Acronyms

°C	degree Celsius
°F	degree Fahrenheit
ABS	acrylonitrile-butadiene-styrene
ASME	American Society of Mechanical Engineers
BTU	British thermal unit
Btu/ft./h	British thermal units per foot per hour
Btu/ft²/h	British thermal units per square foot per hour
Btuh	British thermal units per hour
cm	centimetre
cm²	square centimetre
CPR	cardiopulmonary resuscitation
CPVC	chlorinated polyvinyl chloride
CSA	Canadian Standards Association
D	diameter
DCVA	double check valve assembly
DISS	Diameter Index Safety System
DWV	drainage, waste and vent
FIP	female iron pipe
ft.	foot
ft./s	feet per second
ft²	square foot
gal.	gallon
GFI	ground fault interrupter
gpg	grains per gallon
gph	gallons per hour
gpm	gallons per minute
HDPE	high-density polyethylene
hr	hour
ID	inside diameter
in.	inch
in./ft.	inches per foot
JHA	job hazard analysis
kPa	kilopascal
kPa/m	kilopascals per metre
kW	kilowatt
L/s	litres per second
L	litre
lb.	pound
LOTO	lock out tag out

Acronyms (continued)

LPF	litres per flush
LPM	litres per minute
LWCO	low water cut-off
m	metre
m/s	metres per second
m^2	square metre
min	minute
MIP	male iron pipe
MJ	mechanical joint
mm	millimetre
No.	number
NPC	National Plumbing Code
NPS	nominal pipe size
NPT	National Pipe Thread
OHS	Occupational Health and Safety
PEX	cross-linked polyethylene
pH	potential of hydrogen
PPE	personal protective equipment
ppm	parts per million
PRV	pressure reducing valve
psi	pounds per square inch
psig	pounds per square inch gauge
PVC	polyvinyl chloride
RFI	request for information
RO	reverse osmosis
RP	reduced pressure principle backflow preventer
RV	recreational vehicle
s	second
SAE	Society of Automotive Engineers
SDS	safety data sheet
T&P	temperature and pressure
TDS	total dissolved solids
U.S. gal.	American gallon
U.S. gph	American gallons per hour
UV	ultraviolet
V	volt
VFD	variable frequency drive
w.c.	water column
WHMIS	Workplace Hazardous Materials Information System
WOG	water, oil, gas

Formulas

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
psi	pounds per square inch
s	second
U.S. gal.	American gallon

Constants

π	3.1416
1 ft² of equivalence of direct radiation (EDR)	240 Btuh
1 U.S. gal.	8.33 lb.
12 000 BTU of cooling	1 ton
Pressure head conversion unit	0.433 psi/ ft.
Travel offset of a 45° elbow	1.414

Coefficients

Material	**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 / m³	lb. / ft³	0.06243
kN	lb.	224.81
kN / m	lbf / ft.	68.52
kN / m³	lbf / ft³	6.360
kPa	lbf / ft²	20.88
kPa	lbf / in²	0.1450
L	gal. imp.	0.2200
L / s	gpm	13.20
m	ft.	3.281
m²	ft²	10.76
mm	in.	0.03937
m / s²	ft. / s²	3,281

General formulas

Description	Full	Abbreviated
Boyle's law	$\frac{\text{volume}_1}{\text{volume}_2} = \frac{\text{pressure}_2}{\text{pressure}_1}$	$\frac{V_1}{V_2} = \frac{P_1}{P_2}$
Charles' law	$\frac{\text{volume}_1}{\text{temperature}_1} = \frac{\text{volume}_2}{\text{temperature}_2}$	$\frac{V_1}{T_1} = \frac{P_1}{T_2}$

General formulas (continued)

Expansion	length × temperature difference × coefficient of expansion	$L \times \Delta T \times \alpha$
Force	pressure × area	$P \times A$
gpm	$\frac{\text{BTU}}{\text{pounds per gallon} \times \text{temperature difference}}$	$\frac{\text{BTU}}{\text{lb./gal.} \times \Delta T}$
gpm	$\frac{\text{total Btuh}}{\text{temp. diff.} \times \text{mass} \times \text{specific heat capacity}}$	$\frac{\text{total Btuh}}{\Delta T \times M \times \text{spec. heat cap.}}$
Grade	$\frac{\text{drope or rise}}{\text{run}}$	
Grains	(number of persons × gallons per day) × (hardness in grains + iron concentration × days of regeneration	
Grains removal rate	water usage × grains per gallon × regeneration value	
Litres	area × rainfall intensity	A × rainfall intensity
Watt's law	power = voltage × current	$P = V \times I$
Pressure	height × density	H × dens.

Hydronic thermal formulas

Temperature difference	$\frac{\text{Btuh}}{500 \times \text{gallons per minute}}$	$\frac{\text{Btuh}}{500 \times \text{gpm}}$
gpm	$\frac{\text{Btuh}}{500 \times \text{temperature difference of water}}$	$\frac{\text{Btuh}}{500 \times \Delta T\,(\text{water})}$
Btuh	gallons per minute × 500 × temperature difference	gpm × 500 × ΔT

Area formulas

Circle	$\pi \times \text{radius}^2$	πr^2
Cylinder (open top)	$(\pi \times \text{radius}^2) + (\pi \times \text{diameter} \times \text{height})$	$\pi r^2 + \pi DH$
Cylinder (totally enclosed)	$(2 \times \pi \times \text{radius}^2) + (\pi \times \text{diameter} \times \text{height})$	$2\pi r^2 + \pi DH$
Rectangle	length × width	$L \times W$
Rectangle box (open top)	$(\text{length} \times \text{width}) + 2(\text{width} \times \text{height}) + 2(\text{length} \times \text{height})$	$(L \times W) + 2(W \times H) + 2(L \times H)$
Rectangle box (totally enclosed)	$2(\text{length} \times \text{width}) + 2(\text{width} \times \text{height}) + 2(\text{length} \times \text{height})$	$2(L \times W) + 2(W \times H) + 2(L \times H)$
Sphere	$4 \times \pi \times \text{radius}^2$	$4\pi r^2$
Triangle	$\frac{\text{base} \times \text{height}}{2}$	$\frac{B \times H}{2}$

Circumference and perimeter formulas

Circle	$\pi \times \text{diameter}$	πD
Rectangle	$2 \times (\text{length} + \text{width})$	$2(L + W)$
Triangle	side a + side b + side c	a + b + c

Volume formulas

Cylinder	$\pi \times \text{radius}^2 \times \text{height}$	$\pi r^2 H$
Rectangle box	length × width × height	L × W × H
Sphere	$\frac{4 \times \pi \times \text{radius}^3}{3}$	$\frac{4\pi r^3}{3}$