

Constants	
π	3.1416
1 ft ² of equivalence of direct radiation (EDR)	240 Btuh – steam 150 Btuh - Water
1 U.S. gal.	8.33 lb.
1 Imp gal.	10.00 lb.
1 m	3.33 ft.
1 ft ³	6.23 Imp Gal.
1 cm ³	1 ml
12 000 BTU of cooling	1 ton
Pressure head conversion unit (PHCU)	0.433 psi/ft. 9.81 kPa / m
Travel offset of a 45° elbow	1.414

Coefficients	
Coefficient of linear expansion per 1 ° F	Coefficient of linear expansion per 1 ° C
ABS 0.0000550	0.0000990
Brass 0.0000105	0.0000189
Cast iron 0.0000059	0.0000108
Copper 0.0000095	0.0000171
PVC 0.0000330	0.0000594
Steel 0.0000067	0.0000120

Conversion factors		
To convert	To	Multiply by
°C	°F	1.8 and add 32
gpg	ppm	17.12
kg	lb.	2.205
kg/m ³	lb./ft ³	0.06243
kN	lb.	224.81
kN/m	lbf/ft.	68.52
kN/m ³	lbf/ft ³	6.360
kPa	lbf/ft ²	20.88
kPa	lbf/in ²	0.1450
L	gal. imp.	0.2200
L/s	gpm	13.20
m	ft.	3.281
m ²	ft ²	10.76
mm	in.	0.03937
m/s ²	ft./s ²	3,281

Formula		
Absolute Pressure	Gauge pressure + atmospheric pressure	$P_{gauge} + P_{atm}$
Area of Rectangle	Length x width	$L \times W$
Area of Circle	$Pi \times \text{radius}^2$	πr^2
British Thermal Units (BTUs)	Volume x pounds per gallon x change in temperature	$V \times lb/gal \times \Delta T$
Circumference of Circle	$Pi \times \text{diameter}$	πD
Circumference of Rectangle	$2 \times (\text{length} + \text{width})$	$2 (L + W)$
Force	Pressure x area	$P \times A$
Grade	Drop (or rise) ÷ run	$\frac{d \text{ (or } r\text{)}}{run}$
Hydrostatic (Head) Pressure	Density of liquid x acceleration due to gravity x height	$p \times g \times h$
Linear Expansion	Original length x co-efficient of linear expansion x change in temperature	$L_0 \times \alpha \times \Delta T$
Pressure	Height x density	$H \times d$
Pressure Loss	Pressure head conversion unit x change in elevation (height)	$PHCU \times \Delta h$
Pythagorean Theorem	Side a^2 + side b^2 = side c^2	$a^2 + b^2 = c^2$
Temperature difference	Btuh ÷ (500 x gallons per minute)	$\frac{Btuh}{500 \times gpm}$
Volume of Cube	length x width x height	$L \times W \times H$
Volume of Cylinder	$Pi \times \text{radius}^2 \times \text{height}$	$\pi r^2 h$
Volume of Sphere	$(4 \times pi \times \text{radius}^3) \div 3$	$\frac{4\pi r^3}{3}$

Measurement Unit Abbreviations	
°C	degree Celsius
°F	degree Fahrenheit
ΔT	temperature difference
BTU	British thermal unit
Btuh	British thermal units per hour
ft.	foot
gpg	grains per gallon
gpm	gallons per minute
in.	inch
kg	kilogram
kN	kilonewton
kPa	kilopascal
L	litre
lb.	pound
lbf	pound-force
m	metre
mm	millimetre
ppm	parts per million
N·m	newton meter
psi	pounds per square inch
s	second
U.S. gal.	American gallon