Plumber Level 1

ACRONYMS AND ABBREVIATIONS

TERM	MEANING
°C	degree Celsius
ABV	automatic bypass valve
dBA	A-weighted decibels
DWV	drain, waste, and vent
ID	inside diameter
OD	outside diameter
OS&Y	outside screw and yoke
PEX	cross-linked polyethylene
psia	pounds per square inch area
psig	pounds per square inch gauged
PVC	polyvinylchloride
RPM	revolutions per minute
UV	ultraviolet

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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
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 ft^2 of equivalent direct radiation (EDR)	240 Btuh
1 US 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
Latent heat of fusion	144 BTU/lb.
Latent heat of vaporization	970 BTU/lb.

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 (mild)	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

GENERAL FORMULAS

Description	Full	Abbreviated
Boyle's law	$volume_1 \times pressure_1 = volume_2 \times pressure_2$	$V_1P_1 = V_2P_2$
Charles' law	$\frac{volume_1}{temperature_1} = \frac{volume_2}{temperature_2}$	$\frac{V_1}{T_1} = \frac{V_2}{T_2}$
Expansion	$length \times temperature\ difference \times coefficient\ of\ expansion$	$L \times \Delta T \times \alpha$
Force	$pressure \times area$	$P \times A$
gpm	$\frac{Btuh}{pounds\ per\ gallon \times temperature\ difference \times 60}$	$\frac{Btuh}{lb./gal. \times \Delta T \times 60}$
gpm	$\frac{total\ Btuh}{temp\ diff. \times mass \times specific\ heat\ capacity \times 60}$	$\frac{total\ Btuh}{\Delta T \times M \times spec.heat\ cap. \times 60}$
Grade	$\frac{drop\ or\ rise}{run}$	
Grains	$(number\ of\ persons \times gallons\ per\ day) \times (hardness\ in\ grains + iron\ concentration) \times days\ of\ regeneration$	
Grains removal rate	$water\ usage \times grains\ per\ gallon \times regeneration\ value$	
Litres	$area \times rainfall\ intensity$	$area \times rainfall\ intensity$
Watt's law	$power = voltage \times current$	$power = V \times I$
Pressure	$height \times density$	$H \times dens.$

HYDRONIC THERMAL FORMULAS

Description	Full	Abbreviated
Temperature difference	$\frac{Btuh}{500 \times gallons\ per\ minute}$	$\frac{Btuh}{500 \times gpm}$
gpm	$\frac{Btuh}{500 \times temperature\ difference\ of\ water}$	$\frac{Btuh}{500 \times \Delta T\ (water)}$
Btuh	$gallons\ per\ minute \times 500 \times temperature\ difference$	$gpm \times 500 \times \Delta T$

AREA FORMULAS

Circle	$\pi \times radius^2$ or $diameter^2 \times 0.7854$	πr^2
Cylinder (open top)	$(\pi \times radius^2) + (\pi \times diameter \times height)$ or $(diameter^2 \times 0.7854) + (\pi \times diameter \times height)$	$\pi r^2 + \pi DH$ or $D^2 \times 0.7854 + \pi DH$
Cylinder (totally enclosed)	$(2 \times \pi \times radius^2) + (\pi \times diameter \times height)$ or $(2 \times diameter^2 \times 0.7854) + (\pi \times diameter \times height)$	$2\pi r^2 + \pi DH$ or $2D^2 \times 0.7854 + \pi DH$
Rectangle	$length \times width$	$L \times W$
Rectangle box (open top)	$(length \times width) + 2\,(width \times height) + 2\,(length \times height)$	$(L \times W) + 2(W \times H) + 2\,(L \times H)$
Rectangle box (totally enclosed)	$2\,(length \times width) + 2\,(width \times height) + 2\,(length \times height)$	$2\,(L \times W) + 2(W \times H) + 2\,(L \times H)$
Sphere	$4 \times \pi \times radius^2$ or $4 \times diameter^2 \times 0.7854$	$4\pi r^2$ or $4D^2 \times 0.7854$
Triangle	$\frac{base \times height}{2}$	$\frac{B \times H}{2}$

CIRCUMFERENCE AND PERIMETER FORMULAS

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

VOLUME FORMULAS

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

DENSITY FORMULAS

Density	$\frac{mass}{volume}$	$D = \frac{m}{v}$
Relative Density	$\frac{Density\ of\ substance}{Density\ of\ water}$	

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