfs-days

1 cfs-day (cfsd) = 86400 ft<sup>3</sup> = (86400/43560) or 1.983471 acre-feet

- Flow

1 cms = 35.315 cfs

1 gal/min = 0.002228 cfs

1 MGD (10<sup>6</sup> gal day<sup>-1</sup>) = 1.547 cfs

- Pressure

100 Pa = 1 millibar (mb)

1 lb in<sup>-2</sup> = 6895 Pa

1 Standard Atmosphere = 1013.25 mb = 101.325 kPa

= 14.696 lb in<sup>-2</sup>

= 760 mm Hg = 29.92 in Hg

- Energy

1 foot-pound = 1.35582 J

1 calorie (cal) = 4.186 J

1 BTU = 252.08 cal

1 Langley = 1 cal cm<sup>-2</sup>

- Power

1 horsepower = 550 ft lb s<sup>-1</sup> = 745.7 W